

**BOE Meeting Template**  
**Monday, March 22, 2010 6:30 PM**  
Town Hall, 4 Vision Boulevard, Somers, CT 06071

1. BUDGET PRESENTATION TO BOARD OF FINANCE - 6:30 PM - TOWN HALL  
The regular Board of Education meeting will be held in the Board of Selectmen conference room at the Town Hall immediately following the budget presentation to the Board of Finance beginning at 6:30 p.m..
2. CALL TO ORDER
3. PLEDGE OF ALLEGIANCE
4. APPROVAL OF MINUTES 3
5. AUDIENCE TO CITIZENS/STAFF/STUDENTS
6. CORRESPONDENCE
7. OPPORTUNITY TO ADD/DELETE AGENDA ITEMS
8. CONSENT AGENDA
  - 1. Approval of Bills 7
  - 2. Retirement Notification (A. Poitras) 11  
Anna Poitras, SHS Business Ed teacher has submitted her intent to retire at the conclusion of this school year. Ms. Poitras has been employed by the Somers BOE since 1970.
9. NEW BUSINESS
  - 1. Approval of Science Electives: Anatomy/Physiology Gr. 11 & 12; AP Biology; AP Chemistry Gr. 12; Astronomy Gr. 11 & 12; Biotechnology; Physics; Honors Chemistry Gr. 11 & 12; Marine Science Gr. 11 & 12; Science & Law Gr. 11 & 12; 12  
The K-10 Science curriculum was approved by the Board of Education in June of 2008. The nine documents up for approval are the 11<sup>th</sup> and 12<sup>th</sup> grade electives that have not been previously approved. Included are:  
Anatomy and Physiology  
AP Biology  
AP Chemistry  
Astronomy  
Biotechnology  
Chemistry – Honors  
Marine Biology  
Physics  
Science and Law
  - 2. Approval of Curriculum Development Guide 117  
The Curriculum Development Guide was revised to ensure that our curriculum and curriculum development process meets the state guidelines for curriculum. In previous iterations, the UbD units have not been included as part of the curriculum. As the next cycle of curriculum revision begins, subject areas will have to include their unit plans in the official curriculum documents. The revision timeline has been adjusted to ensure that multiple core areas of instruction are not in revision at the same time and that roughly the same number of teachers are engaged in revision in any given year. This will cause less variation in the amount of money requested for curriculum revision from year-to-year and ensure that the elementary staff is not overloaded with simultaneous revisions.
  - 3. First Warning of TIDE Textbooks 150  
As part of implementing their approved curriculum, the Tech Ed. teachers at the high school have requested classroom sets of three books.

<b>Course</b>	<b>Book</b>
Welding	<u>Welding Technology Fundamentals</u>
Solid Modeling and Design	<u>Print Reading for Industry</u>
Digital Photo	<u>Complete Adobe Photoshop CS4 for Digital Photographers</u>

The books are available in Central Office for perusal. Second warning/adoption will be included on the 4/12/10 board agenda.

4. Second Warning/Adoption of DBS Code 4122: Student Teachers 157  
This policy was first warned at the 3/8/10 BOE meeting and is now ready for adoption.
5. Open Choice Student Enrollment 2010-2011 159  
The recommendation from the CSDE Commissioner is to increase our number of seats for Choice students for the 2010-2011 school year by 11 students. Given the uncertainty of our budget and the potential for significant increases in class sizes over the next few years, acceptance of this recommendation will dramatically impact our class size problem.
6. Nonrenewals  
In accordance with the provisions of Connecticut General Statutes Section 10-151 applicable to the nonrenewal of nontenured teachers, the law requires that nontenured teachers be notified prior to April 1st that their contracts will not be renewed at the end of the school year. I am requesting the board's vote to nonrenew the contract of Susan Atwood as per my recommendation and approval for the superintendent to notice such nontenured staff.
10. OLD BUSINESS
11. ADMINISTRATIVE REPORTS
  1. Somers Public Library Update
12. COMMITTEE REPORTS
  1. Budget
  2. Curriculum
  3. Policy
  4. Salary & Negotiations
  5. Planning
  6. Other Committees
13. OTHER
14. ADJOURNMENT
15. 3/22/10 Minutes 163

**SOMERS BOARD OF EDUCATION**

Ninth District Road  
Somers, CT 06071  
[www.somers.k12.ct.us](http://www.somers.k12.ct.us)

**MINUTES OF THE MEETING – March 8, 2010**

**Members Present:** D.Palmer, S.Bollinger, B.Devlin, M.Marquardt, T.Potrikus, R.Lees  
**Members Absent:** A.Kirkpatrick, J.Formeister, J.Taylor  
**Administrators Present:** M.Suffredini, P.Collin, K.Pezza, B.Boutwell, R.Kapner  
**Staff Present:** P.Goduti  
**Citizens Present:** Dick and Deb Stone  
**Students Present:** None in attendance  
**Others:**

**1.0 BUDGET HEARING – SES AUDITORIUM**

Dr. Suffredini presented the Board of Education’s Proposed 2010-2011 Budget to the citizens in attendance. Dr. Suffredini responded to questions.

**2.0 CALL TO ORDER**

The regular meeting of the Board of Education was called to order at 8:11 p.m. by Chairman Palmer in the Somers Elementary School Media Center.

**3.0 PLEDGE OF ALLEGIANCE**

**4.0 APPROVAL OF MINUTES**

**4.1** February 22, 2010 Regular Meeting – It was MOVED (B.Devlin) SECONDED (S.Bollinger) to approve the February 22, 2010 Board of Education regular meeting minutes as corrected. PASSED 6-0

The February 22, 2010 minutes were corrected as follows:

7.2 Requests for Leaves: 7.2.4 add “PASSED 7-0” as the end of the sentence.

**5.0 AUDIENCE TO CITIZENS/STAFF/STUDENTS**

**5.1** Mr. and Mrs. Stone expressed their concerns to the Board regarding alleged incidents of bullying and discrimination directed toward their two daughters by the dance team’s advisor while participating in the Somers High School Dance Team program. Chairman Palmer admonished the Stones about making negative comments about the Dance Team Advisor in a public forum. The Stones responded by saying they wanted the advisor “out” now. Chairman Palmer responded that the Board is taking this situation very seriously. The Superintendent is in dialogue with administration.

**5.2** Dr. Collin reported that the Somers Early Start Preschool has maintained its NAEYC Academy for Early Childhood Program accreditation and that the program was commended for providing high quality care and education for the children and families involved.

## **6.0 CORRESPONDENCE**

Chairman Palmer reported receipt of the following:

- A letter from an anonymous sender regarding the high school dance team.
- Correspondence from NEASC.

## **7.0 OPPORTUNITY TO ADD/DELETE AGENDA ITEMS**

### **8.0 CONSENT AGENDA**

#### **8.1 Approval of Bills 3/8/10 (\$104,373.27)**

It was MOVED (T.Potrikus) SECONDED (B.Devlin) to approve the 3/8/10 Bills in the amount of \$104,373.27 as presented. PASSED 6-0

### **9.0 NEW BUSINESS**

#### **9.1 First Warning of DBS Code 4122: Student Teachers**

The Policy Committee revised this policy based on changes recommended by CABE. Second Warning/Adoption will be scheduled for the March 22<sup>nd</sup> BOE Meeting.

#### **9.2 SHS Field Trip Request – Washington, D.C.**

Somers High School Social Studies Teacher, Phil Goduti, presented the itinerary and details of the trip to the Board.

It was MOVED (B.Devlin) SECONDED (T.Potrikus) to approve the overnight field trip request to travel to Washington, D.C. with Somers High School AP American History students scheduled for May 29, 2010-May 31, 2010 as presented by Mr. Goduti. PASSED 6-0

T. Potrikus questioned if the number of chaperones per student scheduled for this field trip conformed to Board Policy. Mr. Goduti stated that currently there are four chaperones for 33 students. A fifth chaperone is available if needed. After further discussion it was determined that the trip does adhere to Board policy.

## **10.0 OLD BUSINESS**

### **11.0 ADMINISTRATIVE REPORTS**

Dr. Suffredini reported the following:

- The Somers High School Wrestling Team won the Class S State Wrestling Championship. Dr. Suffredini congratulated the team and coaches.
- CMT and CAPT testing will continue through the month of March. All state testing will be concluded on March 26<sup>th</sup>.
- Connecticut was not selected to receive funding from the Race to the Top grant. Dr. Suffredini would like to have the Board vote on whether or not Somers should participate in the second application presentation process. This discussion will be scheduled for a future BOE meeting when more information becomes available.
- Commissioner of Education, Dr. McQuillan, has recommended that Somers accept an additional eleven Choice students for the 2010-2011 school year. Dr. Suffredini would like the Board to discuss and vote on the Commissioner's recommendation at the March 22<sup>nd</sup> BOE meeting.
- Dr. Suffredini and Mr. Boutwell will be meeting with the school's insurance provider this week.
- Dr. Suffredini will present the BOE's Proposed 2010-2011 Budget to the PTSA on March 18<sup>th</sup>.

## 12.0 COMMITTEE REPORTS

### 12.1 Budget

- The Board of Education will present their 2010-2011 Proposed Budget to the Board of Finance on March 15<sup>th</sup>.
- The Board of Education & Town Public Hearing is scheduled for May 3<sup>rd</sup> and the Annual Town Meeting is scheduled for May 17<sup>th</sup>. The Budget Referendum is scheduled for May 25<sup>th</sup>.
- Representative Bacchiochi and Senator Kissel will be speaking at the Board of Selectmen's meeting on March 11<sup>th</sup>. Board members were encouraged to attend.

### 12.2 Curriculum

Approval/Adoption of the Tech Ed textbooks, the revised Curriculum Development Guide and the high school science electives will be on the March 22<sup>nd</sup> BOE meeting agenda.

### 12.3 Policy

The next meeting is scheduled for March 25<sup>th</sup>.

### 12.4 Salary & Negotiations

Will be discussed in Executive Session.

### 12.5 Planning Committee

Nothing to report until CIP is approved.

### 12.6 Other Committees

## 13.0 OTHER

- Chairman Palmer reported that he, along with B.Boutwell and Dr. Suffredini, have met with the First Selectman, Lisa Pellegrini, to investigate possible areas where the town and schools might be able to collaborate services. There is a follow-up meeting scheduled for this week.

A meeting was held today with the school's telephone system provider and town and school personnel to explore collaboration of services.

S. Bollinger reported that she and First Selectmen, Lisa Pellegrini, met with J.MacFeat to learn how the school energy management system operates.

- A question was raised regarding the additional student out-placement reported on the March 1, 2010 enrollment report. The Board questioned if this additional out-placement had any significant impact on the budget. Dr. Collin and Mr. Boutwell both responded that the budget impact is minimal.
- A congratulatory letter will be sent to the High School Wrestling Team and Coaches.
- S. Bollinger presented some suggestions that may help the Somers Public Library monitor the team room. Mrs. Bollinger will present her suggestions to the Library Board of Directors.
- S. Bollinger commented on how much information was in the recent issue of *Campus View*. Mrs. Bollinger reported that *North Central News* has expressed interest in printing future issues of *Campus View* in their publication. Dr. Suffredini will contact the editor to discuss this option.

**14.0 EXECUTIVE SESSION (Negotiations)**

It was MOVED (R.Lees) and SECONDED (B.Devlin) to move into EXECUTIVE SESSION for the purpose of negotiations at 9:19 p.m. PASSED 6-0

The Board came out of EXECUTIVE SESSION at 9:40 p.m.

**15.0 ADJOURNMENT**

It was MOVED (T.Potrikus) and SECONDED (B.Devlin) to adjourn the regular meeting of the Somers Board of Education at 9:41 p.m. PASSED 6-0

Respectfully submitted,

Rick Lees, Jr., Secretary  
Joan Jaquith, Recording Secretary

These minutes are not official until approved at a subsequent meeting.

# Somers Board of Education General Budget Treasury Warrant

Report # 5026

Check Batch: 1540  
 Check Header: (N / A)  
 Check Numbers: (First) - (Last)  
 Check Dates: (Earliest) - (Latest)  
 Cash Account Numbers: (First) - (Last)  
 Bank Account Code: (N/A)  
 Check Authorization Code: AP GB  
 Minimum Check Amount: \$0.00  
 Sorted By:  
 Include Payable Information: No  
 Include Payable Dist Information: No  
 Include Authorization Information: Yes

Batch #	Check #	Check Date	Vendor Code	Vendor Name	Electronic Amount	Check Amount
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Approved by:  Date: 3/17/10  
William B. Boutwell, Director of Business Services

1540	963	03/22/2010	V58674	Administrator, Unemployment Compensation	0.00	315.00
	964	03/22/2010	V52847	American School for the Deaf	0.00	3,354.00
	965	03/22/2010	V52306	Ameripride	0.00	88.46
	966	03/22/2010	V60041	Anthem Blue Cross and Blue Shield	0.00	185,759.89
	967	03/22/2010	V00555	AT&T	0.00	84.46
	968	03/22/2010	E00025	Boutwell, Bill	0.00	30.00
	969	03/22/2010	V60085	Camphill Special School, Inc.	0.00	11,159.00
	970	03/22/2010	E00038	Collin, Patricia	0.00	245.50
	971	03/22/2010	V00167	Colonial Flower Shop	0.00	35.00
	972	03/22/2010	E00076	Cotzin, Gary	0.00	61.50
	973	03/22/2010	V00204	CREC	0.00	428.23
	974	03/22/2010	V54198	Dartware, LLC	0.00	198.90
	975	03/22/2010	E00091	Dewey, Linda	0.00	65.11
	976	03/22/2010	E00096	Duffy, Margaret	0.00	36.00
	977	03/22/2010	V00605	Electrical Wholesalers	0.00	202.50
	978	03/22/2010	V54168	First Student, Inc	0.00	4,033.05
	979	03/22/2010	V01563	Follett Educational Services	0.00	137.18
	980	03/22/2010	V00314	Follett Library Resources	0.00	171.23
	981	03/22/2010	E00121	Goduti, Philip	0.00	203.30
	982	03/22/2010	V60035	Google, Inc.	0.00	6.38

## Somers Board of Education General Budget Treasury Warrant

Batch #	Check #	Check Date	Vendor Code	Vendor Name	Electronic Amount	Check Amount
	983	03/22/2010	V53439	Group Dynamic	0.00	105.45
	984	03/22/2010	V60211	Gym Closet	0.00	297.70
	985	03/22/2010	V51232	Hartford Hospital	0.00	11,214.00
	986	03/22/2010	V60227	Healy Awards, Inc	0.00	572.45
	987	03/22/2010	V54063	HSABank	0.00	13.50
	988	03/22/2010	V60219	Industrial Fans Direct	0.00	259.00
	989	03/22/2010	V02898	MAGNAKLEEN	0.00	325.50
	990	03/22/2010	E00226	Messenger, Linda	0.00	377.33
	991	03/22/2010	E00234	Morrow, Jim	0.00	10.61
	992	03/22/2010	V01013	NASCO Fort Atkinson	0.00	333.75
	993	03/22/2010	V01911	Natchaug Hospital	0.00	5,130.00
	994	03/22/2010	V60068	Pro-Ed, Inc.	0.00	68.20
	995	03/22/2010	V53356	ProCom Telecommunications Corp	0.00	1,100.70
	996	03/22/2010	V01292	School Specialty, Inc.	0.00	190.15
	997	03/22/2010	V02404	Somers Ace Hardware	0.00	412.35
	998	03/22/2010	V00486	Somers High School	0.00	9,439.53
	999	03/22/2010	V00886	Somers Lunch Program	0.00	10.50
	1000	03/22/2010	V01591	Town of Somers	0.00	2,941.92
	1001	03/22/2010	V00547	Sullivan, Schoen, Campane & Connon, LLC	0.00	1,969.35
	1002	03/22/2010	V54314	Teacher Created Resources	0.00	165.87
	1003	03/22/2010	V60076	The Ockers Company	0.00	95.50
	1004	03/22/2010	E00399	Tomson, Catherine	0.00	20.00
	1005	03/22/2010	V01638	Tree House, The	0.00	349.53
	1006	03/22/2010	V00766	Valley Communications Systems, Inc.	0.00	153.00
	1007	03/22/2010	V54059	Verizon Wireless	0.00	339.88
	1008	03/22/2010	V60223	Ward's National Science	0.00	123.09
	1009	03/22/2010	V60210	Youthlight Inc.	0.00	193.31
<b>Totals:</b>					0.00	\$242,826.86

47 Checks Listed.

# Somers Board of Education General Journal Register

Report # 5012

Batch: 1532

Transaction: N/A

Show Summary Only: Yes

<b>Batch #</b> 1532	<b>Control Total</b> \$242,826.86	<b>Status</b> Posted	<b>Created By</b> lbergamini	<b>Created On</b> 03/12/2010	<b>Last Updated By</b> lbergamini	<b>Last Updated On</b> 03/16/2010
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<b>General Ledger Distribution Summary</b>						
Period, Fiscal Year	Account Number	Account Description	DTF Base	Over Budget	Debits	Credits
<b>March, 2010</b>						
<b>Generated Distributions</b>						
	10-000-0-0-00-000-710-00-0-00000	ENCUMBRANCE CONTROL			239,340.55	0.00
	10-000-0-0-00-000-720-00-0-00000	RESERVE FOR ENCUMBRANCE			0.00	239,340.55
		Total Generated Distributions			<b>\$239,340.55</b>	<b>\$239,340.55</b>
<b>User-Entered Distributions</b>						
	10-000-0-0-00-000-241-00-0-00000	ACCOUNTS PAYABLE			202.65	0.00
	10-000-0-0-00-000-241-00-0-00000	ACCOUNTS PAYABLE			0.00	243,029.51
	10-100-2-2-00-242-611-01-5-01183	K-5 FIFTH GRADE SUPPLIES			97.21	0.00
	10-100-2-2-28-242-611-01-5-00202	K-5 - SCIENCE/HEALTH SUPPLIES			470.27	0.00
	10-100-2-3-22-242-611-01-5-00194	MA - PHYSICAL ED SUPPLIES			333.75	0.00
	10-100-2-3-30-243-611-01-5-01074	MA - SOCIAL STUDIES WORKBOOKS			165.87	0.00
	10-100-2-4-08-220-641-01-5-00130	HS - FOREIGN LANGUAGE TEXTBOOK			0.00	163.65
	10-100-2-4-16-220-641-01-5-00120	HS - ENGLISH TEXTBOOKS			300.83	0.00
	10-100-2-4-28-220-641-01-5-00129	HS - SCIENCE TEXTBOOKS			123.09	0.00
	10-100-2-5-14-241-611-01-5-00873	SW - GENERAL COMPUTER SUPPLIES			196.80	0.00
	10-100-8-2-66-910-730-01-5-00603	K-5 CAPITAL OUTLAY			259.00	0.00
	10-120-9-9-98-251-580-05-5-00273	SP ED - DIRECTOR'S TRAVEL			245.50	0.00
	10-210-2-9-32-242-611-02-5-00225	SW - SOCIAL WORK SUPPLIES			65.11	0.00
	10-212-2-3-46-242-611-02-5-00224	MA - GUIDANCE INSTRUCT. SUPPLY			193.31	0.00
	10-212-2-5-46-243-611-02-5-00252	SW - TESTING			68.20	0.00
	10-221-1-3-52-231-690-05-5-00282	MA - PROFESSIONAL LIBRARY			85.00	0.00
	10-221-1-4-50-251-580-05-5-00267	HS - TRAVEL/IN-SERVICE			239.30	0.00
	10-221-1-4-50-251-580-05-5-00269	HS - PRINCIPAL'S TRAVEL			61.50	0.00
	10-222-1-5-44-258-690-03-5-00305	SW MEDIA - OFFICE SUPPLIES			152.73	0.00
	10-222-2-3-52-231-690-03-5-00153	MA - OTHER LIBRARY SUPPLIES			86.23	0.00
	10-222-2-5-14-233-611-03-5-00150	SW - COMPUTER SOFTWARE			209.51	0.00
	10-231-1-5-74-134-330-10-5-00045	B.O.E. - OTHER PROF. SERVICES			1,969.35	0.00
	10-231-1-5-74-134-590-10-5-00648	B.O.E. - COMMUNITY RELATIONS			35.00	0.00
	10-231-1-5-74-134-690-10-5-00047	B.O.E. - SUPPLIES			10.50	0.00
	10-232-1-5-72-251-580-05-5-00271	CO - TRAVEL/IN-SERVICE			30.00	0.00
	10-260-1-5-64-642-530-04-5-01217	SW - COMMUNICATION SUPPLIES			1,100.70	0.00



March 9, 2010

Dr. Maynard Suffredini  
Superintendent of Schools  
Att: Somers Board of Education  
55 Ninth District Road  
Somers, CT 06071

Dear Dr. Suffredini:

After teaching at Somers High School for the past 40 years, I have decided to retire at the end of the school year, June, 2010. This decision comes with mixed emotions as I have truly enjoyed being part of the Somers School System.

As I move forward to pursue my personal goals, I will look back fondly at the many memories I have made over the years in my teaching career both personally and professionally.

Sincerely,

A handwritten signature in cursive script, appearing to read "Anna Poitras".

Anna Poitras  
Business Department  
Somers High School

**Somers Public Schools  
Somers, Connecticut 06071  
Science Curriculum**

**Anatomy and Physiology Grades 11 and 12**

Content Standards	Expected Performances
<p><b>Evolution</b>  <b>State Frameworks:</b>  <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> </ul> <p><b>Evolution</b></p> <ul style="list-style-type: none"> <li>▪ A great diversity of species increases the chance that at least some organisms survive major changes in the environment.</li> </ul> <p><b>Core Theme:</b> The phylogenetic tree from single celled organisms to humans.</p> <p><b>Guiding Question:</b> How did the modern body plan of humans evolve?</p>	<p><b>1. Essential Question:</b>  How did life arise from the raw chemicals present on the early earth?  <b>Students will:</b></p> <p><b>a.</b> Describe the raw chemical building blocks that make up all life on earth</p> <ul style="list-style-type: none"> <li>▪ categorize the structural components that make up a living organism, from least to most complex, using the proper nomenclature.</li> <li>▪ explain the structure of specific organic compounds.</li> <li>▪ describe the functionality the cell membrane.</li> <li>▪ explain the importance of the cell membrane.</li> <li>▪ discuss the theory of the evolution of a mitochondria.</li> </ul> <p><b>2. Essential Question:</b>  What were the important evolutionary stages in the development of the human body plan?  <b>Students will:</b></p> <p><b>b.</b> Evaluate evidence that vertebrate terrestrial organisms arose from invertebrate aquatic or marine organisms</p> <ul style="list-style-type: none"> <li>▪ observe hydra engulfing daphnia in their gastrovascular cavity.</li> <li>▪ observe vinegar eels, draw and label the mouth and anus.</li> <li>▪ observe and sketch plattylhelmenthes labeling the eye spots and taking note of bilateral symmetry and cephalization.</li> <li>▪ draw a general segmented worm making note of body segments and a circulatory system.</li> <li>▪ sketch and label the phylogenetic tree of vertebrates making note of such evolutionary advantages as the notochord, vertebra, gills, a jaw, limbs, lungs, eggs, placenta, mammary glands, walking upright, opposable thumbs and cerebral cortex.</li> <li>▪ research “ontogeny recapitulates phylogeny”</li> <li>▪ discuss the validity of biogenetic law</li> <li>▪ define the basic terms of anatomical directions, positions and general human body cavities</li> </ul>

**Somers Public Schools  
Somers, Connecticut 06071  
Science Curriculum**

**Anatomy and Physiology Grades 11 and 12**

<b>Content Standards</b>	<b>Expected Performances</b>
<p><b><i>Enduring Understandings:</i></b></p> <ul style="list-style-type: none"><li>▪ Given the right chemicals in the proper conditions, organic compounds synthesize spontaneously.</li><li>▪ The evolution and abundance of photosynthetic autotrophs changed the chemistry of the Earth by creating an oxidizing atmosphere, therefore no more abiogenesis is possible.</li><li>▪ Tissues, multi-cellularity, the gut, a central nervous system, sexual reproduction, bilateral symmetry, body cavities, and segmentation are all important steps in the evolution of the modern body plan.</li></ul>	

**Somers Public Schools  
Somers, Connecticut 06071  
Science Curriculum**

**Anatomy and Physiology Grades 11 and 12**

Content Standards	Expected Performances
<p><b>The Digestive System</b>  <b>State Frameworks:</b>  <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> </ul> <p><b>Physiology</b></p> <ul style="list-style-type: none"> <li>▪ Digestion includes the secretion of stomach acid, digestive enzymes (amylases, proteases, nucleases, lipases) and bile salts into the digestion system.</li> </ul> <p><b>Core Theme:</b> The Digestive System  <b>Guiding Question:</b> How does the food you eat become you?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ The digestive process begins when you see, smell, or think about food.</li> <li>▪ The alimentary canal has supporting organs to aid in the digestive process.</li> <li>▪ The breakdown of food in the digestive tract is both mechanical and chemical.</li> </ul>	<p><b>1. Essential Question:</b>            What happens to your food as it passes through the alimentary canal?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ experience the cephalic phase of the digestive process by salivating while they smell hot buttered popcorn.</li> <li>▪ chew a doughnut while being conscious of what their tongue and teeth are doing with the food as it is rolled up into a bolus.</li> <li>▪ experience the swallowing reflex, and feel the mechanics of the hyphoid bone as the epiglottis closes off the trachea.</li> <li>▪ imagine the peristaltic contractions as the bolus makes it's way down to the stomach</li> <li>▪ take notes on the chemical digestion of starches in the oral cavity as they continue to eat the food.</li> <li>▪ use a strategy to memorize all the adult teeth.</li> <li>▪ color and label a diagram of the alimentary canal and the supporting organs.</li> <li>▪ become familiar with the orientation of the organs by dissecting a fetal pig.</li> <li>▪ observe the emulsification of fats using bile salts.</li> <li>▪ discuss the digestive function of the liver and gall bladder.</li> <li>▪ discuss the role of the pancreas and it's enzymes in the chemical breakdown of chime in the duodenum.</li> <li>▪ view diagrams of the hormonal feed back mechanisms which control various digestive processes.</li> <li>▪ observe the villi in the pig intestine.</li> <li>▪ demonstrate an understanding of the complete digestive process from mastication to defecation.</li> </ul> <p><b>b. Essential Question:</b>            What happens to the nutrients once they get absorbed by the small intestines into the bloodstream?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ color and label a diagram of the mesentery veins, hepatic portal vein, and the hepatic vein as they lead up to the inferior vena cava</li> <li>▪ investigate the “unwinding” of pig intestines to discover the intestinal mesentery.</li> </ul>

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<b>Content Standards</b>	<b>Expected Performances</b>
<ul style="list-style-type: none"><li>▪ The smallest components of the food and water are absorbed in the intestines leaving indigestible waste to be evacuated by the body.</li><li>▪ Increasing surface area to volume ratio is an evolutionary strategy that allows multi-cellular organisms to maximize efficiency.</li></ul>	

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Content Standards	Expected Performances
<p><b>The Cardiopulmonary System</b></p> <p><b>State Frameworks:</b> <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> </ul> <p><b>Physiology</b></p> <ul style="list-style-type: none"> <li>▪ The complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.</li> </ul> <p><b>Core Theme:</b> The Cardiopulmonary System</p> <p><b>Guiding Question:</b> How does your body move stuff around?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ Blood from the small intestines carry nutrients to the liver before continuing on to the heart.</li> <li>▪ The liver has many functions both in the digestion</li> </ul>	<p><b>a. Essential Question:</b> How does the heart’s structure allow it to perform its function?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ draw a heart and label the distinguishing-parts.</li> <li>▪ play “heart potato” with a model heart, attempting to stump their classmates on the parts of the heart.</li> <li>▪ dissect a sheep heart and describe the parts to the teacher.</li> <li>▪ carve a heart in cross section to determine what would be seen in an ultra-sound of a heart.</li> <li>▪ demonstrate their knowledge of the parts of the heart by labeling a diagram.</li> <li>▪ listen to their heart sounds using a stethoscope.</li> <li>▪ measure and compare each others heart rate at rest and stressed.</li> <li>▪ take each others blood pressure.</li> <li>▪ examine a medical “triple bypass heart.”</li> </ul>

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<b>Content Standards</b>	<b>Expected Performances</b>
<p>of food and the processing of raw chemicals into usable forms.</p> <ul style="list-style-type: none"><li>▪ Veins bring blood towards the heart and arteries carry blood away from the heart.</li><li>▪ The heart is a muscular pump that pushes blood through specialized valves to the lungs and to the body simultaneously; such that the oxygenated blood and deoxygenated blood have separate pathways.</li><li>▪ Heart rate increases to provide more oxygen to the tissues as the demand increases.</li><li>▪ Oxygenated blood goes to the heart tissue first via the coronary arteries.</li><li>▪ Blockage of the coronary arteries can cause a myocardial infarction.</li></ul>	

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Content Standards	Expected Performances
<p><b>The Respiratory and Circulatory System</b></p> <p><b>State Frameworks:</b> <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> </ul> <p><b>Core theme:</b> The Respiratory and Circulatory System</p> <p><b>Guiding Question:</b> How do your lungs exchange oxygen for carbon dioxide?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ The pulmonary arteries are the only arteries that carry deoxygenated blood.</li> <li>▪ Many structures involved in absorption in the body, branch further and smaller, increasing surface area to volume ratio.</li> <li>▪ Air flows into the lungs when atmospheric pressure is</li> </ul>	<p><b>a. Essential Question:</b> Once the blood leaves the heart and enters the lungs, how does it pick up oxygen and where does it go from there?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ measure the peak flow rate of their lungs.</li> <li>▪ examine a model showing the diaphragm's role in breathing.</li> <li>▪ compete to see who can inflate a bag first using Bernoulli's principle.</li> <li>▪ demonstrate their knowledge of blood flow through the heart and lungs.</li> <li>▪ calculate the partial pressure of oxygen in the air.</li> <li>▪ calculate the difference in pressure between oxygen in the air and blood pressure.</li> <li>▪ discuss the reason oxygen diffuses into the bloodstream.</li> <li>▪ list the major differences between arteries and veins.</li> <li>▪ label the major arteries of the body.</li> <li>▪ draw and label the diffusion gradient of glucose, oxygen, carbon dioxide and nitrogenous wastes on the arteriole and the venous side of a generalized body cell.</li> <li>▪ explain how CO<sub>2</sub> is released from the blood stream, as the blood is pushed once more into the lung by the heart.</li> </ul>

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Content Standards	Expected Performances
<p>higher than the pressure of air in the lungs.</p> <ul style="list-style-type: none"> <li>▪ The partial pressure of oxygen in the atmosphere is higher than the pressure of the blood, causing oxygen to diffuse into the capillaries of the lungs.</li> <li>▪ Red blood cells are specialized and use iron in hemoglobin to bind with oxygen.</li> <li>▪ Oxygenated blood leaves the lungs and re-enters the heart via the pulmonary veins.</li> <li>▪ Oxygenated blood leaves the heart to the cells of the body via the aorta and a system of arteries.</li> <li>▪ Oxygen and nutrient rich blood contact oxygen and nutrient poor cells causing oxygen and nutrients to diffuse into the cells.</li> <li>▪ The mitochondria of the cells metabolize the oxygen and glucose to synthesize Adenosine Triphosphate for energy.</li> <li>▪ The byproducts of cellular respiration are poisonous carbon dioxide and nitrogenous wastes.</li> <li>▪ When the concentration of carbon-dioxide and nitrogenous wastes in the cell exceed that of the capillaries, they diffuse into the bloodstream.</li> <li>▪ A network of veins carries the deoxygenated blood back to the heart.</li> <li>▪ Veins are superficial, arteries are deep and arteries are under high pressure, veins are low pressure vessels that have valves to prevent back flow.</li> <li>▪ Deoxygenated blood enters and goes back through the heart and to the lungs.</li> <li>▪ The partial pressure of carbon dioxide dissolved in the blood is higher than the partial pressure of carbon-dioxide in the alveoli causing carbon dioxide to diffuse out of the blood and into the lungs where it is exhaled.</li> </ul>	

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Content Standards	Expected Performances
<p><b>The Urinary System</b></p> <p><b>State Frameworks:</b></p> <p><b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> </ul> <p><b>Physiology</b></p> <ul style="list-style-type: none"> <li>▪ The kidneys have a homeostatic role in the removal of nitrogenous wastes from the blood.</li> </ul> <p><b>Core Theme:</b> The Urinary System</p> <p><b>Guiding Question:</b> What role do your kidneys play in keeping you healthy?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ Blood high in nitrogenous wastes leaves the heart and travels down the descending aorta toward the renal arteries.</li> <li>▪ Two kidneys to maximize filtration and increase survival.</li> </ul>	<p><b>a. Essential Question:</b> How does blood carrying waste get “cleaned”?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ dissect an animal kidney.</li> <li>▪ identify the parts of an actual kidney to that of a diagram.</li> <li>▪ become familiar with the anatomy of the urinary system.</li> <li>▪ be able to identify the micro anatomy of the nephron.</li> <li>▪ describe how the nephrons filter wastes from the bloodstream while replenishing the water and blood pressure to normal level.</li> <li>▪ analyze the chemical composition of urine.</li> <li>▪ perform urinalysis to determine abnormalities which may indicate diseases.</li> </ul>

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<b>Content Standards</b>	<b>Expected Performances</b>
<ul style="list-style-type: none"><li>▪ Blood is filtered through a network of nephrons which increase surface area to volume ratio.</li><li>▪ All of the liquid blood and dissolved ions entering the kidney are pushed out of the bloodstream because of varying pressures. Only the essential fluids and ions are reabsorbed to become clean blood.</li><li>▪ Excess fluids and wastes are evacuated by the body through urination.</li><li>▪ The kidneys regulate blood pressure by various chemical and physical processes.</li><li>▪ The water one drinks is not the same water that is urinated out.</li></ul>	

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**Anatomy and Physiology Grades 11 and 12**

Content Standards	Expected Performances
<p><b>The Nervous and Muscular System</b></p> <p><b>State Frameworks:</b>  <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> </ul> <p><b>Physiology</b></p> <ul style="list-style-type: none"> <li>▪ The nervous system mediates communication between different parts of the body and the body’s interactions with the environment.</li> </ul> <p><b>Core Theme:</b> The Nervous and Muscular System</p> <p><b>Guiding Question:</b> How does your nervous system control your body?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"> <li>▪ The physiology of the nerves and muscles are very similar but the functions are different.</li> <li>▪ The function of the nervous system is to receive</li> </ul>	<p><b>a. Essential Question:</b> How does your body communicate with itself?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ process how the various parts of the body work together to form a functional human being while observing human cadavers.</li> <li>▪ examine and discuss the various reflex actions in their own bodies.</li> <li>▪ label the names of various muscles in the body.</li> <li>▪ evaluate the process by which the nerves depolarize to propagate a nervous impulse.</li> <li>▪ examine their various special senses in the lab.</li> <li>▪ be able to identify the microanatomy of the muscular system and understand why skeletal muscles are striated.</li> <li>▪ demonstrate an understanding of the sliding filament theory.</li> </ul>

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Content Standards	Expected Performances
<p>stimuli from the environment, integrate, process, and respond.</p> <ul style="list-style-type: none"> <li>▪ The nervous system is responsible for voluntary and involuntary responses and maintains homeostasis.</li> <li>▪ The voluntary nervous system is connected to the muscular system to respond to the environment.</li> <li>▪ There are three types of muscle tissue in the human body</li> <li>▪ Skeletal muscles are attached to bone and can only contract.</li> <li>▪ Bones move back and forth because of the antagonistic contraptions of opposing muscles.</li> <li>▪ Neurotransmitter substances allow communication between nerve cells themselves and between nerves and muscles.</li> <li>▪ Muscles relax as ATP is created and contract as ATP is used.</li> <li>▪ Muscles contract because of proteins which act as sliding, ratcheting filaments.</li> </ul>	

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**AP Biology**

Content Standards	Expected Performances
<p><b>State Frameworks:</b> <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Grade 9 – Strand I: Energy Transformations</b> 9.1 - Energy cannot be created or destroyed; however, energy can be converted from one form to another.</p> <p><b>Grade 9 – Strand III: Global Interdependence</b> 9.9 - Some materials can be recycled, but others accumulate in the environment and may affect the balance of the Earth systems.</p> <p><b>Grade 10 – Strand V: Genetics Evolution and Biodiversity</b> 10.6 - Living organisms have the capability of producing populations of unlimited size, but the environment can support only a limited number of individuals from each species.</p> <p><b>Ecology</b> Stability in an ecosystem is a balance between competing effects.</p> <p><b>Biogeochemical Cycles</b> Each element on Earth moves among reservoirs which exist in the solid earth, in oceans, in the atmosphere, and within and among organisms as part of biogeochemical cycles.</p>	<p><b>a. Essential Question:</b> How are the environment and organisms intertwined?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ recognize and explain different biomes and the factors that influence organisms and their environment</li> <li>▪ understand community ecology, ecological succession, soil and its role in succession and the human influence</li> <li>▪ Explain ecosystem ecology and trophic structure</li> <li>▪ Explore how productivity is measured in an aquatic ecosystem.</li> <li>▪ Explain population ecology and apply the principles and concepts involved in population determinations.</li> </ul>

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<b>Content Standards</b>	<b>Expected Performances</b>
<p><b>Heat and Thermodynamics</b> Energy cannot be created or destroyed although, in many processes, energy is transferred to the environment as heat.</p> <p><b>College Board Standards:</b></p> <ul style="list-style-type: none"><li>▪ Interdependence in nature</li><li>▪ Applications of biological knowledge and critical thinking to environmental and social concerns.</li><li>▪ Organisms and Populations</li><li>▪ An understanding of science as a process rather than an accumulation of facts</li></ul> <p><b>Core Theme:</b> The interdependency of abiotic and biotic factors is important in the study of ecology.</p> <p><b>Guiding Question:</b> How are abiotic and biotic factors involved in the study of ecology?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"><li>▪ The environment and organisms are intertwined.</li></ul>	

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Content Standards	Expected Performances
<p><b>State Frameworks:</b> <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Grade 10 – Strand V: Genetics Evolution and Biodiversity</b></p> <p>10.5 - Evolution and biodiversity are the result of genetic changes that occur over time in constantly changing environments.</p> <p><b>Genetics</b></p> <ul style="list-style-type: none"> <li>▪ Mutation and sexual reproduction lead to genetic variation in a population.</li> <li>▪ Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism.</li> </ul> <p><b>Evolution</b></p> <ul style="list-style-type: none"> <li>▪ The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time</li> <li>▪ Evolution is the result of genetic changes that occur in constantly changing environments.</li> </ul> <p><b>College Board Standards:</b></p> <ul style="list-style-type: none"> <li>▪ Relationship of structure to function</li> </ul> <p><b>Core Theme:</b> The study and understanding of animal behavior</p>	<p><b>a. Essential Question:</b> What is the relationship between structure and function in animal behavior? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explain the behavior of animals, and how it is related to structure and function.</li> <li>▪ explain how the structure and function is genetically predetermined.</li> <li>▪ explain how the structure of organisms influences their behavior.</li> </ul> <p><b>b. Essential Question</b> What is sociobiology and why is it important? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explain and apply the concept of sociobiology</li> </ul>

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Content Standards	Expected Performances
<p><b>Guiding Question</b> How is animal behavior studied and what determines the behavior of animals?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ An animal’s structure and function are genetically predetermined and influence behavior.</li> <li>▪ Certain animal behaviors confer an evolutionary advantage.</li> </ul>	
<p><b>State Frameworks:</b></p> <p><b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> <li>▪</li> </ul> <p><b>Scientific Numeracy</b> Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</p> <p><b>Grade 10 – Strand V: Genetics Evolution and Biodiversity</b></p> <p>10.4. - In sexually reproducing organisms, each offspring contains a mix of characteristics inherited from both parents.</p> <p>10.5 - Evolution and biodiversity are the result of genetic changes that occur over time in constantly changing environments.</p>	<p><b>a. Essential Question:</b> How is continuity and change important in evolution?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explain Darwin’s theory of evolution</li> <li>▪ explain the evidence for evolution.</li> <li>▪ describe how evolution continues today.</li> <li>▪ illustrate Hardy-Weinberg law of genetic equilibrium.</li> <li>▪ understand and explain natural selection, microevolution events, types of selection, preservation of variation.</li> <li>▪ explain and give examples of speciation, prezygotic and postzygotic mechanisms, allopatric and sympatric speciation aspects to populations.</li> </ul>

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Content Standards	Expected Performances
<p><b>Genetics</b> Mutation and sexual reproduction lead to genetic variation in a population.</p> <p><b>Ecology</b> Stability in an ecosystem is a balance between competing effects.</p> <p><b>Evolution</b> The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time. Evolution is the result of genetic changes that occur in constantly changing environments.</p> <p><b>College Board Standards:</b></p> <ul style="list-style-type: none"> <li>▪ Heredity and Evolution</li> <li>▪ Science as Process</li> <li>▪ Continuity and Change</li> <li>▪ Recognition of evolution as the foundation of modern biological models and thought</li> <li>▪ Evolution</li> </ul> <p><b>Core Theme:</b> Evolutionary Biology</p> <p><b>Guiding Question</b> How does evolution drive biological diversity?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"> <li>▪ Evolution is a continuous process and is determined by many factors.</li> </ul>	

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Content Standards	Expected Performances
<p><b>State Frameworks:</b> <b>Scientific Inquiry</b> Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</p> <p><b>Grade 9 – Strand II: Chemical Structures and Properties</b> 9.4 - Atoms react with one another to form new molecules. 9.5 – Due to its unique chemical structure, carbon forms many organic and inorganic compounds.</p> <p><b>Grade 10 – Strand IV: Cell Chemistry and Biotechnology</b> 10.1 Fundamental life processes depend on the physical structure and the chemical activities of the cell.</p> <p><b>Cell Biology</b> The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism’s cells.</p> <p><b>Chemical Bonds</b> Biological, chemical and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules.</p> <p><b>Reaction Rates</b> Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules.</p> <p><b>Organic Chemistry and Biochemistry</b> The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes and chemical properties, and provide the biochemical basis of life.</p>	<p><b>a. Essential Question:</b> How are molecules and atoms important to living organisms? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explain the principles of inorganic chemistry (e.g., atoms, molecules, etc.)</li> <li>▪ explain the structure of water, carbon and the functional groups and their function in living organisms.</li> <li>▪ explore the structure of macromolecules and their role in living organisms.</li> <li>▪ investigate the role of proteins and enzymes in living organisms.</li> </ul>

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<b>Content Standards</b>	<b>Expected Performances</b>
<p><b>College Board Standards:</b></p> <ul style="list-style-type: none"><li>▪ Molecules and cells.</li><li>▪ Relationship of structure to function.</li></ul> <p><b>Core Theme:</b> Chemistry of Life</p> <p><b>Guiding Question</b> What is the role of chemistry in living organisms?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"><li>▪ Cell structure and function are determined by their chemical make up.</li></ul>	

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Content Standards	Expected Performances
<p><b>State Frameworks:</b>  <b>Scientific Inquiry</b>            Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</p> <p><b>Scientific Literacy</b>            Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science. Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</p> <p><b>Grade 10 – Strand IV: Cell Chemistry and Biotechnology</b>            10.1 - Fundamental life processes depend on the physical structure and the chemical activities of the cell.            10.2 - Microorganisms have an essential role in life processes and cycles on Earth.            10.3 - Similarities in the chemical and structural properties of DNA in all living organisms allow the transfer of genes from one organism to another</p> <p><b>Cell Biology</b>            The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism’s cells.</p> <p><b>Genetics</b>            The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells.</p>	<p><b>a. Essential Question:</b>            How does cell structure and function work together to create a multicellular organism?  <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explore the structure and function of each organelle, and the cell membrane, and how they work together to assist the whole organism to function</li> <li>▪ explain how cells communicate with each other and the environment and how they assist in the functioning of the whole organism.</li> </ul> <p><b>b. Essential Question:</b>            How does science and technology use the knowledge of cell biology to better society?  <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ research and discuss a way in which science uses knowledge about cells to improve the lives of organisms on the planet.</li> <li>▪ explain how the study of cells has led to the discovery of new drugs and treatments for disease.</li> </ul>

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Content Standards	Expected Performances
<p><b>College Board Standards:</b></p> <ul style="list-style-type: none"> <li>▪ Molecules and cells</li> <li>▪ Relationship of structure to function</li> <li>▪ Continuity and Change</li> <li>▪ Regulation</li> <li>▪ Interdependence in nature</li> <li>▪ Science, Technology and society</li> </ul> <p><b>Core Theme:</b> Cells and Cell Functions</p> <p><b>Guiding Question:</b> How do the components of cells allow them to function?</p> <p><b>Guiding Question:</b> How can knowledge of cellular biology be used to improve society?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"> <li>▪ The structures and functions of cells allow them to survive, create larger organisms and the knowledge of cell biology can be used to improve society.</li> </ul>	This area is currently blank, overlaid with a large diagonal watermark reading 'DRAFT 2/17/2019'

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Content Standards	Expected Performances
<p><b>State Frameworks:</b> <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> </ul> <p><b>Grade 9 – Strand I: Energy Transformations</b> 9.1 - Energy cannot be created or destroyed; however, energy can be converted from one form to another.</p> <p><b>Grade 10 – Strand IV: Cell Chemistry and Biotechnology</b> 10.1 - Fundamental life processes depend on the physical structure and the chemical activities of the cell.</p> <p><b>Grade 10 – Strand V: Genetics Evolution and Biodiversity</b> 10.5 - Evolution and biodiversity are the result of genetic changes that occur over time in constantly changing environments. 10.6 - Living organisms have the capability of producing populations of unlimited size, but the environment can support only a limited number of individuals from each species.</p> <p><b>Cell Biology</b> The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism’s cells.</p>	<p><b>a. Essential Question:</b> Why is energy conservation important to the living system? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explain the conservation of energy and its importance on living systems.</li> <li>▪ describe the importance of energy transfer among living things.</li> <li>▪ give a specific example to explain how the evolution of organisms has led to the creation of new species that obtain and use energy in different ways.</li> <li>▪ use at least two examples to explain how humans have impacted cellular energetics.</li> </ul> <p><b>b. Essential Question:</b> How are autotrophs and heterotrophs dependent on each other? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ illustrate the interdependence of autotrophs and heterotrophs by carrying out an extended lab.</li> </ul>

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Content Standards	Expected Performances
<p><b>Ecology</b> Stability in an ecosystem is a balance between competing effects.</p> <p><b>Evolution</b></p> <ul style="list-style-type: none"> <li>▪ The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time.</li> <li>▪ Evolution is the result of genetic changes that occur in constantly changing environments.</li> </ul> <p><b>Organic Chemistry and Biochemistry</b> The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes and chemical properties, and provide the biochemical basis of life.</p> <p><b>Heat and Thermodynamics</b> Energy cannot be created or destroyed although, in many processes, energy is transferred to the environment as heat.</p> <p><b>College Board Standards</b></p> <ul style="list-style-type: none"> <li>▪ Science as Process</li> <li>▪ Evolution</li> <li>▪ Energy Transfer</li> <li>▪ Relationship of structure to function</li> <li>▪ Regulation</li> <li>▪ Interdependence in nature</li> </ul> <p><b>Core Theme:</b> Cellular Energetics</p> <p><b>Guiding Questions:</b></p> <ul style="list-style-type: none"> <li>▪ How do cells receive and transfer energy, and depend on each other?</li> <li>▪ What role does evolution and humans play in cellular energetics?</li> </ul>	

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<b>Content Standards</b>	<b>Expected Performances</b>
<p><b><i>Enduring Understanding:</i></b></p> <ul style="list-style-type: none"><li>▪ Organisms create, use and transfer energy by relying on each other, evolution and humans have impacted these processes.</li></ul>	

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Content Standards	Expected Performances
<p><b>State Frameworks:</b></p> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> <li>▪ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li> </ul> <p><b>Genetics</b></p> <ul style="list-style-type: none"> <li>▪ Mutation and sexual reproduction lead to genetic variation in a population.</li> <li>▪ A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization.</li> </ul> <p><b>Evolution</b></p> <p>Evolution is the result of genetic changes that occur in constantly changing environments.</p> <p><b>College Board Standards</b></p> <ul style="list-style-type: none"> <li>▪ Applications of biological knowledge and critical thinking to environmental and social concerns.</li> <li>▪ Evolution</li> <li>▪ Relationship of structure to function</li> <li>▪ Heredity and Evolution</li> <li>▪ Recognition of evolution as the foundation of modern biological models and thought;</li> </ul> <p><b>Core Theme:</b> Reproduction and Embryology</p> <p><b>Guiding Question</b> How does the reproduction and development of the organism reflect genetic and evolutionary changes?</p>	<p><b>a. Essential Question:</b> How does a human embryo develop from a single cell into a multicellular organism?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explain in detail the stages of human embryonic development.</li> <li>▪ explore mitosis and the cell cycle</li> <li>▪ explain the role of the cell cycle in cancer.</li> </ul> <p><b>b. Essential Question:</b> How has the reproductive process changed over time?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ illustrate meiosis and the formation of egg and sperm in plants and animals.</li> <li>▪ describe the role of evolutionary adaptations in reproduction.</li> </ul> <p><b>c. Essential Question:</b> How has evolution led to the similarities and differences in the development of the sea urchin, frog, and chicken?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explore how evolution led to the similarities and differences in the development of the sea urchin, frog, and chicken.</li> </ul>

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Content Standards	Expected Performances
<p><b><i>Enduring Understanding:</i></b></p> <ul style="list-style-type: none"><li>▪ The reproduction and development of the organism reflect genetic and evolutionary changes?</li></ul>	

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Content Standards	Expected Performances
<p><b>State Frameworks:</b> <b>Scientific Inquiry</b> Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</p> <p><b>Grade 10 – Strand IV: Cell Chemistry and Biotechnology</b> 10.3 - Similarities in the chemical and structural properties of DNA in all living organisms allow the transfer of genes from one organism to another.</p> <p><b>Grade 10 – Strand V: Genetics Evolution and Biodiversity</b> 10.4. - In sexually reproducing organisms, each offspring contains a mix of characteristics inherited from both parents.</p> <p><b>Cell Biology</b> The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism’s cells.</p> <p><b>Genetics</b></p> <ul style="list-style-type: none"> <li>▪ Mutation and sexual reproduction lead to genetic variation in a population.</li> <li>▪ A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization.</li> <li>▪ Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism.</li> <li>▪ The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells.</li> </ul>	<p><b>a. Essential Question:</b> How does genetics explain the variations in organisms? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explain how Mendelian genetics explains the variations in organisms.</li> <li>▪ illustrate by giving examples of different characteristics of different organisms the concepts of non-Medelian patterns of codominance, pleiotropy, epistasis, polygeny.</li> <li>▪ use pedigree analysis predict human genetic disorders.</li> <li>▪ explore the concept of genetic linkage.</li> </ul> <p><b>b. Essential Question:</b> How are genes expressed? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explain the processes of protein synthesis and DNA replication, and all the enzymes involved.</li> <li>▪ explain the control of gene expression, using the Lac Operon as an example.</li> </ul> <p><b>c. Essential Question:</b> What are the types of DNA technology and what are its uses? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explain and demonstrate the use of DNA technology, including electrophoresis and RFLP.</li> </ul> <p><b>d. Essential Question:</b> What is the relationship between evolution and genetics? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ using Examples, explain the relationship between evolution and genetics.</li> <li>▪ describe and explain the eukaryotic chromosome, and its role in evolution.</li> </ul>

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Content Standards	Expected Performances
<p><b>Evolution</b> Evolution is the result of genetic changes that occur in constantly changing environments.</p> <p><b>College Board Standards</b></p> <ul style="list-style-type: none"><li>▪ Science as Process</li><li>▪ Evolution</li><li>▪ Continuity and Change</li><li>▪ Recognition of evolution as the foundation of modern biological models and thought</li><li>▪ Heredity and evolution</li></ul> <p><b>Core Theme:</b> Genetics and Heredity</p> <p><b>Guiding Question</b> How does genetics and evolution drive heredity?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"><li>▪ Heredity is determined by genetics and evolution.</li></ul>	

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Content Standards	Expected Performances
<p><b>State Frameworks:</b> <b>Scientific Inquiry</b> Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</p> <p><b>Physiology</b> As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment.</p> <p><b>College Board Standards</b></p> <ul style="list-style-type: none"> <li>▪ Relationship of structure to function</li> <li>▪ Regulation</li> <li>▪ Interdependence in nature</li> </ul> <p><b>Core Theme:</b> Structure and Function of Animals</p> <p><b>Guiding Question:</b> How does the structure and function of mammals, compare and contrast to insects and fish?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"> <li>▪ All organisms on this planet have some similarities and differences in their systems depending on the adaptations to their particular environments.</li> </ul>	<p><b>a. Essential Question:</b> What are the structure and function of the mammalian systems and how does each system compare and contrast to the same system in an insect and a fish?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explain the structure and function of each of the mammalian systems including: digestive, circulatory, respiratory, immune, osmoregulation and excretory, endocrine, nervous and muscular.</li> <li>▪ explain using examples how these systems compare and contrast to an insect and a fish.</li> </ul> <p><b>b. Essential Question:</b> How does each system allow each organism to survive in their particular environment?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ describe how each system aides in the survival of mammalian, invertebrate and aquatic organisms in their particular environment.</li> </ul>

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Content Standards	Expected Performances
<p><b>State Frameworks:</b> <b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> <li>▪ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media</li> </ul> <p><b>Cell Biology</b> The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism’s cells.</p> <p><b>College Board Standards:</b></p> <ul style="list-style-type: none"> <li>▪ Heredity and Evolution</li> <li>▪ Energy Transfer</li> <li>▪ Science, Technology and society</li> </ul> <p style="padding-left: 40px;"><b>Core Theme:</b> Structure and Function of Plants &amp; Fungi</p> <p style="padding-left: 40px;"><b>Guiding Question:</b> How do plants and fungi use certain structures to survive in their environment, and how can these organisms benefit society?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"> <li>▪ The structure and function of plants and fungi and their uses in society.</li> </ul>	<p><b>a. Essential Question:</b> How are plants and fungi similar and different to each other and how did these differences arise? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explain different types of plant and fungi diversity, adaptation and their relationship to each other.</li> </ul> <p><b>b. Essential Question:</b> How do plants and fungi regulate and control all their functional activities? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explain the mechanism of plant and fungi transportation, nutrition and the control systems of plants and fungi.</li> </ul> <p><b>c. Essential Question:</b> How are plants and fungi useful for society? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ describe at least two ways in which plants are useful in society.</li> </ul>

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**AP Chemistry Grade 12**

<b>Content Standards</b>	<b>Expected Performances</b>
<p><b>UNIT 1</b> <b>State Framework Standards:</b></p> <p><b>Atomic and Molecular Structure</b></p> <p>The periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure.</p> <p><b>Core Theme:</b> Introduction to the atomic theory</p> <p><b>Guiding Question</b> Since ancient times people have wondered about what makes up material things. We now know that all matter is made of atoms, molecules, and ions. All of chemistry is concerned in one way or another with these species. What have we learned about these particles without ever seeing them?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"><li>▪ All material things are made of atoms, molecules or ions.</li></ul>	<p><b>Essential Questions:</b></p> <ol style="list-style-type: none"><li>1. How do we know atoms exist?</li><li>2. How do we represent elements and compounds?</li><li>3. What does the periodic table tell us about elements and compounds?</li></ol> <p><b>Students will:</b></p> <ul style="list-style-type: none"><li>▪ trace the history of the atomic theory.</li><li>▪ write symbols and formulas for ions and compounds</li></ul>

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<p><b>UNIT 2</b> <b>State Framework Standards:</b></p> <p><b>Conservation of Matter and Stoichiometry</b></p> <p>The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants.</p> <p><b>Core Theme:</b> Mass Relationships in Chemical Reactions.</p> <p><b>Guiding Question</b> How many grams of zinc sulfide can you make from 1 gram of zinc and 1 gram of sulfur?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"><li>▪ Students will understand how masses of chemicals before a reaction relate to the masses of chemicals after a reaction.</li></ul>	<p><b>Essential Questions:</b></p> <ol style="list-style-type: none"><li>1. How are chemical formulas determined from lab data?</li><li>2. How is the mass of a product determined from the mass of a reactant?</li><li>3. What is a limiting reagent and how is the percent yield of a reaction calculated?</li></ol> <p><b>Students will:</b></p> <ul style="list-style-type: none"><li>▪ perform calculations to determine the formula of a compound from lab data.</li><li>▪ calculate the mass of a product from the mass of a reactant in a chemical reaction.</li><li>▪ determine the limiting reagent and percent yield from lab data.</li></ul>
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<p><b>UNIT 3</b></p> <p><b>State Framework Standards:</b></p> <p><b>Chemical Bonds</b></p> <p>Biological, chemical and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules.</p> <p><b>Reaction Rates</b></p> <p>Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules.</p> <p><b>Core Theme:</b> Reactions in Aqueous Solutions</p> <p><b>Guiding Question</b> Gatorade is considered an electrolyte due to ions in solution and therefore conducts electricity. How can you explain the behavior of 2 electrolytes such as sulfuric acid and barium hydroxide each conducting electricity, but when slowly mixed the conductivity diminishes to virtually nothing, then increases dramatically again as more of either ingredient is added?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"><li>▪ Students will understand that the behavior of solutions depends on the ions that compose them as well as their concentration.</li></ul>	<p><b>Essential Questions:</b></p> <ol style="list-style-type: none"><li>1. How do electrolytes and nonelectrolytes behave in water?</li><li>2. What are precipitate reactions?</li><li>3. How do acids react with bases?</li><li>4. How do oxidation reactions differ from the other types?</li><li>5. How do you calculate the concentration of diluted solutions and products from reactions?</li></ol> <p><b>Students will:</b></p> <ul style="list-style-type: none"><li>▪ predict which combinations of electrolytes produce precipitates.</li><li>▪ identify acids and bases from given compound formulas.</li><li>▪ determine oxidation numbers for atoms and ions.</li><li>▪ predict products of acid-base and redox reactions.</li><li>▪ write balanced net-ionic equations for the 3 basic reaction types.</li><li>▪ calculate, from given data, the mass or concentration of products of various reactions.</li></ul>
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<p><b>UNIT 4</b> <b>State Framework Standard:</b></p> <p><b>Atomic and Molecular Structure</b></p> <p>The periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure.</p> <p><b>Chemical Bonds</b></p> <p>Biological, chemical and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules.</p> <p><b>Reaction Rates</b></p> <p>Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules.</p> <p><b>Core Theme:</b> The Uniqueness of Gases</p> <p><b>Guiding Question</b> An automobile air bag appears to be empty as it is stored in your car. How do the gas molecules in an automobile air bag prevent serious injuries and where do they come from?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"><li>▪ Students will understand how the behavior of gases depends on the molecules, volume, temperature and pressure.</li></ul>	<p><b>Essential Questions:</b></p> <ol style="list-style-type: none"><li>1. How do the molecules of a gas differ from those in liquids and solids?</li><li>2. How are volume, pressure, temperature and moles of gas interrelated?</li><li>3. What is the strategy used to calculate the amount of gas produced in a chemical reaction at various temperatures and pressures?</li><li>4. How are gases collected and measured?</li></ol> <p><b>Students will:</b></p> <ul style="list-style-type: none"><li>▪ describe the behavior of gases in the real world in terms of the nature of the molecules that make them up.</li><li>▪ solve a variety of problems dealing with variables of volume, pressure, temperature and moles of gas.</li><li>▪ calculate the amount of gas produced in a chemical reaction at various temperatures and pressures.</li><li>▪ perform experiments where the properties of gases are investigated, such as molar mass, molar volume, and temperature effects.</li></ul>
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<p><b>UNIT 5</b> <b>State Framework Standards:</b></p> <p><b>Conservation of Matter and Stoichiometry</b></p> <p>The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants.</p> <p><b>Heat and Thermodynamics</b></p> <p>Energy cannot be created or destroyed although, in many processes, energy is transferred to the environment as heat.</p> <p><b>Core Theme:</b> Energy Changes in Chemical Reactions</p> <p><b>Guiding Question:</b> The Hindenburg and the Goodyear Blimp are similar in many ways, yet quite different in on special way. Why does a balloon filled with hydrogen explode, while one filled with air simply “pops” like a birthday balloon?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"><li>▪ Students will understand how energy is like a fluid, as once thought, and is stored in chemicals (food and gasoline are examples), but can be transferred and also do work.</li></ul>	<p><b>Essential Questions:</b></p> <ol style="list-style-type: none"><li>1. What is the nature of heat and work, and how are they related?</li><li>2. What are the mathematical strategies for calculating energy change and work?</li><li>3. How does Hess’s Law relate to chemical reactions?</li><li>4. What is the chemical and “real world” significance of “enthalpy”?</li><li>5. How is “heat capacity” of a substance determined in the laboratory?</li></ol> <p><b>Students will:</b></p> <ul style="list-style-type: none"><li>▪ describe the nature of heat and work.</li><li>▪ calculate the amount of energy change and work in various chemical reactions.</li><li>▪ describe the nature of enthalpy and calculate its change in various reactions.</li><li>▪ perform an experiment to measure the enthalpy change in a chemical reaction.</li><li>▪ perform an experiment to determine the heat capacity of a chemical.</li></ul>
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<p><b>UNIT 6</b> <b>State Framework Standards:</b></p> <p><b>Atomic and Molecular Structure</b></p> <p>The periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure.</p> <p><b>Chemical Bonds</b></p> <p>Biological, chemical and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules.</p> <p><b>Core Theme:</b> The Periodic Table &amp; Quantum Theory</p> <p><b>Guiding Questions:</b></p> <ul style="list-style-type: none"><li>▪ How many versions of the periodic table have there been historically?</li><li>▪ Why does the table have the shape it does?</li><li>▪ Why does sodium explode in water?</li></ul> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"><li>▪ Students will understand how chemical elements have periodic properties and be able to explain them using the quantum theory.</li></ul>	<p><b>Essential Questions:</b></p> <ol style="list-style-type: none"><li>1. Why are sodium and chlorine so deadly and dangerous, yet react to make a harmless salt for our foods?</li><li>2. What is periodic about the periodic table?</li><li>3. Why do sodium, potassium and lithium behave similarly?</li><li>4. Why do some elements react with each other, yet others do not?</li><li>5. How are electrons arranged in atoms and ions?</li><li>6. What are quantum numbers?</li></ol> <p><b>Students will:</b></p> <ul style="list-style-type: none"><li>▪ describe periodic properties of elements.</li><li>▪ explain reactivity of elements in terms of electron configurations and quantum numbers.</li><li>▪ draw electron configurations for a variety of atoms and ions.</li><li>▪ list quantum numbers for a variety of atoms and ions.</li><li>▪ determine the relative reactivity of representative metals and non metals.</li></ul>
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<p><b>UNIT 7</b> <b>State Framework Standards:</b></p> <p><b>Chemical Bonds</b></p> <p>Biological, chemical and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules.</p> <p><b>Core Theme:</b> Chemical Bonding</p> <p><b>Guiding Questions:</b></p> <ul style="list-style-type: none"><li>▪ Why are electrolytes important to us?</li><li>▪ Why do some chemicals conduct and others do not?</li><li>▪ Why does a stream of water attract to both a positively and negatively charged rod?</li></ul> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"><li>▪ Students will understand why compounds look and behave differently.</li></ul>	<p><b>Essential Questions:</b></p> <ol style="list-style-type: none"><li>1. Why is sodium chloride a crystal, water a liquid and oxygen a gas at room temp.?</li><li>2. Why does sodium chloride dissolve in water and conduct electricity, while carbon tetrachloride does not do either?</li><li>3. What are the types of inter-molecular bonds?</li><li>4. What are the types of intra-molecular bonds?</li><li>5. How do chemists symbolize chemical bonds?</li><li>6. What does polarity have to do with solubility?</li><li>7. How can you predict the shape of molecules?</li></ol> <p><b>Students will:</b></p> <ul style="list-style-type: none"><li>▪ describe ionic and covalent bonding.</li><li>▪ explain properties of compounds based on inter and intra-molecular bonds.</li><li>▪ draw Lewis dot structures for a variety of compounds and ions.</li><li>▪ predict the shape of molecules and thus determine their polarity and solubility.</li><li>▪ perform an experiment to determine the relative solubility and conductivity of various compounds.</li><li>▪ build molecular models of a variety of polar and non-polar compounds.</li></ul>
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<p><b>UNIT 8</b> <b>State Framework Standards:</b></p> <p><b>Reaction Rates</b></p> <p>Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules.</p> <p><b>Core Theme:</b> Chemical Kinetics</p> <p><b>Guiding Questions:</b></p> <ul style="list-style-type: none"><li>▪ Why are some reactions slow and others fast?</li><li>▪ What are some of the mechanisms for chemical reactions?</li></ul> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"><li>▪ Students will understand the factors that affect reaction rate.</li></ul>	<p><b>Essential Questions:</b></p> <ol style="list-style-type: none"><li>1. What is the relationship between rate and reactant concentrations?</li><li>2. How are time, concentration and rate law related?</li><li>3. How do activation energy and the collision theory explain why some reactions only occur at high temperatures?</li><li>4. How does a reaction mechanism affect the rate law?</li><li>5. What is a catalyst and how does it work?</li></ol> <p><b>Students will:</b></p> <ul style="list-style-type: none"><li>▪ calculate the rate of a chemical reaction from given data.</li><li>▪ determine the order for a reaction from the rate laws.</li><li>▪ determine the order and mechanism for a reaction from concentration and rate data.</li><li>▪ explain why a reaction may be fast or slow based on the collision theory and activation energy.</li><li>▪ explain how a catalyst works.</li><li>▪ perform a timed experiment to determine the rate law, reaction order and activation energy.</li></ul>
<p><b>UNIT 9</b> <b>State Framework Standards:</b></p> <p><b>Reaction Rates</b></p> <p>Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules.</p> <p><b>Core Theme:</b> Chemical Equilibrium</p> <p><b>Guiding Questions:</b></p> <ul style="list-style-type: none"><li>▪ What is a chemical equilibrium state?</li><li>▪ How can reactant A seem to be in excess at the same time as reactant B?</li></ul> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"><li>▪ Students will understand that reactions seem to stop, yet something is still going on chemically.</li></ul>	<p><b>Essential Questions:</b></p> <ol style="list-style-type: none"><li>1. How are concentrations of reactants and products related?</li><li>2. How does LeChatelier's Principle work in an equilibrium state?</li><li>3. How do you determine the concentration of a given reactant or product from the equilibrium constant?</li></ol> <p><b>Students will:</b></p> <ul style="list-style-type: none"><li>▪ calculate the equilibrium constant from given data.</li><li>▪ calculate the concentration of a product or a reactant from given data and the equilibrium constant.</li><li>▪ determine how temperature or pressure or a concentration change affects the other variables in an equilibrium state.</li><li>▪ explain why nothing seems to be happening in an equilibrium state.</li><li>▪ perform an experiment to determine the equilibrium concentrations of chemicals and the equilibrium constant using a colorimeter.</li></ul>

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<p><b>UNIT 10</b> <b>State Framework Standards:</b></p> <p><b>Chemical Bonds</b></p> <p>Biological, chemical and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules.</p> <p><b>Reaction Rates</b></p> <p>Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules.</p> <p><b>Core Theme:</b> Acids, Bases and Buffers</p> <p><b>Guiding Questions:</b></p> <ul style="list-style-type: none"><li>▪ Why are some acids harmful to your eyes, yet many eye washes have acid in them?</li><li>▪ How does a base take away the acidity of an acid?</li></ul> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"><li>▪ Students will understand that acids and bases are unique compounds, neutralize each other and can be buffered.</li></ul>	<p><b>Essential Questions:</b></p> <ol style="list-style-type: none"><li>1. What are differences between acids and bases according to Arrhenius and also according to Bronsted?</li><li>2. How is pH related to acids and bases?</li><li>3. Is a strong acid really strong?</li><li>4. How do you determine the pH of a weak acid or base?</li><li>5. How do you make a buffer and determine its pH ?</li><li>6. What is a titration and how does it differ for weak and strong acids and bases?</li></ol> <p><b>Students will:</b></p> <ul style="list-style-type: none"><li>▪ identify acids and bases according to Arrhenius and according to Bronsted.</li><li>▪ calculate the pH of strong and weak acidic, basic and buffered solutions.</li><li>▪ explain the differences between strong and weak acids and bases</li><li>▪ explain how a titration works and determine the pH a various stages.</li><li>▪ perform a titration experiment to determine the concentration of an unknown compound using a buret and pipet.</li><li>▪ perform an experiment to prepare a buffer and observe the pH changes by adding an acid and a base.</li></ul>
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<p><b>UNIT 11</b> <b>State Framework Standard:</b> <b>Heat and Thermodynamics</b></p> <p>Energy cannot be created or destroyed although, in many processes, energy is transferred to the environment as heat.</p> <p><b>Core Theme:</b> Thermodynamics</p> <p><b>Guiding Questions:</b></p> <ul style="list-style-type: none"><li>▪ How come hydrogen and oxygen can sit unreacted in a balloon for hours, but explode when heated?</li><li>▪ Why is skiing downhill a spontaneous change, but skiing uphill in non-spontaneous?</li><li>▪ Why do our desks, closets and garages seem to spontaneously get disorganized.</li></ul> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"><li>▪ Students will understand that the balance between entropy and enthalpy determine whether a chemical reaction takes place.</li></ul>	<p><b>Essential Questions:</b></p> <ol style="list-style-type: none"><li>1. What are the 3 laws of thermodynamics?</li><li>2. How do entropy and enthalpy play a part in determining whether a reaction between 2 chemicals will occur?</li><li>3. What is Gibbs Free Energy, its significance and how is it determined?</li><li>4. How is an oxidation-reduction reaction related to thermodynamics?</li></ol> <p><b>Students will:</b></p> <ul style="list-style-type: none"><li>▪ state the 3 laws of thermodynamics and apply them to chemical reactions</li><li>▪ calculate the free energy for a reaction from data.</li><li>▪ calculate the standard entropy for a reaction from data.</li><li>▪ determine the spontaneity of an oxidation-reduction reaction using the Nernst equation.</li><li>▪ perform an oxidation titration experiment to determine the concentration of bleach using a buret.</li><li>▪ perform an experiment to build an electrochemical cell and vary voltage.</li></ul>
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**Astronomy Grades 11 and 12**

Content Standards	Expected Performances
<p><b>Earth's Place in the Universe</b> Earth-based and space-based astronomy reveal the structure, scale and changes in stars, galaxies and the universe over time.</p> <p><b>State Frameworks:</b> <b>Scientific Numeracy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</li> </ul> <p><b>Core Theme:</b> Our place in space</p> <p><b>Guiding Question:</b> How vast is space?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ Earth (and humans) are just a tiny part of the universe.</li> <li>▪ Distance makes space travel outside the solar system prohibitive.</li> <li>▪ Our tiny Sun gives off tremendous amounts of energy across great distances.</li> <li>▪ All of human observations is just a snapshot of the complex workings of the cosmos.</li> </ul>	<p><b>a. Essential Question:</b> How much does distance grow as zeros are added to a number?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>• observe satellite photos of Somers High School from increasing distances until familiar structure are no longer observable.</li> <li>• view “Powers of Ten” to see how scale changes as numbers are increased by the tenth power.</li> <li>• compare sizes and distances of planets, stars, solar systems, galaxies, etc.</li> <li>• build and evaluate a scale model of the Earth and Sun.</li> <li>• relate themselves to the distance the Earth is away from the Sun.</li> <li>• evaluate the power of the sun which influences the Earth at such a great distance.</li> <li>• examine the Hubble Space Telescope deep field view of the Virgo cluster of galaxies.</li> <li>• compare the size of a red giant to our solar system.</li> </ul>

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Content Standards	Expected Performances
<p><b>Earth's Place in the Universe</b></p> <p>Earth-based and space-based astronomy reveal the structure, scale and changes in stars, galaxies and the universe over time.</p> <p><b>Core Theme:</b> Our perspective of Space</p> <p><b>Guiding Question:</b> How does our view of the heavens influence our perception of space?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ The change in the angle of the Earth relative to the Sun causes the seasons as the Earth revolves around the Sun.</li> <li>▪ The Earth rotates towards the east (or counter clockwise as seen from above the north pole) making the sun appear to rise in the east.</li> <li>▪ The sun, moon, and planets follow the imaginary line in the southern sky, called the ecliptic, because they are on the same plane in the solar system as our equator.</li> <li>▪ The signs of the Zodiac appear on the ecliptic and were special to the ancient Greeks because the Sun God passed in front of them during specific months.</li> <li>▪ The appearance of the moon changes as it revolves around the Earth, because the angle from which we see the "lighted side" changes.</li> </ul>	<p><b>a. Essential Question:</b> What is the view from our perspective? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explore the celestial sphere using star mapping software.</li> <li>▪ locate stars using landmark constellations.</li> <li>▪ compare the phases of the moon as viewed from Earth to that of space.</li> </ul> <p><b>b. Essential Question:</b> Is it the distance or the angle the Sun is to the Earth that makes it warmer in the Summer? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ examine the causes of the seasons.</li> <li>▪ perform an experiment comparing the angle of incidence to the amount of heat absorbed.</li> </ul> <p><b>c. Essential Question:</b> Why do the planets, moon and Sun all travel around the same area of our southern sky? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ manipulate a sky map to observe the paths of the planets and the moon over time.</li> <li>▪ draw their personal zodiac sign and map it out around the room.</li> <li>▪ report on their personal sign of the Zodiac.</li> </ul>

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Content Standards	Expected Performances
<p><b>Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</b></p> <p>Read, interpret and examine the credibility and validity of scientific claims in different sources of information.</p> <p><b>Core Theme:</b> The History of Astronomy</p> <p><b>Guiding Question:</b> How did our current understanding of space develop?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ Ancient peoples started studying the heavens for practical reasons such as navigation, harvest, and religion.</li> <li>▪ People often attach supernatural meaning to natural phenomena they can't explain.</li> <li>▪ Scientific method was developed to avoid generalizations based on anecdotal information.</li> <li>▪ Copernicus, with the scientific evidence later from Kepler and Galileo, challenged religious dogma and opened the way for scientific discovery.</li> </ul>	<p><b>a. Essential Question:</b> Why did we start studying the Heavens?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ discuss and evaluate the purpose of Stonehenge and The Great Pyramids of Giza.</li> <li>▪ discuss how the nomadic Arabians navigated the desert using the stars.</li> <li>▪ examine Aristotle's misguided understanding of the Universe.</li> <li>▪ study Ptolemy's complicated explanation, reinforcing Aristotle's ideas.</li> <li>▪ evaluate how people in power will perpetuate ignorance in order to control the masses.</li> <li>▪ demonstrate their understanding of Keplers law by modeling an ellipse.</li> <li>▪ evaluate Galileo's discoveries and his struggles to expose the truth.</li> </ul>

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Content Standards	Expected Performances
<p><b>State Frameworks:</b> <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> <li>▪ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li> </ul> <p><b>Grade 9 – Strand II Chemical Structures &amp; Properties</b> <b>9.5</b> Carbon atoms can bond to one another in chains, rings and branching networks to form a variety of structures, including fossil fuels, synthetic polymers and the large molecules of life.</p> <p><b>Earth’s Place in the Universe</b></p> <ul style="list-style-type: none"> <li>▪ Earth-based and space-based astronomy reveal the structure, scale and changes in stars, galaxies and the universe over time.</li> </ul> <p><b>Motion and Forces</b></p> <ul style="list-style-type: none"> <li>▪ Newton's laws predict the motion of most objects.</li> <li>▪ The law <math>F = ma</math> is used to solve motion problems that involve constant forces.</li> </ul> <p><b>Waves</b></p> <ul style="list-style-type: none"> <li>▪ Waves have characteristic properties that do not depend on the type of wave.</li> <li>▪ Wavelength, frequency and wave speed are related.</li> </ul> <p><b>Core Theme:</b> Cosmology and Space exploration</p>	<p><b>a. Essential Question:</b> Where did the universe begin and where is it going?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ research and report a multi-media presentation to the class on their own topic in cosmology.</li> <li>▪ build and launch rockets to understand the difficulties we faced to reach the moon.</li> </ul>

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Content Standards	Expected Performances
<p><b>Guiding Question:</b> How did universe begin, how will it end and how do we know?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ Evidence suggests the universe started at a single point.</li> <li>▪ The Universe is expanding at an accelerating rate.</li> <li>▪ Galaxies and stars formed as gasses accrete from gravitational force.</li> <li>▪ The solar system was created from the debris of a large star.</li> <li>▪ Life was created as chemicals came together under the right conditions.</li> <li>▪ Newton thought gravity was a pulling force, and explained how it acts on objects but never knew what causes gravity.</li> <li>▪ Einstein linked space and time and thought gravity is a warped space so objects fall towards it.</li> <li>▪ Matter is congealed energy.</li> <li>▪ Space travel was facilitated by WWII and the Cold war.</li> <li>▪ Our slow speeds limits space travel.</li> <li>▪ Conditions for life on other planets exist in this solar system.</li> <li>▪ Statistically, intelligent life should exist on an extra solar planet.</li> <li>▪ The vastness of space makes communication with intelligent life on other planets improbable.</li> <li>▪ There are several theories of the future of the universe.</li> <li>▪ The more we know, the more we realize we don't know.</li> </ul>	

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**Biotechnology**

Content Standards	Expected Performances
<p><b>11.1 The field of biotechnology has been evolving over time.</b></p> <p><b>Core Theme:</b> Biotechnology employs the concept of using living organisms to help society perform a job or make a product. In order to understand how biotechnology is evolving, one must be familiar with DNA, genes, and proper lab technique.</p> <p><b>Guiding Question:</b> How has biotechnology and been used in the past, and how has it evolved over time for present and future applications?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ Biotechnology applications have been evolving as science becomes more advanced.</li> </ul> <p><b>State Frameworks:</b> <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul>	<p><b>1. Essential Question:</b> What is Biotechnology, and how has it evolved over time?</p> <p><b>Students will:</b></p> <p><b>a. Familiarize themselves with biotechnology.</b></p> <ul style="list-style-type: none"> <li>▪ explain what biotechnology is.</li> <li>▪ compare how biotechnology has been used in the past, and how it is used today.</li> <li>▪ research and explore different applications of biotechnology.</li> <li>▪ explore the various ways living organisms are used in the food industry (cheese, fermentation, bread, etc.)</li> </ul>

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Content Standards	Expected Performances
<p><b>11.2 Bacteria, yeast and viruses are essential to the field of Biotechnology.</b></p> <p><b>Core Theme:</b> Modern genetic engineering practices often involve the use of bacteria, yeast, and viruses, especially for their role in delivering DNA. Bacteria and yeast are also utilized for their ability to be easily cloned and to produce proteins (pharmaceuticals).</p> <p><b>Guiding Question</b> How do bacteria’s and virus’ structures and growth habits enable them to be utilized in the genetic engineering process?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ Microscopic organisms are widely used in the field of Biotechnology due to their ease of growth and genetic manipulation.</li> </ul> <p><b>State Frameworks:</b> <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Cell Biology</b></p> <ul style="list-style-type: none"> <li>▪ The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism’s cells.</li> </ul>	<p><b>1. Essential Question:</b> How and why are bacteria and yeast used in genetic engineering? <b>Students will:</b></p> <p><b>a. Examine the structure and growth habits of bacteria and yeast, and how these are utilized in genetic engineering.</b></p> <ul style="list-style-type: none"> <li>▪ by performing gram staining and culturing, become familiar with the structure and reproduction of bacteria and yeast.</li> <li>▪ investigate the reproductive and growing habits of bacteria and yeast.</li> <li>▪ through lab investigation, realize how small microscopic organisms are.</li> </ul> <p><b>2. Essential Question:</b> How and why are viruses used in genetic engineering? Students will:</p> <p><b>a. Understand the structure and function of viruses and how they are utilized in genetic engineering.</b></p> <ul style="list-style-type: none"> <li>▪ diagram the infectious and replication process of viruses.</li> <li>▪ appreciate the versatility and usage of viral vectors.</li> <li>▪ investigate and become familiar with the operational procedures of a contained biolab and consider the implications of a biolab in your town by assuming the role of a concerned citizen.</li> </ul>

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<b>Content Standards</b>	<b>Expected Performances</b>
<p><b>Genetics</b></p> <ul style="list-style-type: none"><li>▪ Mutation and sexual reproduction lead to genetic variation in a population.</li><li>▪ A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization.</li><li>▪ Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism.</li><li>▪ The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells.</li></ul> <p><b>Scientific Numeracy</b></p> <p><b>10.3</b> Similarities in the chemical and structural properties of DNA in all living organisms allow the transfer of genes from one organism to another.</p>	

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Content Standards	Expected Performances
<p><b>11.3 Knowledge of the structure of DNA is inherent in understanding its usefulness in the field of biotechnology.</b></p> <p><b>Core Theme:</b> Modern biotechnology involves genetic engineering processes that manipulate the DNA of organisms in order to insert desirable traits. Understanding the structure of DNA is essential in understanding how this is done.</p> <p><b>Guiding Question:</b> How does the structure of DNA enable scientists to easily manipulate the genetic traits of organisms?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ DNA manipulation is the basis for many modern biotechnology applications involving genetic engineering processes.</li> </ul> <p><b>State Frameworks:</b></p> <p><b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Cell Biology</b></p> <ul style="list-style-type: none"> <li>▪ The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells.</li> </ul>	<p><b>1. Essential Question:</b> How is DNA structured?</p> <p><b>Students will:</b></p> <p><b>a. Recognize the structure and function of DNA</b></p> <ul style="list-style-type: none"> <li>▪ model the structure of DNA and how it replicates.</li> <li>▪ review how DNA is a code for protein production.</li> <li>▪ recognize genotype and phenotype expressions.</li> <li>▪ construct a pedigree chart to understand genetic inheritance and the relationship between genes and inheritable traits.</li> </ul> <p><b>2. Essential Question:</b> What role do proteins play in biotechnology?</p> <p><b>Students will:</b></p> <p><b>a. Recognize the various roles proteins play in the biotechnology.</b></p> <ul style="list-style-type: none"> <li>▪ review the various functions of proteins (enzymes, antibodies, pharmaceuticals) and how they are used in the biological fields. (This will be emphasized later in Standard 11.7).</li> </ul>

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<b>Content Standards</b>	<b>Expected Performances</b>
<p><b>Genetics</b></p> <ul style="list-style-type: none"><li>▪ Mutation and sexual reproduction lead to genetic variation in a population.</li><li>▪ A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization.</li><li>▪ Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism.</li><li>▪ The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells.</li></ul> <p><b>Organic Chemistry &amp; Biochemistry</b></p> <ul style="list-style-type: none"><li>▪ The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes and chemical properties, and provide the biochemical basis of life.</li></ul> <p><b>Scientific Numeracy</b></p> <p><b>10.4</b> In sexually reproducing organisms, each offspring contains a mix of characteristics inherited from both parents.</p>	

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Content Standards	Expected Performances
<p><b>11.4 Analysis of the structure of DNA has lent itself to many modern biotechnology applications.</b></p> <p><b>Core Theme:</b> Modern biotechnology involves genetic engineering processes that manipulate the DNA of organisms in order to insert desirable traits. In order to accomplish this, scientist must be able to analyze the DNA.</p> <p><b>Guiding Question:</b> How do scientists analyze DNA, and ultimately manipulate the DNA?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ Because of its structure, DNA has numerous applications in the field of biotechnology and bioengineering.</li> </ul> <p><b>State Frameworks:</b></p> <p><b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> <li>▪ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li> </ul>	<p><b>1. Essential Question:</b> How is DNA analyzed?</p> <p><b>Students will:</b></p> <p><b>a. Become familiar with the various DNA testing methods.</b></p> <ul style="list-style-type: none"> <li>▪ investigate the methodology and applications of gel electrophoresis.</li> <li>▪ understand what restriction enzymes are and simulate how they cut DNA.</li> <li>▪ simulate how gel electrophoresis separates fragments by size and investigate how it is used to measure DNA fragment size.</li> <li>▪ examine how PCR (polymerase chain reaction) and microarray assays work and their applications.</li> <li>▪ explore how bases in the DNA chain are sequenced.</li> <li>▪ recognize the potential of The Human Genome Project.</li> <li>▪ explore ethical issues involved in the Human Genome Project.</li> </ul> <p><b>3. Essential Question:</b> How can DNA be changed?</p> <p><b>Students will:</b></p> <p><b>a. Understand that DNA is altered in organisms using recombinant DNA technology.</b></p> <ul style="list-style-type: none"> <li>▪ simulate the genetic transformation process in plasmids and viruses.</li> <li>▪ research and report on an actual genetic engineering component, such as a company or a product.</li> </ul>

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<b>Content Standards</b>	<b>Expected Performances</b>
<p><b>Scientific Numeracy</b></p> <ul style="list-style-type: none"><li>▪ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</li></ul> <p><b>Cell Biology</b></p> <ul style="list-style-type: none"><li>▪ The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism’s cells.</li></ul> <p><b>Genetics</b></p> <ul style="list-style-type: none"><li>▪ Mutation and sexual reproduction lead to genetic variation in a population.</li><li>▪ A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization.</li><li>▪ Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism.</li><li>▪ The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells.</li></ul>	

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Content Standards	Expected Performances
<p><b>11.5 Biotechnology has many applications in the field of Agriculture.</b></p> <p><b>Core Theme:</b> Biotechnology is used in agriculture to make genetically modified plants and animals. This is done to make them more tolerant to disease, increase production, and to add desirable traits.</p> <p><b>Guiding Question:</b> How has biotechnology been applied in the agricultural field, and what are the advantages and disadvantages of these applications?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ Plants and animals are genetically modified to be more disease tolerant, produce greater yields, and insert desirable traits.</li> <li>▪ There are advantages and disadvantages in regards to genetically modified organisms.</li> </ul> <p><b>State Frameworks:</b></p> <p><b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> </ul>	<p><b>1. Essential Question:</b> What effect have genetically modified plants had on agriculture? <b>Students will:</b></p> <p><b>a. Understand how sections of DNA code for traits for plants</b></p> <ul style="list-style-type: none"> <li>▪ research the many different uses for genetically modified plants in agriculture; for example: disease resistance, increased production, desired traits, etc.</li> <li>▪ compare the advantages and disadvantages involved in transgenic plants.</li> <li>▪ investigate how plant protoplast are made as precursors for plant transformation.</li> </ul> <p><b>2. Essential Question:</b> What effect have genetically modified animals had on agriculture? <b>Students will:</b></p> <p><b>a. Explore the impact genetically modified animals has had on agriculture.</b></p> <ul style="list-style-type: none"> <li>▪ research the many ways animals have been genetically modified in the agricultural business.</li> <li>▪ compare the advantages and disadvantages involved in transgenic animals.</li> </ul>

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Content Standards	Expected Performances
<ul style="list-style-type: none"> <li>▪ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li> </ul> <p><b>Cell Biology</b></p> <ul style="list-style-type: none"> <li>▪ The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism’s cells.</li> </ul> <p><b>Genetics</b></p> <ul style="list-style-type: none"> <li>▪ Mutation and sexual reproduction lead to genetic variation in a population.</li> <li>▪ A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization.</li> <li>▪ Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism.</li> <li>▪ The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells.</li> </ul> <p><b>Scientific Numeracy</b></p> <p><b>10.2</b> Microorganisms have an essential role in life processes and cycles on Earth.</p> <p><b>10.3</b> Similarities in the chemical and structural properties of DNA in all living organisms allow the transfer of genes from one organism to another.</p>	

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Content Standards	Expected Performances
<p><b>11.6 Biotechnology has many useful and varied applications in bettering the Environment.</b></p> <p><b>Core Theme:</b> Microorganisms and plants, some genetically modified, can be used to clean up toxic waste sites in the environment.</p> <p><b>Guiding Question</b> How can plants and microorganisms be used to clean up the environment?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ Phytoremediation is the process of using plants to clean up the environment.</li> <li>▪ Bioremediation is the process of using microorganisms to clean up the environment.</li> <li>▪ There are both advantages and disadvantages in phytoremediation and bioremediation applications.</li> </ul> <p><b>State Frameworks:</b></p> <p><b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> <li>▪ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li> </ul>	<p><b>1. Essential Question:</b> What impact do genetically modified organisms have on the environment?</p> <p><b>Students will:</b></p> <p><b>a. Explore the impact genetically modified plants have had on society</b></p> <ul style="list-style-type: none"> <li>▪ research the many different uses for genetically modified plants in the environment (phytoremediation).</li> <li>▪ compare the advantages and disadvantages involved in the use of transgenic plants in the environment.</li> </ul> <p><b>b. Explore the impact genetically modified bacteria has had on agriculture.</b></p> <ul style="list-style-type: none"> <li>▪ Research the many ways bacteria have been genetically modified for use in the environment (bioremediation).</li> <li>▪ compare the advantages and disadvantages involved in the bioremediation process.</li> <li>▪ explore how various proteins are contributing to a “greener” environment (biocatalysts, biodegradable plastics, etc.)</li> </ul>

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<b>Content Standards</b>	<b>Expected Performances</b>
<p><b>Genetics</b></p> <ul style="list-style-type: none"><li>▪ Mutation and sexual reproduction lead to genetic variation in a population.</li><li>▪ A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization.</li><li>▪ Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism.</li><li>▪ The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells.</li></ul> <p><b>Scientific Numeracy</b></p> <p><b>9.8</b> The use of resources by human populations may affect the quality of the environment.</p> <p><b>9.9</b> Some materials can be recycled, but others accumulate in the environment and may affect the balance of the Earth systems.</p> <p><b>10.3</b> Similarities in the chemical and structural properties of DNA in all living organisms allow the transfer of genes from one organism to another.</p>	

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Content Standards	Expected Performances
<p><b>11.7 Biotechnology is responsible for great advances in the Pharmaceutical business and the Medical Field.</b></p> <p><b>Core Theme:</b> Through bioengineering, specifically designed protein products can be made. These protein products have many applications in the pharmaceutical and medical field.</p> <p><b>Guiding Question:</b> What are some of the ways biotechnology is being used in the pharmaceutical and medical field?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ Bioengineered protein drugs have become common in the pharmaceutical business.</li> <li>▪ Bioengineered proteins, as well as biotechnological processes, are used for diagnostic tools and for treatment in the medical field.</li> </ul> <p><b>State Frameworks:</b></p> <p><b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul>	<p><b>1. Essential Question:</b> What impact have genetically modified organisms had on the pharmaceutical business?</p> <p><b>Students will:</b></p> <p><b>a. Investigate the many ways genetically modified organisms are used in the pharmaceutical business.</b></p> <ul style="list-style-type: none"> <li>▪ research and report on the various uses of genetically engineered proteins in medicine; such as antibodies, hormones, and enzymes.</li> </ul> <p><b>b. Investigate the many ways genetically modified organisms are used in the medical field.</b></p> <ul style="list-style-type: none"> <li>▪ research and report on the various uses of genetically engineered proteins, as well as organisms themselves, are used in the medical field.</li> <li>▪ investigate how proteins can be used as diagnostic tools.</li> </ul>

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<b>Content Standards</b>	<b>Expected Performances</b>
<p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"><li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li><li>▪ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li></ul> <p><b>Scientific Numeracy</b></p> <p><b>9.6</b> Chemical technologies present both risks and benefits to the health and well-being of humans, plants and animals.</p> <p><b>10.2</b> Microorganisms have an essential role in life processes and cycles on Earth.</p>	

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Content Standards	Expected Performances
<p><b>11.8 The field of Biotechnology has seen a great increase in the area of business opportunities.</b></p> <p><b>Core Theme:</b> Because of new technological advances, the field of Biotechnology has seen an increase in the number of businesses and careers available.</p> <p><b>Guiding Question:</b> What business opportunities exist for one interested in the Biotechnological Sciences?</p> <p><b>Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>▪ There are many business opportunities for ones interested in a career in the biotechnological sciences.</li> </ul> <p><b>State Frameworks:</b></p> <p><b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul>	<p><b>1. Essential Question:</b> What career options exist in the field of Biotechnology?</p> <p><b>Students will:</b></p> <p><b>a. Research and report on the plethora of career opportunities available in the field of Biotechnology.</b></p> <ul style="list-style-type: none"> <li>▪ research an actual biotechnology company, and a career opportunity within the institution.</li> </ul>

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**Honors Chemistry - Grades 11 and 12**

Content Standards	Expected Performances
<p><b>Strand I - Atomic and Molecular Structure</b></p> <p><b>Core Theme:</b> Atomic and Molecular Structure The periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure.</p> <p><b>Guiding Question:</b> How does the periodic table relate physical and chemical properties of the elements to their atomic structure?</p> <p><b>State Frameworks:</b> <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> <li>▪ Scientific literacy also includes the ability to search for and assess the relevance and credibility of</li> </ul>	<p><b>1.1 Essential Question:</b> How are atoms structured?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ distinguish among protons, electrons, and neutrons in terms of relative mass and charge</li> <li>▪ describe the structure of an atom, including the location of the protons, electrons and neutrons with respect to the nucleus</li> </ul>

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Content Standards	Expected Performances
<p>scientific information found in various print and electronic media.</p> <p><b>Scientific Numeracy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</li> </ul> <p><b>Enduring Understanding:</b></p> <p><b>1.1</b> The nucleus of the atom is much smaller than the atom, yet contains most of its mass.</p>	
<p><b>Enduring Understanding:</b></p> <p><b>1.2</b> The quantum model of the atom is based on experiments and analyses by many scientists, including Dalton, Thomson, Bohr, Rutherford, Millikan and Einstein.</p>	<p><b>1.2 Essential Question:</b> What is the quantum model of the atom?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ summarize the development of atomic theory</li> <li>▪ explain the significance of quantized energies of electrons as they relate to the quantum mechanical model of the atom</li> <li>▪ apply the aufbau principle, the Pauli exclusion principle, and Hund’s rule in writing the electron configurations of elements</li> </ul>

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**Honors Chemistry - Grades 11 and 12**

Content Standards	Expected Performances
<p><b>Enduring Understanding:</b> 1.3 The position of an element in the periodic table is related to its atomic number.</p>	<p><b>1.3 Essential Question:</b> What determines an elements position in the periodic table? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explain how the atomic number identifies an element.</li> <li>▪ use the atomic number and mass number of an element to find the numbers of protons, neutrons and electrons.</li> <li>▪ explain how isotopes differ.</li> <li>▪ calculate the average atomic mass of an element from isotope data.</li> <li>▪ describe the origin of the periodic table.</li> </ul>
<p><b>Enduring Understanding:</b> 1.4 The periodic table can be used to identify metals, semimetals, non-metals and halogens.</p>	<p><b>1.4 Essential Question:</b> How are the elements organized? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ identify the position of groups, periods, metals, nonmetals and metalloids in the periodic table.</li> </ul>
<p><b>Enduring Understanding:</b> 1.5 The periodic table can be used to identify trends in ionization energy, electronegativity, the relative sizes of ions and atoms, and the number of electrons available for bonding.</p>	<p><b>1.5 Essential Question:</b> How does electron configuration determine the reactivity of an atom? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ interpret group trends in atomic radii, ionic radii, ionization energies, and electronegativities</li> <li>▪ interpret periodic trends in atomic radii, ionic radii, ionization energies, and electronegativities</li> </ul>
<p><b>Enduring Understanding:</b> 1.6 The electronic configuration of elements and their reactivity can be identified based on their position in the periodic table</p>	<p><b>1.6 Essential Question:</b> How can the electronic configuration of elements and their reactivity be identified based on their position in the periodic table? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ infer the properties of an element based on those of other elements in the periodic table.</li> <li>▪ use electron configurations to classify elements as noble gases, representative elements, transition metals, or inner transition metals.</li> </ul>

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Content Standards	Expected Performances
<p><b>Strand II – Chemical Bonds</b></p> <p><b>Core Theme:</b> Biological, chemical and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules.</p> <p><b>Guiding Question:</b> How does matter change?</p> <p><b>State Frameworks:</b>  <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> <li>▪ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li> </ul>	<p><b>2.1 Essential Question:</b> How do atoms combine?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ describe the formation of cations from metals and anions from nonmetals.</li> <li>▪ list the characteristics of an ionic bond.</li> </ul>

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Content Standards	Expected Performances
<p><b>Scientific Numeracy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</li> </ul> <p><b>Enduring Understanding:</b></p> <p><b>2.1</b> Atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds.</p>	
<p><b>Enduring Understanding:</b></p> <p><b>2.2</b> Chemical bonds between atoms in molecules such as H<sub>2</sub>, CH<sub>4</sub>, NH<sub>3</sub>, H<sub>2</sub>CCH<sub>2</sub>, N<sub>2</sub>, Cl<sub>2</sub>, and many large biological molecules are covalent.</p>	<p><b>2.2 Essential Question:</b> How do covalent bonds form?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ use electron dot structures to show the formation of single, double, and triple covalent bonds.</li> </ul>
<p><b>Enduring Understanding:</b></p> <p><b>2.3</b> Salt crystals, such as NaCl, are repeating patterns of positive and negative ions held together by electrostatic attraction.</p>	<p><b>2.3 Essential Question:</b> What are the characteristics of ionically bonded compounds?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ use the characteristics of ionic compounds to explain the electrical conductivity of ionic compounds when melted and when in aqueous solutions.</li> </ul>

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<p><b>Enduring Understanding:</b> 2.4 The atoms and molecules in liquids move in a random pattern relative to one another because the intermolecular forces are too weak to hold the atoms or molecules in a solid form.</p>	<p><b>2.4 Essential Question:</b> How are molecules attracted to one another? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ name and describe the attractive forces that hold groups of molecules together.</li> <li>▪ describe the hydrogen bonding that occurs in water.</li> </ul>
<p><b>Enduring Understanding:</b> 2.5 Lewis dot structures can provide models of atoms and molecules.</p>	<p><b>2.5 Essential Question:</b> How do we symbolically represent atoms and molecules? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ use the periodic table to infer the number of valence electrons in an atom and draw its electron dot structure.</li> </ul>
<p><b>Enduring Understanding:</b> 2.6 The shape of simple molecules and their polarity can be predicted from Lewis dot structures.</p>	<p><b>2.6 Essential Question:</b> How can the shape of simple molecules and their polarity be predicted? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ use VSEPR theory to predict the shapes of simple covalently bonded molecules.</li> </ul>
<p><b>Enduring Understanding:</b> 2.7 Electronegativity and ionization energy are related to bond formation.</p>	<p><b>2.7 Essential Question:</b> How do electronegativity and ionization energy affect bond formation? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ use electronegativity to classify a bond as nonpolar covalent, polar covalent, or ionic.</li> </ul>
<p><b>Enduring Understanding:</b> 2.8 Solids and liquids held together by Van der Waals forces or hydrogen bonds are affected by volatility and boiling/melting point temperatures.</p>	<p><b>2.8 Essential Question:</b> What are the forces that hold liquids and solids together? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explain the high surface tension and low vapor pressure of water in terms of hydrogen bonding.</li> <li>▪ account for the high heat of vaporization and the high boiling point of water in terms of hydrogen bonding.</li> <li>▪ explain why ice floats in water.</li> <li>▪ explain the significance of the statement “like dissolves like.”</li> <li>▪ distinguish among strong electrolytes, weak electrolytes, and nonelectrolytes, giving examples of each.</li> <li>▪ identify the factors that determine the rate at which a solute dissolves.</li> <li>▪ solve problems involving the molarity of a solution.</li> <li>▪ describe how to prepare dilute solutions from more concentrated solutions of known molarity.</li> </ul>

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<p><b>Strand III – Conservation of Matter and Stoichiometry</b></p> <p><b>Core Theme:</b> The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants</p> <p><b>Guiding Question:</b> How is matter measured?</p> <p><b>Enduring Understanding:</b>  <b>3.1</b> Chemical reactions can be described by writing balanced equations.</p> <p><b>State Frameworks:</b>  <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> <li>▪ Scientific literacy also includes the ability to search</li> </ul>	<p><b>3.1 Essential Question:</b> How are chemical reactions expressed?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ write equations describing chemical reactions using appropriate symbols.</li> <li>▪ write balanced chemical equations when given the names or formulas of the reactants and products in a chemical reaction.</li> <li>▪ identify reactions as combination, decomposition, single-replacement, double-replacement, or combustion.</li> <li>▪ predict the products of combination, decomposition, single-replacement, double-replacement, or combustion.</li> <li>▪ write and balance net ionic equations.</li> <li>▪ calculate the amount of reactants required or product formed in a chemical process.</li> <li>▪ construct mole ratios from balanced chemical equations and apply these ratios in mole-mole stoichiometric calculations.</li> <li>▪ calculate stoichiometric quantities from balanced chemical equations.</li> <li>▪ identify and use the limiting reagent in a reaction to calculate the maximum amount of product(s) produced and the amount of excess reagent.</li> <li>▪ calculate theoretical yield, actual yield, or percent yield given appropriate information to predict the precipitate formed in double-replacement reactions.</li> </ul>

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<p>for and assess the relevance and credibility of scientific information found in various print and electronic media.</p> <p><b>Scientific Numeracy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</li> </ul>	
<p><b>Enduring Understanding:</b></p> <p><b>3.2</b> The quantity one mole is set by defining one mole of carbon 12 atoms to have a mass of exactly 12 grams.</p>	<p><b>3.2 Essential Question:</b> How do we measure atoms and molecules using the quantity of a mole?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ describe how Avogadro’s number is related to a mole of any substance.</li> </ul>
<p><b>Enduring Understanding:</b></p> <p><b>3.3</b> One mole equals <math>6.02 \times 10^{23}</math> particles (atoms or molecules).</p>	<p><b>3.3 Essential Question:</b> How are atoms or molecules counted?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ describe how Avogadro’s number is related to a mole of any substance.</li> </ul>

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<p><b>Enduring Understanding:</b>  <b>3.4</b> The molar mass of a molecule can be determined from its chemical formula and a table of atomic masses.</p>	<p><b>3.4 Essential Question:</b>            How are the molar mass of atoms and molecules determined?  <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ use the molar mass to convert between mass and moles of a substance.</li> <li>▪ calculate molar mass of a molecule from its chemical formula and from experimental data.</li> </ul>
<p><b>Enduring Understanding:</b>  <b>3.5</b> The mass of a molecular substance can be converted to moles, number of particles, or volume of gas at standard temperature and pressure.</p>	<p><b>3.5 Essential Question:</b>            How can the mass of a molecular substance be converted to moles, number of particles, or volume of gas at standard temperature and pressure?  <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ use the mole to convert among measurements of mass, volume, and number of particles.</li> <li>▪ calculate the percent composition of a substance from its chemical formula or experimental data.</li> </ul>
<p><b>Enduring Understanding:</b>  <b>3.6</b> Hess's law is used to calculate enthalpy change in a reaction.</p>	<p><b>3.6 Essential Question:</b>            How can Hess's law be used to calculate enthalpy change in a reaction?  <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ construct equations that show the heat changes for chemical and physical processes.</li> <li>▪ calculate heat changes in chemical and physical processes.</li> <li>▪ classify the heat changes that occur during melting, freezing, boiling and condensing.</li> <li>▪ calculate heat changes that occur during melting, freezing, boiling and condensing.</li> </ul>

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Content Standards	Expected Performances
<p><b>Strand IV – Reaction Rates</b></p> <p><b>Core Theme:</b> Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules.</p> <p><b>Guiding Question</b> How do chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules?</p> <p><b>State Frameworks:</b>  <b>Scientific Inquiry</b> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <b>Scientific Literacy</b> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> </ul> <b>Scientific Numeracy</b> <ul style="list-style-type: none"> <li>▪ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</li> </ul> </p>	<p><b>4.1 Essential Question:</b> How is the rate of reaction the decrease in concentration of reactants or the increase in concentration of products with time?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explain what is meant by the rate of a chemical reaction.</li> </ul>

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**Honors Chemistry - Grades 11 and 12**

Content Standards	Expected Performances
<p><b>Enduring Understanding:</b> 4.1 The rate of reaction is the decrease in concentration of reactants or the increase in concentration of products with time.</p>	
<p><b>Enduring Understanding:</b> 4.2 Reaction rates depend on factors such as concentration, temperature and pressure.</p>	<p>4.2 <b>Essential Question:</b> How do reaction rates depend on factors such as concentration, temperature and pressure? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ using collision theory, explain how the rate of a chemical reaction is influenced by the reaction conditions.</li> <li>▪ determine the effects of reaction conditions on reaction rate using experimental data.</li> </ul>
<p><b>Enduring Understanding:</b> 4.3 Equilibrium is established when forward and reverse reaction rates are equal.</p>	<p>4.3 <b>Essential Question:</b> How is equilibrium established? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ predict changes in the equilibrium position due to change in concentration, temperature and pressure.</li> <li>▪ write the equilibrium constant expression for a reaction and calculate its value from experimental data.</li> </ul>
<p><b>Enduring Understanding:</b> 4.4 Catalysts play a role in increasing the reaction rate by changing the activation energy in a chemical reaction.</p>	<p>4.4 <b>Essential Question:</b> How do catalysts play a role in increasing the reaction rate? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ investigate the effect of energy on reaction rate</li> <li>▪ interpret catalytic activity in terms of lowering activation energy</li> </ul>

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**Honors Chemistry - Grades 11 and 12**

Content Standards	Expected Performances
<p><b>Strand V – Organic Chemistry and Biochemistry</b></p> <p><b>Core Theme:</b> The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes and chemical properties, and provide the biochemical basis of life.</p> <p><b>Guiding Question:</b> How does the bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes and chemical properties, and provide the biochemical basis of life?</p> <p><b>State Frameworks:</b>  <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> </ul>	<p><b>5.1 Essential Question:</b> How are large molecules , such as proteins, nucleic acids and starch, considered polymers?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ describe the important structural characteristics of proteins</li> <li>▪ describe the important structural characteristics of nucleic acids</li> <li>▪ describe the important structural characteristics of monosaccharides, disaccharides, and polysaccharides</li> </ul>

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Content Standards	Expected Performances
<p><b>Scientific Numeracy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</li> </ul> <p><b>Enduring Understanding:</b></p> <p><b>5.1</b> Large molecules (polymers), such as proteins, nucleic acids and starch, are formed by repetitive combinations of organic monomers.</p>	
<p><b>Enduring Understanding:</b></p> <p><b>5.2</b> The bonding characteristics of carbon result in the formation of a large variety of structures, ranging from simple hydrocarbons to complex biological molecules and synthetic polymers.</p>	<p><b>5.2 Essential Question:</b> How do the bonding characteristics of carbon result in the formation of a large variety of structures?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ describe the bonding in hydrocarbons.</li> <li>▪ distinguish between straight-chain and branched-chain hydrocarbons.</li> <li>▪ explain the difference between unsaturated and saturated hydrocarbons.</li> <li>▪ distinguish among structural, geometric and stereoisomers.</li> <li>▪ identify common cyclic ring structures.</li> <li>▪ explain resonance in terms of the aromatic ring of benzene.</li> <li>▪ define a functional group.</li> <li>▪ distinguish between alcohols, ethers and carbonyl compounds.</li> <li>▪ explain the relationship between photosynthesis and all life on Earth.</li> </ul>

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Content Standards	Expected Performances
<p><b>Enduring Understanding:</b>  <b>5.3</b> Amino acids are the building blocks of proteins.</p>	<p><b>5.3 Essential Question:</b>            What is the composition of proteins?  <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ write a general formula for an amino acid, and describe the bonding between amino acids in peptides and proteins.</li> <li>▪ describe the effect of enzymes on biochemical reactions.</li> <li>▪ characterize the molecular structures of triglycerides, phospholipids, and waxes.</li> <li>▪ describe the structural components of nucleotides and nucleic acids, including DNA.</li> <li>▪ describe the role of ATP in energy production and energy use in the cell.</li> </ul>

Content Standards	Expected Performances
<p><b>Strand VI – Acids and Bases</b></p>	<p><b>6.1 Essential Questions:</b></p>

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Content Standards	Expected Performances
<p><b>Core Theme:</b> Acids and bases form a unique group of compounds.</p> <p><b>Guiding Question:</b> What are acids and bases and how do they react?</p> <p><b>State Frameworks:</b>  <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> </ul> <p><b>Scientific Numeracy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</li> </ul> <p><b>Enduring Understanding:</b>  <b>6.1</b> The type of chemical structure determines whether a compound is an acid or a base.</p>	<ul style="list-style-type: none"> <li>a. What are acids and bases and how is acidity measured?</li> <li>b. What effect does an acid have on a base?</li> <li>c. What is the relationship between concentration and strength?</li> </ul> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ identify chemical structures characteristic of acids and bases.</li> <li>▪ measure acidity using indicators and pH meters.</li> <li>▪ convert between concentration and pH.</li> <li>▪ experimentally determine the concentration of an unknown acid by using a known base.</li> <li>▪ distinguish between strong and weak acids and bases.</li> <li>▪ identify and write balanced equations for typical reactions of acids and bases.</li> </ul>

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**Marine Science - Grades 11 and 12**

Content Standards	Expected Performances
<p><b>State Framework Standards:</b></p> <p><b>Ecology</b> Stability in an ecosystem is a balance between competing effects.</p> <p><b>Energy in the Earth System</b> Heating of Earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents.</p> <p><b>Biogeochemical Cycles</b> Each element on Earth moves among reservoirs which exist in the solid earth, in oceans, in the atmosphere, and within and among organisms as part of biogeochemical cycles.</p> <p><b>Chemical Bonds</b> Biological, chemical and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules.</p> <p style="text-align: center;"><b>Core Theme:</b> Chemical Properties of Water</p> <p style="text-align: center;"><b>Guiding Question:</b> How are chemical properties of water important to aquatic organisms?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"> <li>▪ Living organisms require certain chemical components in order to survive in an aquatic environment.</li> </ul>	<p><b>a. Essential Question:</b> What is the relationship between density, salinity and temperature of different aquatic systems, and how are living organisms affected by these relationships? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explore the relationship between density, salinity and temperature of different aquatic systems and the organisms living there</li> <li>▪ identify the different molecules and compounds in each aquatic system, and describe how these are related to each other.</li> <li>▪ describe how the aquatic organisms contribute to the chemical make up of the water and how they are affected by the chemical changes in the system.</li> </ul> <p><b>b. Essential Question:</b> How are the biogeochemical cycles of the earth related to each other? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ illustrate the carbon, nitrogen, phosphate and water cycle.</li> </ul>

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**Marine Science - Grades 11 and 12**

Content Standards	Expected Performances
<p><b>State Framework Standards:</b></p> <p><b>SCIENTIFIC LITERACY</b></p> <ul style="list-style-type: none"> <li>◆ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> <li>◆ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li> </ul> <p><b>Ecology</b> Stability in an ecosystem is a balance between competing effects.</p> <p><b>Evolution</b> Evolution is the result of genetic changes that occur in constantly changing environments.</p> <p><b>Energy in the Earth System</b> Heating of Earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents.</p> <p style="text-align: center;"><b>Core Theme:</b> Aquatic Communities</p> <p><b>Guiding Question:</b> What are the similarities and differences between different aquatic systems and organisms?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"> <li>▪ Aquatic systems have similarities and differences that require specific adaptations.</li> </ul>	<p><b>a. Essential Question:</b> How are the different aquatic systems similar and different to each other?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ compare and contrast different aquatic systems, such as wetlands, oceans, lakes, ponds and rivers.</li> <li>▪ illustrate how different marine organisms have adapted to live in their environment and how they are related.</li> <li>▪ identify different marine organisms place them in a food web.</li> </ul> <p><b>b. Essential Question:</b> How do invasive species have an impact on the ecosystems?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ research how and why an invasive species impacts the environment.</li> </ul>

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Content Standards	Expected Performances
<p><b>State Framework Standards:</b></p> <p><b>Dynamic Earth Processes</b></p> <p>Plate tectonics operating over geologic time has changed the patterns of land, sea and mountains on Earth's surface</p> <p><b>Energy in the Earth System</b></p> <p>Heating of Earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents.</p> <p><b>Biogeochemical Cycles</b></p> <p>Each element on Earth moves among reservoirs which exist in the solid earth, in oceans, in the atmosphere, and within and among organisms as part of biogeochemical cycles.</p> <p style="padding-left: 40px;"><b>Core Theme:</b> Behavior of Water</p> <p style="padding-left: 40px;"><b>Guiding Question:</b> What are the effects that currents, waves, and sediment have on living organisms?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"> <li>▪ The behavior of water affects all the living organisms living in a marine system.</li> </ul>	<p><b>a. Essential Question:</b> How does the movement of water effect marine organisms?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explore different types of waves and currents including surface, deep waves and currents and tsunamis, and their affects on marine organisms.</li> <li>▪ investigate different types of marine sediment and conclude how they affect organisms.</li> <li>▪ illustrate different beach types and investigate what affects their formation.</li> </ul> <p><b>b. Essential Question:</b> How does a thermocline and halocline affect the organisms living in the system?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ investigate the way in which a thermocline and halocline affect marine organisms.</li> </ul>

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Content Standards	Expected Performances
<p><b>State Framework Standards:</b></p> <p><b>Cell Biology</b> The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells.</p> <p><b>Physiology</b> As a result of the coordinated structures and functions of organ systems, the internal environment of the body remains relatively stable (homeostatic) despite changes in the outside environment.</p> <p style="padding-left: 40px;"><b>Core Theme:</b> Marine Organisms</p> <p style="padding-left: 40px;"><b>Guiding Question:</b> How do different types of marine organisms function in their environment?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"> <li>▪ Different types of marine organisms have specific anatomical and physiological needs and are dependent on each other for survival.</li> </ul>	<p><b>a. Essential Question:</b> How are different types of marine organisms adapted to the marine ecosystem?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ observe and identifying different types of algae and describe their role in the marine system.</li> <li>▪ observe and identify different types of zooplankton.</li> <li>▪ investigate how zooplankton respond to different factors in the environment.</li> <li>▪ illustrate the parts of a sea star, squid and dogfish that have allowed them to adapt to their environment.</li> <li>▪ describe the role of these organisms in their ecosystem.</li> </ul>

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Content Standards	Expected Performances
<p><b>State Framework Standards:</b></p> <p><b>Grade 9 – Strand III: Global Interdependence</b></p> <p>9.8 - The use of resources by human populations may affect the quality of the environment.</p> <p>9.9 - Some materials can be recycled, but others accumulate in the environment and may affect the balance of the Earth systems.</p> <p><b>Grade 10 – Strand V: Genetics Evolution and Biodiversity</b></p> <p>10.6 - Living organisms have the capability of producing populations of unlimited size, but the environment can support only a limited number of individuals from each species.</p> <p><b>Ecology</b> Stability in an ecosystem is a balance between competing effects.</p> <p style="padding-left: 40px;"><b>Core Theme:</b> Marine Ecology</p> <p style="padding-left: 40px;"><b>Guiding Question:</b> How does human activity affect the health of marine aquatic systems?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"> <li>▪ Human activity affects the health of aquatic systems.</li> </ul>	<p><b>a. Essential Question:</b> What does it take to keep a marine environment in balance?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ research and apply data obtained from Long Island Sound to determine what factors are necessary to keep a marine environment in balance.</li> </ul>

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**Physics**

Content Standards	Expected Performances
<p><b>Strand I - Motion and Forces</b></p> <p><b>Core Theme:</b> Newton’s laws predict the motion of most objects.</p> <p><b>Guiding Question:</b> How can the Laws of Physics unify physical phenomena?</p> <p><b>State Frameworks:</b>  <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> <li>▪ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li> </ul>	<p><b>1.1 Essential Question:</b> How does an object accelerate when forces are balanced?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ distinguish between scalars and vectors and define distance and displacement.</li> <li>▪ define and calculate speed and velocity, and perform graphical analyses of velocity.</li> <li>▪ add and subtract vectors graphically and analytically.</li> <li>▪ determine relative velocity through vector addition or subtraction.</li> </ul>

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**Physics**

Content Standards	Expected Performances
<p><b>Scientific Numeracy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</li> </ul> <p><b>Enduring Understanding:</b></p> <p><b>1.1</b> When forces are balanced, no acceleration occurs; thus an object continues to move at a constant speed or stays at rest.</p>	
<p><b>Enduring Understanding:</b></p> <p><b>1.2</b> Applying a force to an object perpendicular to the direction of its motion causes the object to change direction.</p>	<p><b>1.2 Essential Question:</b> How does applying a force to an object perpendicular to the direction its motion affect the object?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ state and explain Newton’s 1<sup>st</sup> law of motion and describe inertia and its relationship to mass.</li> <li>▪ explain the relationship between velocity and acceleration and perform graphical analyses of acceleration.</li> <li>▪ explain kinematic equations and apply them in physical situations.</li> <li>▪ analyze free fall using the kinematic equations.</li> <li>▪ analyze motion in terms of its components and apply the kinemtic equations for components of motion.</li> <li>▪ analyze projectile motion to find position, time of flight and range.</li> <li>▪ relate force and motion and explain what is meant by a net or unbalanced force.</li> </ul>

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**Physics**

Content Standards	Expected Performances
<p><b>Enduring Understanding:</b>  <b>1.3</b> The law <math>F=ma</math> is used to solve motion problems that involve constant forces.</p>	<p><b>1.3 Essential Question:</b>            How can the law <math>F=ma</math> be used to solve motion problems that involve constant forces?  <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ state and explain Newton’s 2<sup>nd</sup> law of motion and apply it to physical situations.</li> <li>▪ use Newton’s 2<sup>nd</sup> law, including the component form, to various situations.</li> </ul>
<p><b>Enduring Understanding:</b>  <b>1.4</b> When one object exerts a force on a second object, the second object always exerts a force of equal magnitude and in the opposite direction.</p>	<p><b>1.4 Essential Question:</b>            What happens when one object exerts a force on a second object?  <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ state and explain Newton’s 3<sup>rd</sup> law of motion and identify action-reaction pairs.</li> <li>▪ investigate the causes of friction and how it is described using coefficients of friction.</li> </ul>
<p><b>Enduring Understanding:</b>  <b>1.5</b> Circular motion requires the application of a constant force directed toward the center of the circle.</p>	<p><b>1.5 Essential Question:</b>            Why does circular motion require the application of a constant force directed toward the center of the circle?  <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ define units of angular measure and show how angular measure is related to circular arc length.</li> <li>▪ describe and compute angular speed and velocity and explain their relationship to tangential speed</li> <li>▪ explain why there is a centripetal acceleration in constant or uniform circular motion and compute centripetal acceleration.</li> <li>▪ analyze rotational kinematics.</li> <li>▪ distinguish between pure translational and pure rotational motions of a rigid body and state the conditions for rolling without slipping.</li> <li>▪ define torque, apply the conditions for mechanical equilibrium, and describe the relationship between the location of the center of gravity and stability.</li> <li>▪ describe what is meant by the moment of inertia of a rigid body and apply the rotational form of Newton’s 2<sup>nd</sup> law to physical situations.</li> <li>▪ discuss, explain, and use the rotational forms of work, kinetic energy, and power.</li> <li>▪ define angular momentum and apply the conservation of angular momentum to physical situations.</li> </ul>

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Content Standards	Expected Performances
<p><b>Enduring Understanding:</b>  <b>1.6</b> Newton’s laws are not exact, but provide very good approximations unless an object is small enough that quantum effects become important.</p>	<p><b>1.6 Essential Question:</b>            Why are Newton’s laws not exact, but provide very good approximations unless an object is small enough that quantum effects become important?  <b>Students will:</b></p> <ul style="list-style-type: none"> <li>• summarize the concepts of classical relativity and relative velocities, define inertial and noninertial reference frames and explain the reasoning behind the ether hypothesis.</li> <li>• explain the general concept and operation of the Michelson-Morley experiment and the effect on the ether concept.</li> <li>• explain how the two postulates of relativity imply the relativity of simultaneity, and how the relativity of simultaneity leads to length contraction.</li> <li>• understand the concepts of time dilation and length contraction, and calculate the relationship between time and intervals and lengths observed in different inertial frames.</li> <li>• understand the need for more general expressions for kinetic energy, mass, momentum, and total energy when objects move near the speed of light; and use the relativistically correct expressions to calculate energy and momentum in particle interactions.</li> <li>• explain the principle of equivalence and specify some of the predictions of general relativity.</li> <li>• understand the necessity for a relativistic velocity addition formula and apply it to simple relative velocity calculations.</li> </ul>

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Content Standards	Expected Performances
<p><b>Strand II – Conservation of Energy and Momentum</b></p> <p><b>Core Theme:</b> The laws of conservation of energy and momentum provide a way to predict and describe the movement of objects.</p> <p><b>Guiding Question:</b> Are there any physical properties which are always conserved?</p> <p><b>State Frameworks:</b>  <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> <li>▪ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li> </ul>	<p><b>2.2 Essential Question:</b> How can kinetic energy be calculated by formula <math>E = (1/2) mv^2</math>.</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ define mechanical work and compute the work done in various situations.</li> <li>▪ differentiate work done by constant and variable force and compute to work done by a spring force.</li> <li>▪ show how the work-energy theorem is used in defining kinetic energy.</li> </ul>

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Content Standards	Expected Performances
<p><b>Scientific Numeracy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</li> </ul> <p><b>Enduring Understanding:</b></p> <p><b>2.1</b> Kinetic energy can be calculated by formula <math>E = (1/2)mv^2</math>.</p>	
<p><b>Enduring Understanding:</b></p> <p><b>2.2</b> Changes in gravitational potential energy near Earth can be calculated by using the formula <math>(\text{change in potential energy}) = mgh</math>.</p>	<p><b>2.2 Essential Question:</b> How can changes in gravitational potential energy near Earth can be calculated by using the formula <math>(\text{change in potential energy}) = mgh</math>?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ determine how potential energy depends on position and compute values of gravitational potential energy.</li> <li>▪ distinguish between conservative and nonconservative forces, and explain their effects on the conservation of energy.</li> <li>▪ describe Newton’s law of gravitation and how it relates to the acceleration due to gravity and apply the general formulation of gravitational potential energy.</li> <li>▪ state and explain Kepler’s laws of planetary motion and describe the orbits and motions of satellites.</li> <li>▪ define power and mechanical efficiency.</li> </ul>
<p><b>Enduring Understanding:</b></p> <p><b>2.3</b> Momentum is calculated as the product <math>mv</math>.</p>	<p><b>2.3 Essential Question:</b> How can momentum be calculated as the product <math>mv</math>?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ compute linear momentum and the components of momentum.</li> </ul>
<p><b>Enduring Understanding:</b></p> <p><b>2.4</b> Momentum is a separately conserved quantity from energy.</p>	<p><b>2.4 Essential Question:</b> How is momentum a separately conserved quantity different from energy?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ investigate the condition for the conservation of linear momentum and apply it to physical situations.</li> </ul>

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Content Standards	Expected Performances
<p><b>Enduring Understanding:</b> 2.5 An unbalanced force on an object produces a change in its momentum.</p>	<p><b>2.5 Essential Question:</b> How does an unbalanced force on an object produce a change in its momentum? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ relate impulse and momentum, and kinetic energy and momentum.</li> </ul>
<p><b>Enduring Understanding:</b> 2.6 The principles of conservation of momentum and energy can be used to solve problems involving elastic and inelastic collisions.</p>	<p><b>2.6 Essential Question:</b> How can the principles of conservation of momentum and energy be used to solve problems involving elastic and inelastic collisions? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>• describe the conditions on kinetic energy and momentum in elastic and inelastic collisions.</li> <li>• determine conservation of linear momentum in both elastic and inelastic collisions.</li> <li>• explain the concept of the center of mass, compute its location for simple systems, and describe how the center of mass and center of gravity are related.</li> <li>• apply the conservation of momentum in the explanation of jet propulsion and the operation of rocket.</li> </ul>

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Content Standards	Expected Performances
<p><b>Strand III – Heat and Thermodynamics</b></p> <p><b>Core Theme:</b> Energy cannot be created or destroyed although, in many processes, energy is transferred to the environment as heat.</p> <p><b>Guiding Question:</b> Are any non-mechanical physical properties conserved?</p> <p><b>State Frameworks:</b>  <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> </ul> <p><b>Scientific Numeracy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</li> </ul>	<p><b>3.1 Essential Question:</b> How are heat flow and work two forms of energy transfer between systems?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ distinguish the various units of heat and define the mechanical equivalent of heat.</li> <li>▪ describe specific heat and its cause, and explain how the specific heat of materials are obtained using calorimetry.</li> <li>▪ compare and contrast the three common phases of matter, and relate latent heat to phase changes.</li> <li>▪ describe the three methods of heat transfer and give practical and/or environmental examples of each.</li> </ul>

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Content Standards	Expected Performances
<p><b>Enduring Understanding:</b> 3.1 Heat flow and work are two forms of energy transfer between systems.</p>	
<p><b>Enduring Understanding:</b> 3.2 The work done by a heat engine that is working in a cycle is the difference between the heat flow into the engine at high temperature and the heat flow out as a lower temperature.</p>	<p><b>3.2 Essential Question:</b> How is the work done by a heat engine that is working in a cycle the difference between the heat flow into the engine at high temperature and the heat flow out as a lower temperature? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ define thermodynamic systems and states of systems, and explain how processes affect such systems.</li> </ul>
<p><b>Enduring Understanding:</b> 3.3 The work done by a heat engine that is working in a cycle is the difference between the heat flow into the engine at high temperature and the heat flow out at a lower temperature.</p>	<p><b>3.3 Essential Question:</b> How is the work done by a heat engine that is working in a cycle the difference between the heat flow into the engine at high temperature and the heat flow out at a lower temperature? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ define thermodynamic systems and states of systems, and explain how processes affect such systems.</li> </ul>
<p><b>Enduring Understanding:</b> 3.4 Most processes tend to decrease the order of a system over time, so that energy levels eventually are distributed more uniformly.</p>	<p><b>3.4 Essential Question:</b> How do most processes tend to decrease the order of a system over time, so that energy levels eventually are distributed more uniformly? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ state and explain the second law of thermodynamics in several forms, and explain the concept of entropy.</li> <li>▪ explain the concept of a heat engine and compute thermal efficiency, and explain the concept of a heat pump and compute coefficient of performance.</li> <li>▪ explain how the Carnot cycle applies to heat engines, compute the ideal efficiency, and state the third law of thermodynamics.</li> </ul>

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Content Standards	Expected Performances
<p><b>Strand IV – Waves</b></p> <p><b>Core Theme:</b> Waves have characteristic properties that do not depend on the type of wave.</p> <p><b>Guiding Question</b> What are waves and how can their properties be explained?</p> <p><b>State Frameworks:</b></p> <p><b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> </ul> <p><b>Scientific Numeracy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</li> </ul>	<p><b>4.1 Essential Question:</b> How do waves carry energy from one place to another?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ describe simple harmonic motion and relate energy and speed in such motion.</li> <li>▪ investigate simple harmonic motion of pendulums and springs.</li> <li>▪ write the equation of motion for SHM and explain what is meant by phase and phase differences.</li> </ul>

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Content Standards	Expected Performances
<p><b>Enduring Understanding:</b> 4.1 Waves carry energy from one place to another.</p>	
<p><b>Enduring Understanding:</b> 4.2 Transverse and longitudinal waves exist in mechanical media, such as springs and ropes, and in the Earth as seismic waves.</p>	<p><b>4.2 Essential Question:</b> How do transverse and longitudinal waves exist in mechanical media, such as springs and ropes, and in the Earth as seismic waves? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ describe wave motion in terms of various parameters and identify different types of waves.</li> </ul>
<p><b>Enduring Understanding:</b> 4.3 Wavelength, frequency and wave speed are related.</p>	<p><b>4.3 Essential Question:</b> How are wavelength, frequency and wave speed are related. <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ investigate the relationships between wavelength, frequency and wave speed for waves in water.</li> <li>▪ explain various wave phenomena.</li> <li>▪ describe the formation and characteristics of standing waves, and explain the phenomenon of resonance.</li> </ul>
<p><b>Enduring Understanding:</b> 4.4 Sound is a longitudinal wave whose speed depends on the properties of the medium in which it propagates.</p>	<p><b>4.4 Essential Question:</b> How does sound, a longitudinal wave, whose speed depends on the properties of the medium in which it propagates? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ define sound and explain the sound frequency spectrum.</li> <li>▪ determine the speed of sound in air.</li> <li>▪ tell how the speed of sound differs in different media and describe the temperature dependence of the speed of sound in air.</li> <li>▪ define sound intensity and explain how it varies with distance from a point source, and calculate sound intensities on the decibel scale.</li> <li>▪ explain sound reflection, refraction, and diffraction, and distinguish between constructive and destructive interference.</li> </ul>

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Content Standards	Expected Performances
<p><b>Enduring Understanding:</b> 4.5 Beats and the Doppler Effect result from the characteristic behavior of waves.</p>	<p><b>4.5 Essential Question:</b> How do beats and the Doppler Effect result from the characteristic behavior of waves? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ investigate beats as an example of superposition of waves.</li> <li>▪ describe and explain the Doppler effect, and give some examples of its occurrences and applications.</li> <li>▪ explain some of the sound characteristics of musical instruments in physical terms.</li> </ul>
<p><b>Enduring Understanding:</b> 4.6 Radio waves, light and X-rays are different wavelength bands in the spectrum of electromagnetic waves, the speed of which in a vacuum is approximately <math>3 \times 10^8</math>m/s, and less when passing through other media.</p>	<p><b>4.6 Essential Question:</b> How are Radio waves, light and X-rays different wavelength bands in the spectrum of electromagnetic waves, the speed of which in a vacuum is approximately <math>3 \times 10^8</math>m/s, and less when passing through other media. <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ define and explain the concept of wave fronts and rays.</li> <li>▪ explain the law of reflection, and distinguish between regular (specular) and irregular (diffuse) reflections.</li> </ul>
<p><b>Enduring Understanding:</b> 4.7 Waves have characteristic behaviors, such as interference, diffraction, refraction and polarization.</p>	<p><b>4.7 Essential Question:</b> How do waves have characteristic behaviors, such as interference, diffraction, refraction and polarization. <b>Students will:</b></p> <ul style="list-style-type: none"> <li>• investigate refraction in terms of Snell's law and the index of refraction, and give examples of refractive phenomena.</li> <li>• investigate internal reflection .</li> <li>• explain dispersion and some of its effects.</li> <li>• describe the characteristics of plane mirrors and explain apparent right-left reversals.</li> <li>• investigate differences between converging and diverging spherical mirrors, describe images and their characteristics, and determine these image characteristics using ray diagrams and the spherical mirror equation.</li> <li>• investigate differences between converging and diverging lenses, describe images and their characteristics, and find image characteristics using ray diagrams and the thin-lens equation.</li> </ul>

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<b>Content Standards</b>	<b>Expected Performances</b>
	<ul style="list-style-type: none"><li>• explain how Young’s experiment demonstrates the wave nature of light, and compute the wavelength of light from experimental results.</li><li>• describe how thin films produce colorful displays and give some examples of practical applications of thin-film interference.</li><li>• define diffraction and give examples of diffractive effects.</li><li>• investigate light polarization and give examples of polarization, both in the environment and in commercial applications.</li></ul>

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Content Standards	Expected Performances
<p><b>Strand V – Electric and Magnetic Phenomena</b></p> <p><b>Core Theme:</b> Electric and magnetic phenomena are related and have many practical applications.</p> <p><b>Guiding Question:</b> How can natural forces be used to explain physical phenomena?</p> <p><b>State Frameworks:</b></p> <p><b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> </ul> <p><b>Scientific Numeracy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</li> </ul> <p><b>Enduring Understanding:</b></p> <p><b>5.1</b> Charged particles are sources of electric fields and are subject to the forces of the electric fields from other charges.</p>	<p><b>5.1 Essential Question:</b> How are charged particles sources of electric fields and subject to the forces of the electric fields from other charges?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ distinguish between the two types of electric charge, state the charge-force law that operates between charge objects, and use the law of charge conservation.</li> <li>▪ distinguish between conductors and insulators, explain the operation of the electroscope, and investigate charging by conduction or induction.</li> <li>▪ state Coulomb’s law and use it to calculate the electric force between two charged particles, and on one charge due to several other charges.</li> <li>▪ understand how the electric field vector is defined, plot electric field lines for simple charge distributions, and calculate electric fields due to several point charges.</li> <li>▪ describe the electric field near the surface and the interior of a good conductor, determine where the highest concentration of excess charge accumulates on a charged conductor, and sketch the electric field line pattern outside a charged conductor.</li> <li>▪ state the physical basis of Gauss’s law and use the law to make qualitative predictions.</li> <li>▪ understand the concept of electric potential difference (voltage) and its relationship to electric potential energy, and calculate electric potential differences and electric potential energy in simple cases.</li> <li>▪ explain what is meant by an equipotential surface, sketch equipotential surfaces for simple charge configurations, and explain the relationship between equipotential surfaces and electric fields.</li> <li>▪ define capacitance and explain what it means physically, calculate the charge, electric field, and energy stored for parallel plate capacitors.</li> <li>▪ understand what a dielectric is and how it affects the physical properties of a capacitor.</li> <li>▪ find the equivalent capacitance of capacitors connected in series and in parallel, calculate the charge, voltages and energy storage of individual capacitors in series and parallel configurations, and analyze capacitor networks that include both series and parallel arrangements.</li> <li>▪ summarize the basic features of a battery and explain how a battery produces a direct current in a circuit.</li> </ul>

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Content Standards	Expected Performances
<p><b>Enduring Understanding:</b>  <b>5.2</b> The voltage or current in simple direct current (DC) electric circuits constructed from batteries, wires, resistors and capacitors can be predicted using Ohm’s law.</p>	<p><b>5.2 Essential Question:</b>            How can the voltage or current in simple direct current (DC) electric circuits constructed from batteries, wires, resistors and capacitors can be predicted using Ohm’s law?  <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ define electric current; distinguish between electron flow and conventional current.</li> <li>▪ define electrical resistance and explain what is meant by an ohmic resistor.</li> <li>▪ investigate the relationship between voltage and current in simple DC circuits.</li> <li>▪ formulate from experimental data Ohm’s law and use it to characterize voltage and current in simple circuits.</li> <li>▪ determine the equivalent resistance of resistors in series, parallel, and series-parallel combinations, and use equivalent resistance to solve simple circuits.</li> <li>▪ understand the charging and discharging of a capacitor through a resistor and calculate the current and voltage at specific times during these processes.</li> </ul>
<p><b>Enduring Understanding:</b>  <b>5.3</b> Any resistive element in a DC circuit dissipates energy, which heats the resistor.</p>	<p><b>5.3 Essential Question:</b>            How does any resistive element in a DC circuit dissipate energy, which heats the resistor?  <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ summarize the factors that determine resistance and calculate the effect of these factors in simple situations.</li> <li>▪ determine the amount of heat dissipated by a resistive element.</li> </ul>
<p><b>Enduring Understanding:</b>  <b>5.4</b> The power in any resistive circuit element can be calculated by using the formula <math>Power = I^2R</math>.</p>	<p><b>5.4 Essential Question:</b>            How can the power in any resistive circuit element be calculated by using the formula <math>Power = I^2R</math>?  <b>Students will:</b></p> <ul style="list-style-type: none"> <li>• define electric power, calculate the power delivery of simple electric circuits, and explain joule heating and its significance.</li> <li>• understand how galvanometers are used as ameters and voltmeters, how multirange versions of these devices are constructed, and how they are connected to measure current and voltage in real circuits.</li> <li>• understand how circuits are wired and the underlying principles that govern safety devices.</li> </ul>

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Content Standards	Expected Performances
<p><b>Enduring Understanding:</b> 5.5 Magnetic materials and electric currents (moving electric charges) are sources of magnetic fields and are subject to forces arising from the magnetic fields of other sources.</p>	<p><b>5.5 Essential Question:</b> How are magnetic materials and electric currents (moving electric charges) sources of magnetic fields and subject to forces arising from the magnetic fields of other sources? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ state the force rule between magnetic poles and explain how the magnetic field is defined.</li> <li>▪ determine the direction and magnitude of the magnetic force exerted by a magnetic field on a moving charge particle, and calculate the direction and magnitude of the magnetic field produced by an electric current.</li> <li>▪ calculate the strength and direction of the magnetic force on a current-carrying wire and the torque on a current-carrying loop, and explain the concept of a magnetic moment for such a loop.</li> <li>▪ state some of the general characteristics of the Earth’s magnetic field, explain the theory about its possible source, and discuss some of the ways in which it affects the Earth’s local environment.</li> </ul>
<p><b>Enduring Understanding:</b> 5.6 Magnetic materials and electric currents (moving electric charges) are sources of magnetic fields and are subject to forces arising from the magnetic fields of other sources.</p>	<p><b>5.6 Essential Question:</b> How are magnetic materials and electric currents (moving electric charges) sources of magnetic fields and subject to forces arising from the magnetic fields of other sources? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ state the force rule between magnetic poles and explain how the magnetic field is defined.</li> <li>▪ determine the direction and magnitude of the magnetic force exerted by a magnetic field on a moving charge particle, and calculate the direction and magnitude of the magnetic field produced by an electric current.</li> <li>▪ calculate the strength and direction of the magnetic force on a current-carrying wire and the torque on a current-carrying loop, and explain the concept of a magnetic moment for such a loop.</li> <li>▪ state some of the general characteristics of the Earth’s magnetic field, explain the theory about its possible source, and discuss some of the ways in which it affects the Earth’s local environment.</li> </ul>
<p><b>Enduring Understanding:</b> 5.7 Plasmas, the fourth state of matter, contain ions, or free electrons or both and conduct electricity.</p>	<p><b>5.7 Essential Question:</b> How do plasmas, the fourth state of matter, contain ions, or free electrons or both and conduct electricity? <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ describe the nature of plasmas and indicate some natural and man-made plasmas.</li> <li>▪ investigate the properties of simple plasmas.</li> </ul>

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**Science & Law - Grades 11 and 12**

Content Standards	Expected Performances
<p><b>State Frameworks:</b> <b>Social Studies</b></p> <p>2. Trace the evolution of citizens' rights</p> <p>39. Explain how different factors contribute to making and implementing laws in different government systems.</p> <p>40. Analyze the relationship between law enforcement and personal behavior.</p> <p><b>Core Theme:</b> Crime</p> <p><b>Guiding Question:</b> What is crime and what are the impacts of crime on society?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"> <li>▪ The meaning of crime and its impact on society.</li> </ul>	<p><b>a. Essential Question:</b> What is crime? What determines whether a particular act is determined to be against the law?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ explain crime and describe the different types of crime by looking at different crime scenarios.</li> <li>▪ explain how a particular act is determined to be against the law.</li> </ul> <p><b>b. Essential Question:</b> How does crime influence society?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ describe how the media coverage of crime impacts society.</li> <li>▪ depict the impact that crime has on society.</li> </ul>

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<b>Content Standards</b>	<b>Expected Performances</b>
<p><b>State Frameworks: Social Studies</b></p> <p>38. Analyze laws that have been modified to meet society's changing values and needs</p> <p>39. Explain how different factors contribute to making and implementing laws in different government systems.</p> <p><b>Core Theme:</b> Law</p> <p><b>Guiding Question:</b> What is law, the origin of law, and how does it evolve?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"><li>▪ The many types of laws are always evolving and they have specific origins in history.</li></ul>	<p><b>a. Essential Question:</b> Where does law originate and how does it change?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"><li>▪ describe the origins of law.</li><li>▪ explain the different types of law.</li><li>▪ demonstrate and explain the evolution of law.</li></ul>

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Content Standards	Expected Performances
<p><b>State Frameworks:</b> <b>Social Studies (8<sup>th</sup> Grade)</b> 18. Evaluate the impact of the U.S. Constitution on the lives of U.S. citizens</p> <p><b>(Grades 9-12)</b> 22. Analyze the impact of technological and scientific change on world civilizations</p> <p><b>Core Theme:</b> Court History and Science</p> <p><b>Guiding Question:</b> How has the history of the court system and science impacted recent cases?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"> <li>▪ The history of the court system, historic cases and science has been used to summarize and render decisions on more recent cases.</li> </ul>	<p><b>a. Essential Question:</b> How is the court system in the United States arranged?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ describe the United States court system.</li> <li>▪ explain the types of cases that are presided over in each court.</li> <li>▪ demonstrate how to summarize a court case.</li> </ul> <p><b>b. Essential Question:</b> How do historic cases involving science impact today's court cases?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ demonstrate the impact of science and court history on today's cases.</li> </ul>

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Content Standards	Expected Performances
<p><b>State Frameworks:</b>  <b>Scientific Inquiry</b>            Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</p> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> <li>▪ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li> </ul> <p><b>Grade 9 – Strand III: Global Interdependence</b>            9.8 - The use of resources by human populations may affect the quality of the environment.            9.9 - Some materials can be recycled, but others accumulate in the environment and may affect the balance of the Earth systems.</p> <p><b>Ecology</b>            Stability in an ecosystem is a balance between competing effects.</p> <p><b>Core Theme:</b> Environmental Law</p> <p><b>Guiding Question:</b> How has science, the law, and specific cases impacted the environment?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"> <li>▪ Science and law have significantly impacted the environment.</li> </ul>	<p><b>a. Essential Question:</b>            How have science and law impacted the environment?  <b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ describe the laws and science involved in certain environmental decisions.</li> </ul>

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Content Standards	Expected Performances
<p><b>State Frameworks:</b> <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> <li>▪ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li> </ul> <p><b>Grade 10 – Strand IV: Cell Chemistry and Biotechnology</b></p> <p>10.3 - Similarities in the chemical and structural properties of DNA in all living organisms allow the transfer of genes from one organism to another</p> <p><b>Grade 10 – Strand V: Genetics Evolution and Biodiversity</b></p> <p>10.5 - Evolution and biodiversity are the result of genetic changes that occur over time in constantly changing environments.</p> <p><b>Genetics</b> The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells.</p>	<p><b>a. Essential Question:</b> How is morality, science and law evolving?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ describe the impact of changing morality, science and law on ethical and controversial questions</li> </ul>

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<b>Content Standards</b>	<b>Expected Performances</b>
<p><b>Evolution</b></p> <ul style="list-style-type: none"><li>▪ The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time.</li><li>▪ Evolution is the result of genetic changes that occur in constantly changing environments.</li></ul> <p><b>Core Theme:</b> Bioethics and Law</p> <p><b>Guiding Question</b> How has the evolution of morality, science and law impacted ethical questions?</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"><li>▪ Science, law, and morality are evolving and they have a significant impact on answering ethical and controversial dilemmas.</li></ul>	

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Content Standards	Expected Performances
<p><b>State Frameworks:</b> <b>Scientific Inquiry</b></p> <ul style="list-style-type: none"> <li>▪ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> <li>▪ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li> </ul> <p><b>Grade 10 – Strand IV: Cell Chemistry and Biotechnology</b></p> <p>10.2 - Microorganisms have an essential role in life processes and cycles on Earth.</p> <p><b>Physiology</b></p> <ul style="list-style-type: none"> <li>▪ As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment.</li> <li>▪ Organisms have a variety of mechanisms to combat disease.</li> </ul> <p style="padding-left: 40px;"><b>Core Theme:</b> Health Law</p> <p style="padding-left: 40px;"><b>Guiding Question:</b> How has science and technology impacted health law?</p>	<p><b>a. Essential Question:</b> How has science and technology impacted the reporting and enforcement of health law?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ demonstrate how science and technology have impacted the reporting and enforcement of health law.</li> </ul>

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<b>Content Standards</b>	<b>Expected Performances</b>
<p><b><i>Enduring Understanding:</i></b></p> <ul style="list-style-type: none"><li>▪ Science and technology have changed the way health laws are made and enforced and reported.</li></ul>	

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**Science & Law - Grades 11 and 12**

Content Standards	Expected Performances
<p><b>State Frameworks:</b> <b>Scientific Inquiry</b> Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</p> <p><b>Scientific Literacy</b></p> <ul style="list-style-type: none"> <li>▪ Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> <li>▪ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li> </ul> <p><b>Physiology</b></p> <ul style="list-style-type: none"> <li>▪ As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment.</li> <li>▪ Organisms have a variety of mechanisms to combat disease.</li> </ul> <p style="padding-left: 40px;"><b>Core Theme:</b> Medical Malpractice</p> <p style="padding-left: 40px;"><b>Guiding Question</b> How has science, technology, law and insurance determined how health care is provided for in the United States</p> <p><b>Enduring Understanding:</b></p> <ul style="list-style-type: none"> <li>▪ The impact of science, technology, law and insurance on medicine in the United States.</li> </ul>	<p><b>a. Essential Question:</b> How has science, technology, law and insurance impacted medicine in the United States?</p> <p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>▪ describe how science, technology, law and insurance impacted medicine in the United States?</li> </ul>

SOMERS PUBLIC SCHOOLS



*Our Commitment to the Future*

## Curriculum Development Guide

## **Somers Public School's Mission Statement**

The mission of the Somers Public Schools, a public educational community dedicated to excellence, is to prepare and inspire all students to realize their fullest potential in a challenging learning environment.

## **Somers Public School's Vision Statement**

The vision of the Somers Public Schools is that we be challenged to excellence, creative expression, and the development of concern for the quality of life for all. The vision embraces a culture and an environment that: promotes lifelong learning; develops self worth; supports uniqueness and diversity; values independence and interdependence; inspires community and parental involvement; and empowers individuals to make choices that lead to lives filled with dignity, respect, happiness, and opportunity.

## **Somers Public School's Goals**

**Goal #1:** Link state and local curriculum standards, student assessments, and instruction so that students acquire the knowledge and skills they need to succeed.

**Goal #2:** Integrate technology throughout the district and expand the use of technology in the classroom to sustain a 21<sup>st</sup> century learning environment.

**Goal #3:** Maintain school facilities and grounds to provide a safe, healthy environment conducive to learning.

## **Vision Statement**

The vision of the Somers Public Schools Office of Curriculum, Instruction and Assessment (OCIA) is to foster the development and demonstration of personal excellence, creative expression, and collective well-being through the use of current and innovative practices in curriculum, instruction, assessment and professional development

## **Somers Curriculum Goals**

1. To provide all students with a high quality district curriculum that enables them to acquire the concepts and skills delineated in the State of Connecticut's Curriculum Frameworks.
2. To promote thinking, problem solving, originality, global perspective, interdisciplinary understanding and a respect for diversity.
3. To assure that the curriculum content is accessible to all students regardless of special need, readiness level, interest or style of learning through the use of differentiated curriculum materials.
4. To make assessment an informative part of the learning process.
5. To integrate technology, where appropriate, based on the Connecticut Information and Technology Literacy Standards.
6. To use community resources in an equitable and responsible manner.
7. To ensure parents have the opportunity to be involved in their child's education.
8. To create collaborative professional opportunities for all Somers educators.
9. To provide teachers with curriculum goals which promote the use creativity and skill in addressing individual student needs.

## Curriculum Development Process

### Year 1: Self-Study

#### Activities:

- Establishing K-12 Curriculum Development Team
  - K-5 Team will consist of representation from each grade level, special education, and intervention specialist where appropriate
  - 6-12 Team will consist of all members of the content area departments
- Analysis of:
  - Student achievement data (CMT/CAPT/CBAS/local assessments)
  - Curriculum implementation against state frameworks
    - Stage 1 of UbD units versus the state frameworks
    - Stage 1 of the UbD units versus stages 2 and 3
    - Curricular material adequacy
- Evaluation of curriculum using the Curriculum Assessment Tool and the establishment of long and short term revision goals.

### Year 2: Development/Revision

#### Activities:

- Write/Revise the content area curriculum guide to align curriculum expectations with state and national frameworks by grade level/course.
  - Determine common core experiences for all students and develop/revise UbD units by grade level/course according to the district's UbD template
  - Adoption/Publication of content area Curriculum Maps and UbD Units
    - Administration
    - Board of Education Curriculum Subcommittee
    - Board of Education
- Identification of textbooks/resource materials to complement curriculum
  - Preparation of budget requests
  - Adoption of textbooks/materials to implement
    - Administration
    - Board of Education Curriculum Subcommittee
    - Board of Education

### Year 3-4: Piloting

#### Activities:

- Purchase new core textbooks/materials (year 3)/additional resources (year 4) as necessary
- Professional development
  - Familiarization with Curriculum Guide
  - Familiarization with textbooks/materials
  - Instructional strategies to support implementation of UbD Units

Years 5-7: Implementation

Activities:

- Refine UbD units, instructional strategies as determined by data analysis, and (Common) Formative Assessments
- Data monitoring (CMT/CAPT/local assessments)

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*Roles and Responsibilities*

Activity	Person(s)/Group(s) Responsible
Analysis of student assessment data	<ul style="list-style-type: none"> <li>• All administrators and teachers of the Somers Public Schools</li> </ul>
Compiling Curriculum maps	<ul style="list-style-type: none"> <li>• Director of Curriculum</li> <li>• K-12 Curriculum Development Teams</li> <li>• Teachers</li> </ul>
Development/Revision of content Curriculum Guides	<ul style="list-style-type: none"> <li>• Director of Curriculum</li> <li>• K-12 Curriculum Development Teams</li> <li>• Administration</li> <li>• Teachers</li> </ul>
Selection of Textbooks/Materials	<ul style="list-style-type: none"> <li>• Director of Curriculum</li> <li>• K-12 Curriculum Development Teams</li> <li>• Teachers</li> <li>• Administration</li> <li>• Board of Education Curriculum Subcommittee</li> <li>• Board of Education</li> </ul>
Approval of content Curriculum Guides and Textbooks	<ul style="list-style-type: none"> <li>• Administration</li> <li>• Board of Education Curriculum Subcommittee</li> <li>• Board of Education</li> </ul>
Oversight of Curriculum Development/Implementation Process	<ul style="list-style-type: none"> <li>• Director of Curriculum</li> <li>• Administration</li> </ul>

## *Curriculum Documentation*

All curriculum documents will be formatted in a similar fashion for ease of understanding and use by all members of our school community. Downloadable templates to facilitate this work may be found on the Director of Curriculum web page and on the Somers Public Schools Staff Intranet site.

The district curriculum guide for each content area includes:

- (a) State Framework standards organized by strand and correlated to grade levels/course offerings
- (b) UbD units that incorporate all standards for a given grade level/course and include assessment, instruction and resource information

These documents will be distributed electronically through the office of the Director of Curriculum for presentation to the Board of Education Curriculum Subcommittee, and the full Board of Education as it moves through the approval process. One hard copy will be stored in the District Office's Curriculum Library and a complete electronic copy will be available on the OCIA section of the district website

During the Development/Revision Phase, K-12 District Curriculum Development Teams will review the state frameworks and work with the rest of the teaching staff and administration to delineate common core experiences for all students at each grade level. The teams will then facilitate the development Understanding by Design (UbD) units for these areas using the unit template on the staff intranet and the web page.

The unit template includes:

- (a) Content area(s)
- (b) Time frame
- (c) Developer(s) name(s)
- (d) Unit Title
- (e) Relevant State Standards (including Content Area, Literacy and Technology)
- (f) Essential Questions
- (g) Enduring Understanding(s)
- (h) Knowledge and Skills\*
- (i) Assessments
- (j) Evaluation Criteria
- (k) Instructional Activities
- (l) Instructional Resources
- (m) Teacher Bibliography

\*Knowledge and Skills will be delineated by Priority Standards and Supporting Standards linked to appropriate content frameworks.

**Somers Public Schools**  
**Curriculum Development Cycle: 2009-2017**

For a description of the activities in each year of the cycle, see pp. 2-3 of this document.

<b>Content Areas</b>	<b>English/ Language Arts</b>	<b>Social Studies Tech Ed Food Service</b>	<b>Science</b>	<b>Art Music</b>	<b>World Language Phys Ed Health/Life Skills</b>	<b>Mathematics</b>	<b>Business Guidance</b>
<b>2009-2010</b>	Year 6: Implementation	Year 3: Piloting	Year 4: Piloting	Year 1: Self-Study	Year 3: Piloting	Year 2: Development/ Revision	
<b>2010-2011</b>	Year 7: Implementation	Year 4: Piloting	Year 5: Implementation	Year 2: Development/ Revision	Year 4: Piloting	Year 3: Piloting	Year 1: Self-Study
<b>2011-2012</b>	Year 1: Self-Study	Year 7: Implementation	Year 6: Implementation	Year 3: Piloting	Year 5: Implementation	Year 4: Piloting	Year 2: Development/ Revision
<b>2012-2013</b>	Year 2: Development/ Revision	Year 1: Self-Study	Year 7: Implementation	Year 4: Piloting	Year 6: Implementation	Year 5: Implementation	Year 3: Piloting
<b>2013-2014</b>	Year 3: Piloting	Year 2: Development/ Revision	Year 1: Self-Study	Year 5: Implementation	Year 7: Implementation	Year 6: Implementation	Year 4: Piloting
<b>2014-2015</b>	Year 4: Piloting	Year 3: Piloting	Year 2: Development/ Revision	Year 6: Implementation	Year 1: Self-Study	Year 7: Implementation	Year 5: Implementation
<b>2015-2016</b>	Year 5: Implementation	Year 4: Piloting	Year 3: Piloting	Year 7: Implementation	Year 2: Development/ Revision	Year 1: Self-Study	Year 6: Implementation
<b>2016-2017</b>	Year 6: Implementation	Year 5: Implementation	Year 4: Piloting	Year 1: Self-Study	Year 3: Piloting	Year 2: Development/ Revision	Year 7: Implementation

**Appendix 1**  
**Curriculum Development Template**  
**(To be adjusted as needed to fit CSDE Curriculum Frameworks)**

## Curriculum Template Writing Guide

**Curriculum Name:** Insert the subject area name, and then underneath it identify grade level or course.

**Standard:** Insert the text of the relevant state and/or national standard

**Overarching Idea:** Insert the text that describes the standard at this grade level. What is the enduring understanding?

**Guiding Questions:** Insert the guiding or essential questions associated with that overarching idea or enduring understanding.

### Elementary and Middle School Templates

**Component Statement:** Insert the statements that define the above standard

**Grade Level Expectations:** Insert the grade level expectations that correspond to that component statement

**Term Columns:** Indicate in which term that GLE is taught. You can mark multiple terms if it is taught at increasing levels of complexity as the year progresses

**CMT Correspondences:** Insert the CMT correlations for that component statement/series of GLEs. For subject areas without a direct CMT link, use that column to indicate the connection between the literacy or numeracy standards covered in that grade level and/or on the CMT.

### High School Template

**Component Statement:** Insert the statements that define the above standard

**Grade Level Expectations:** Develop statements that delineate the expected performances for the component statement in that course. If there are no state generated expected performances, then the district generated expectations have to cover all levels of Bloom's Taxonomy.

**Term Columns:** Indicate in which marking period those expected performances are taught/assessed. You can mark multiple terms if it is taught at increasing levels of complexity as the year progresses. For semester courses, mark quarter one or quarter two and leave three and four blank.

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Somers, Connecticut 06071**

\_\_\_\_\_ Curriculum

**Standard :** *[Insert standard here]*

**Overarching Idea:** *[Insert overarching idea here]*

**Guiding Question:** *[Insert guiding question here]*

**Elementary School Template**

Component Statement	Grade Level Expectations Students will:	First Trimester	Second Trimester	Third Trimester	CMT Correlations
<i>[Insert component statement here]</i>	<i>[Insert text here]</i>				

**Somers Public Schools  
Somers, Connecticut 06071**

**\_\_\_\_\_Curriculum**

**Standard :** *[Insert standard here]*

**Overarching Idea:** *[Insert overarching idea here]*

**Guiding Question** *[Insert guiding question here]*

Middle School Template

Component Statement	Grade Level Expectations Students will:	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	CMT Correlations
<i>[Insert component statement here]</i>	<i>[Insert text here]</i>					

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Somers, Connecticut 06071**

\_\_\_\_\_ Curriculum

**Standard :** *[Insert standard here]*

**Overarching Idea:** *[Insert overarching idea here]*

**Guiding Question** *[Insert guiding question here]*

High School Template

Component Statement	Grade Level Expectations	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
<i>[Insert component statement here]</i>	Students will:  <i>[Insert text here]</i>				

**Appendix 2**  
**Understanding by Design (UbD)**  
**Unit Template**

## Unit Template Writing Guide

### Unit Title:

Write in the title of the unit.

### This Unit is designed to be taught [insert time]

Provide the length of the unit in days or weeks.

If appropriate, designate when the unit should be taught by month, marking period or trimester.

### Content Standards Covered

List which state (or national) standards the unit will cover.

Include grade level appropriate literacy standards for your content area in grades 6-12.

For state documents that contain the standards, go to the CT SDE's "Teacher and Administrator's" page, scroll down to the bottom and click the "Teaching and Learning" link.

### Information and Technology Literacy Standards Integration

List which of the ITL standards the unit will cover.

For state documents that contain the standards, go to the CT SDE's "Teacher and Administrator's" page, scroll down to the bottom and click the "Teaching and Learning" link.

### Enduring Understandings

Fill in the big idea(s) students should understand by the end of the unit. Generally, there should be three or less.

### Essential Questions

Essential questions should be questions that help students make connections between various aspects of what they are studying and ideally learning outside that particular unit. They are often tied to the unit's Enduring Understandings.

Unless you are trying to develop student understanding of something that is relatively indefinable, you should avoid questions that begin with "What."

### Knowledge and Skills

#### Priority Standards

Of the GLEs associated with the standards listed in the above sections on Content Standards and Technology Standards, fill in the ones which are the most critical. (If your content area has no GLEs, use the ones you developed when creating the curriculum template.)

Your priority standards are the ones that are so integral to understanding either your discipline or in general that students cannot be successful without knowing them.

Your priority standards should include knowledge and skill statements that encompass all levels of Bloom's Taxonomy.

#### Supporting Standards

Of the GLEs associated with the standards listed in the above sections on Content Standards and Technology Standards, write in the ones which are good to know, but are not the most important.

Your supporting standards are a good basis for differentiating your content to meet the needs of your accelerated learners. They are concepts that you would like students to know as part of the unit, but are willing to sacrifice if a child needs more support learning the priority ones.

### **Assessments**

Assessments should be clearly aligned with the content standards listed on the first page and should emphasize mastery of the priority standards over the knowledge of the support standards. (Assessment of ITL standards and Literacy standards should be included.)

Assessments should be clearly aligned with the learning activities detailed later in the unit plan.

Multiple forms of assessment should be used including formative, summative and self. Common assessments should be used and marked as such.

Assessment alternatives for special populations including SPED, ELL and gifted learners should be indicated.

### **Key Evaluation Criteria/Rubric Titles**

List the most important evaluation criteria for your assessments, including any state level assessment criteria, being used to evaluate student work.

List any rubrics (state, school-wide, departmental or grade level) used to evaluate student work.

### **Activities for Learning**

Learning Activities should be clearly aligned with the content standards/GLEs in the first section and should emphasize mastery of the priority standards over the knowledge of the support standards. (Activities that address the ITL standards and Literacy standards should be included.)

Activities should incorporate:

A variety of learning approaches including

- Teaching strategies to address the needs of different learners (SPED, ELL, gifted learners, students with different learning styles/preferences) and
- A variety of grouping strategies.

Teaching strategies that are supported by research.

Learning activities should involve application, high order thinking, problem solving and 21<sup>st</sup> century skills.

Learning activities should, where appropriate, connect to current events and learning in other disciplines.

Learning activities should utilize culturally responsive text and non-text materials.

### **Instruction Resources Needed**

Resources should align with the standards, assessments and activities.

Resources should include materials to address the needs of different types of learners. Resources should include lists of supplies and equipment for the unit and an explanation of their use where appropriate.

**Teacher Bibliography**

The bibliography should include a list of books, websites, etc. that may be used to teach this unit.

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## Unit Template

**Unit Title:**

**This unit is designed to be taught [insert time]:**

**Discipline(s):**

**Grade or Course:**

**Unit Designed by:**

**Content Standards Covered:**

**Information and Technology Literacy Standards Integration:**

**Enduring Understanding** – Students will understand that...

**Essential Questions:**

Knowledge & Skills

**Priority Standards:**

Students will know and be able to ...

**Supporting Standards:**

Students will know and be able to ...

**Assessments:**

Summative

Performance:

Other:

Formative

Performance:

Other:

Self:

**Key Evaluation Criteria/Rubric Titles:**

**Activities for Learning:**

**Instructional Resources Needed:**

**Teacher Bibliography:**

**Appendix 3**  
**Curriculum Evaluation Checklist**

**Based on the CT Curriculum  
Development Guide  
June 1, 2009**

<b>Content Area</b>			
<b>Date Curriculum Reviewed</b>		<b>Date(s) BOE Adopted Curriculum</b>	
<b>Reviewer(s)</b>			
<b>Grade Levels/Ages/Courses Reviewed</b>			

### **I. Curriculum Development and Support**

This section of the guide addresses district-level planning that is essential to curriculum development. Evidence may be presented from related documents, such as a curriculum development plan or a professional development plan.

<b>The following are important aspects of curriculum development and should be evidenced.</b>	<b>Yes, there is evidence.</b>	<b>No, there is not evidence.</b>	<b>Comments/Next Steps</b>
A. A philosophy and/or mission statement about the teaching and learning of all students (including special education and ELL students) across all curriculums guides the curriculum development.			
B. An overall plan for curriculum development exists, involves stakeholders and indicates where each curriculum area is in the development, implementation, or evaluation cycle with timelines. Plans for data-driven evaluation of the curriculum at the district/program level and for the content areas are also included.			
C. A defined model (e.g., Understanding by Design, Making Standards Work, Balanced Curriculum, The High/Scope Approach) governs the curriculum.			
D. A system to orient teachers and administrators in the use of the curriculum includes professional development and training of new staff as needed.			
E. A list of current references/research guided the curriculum development.			
F. A plan showing alignment with a standards-based report card/child profiles.			

### **II. Curriculum Components**

This section of the guide proposes elements likely to be part of planning high-quality curriculum for all learners. These elements represent current professional

understanding of what it means to plan so all learners have opportunities to achieve. Many of the elements are supported in education literature. Indicators are categorized as Goal or Advanced. Check those indicators that are evident in the curriculum. To meet either category, all indicators in the category must be checked.

<b><u>Curriculum document addresses</u></b>	<b><u>Indicators reflecting goal and advanced performance</u></b>	<b><u>Comments/Next Steps</u></b> (Reference the bullet you are commenting on.)
<p><b>A. Alignment to Standards</b> — <i>the matching of district grade level/course level/learner expectations to standards</i></p>	<p><b><u>GOAL</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> The curriculum aligns with the current state/national standards.</li> <li><input type="checkbox"/> The curriculum aligns with current state grade-level expectations (when available).</li> <li><input type="checkbox"/> The curriculum aligns with current state/national assessments (e.g., CMT, CAPT, SAT, Preschool Assessment Framework, Career and Technical Education Assessments).</li> <li><input type="checkbox"/> The curriculum aligns with other state level resources (e.g., CMT Handbooks, CAPT Handbooks, Guide to EC Program Development, CALI or SRBI (for ECE, Recognition and Response or R&amp;R)).</li> </ul>	
<p><b>B. Learner Expectations (locally designed or CSDE GLEs)</b> — <i>statements about what students should know and be able to do</i></p>	<p><b><u>GOAL</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Learner expectations state what students should know and be able to do by the end of each grade level/course/program.</li> <li><input type="checkbox"/> Learner expectations are prioritized to reflect district/program goals.</li> <li><input type="checkbox"/> Learner expectations are included and organized into units/themes/chapters (based on the district’s curriculum model, as appropriate) for a set period of time (e.g., six weeks for unit 1). For ECE, learner expectations are organized developmentally.</li> <li><input type="checkbox"/> Learner expectations address all six levels of cognitive domain (Bloom’s taxonomy).</li> </ul> <p><b><u>ADVANCED</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Learner expectations are organized in three stated levels of priority from the most important to the least important based on the big ideas.</li> </ul>	

<b><u>Curriculum document addresses</u></b>	<b><u>Indicators reflecting goal and advanced performance</u></b>	<b><u>Comments/Next Steps</u></b> (Reference the bullet you are commenting on.)
<p><b>C. Pacing</b> — <i>the order in which skills and concepts are sequenced along a continuum of development</i></p>	<p><b><u>GOAL</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Within grade level clusters (e.g., PK-2, K-5, 6-8, 9-12), skills and concepts evolve sequentially from grade to grade and/or course to course.</li> <li><input type="checkbox"/> Skills and concepts are sequenced along a continuum of development PK-12.</li> <li><input type="checkbox"/> Big ideas/concepts are stated for each unit/theme/chapter.</li> <li><input type="checkbox"/> Timelines are included for each unit/theme/chapter (N/A for ECE).</li> </ul> <p><b><u>ADVANCED</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> A curriculum matrix (graphic)/scope and sequence showing either topical, thematic or skill development PK-12 is included.</li> </ul>	
<p><b>D. Embedded Literacy</b> — <i>reading, writing, listening, speaking, viewing and presenting across all content areas</i></p>	<p><b><u>GOAL</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Literacy (reading, writing, listening, speaking, viewing and presenting) instruction is systematically embedded at each grade level within this content area, as evidenced by inclusion of targeted instructional strategies.</li> <li><input type="checkbox"/> Literacy (reading, writing, listening, speaking, viewing and presenting) activities are embedded at each grade level within this content area.</li> <li><input type="checkbox"/> Integration of culturally responsive texts is evident in: <ul style="list-style-type: none"> <li><input type="checkbox"/> nonfiction,</li> <li><input type="checkbox"/> fiction and</li> <li><input type="checkbox"/> nonprint materials.</li> </ul> </li> <li><input type="checkbox"/> Examples of text selections at varied readability levels are evident at each grade level.</li> </ul> <p><b><u>ADVANCED</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> There is vertical alignment of expectations for literacy at each grade level.</li> <li><input type="checkbox"/> There are opportunities for assessment of selected literacy skills at each grade level.</li> </ul>	

<b><u>Curriculum document addresses</u></b>	<b><u>Indicators reflecting goal and advanced performance</u></b>	<b><u>Comments/Next Steps</u></b> (Reference the bullet you are commenting on.)
<p><b>E. Embedded Information and Technological Literacy</b> — <i>skills related to information, media and technology across all content areas</i></p>	<p><b><u>GOAL</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> The use of information and technology to support and improve the teaching and learning processes is embedded at each grade level.</li> <li><input type="checkbox"/> Using, searching and evaluating Internet sources and information are embedded at each grade level.</li> <li><input type="checkbox"/> Content specific technology and technology applications are specified.</li> </ul> <p><b><u>ADVANCED</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> There is vertical alignment of expectations for information and technological literacy at each grade level.</li> <li><input type="checkbox"/> There are opportunities for assessment of selected information and technology literacy skills at each grade level.</li> </ul>	
<p><b>F. Teaching Strategies</b> — <i>the plan for and the actions by the teacher to engage students in learning the content</i></p>	<p><b><u>GOAL</u></b> Every unit/theme/chapter/series of learning activities includes:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> information about common misconceptions and teaching strategies to address them;</li> <li><input type="checkbox"/> suggestions for teaching strategies to support learners who struggle;</li> <li><input type="checkbox"/> suggestions for teaching strategies to support the extension of the learning, beyond the lesson objectives;</li> <li><input type="checkbox"/> research-based teaching strategies (e.g., similarities and differences, summarizing and note taking, nonlinguistic representation, advanced organizers);</li> <li><input type="checkbox"/> guidance about classroom environments conducive to learning (e.g., seating arrangements, safety, social interactions);</li> <li><input type="checkbox"/> opportunities for varied approaches and choice for learners (e.g., tasks, resources, product formats);</li> <li><input type="checkbox"/> a variety of teaching and grouping strategies based on student learning needs, preferences, interests, learning styles, intelligences, and cultures;</li> <li><input type="checkbox"/> specific strategies to address ELL students;</li> <li><input type="checkbox"/> specific strategies to address students experiencing learning, social-emotional or behavioral difficulties;</li> <li><input type="checkbox"/> current event connections;</li> <li><input type="checkbox"/> interdisciplinary connections; and</li> <li><input type="checkbox"/> teaching strategies aligned with the learning activities.</li> </ul>	

<b><u>Curriculum document addresses</u></b>	<b><u>Indicators reflecting goal and advanced performance</u></b>	<b><u>Comments/Next Steps</u></b> (Reference the bullet you are commenting on.)
<p><b>G. Learning Activities</b> — <i>cognitive experiences that help learners perceive, process, rehearse, store, and transfer new knowledge or skills</i></p>	<p><b><u>GOAL</u></b> Every unit/theme/chapter/series of learning activities includes:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> activities sequenced to target the content in the learner expectations;</li> <li><input type="checkbox"/> activities promoting higher order thinking and problem-solving;</li> <li><input type="checkbox"/> multiple types of learning opportunities (e.g., group and individual projects, centers, simulations, role playing, performances, debates, demonstrations, discussions, modeling, inter-disciplinary, authentic experiences);</li> <li><input type="checkbox"/> activities differentiated to address prior knowledge, learning styles, interests and the developmental stages of the learners;</li> <li><input type="checkbox"/> opportunities for authentic application of new learning in or out of the classroom;</li> <li><input type="checkbox"/> specific activities to address 21st century skills (e.g., communication, creativity, problem solving, self-direction); and</li> <li><input type="checkbox"/> ways to use information and technology to enhance learning, increase productivity and promote creativity.</li> </ul>	
<p><b>H. Assessments</b> — <i>the ways to measure and monitor a learner’s progress and guide instructional decisions</i></p>	<p><b><u>GOAL</u></b> Every unit/theme/chapter/series of learning activities includes:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> assessments aligned with the content in the learner expectations;</li> <li><input type="checkbox"/> assessments aligned to the learning activities;</li> <li><input type="checkbox"/> multiple methods for assessing (e.g., pre/post, formative and summative, observations) the range of levels of cognitive domain;</li> <li><input type="checkbox"/> grade level or department-generated common assessments (formative and summative);</li> <li><input type="checkbox"/> use of schoolwide and districtwide rubrics;</li> <li><input type="checkbox"/> information about how assessments are applied to ELL students or students experiencing learning, social-emotional or behavioral difficulties; and</li> <li><input type="checkbox"/> opportunities for self-assessment and monitoring.</li> </ul> <p><b><u>ADVANCED</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> strategies for including families in the assessment process.</li> </ul>	

<u>Curriculum document addresses</u>	<u>Indicators reflecting goal and advanced performance</u>	<u>Comments/Next Steps</u> (Reference the bullet you are commenting on.)
<b>I. Resources</b> — <i>materials that support learning</i>	<p><b><u>GOAL</u></b> Every unit/theme/chapter/series of learning activities includes:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> suggested resources aligned with the content in the learner expectations;</li> <li><input type="checkbox"/> a variety of resources that address the age, skill-level and readiness of learners;</li> <li><input type="checkbox"/> suggested print and non-print resources;</li> <li><input type="checkbox"/> suggested learning supplies and equipment resources (e.g. manipulatives, technology); and</li> <li><input type="checkbox"/> explanations for the use of included resources.</li> </ul>	

DRAFT

**Appendix 4**  
**Textbook and Instructional Resource Adoption Forms**

## Textbook Proposal Form

Use this form to propose the purchase of new textbooks for a new course, grade, or multiple grades.

**Date:** \_\_\_\_\_

**Person(s) submitting:** \_\_\_\_\_

**Content Area:** \_\_\_\_\_ **Grade(s)** \_\_\_\_\_ **Course:** \_\_\_\_\_

**Recommended Purchase:**

Title or Name of Resource: \_\_\_\_\_

Type of Resource: \_\_\_\_\_ ISBN# \_\_\_\_\_

Copyright: \_\_\_\_\_ Vendor: \_\_\_\_\_

Address: \_\_\_\_\_

1. Does the text address the content of the curriculum at the appropriate grade level?

Yes  No

What areas of the curriculum are not adequately addressed by this text?

2. Does the text promote the use of differentiated instruction and other research based instructional strategies?

Yes  No

Provide at least three examples from the proposed text.

3. Are there assessments provided that can be used for formative, summative and/or performance based evaluation?

Yes  No

Provide at least three examples from the proposed text.

4. Do the assessments provided with the text align to the CAPT/CMT where appropriate?

Yes  No

If no, please explain what supplemental materials will be necessary.

5. Does the textbook have any technology components?

Yes  No

Please provide some examples.

6. Is the textbook culturally responsive? (Does it include people or information from a diversity of populations? Is it written in a way that it will be accessible to people from a variety of backgrounds?)

Yes  No

Please provide some examples.

7. What is the readability level/DRP of the text and what was used to assess its readability?

Will the text be used for teacher directed instruction or for independent student study?

Is the readability appropriate for its intended use?

Yes  No

**Attach a standard budget sheet to detail the purchase costs.**

## Instructional Resource Proposal Form

Use this form to propose the purchase of new software, or other major instructional resources for a new course, grade, or multiple grades.

**Date:** \_\_\_\_\_

**Person(s) submitting:** \_\_\_\_\_

**Content Area:** \_\_\_\_\_ **Grade(s)** \_\_\_\_\_ **Course:** \_\_\_\_\_

**Recommended Purchase:**

Title or Name of Resource: \_\_\_\_\_

Type of Resource: \_\_\_\_\_ ISBN# \_\_\_\_\_

Copyright: \_\_\_\_\_ Vendor: \_\_\_\_\_

Address: \_\_\_\_\_

**Background:** (Why this purchase is being proposed?)

**Process used to select this curriculum resource:**

**Is this the only curriculum resource for this course? \_\_\_\_\_ If not, what other resource(s) will be used?**

**How was this resource evaluated in terms of providing adequate instructional support for the curriculum?**

**Attach a standard budget sheet to detail the purchase costs.**

**Appendix 5**  
**New Course Proposal Form**

## Course Proposal Form

**Date:**

**Proposed Title:**

**Content Area:**

**Semester(s):**

- (a) What need(s) does this course address?**
- (b) How was the need identified? What data was considered?**
- (c) Who was involved in determining the need?**
- (d) Who designed the course?**
- (e) What implications does this course have on staffing, other curricular areas, and/or space?**
- (f) What special background, if any, would the teacher need to have to teach this elective successfully?**
- (g) This course is designed for: (circle any or all choices)**  
 Freshmen     Sophomores     Juniors     Seniors     Middle School
- (h) What prerequisites must the student fulfill to take this course?**
- (i) Insert curriculum standards this course will address:**
- (j) How will student learning be assessed?**
- (k) What instructional resources are necessary to teach the course? List all books, software, equipment, and materials with rationale and cost.**

(Attach minutes from team meetings in which the course was developed and a budget worksheet.)

## Course Department Sign-Off

**Proposed Title:** \_\_\_\_\_

Signatures of content area members indicate that the proposal has been discussed and feedback has been elicited on the proposal prior to its completion. Interdisciplinary unit proposals require the signatures of members of all involved content areas/departments.

<i>NAME</i>	<i>CONTENT AREA</i>	<i>DATE</i>
_____		
_____		
_____		
_____		
_____		
_____		
_____		
_____		
_____		
_____		

Building Principal: \_\_\_\_\_ Date: \_\_\_\_\_

Curriculum Director: \_\_\_\_\_ Date: \_\_\_\_\_

## Textbook Proposal Form

Use this form to propose the purchase of new textbooks for a new course, grade, or multiple grades.

Date: February 12, 2010

Person(s) submitting: Roy Slater

Content Area: TIDE Grade(s) 9-12 Course: Digital Photo

**Recommended Purchase:**

Title or Name of Resource: Complete Adobe Photoshop CS4 for Digital Photographers

Type of Resource: Book ISBN# 978-1-58450-685-0

Copyright: 2010 Vendor: Cengage Learning

Address: 20 Channel Center Street, Boston, MA 02210

Unit Cost: \$29.69 Number Requested: 14

1. Does the text address the content of the curriculum at the appropriate grade level?

Yes  No

What areas of the curriculum are not adequately addressed by this text?

None. This book is specific to the digital photography and graphic design area.

2. Does the text promote the use of differentiated instruction and other research based instructional strategies?

Yes  No

Provide at least three examples from the proposed text.

None. Differentiation in this class is provided through in-class projects.

3. Are there assessments provided that can be used for formative, summative and/or performance based evaluation?

Yes  No

Provide at least three examples from the proposed text.

4. Do the assessments provided with the text align to the CAPT/CMT where appropriate?

Yes  No

If no, please explain what supplemental materials will be necessary.

Not Applicable

5. Does the textbook have any technology components?

Yes  No

Please provide some examples.

Since this book focuses on digital photography, it is entirely about the computer application Photoshop.

6. Is the textbook culturally responsive? (Does it include people or information from a diversity of populations? Is it written in a way that it will be accessible to people from a variety of backgrounds?)

Yes  No

Please provide some examples.

Not Applicable

7. What is the readability level/DRP of the text and what was used to assess its readability?

Flesh Kincaid Grade Level: 7.68

Gunning Fog: 8.64

Will the text be used for teacher directed instruction or for independent student study?

The text will be used for both teacher directed and independent student study

Is the readability appropriate for its intended use?

Yes  No

**Attach a standard budget sheet to detail the purchase costs.**

## Textbook Proposal Form

Use this form to propose the purchase of new textbooks for a new course, grade, or multiple grades.

Date: February 12, 2010

Person(s) submitting: Roy Slater

Content Area: TIDE Grade(s) 9-12 Course: Solid Modeling & Design

**Recommended Purchase:**

Title or Name of Resource: Print Reading for Industry

Type of Resource: Book ISBN# 978-1-56637-807-9

Copyright: 2002 Vendor: Goodheart-Wilcox Company, Inc.

Address: Tinley Park, Illinois

Unit Cost: \$52.00 Number Requested: 14

1. Does the text address the content of the curriculum at the appropriate grade level?

Yes  No

What areas of the curriculum are not adequately addressed by this text?

None. This book is specific to the solid modeling class's unit on blueprint reading.

2. Does the text promote the use of differentiated instruction and other research based instructional strategies?

Yes  No

Provide at least three examples from the proposed text.

None. Differentiation in this class is provided through in-class projects.

3. Are there assessments provided that can be used for formative, summative and/or performance based evaluation?

Yes  No

Provide at least three examples from the proposed text.

This book comes with an instructor copy that supports the assessment activities in the book.

4. Do the assessments provided with the text align to the CAPT/CMT where appropriate?

Yes  No

If no, please explain what supplemental materials will be necessary.

The lessons in this book are CAPT appropriate. They involve mathematical data and geometry and measurement topics.

5. Does the textbook have any technology components?

Yes  No

Please provide some examples.

This book covers the students' understanding of computer modeling through a reverse process of development. All activities are directly related to the computer modeling software.

6. Is the textbook culturally responsive? (Does it include people or information from a diversity of populations? Is it written in a way that it will be accessible to people from a variety of backgrounds?)

Yes  No

Please provide some examples.

Not Applicable

7. What is the readability level/DRP of the text and what was used to assess its readability?

Flesh Kincaid Grade Level: 12.33

Gunning Fog: 14.14

Will the text be used for teacher directed instruction or for independent student study?

The text will be used for both teacher directed and independent student study

Is the readability appropriate for its intended use?

Yes  No



## Textbook Proposal Form

Use this form to propose the purchase of new textbooks for a new course, grade, or multiple grades.

Date: February 12, 2010

Person(s) submitting: Roy Slater

Content Area: TIDE Grade(s) 9-12 Course: Welding

**Recommended Purchase:**

Title or Name of Resource: Welding Technology Fundamentals

Type of Resource: Book ISBN# 978-1-60525-256-8

Copyright: 2010 Vendor: Goodheart-Wilcox Company, Inc.

Address: Tinley Park, Illinois

Unit Cost: \$52.50 Number Requested: 16

1. Does the text address the content of the curriculum at the appropriate grade level?

Yes  No

What areas of the curriculum are not adequately addressed by this text?

None. This book is specific to the welding/hot metals area.

2. Does the text promote the use of differentiated instruction and other research based instructional strategies?

Yes  No

Provide at least three examples from the proposed text.

None. Differentiation in this class is provided through in-class projects.

3. Are there assessments provided that can be used for formative, summative and/or performance based evaluation?

Yes  No

Provide at least three examples from the proposed text.

The text comes with an exam CD, which covers the main points in each chapter.

4. Do the assessments provided with the text align to the CAPT/CMT where appropriate?

Yes  No

If no, please explain what supplemental materials will be necessary.

Not Applicable

5. Does the textbook have any technology components?

Yes  No

Please provide some examples.

Since this book focuses on hot metal processes it contains applied technology processes.

6. Is the textbook culturally responsive? (Does it include people or information from a diversity of populations? Is it written in a way that it will be accessible to people from a variety of backgrounds?)

Yes  No

Please provide some examples.

Not Applicable

7. What is the readability level/DRP of the text and what was used to assess its readability?

Flesh Kincaid Grade Level: 8.35

Gunning Fog: 10.25

Will the text be used for teacher directed instruction or for independent student study?

The text will be used for both teacher directed and independent student study

Is the readability appropriate for its intended use?

Yes  No

**Attach a standard budget sheet to detail the purchase costs.**

PERSONNEL:

Student Teachers:

~~The Somers Board of Education shall accept their reasonable responsibilities for the preparation and encouragement of high quality student teachers who will eventually become educators of the country's young people.~~

~~Under the direction of the Superintendent, student teachers may be placed in the schools for the practice teaching experience. Care shall be exercised in the selection and placement of student teachers to the extent that the practice teaching experience benefits the student teacher without jeopardizing the education of the youngsters with whom the student teacher works.~~

~~Acceptance of a student teacher for training in his classroom shall be voluntary on the part of the Somers teacher.~~

The Board of Education endorses participation in undergraduate student teaching programs with colleges and universities for the purpose of training competent future teachers. Student teachers will be accepted on a limited basis and placed according to availability of competent cooperating teachers.

The Board of Education authorizes the Superintendent of Schools to approve all prospective student teachers. Decisions to place a student teacher will be determined by the following:

1. Submission of a regular teacher application including copies of transcripts and references.
2. A screening and interview by the building Principal.
3. Recommendation by the building Principal to the Superintendent of Schools on accepting student teachers with the named cooperating teacher. (Normally no more than one student teacher will be assigned to a cooperating teacher in any given school year.)
4. The Superintendent of Schools may interview prospective student teachers and will make the final decision on acceptance of each student teacher.
5. The successful fulfillment of a criminal background check. (Effective July 1, 2010)

It is the responsibility of the Superintendent of Schools to notify the college or university of acceptance of student teacher(s).

Teachers who cooperate in training student teachers must be:

1. Tenured;
2. Successful teachers with good to outstanding evaluations;

3. Recommended by the Principal or Core Coordinator;
4. Participating on a voluntary basis.

(cf. 4112.5 – Security Check/Fingerprinting)

Legal Reference: Connecticut General Statutes  
10-221d Criminal history records checks of school personnel.  
Fingerprinting. Termination or dismissed. (as amended by PA 01-173, PA  
04-181 and June 19 Special Session, Public Act No. 09-1)  
29-17a Criminal history checks. Procedure. Fees.

Adopted: April 27, 1981



STATE OF CONNECTICUT  
STATE BOARD OF EDUCATION



December 28, 2009

Dr. Maynard Suffredini, Jr.  
Superintendent of Schools  
47 Ninth District Road  
Somers, CT 06071-

Dear Dr. Suffredini, Jr.:

Thank you for your participation in assisting the State with meeting our 2009-10 goal of enrolling 27 percent of Hartford-resident minority students in reduced racial isolation settings, as mandated by the Sheff Phase II Stipulation and Order (Order). For the State to continue to meet its mandated goals under the Order, the numbers of Hartford-resident minority students in the Open Choice program in suburban districts must be further increased. Open Choice plays a significant role in helping us to continue to attain our goals; we must expand the number of Hartford students participating in Open Choice by 550 students for the upcoming school year.

This year, we are proposing the number of seats and grade spans where we would like your district to accept new Open Choice students, as follows:

11 - Grades 1 – 3  
6 - Grades 6 – 8

You will receive follow-up communication from CREC's Open Choice Office with information regarding siblings of students currently participating in Open Choice in your district, who are applying to participate in Open Choice in 2010-11. When deciding which seats you will offer, we request that you accommodate siblings whenever possible.

We have projected that by 2011-12, an estimated 3,200 students, equating approximately 3 percent of the student enrollment of the suburban towns participating in Open Choice, must participate in Open Choice in order for the State to be in compliance with the Order. The number of seats proposed above represents the number of required seats that your district should provide in order to maintain or incrementally increase your participation so that Open Choice students make up 3 percent of your district's enrollment by 2011-12.

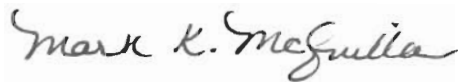
Please complete the attached form and return it to the Connecticut State Department of Education (CSDE) by March 1, 2010. Based on your schools' capacities, you may propose different grade levels for Open Choice seats than those suggested above. If you decide to do so, please keep in mind the following:

Dr. Maynard Suffredini  
December 28, 2009  
Page 2

- many districts tend to offer the most seats at the kindergarten and first grade levels. Although we welcome seats for younger students, please keep in mind that in order to meet our required level of participation, seats are needed across grade levels;
- attending a new school in a new community can be difficult for children. We urge you to seat multiple Open Choice students in the same classroom to enable the students' mutual support, and successful transition and integration into their new school environment;
- if you would like to enroll more Open Choice students than the number specified above, we encourage you to do so. Please note that while March 1st is your initial due date for seat declarations; you may declare additional seats after that date; and
- based on applications, you may receive communication from CSDE or CREC requesting that you revise the grade levels of the seats that you offer for student enrollment.

Thank you for your district's continued support of the Open Choice program. If you have any questions, please contact Christine Ruman at [christine.ruman@ct.gov](mailto:christine.ruman@ct.gov) or (860) 713-6546.

Sincerely,



Mark K. McQuillan  
Commissioner of Education

MKM:er  
Enclosure

cc: Dave Palmer, Chairman, Board of Education  
George A. Coleman, Deputy Commissioner of Education  
Mark Linabury, Chief, Bureau of Choice Programs  
Steven Adamowski, Superintendent, Hartford Public Schools  
Bruce Douglas, Executive Director, CREC  
Sarah Barzee, Assistant Executive Director, CREC  
Nessa Oram, Director, Open Choice Program, CREC  
Christopher Leone, Hartford Director, Regional School Choice Office  
Janet Foster, Bureau of Choice Programs  
Christine Ruman, Sheff Office

**OPEN CHOICE PROGRAM**  
**Report of Seats Available for 2010-11 (SOMERS)**

**Requested Seats per CT State Department of Education**

	School Year	K	1	2	3	4	5	6	7	8	9	10	11	12	Total
Current	2009-10				2	3	2		2	3	2	3	1	3	21
Maintained Seats	2010-11					2	3	2		2	3	2	3	1	18
<b>New Seats</b>	<b>2010-11</b>		<b>11</b>			<b>6</b>									<b>17</b>
<b>Total</b>	<b>2010-11</b>														<b>35</b>

**Current and Proposed New Seats**

In the GRAY spaces in the chart below, please note the number of Open Choice students enrolled in your schools for the 2009-10 school year as of October 1, 2009. **It is assumed that, with the exception of Grade 12 students, each of these students will continue to the next grade in your district in 2010-11.** Please note any exceptions in the "Comments" section.

In the WHITE spaces, please provide your district's proposed grade levels for new Open Choice seats for the 2010-11 school year.

School Name	School Year	K	1	2	3	4	5	6	7	8	9	10	11	12	Total
Somers Elementary	2009-10				2	3	2								7
	2010-11														
Mabelle B. Avery Middle	2009-10								2	3					5
	2010-11														
Somers High	2009-10										2	3	1	3	9
	2010-11														

**Comments:**

### Proposed Seats at New Schools

If you intend to expand the program to schools not currently participating in Open Choice, please use the chart below to indicate proposed new seats for such schools.

School Name	School Year	K	1	2	3	4	5	6	7	8	9	10	11	12	Total
	2010-11														
	2010-11														
	2010-11														

---

Superintendent of Schools (printed)

Name of School District

---

Superintendent of Schools (signature)

Date

**Please return by mail or fax by March 1, 2010 to:**

Christine Ruman  
 Associate Education Consultant  
 Sheff Office  
 CT State Department of Education  
 165 Capitol Ave., Rm. 304  
 Hartford, CT 06106  
 Fax: (860) 713-7021

**SOMERS BOARD OF EDUCATION**

Ninth District Road

Somers, CT 06071

[www.somers.k12.ct.us](http://www.somers.k12.ct.us)

**MINUTES OF THE MEETING – March 22, 2010**

**Members Present:** D.Palmer, J.Formeister, S.Bollinger, B.Devlin, M.Marquardt, T.Potrikus, J.Taylor, R.Lees, A.Kirkpatrick

**Members Absent:**

**Administrators Present:** M.Suffredini, P.Collin, K.Pezza, B.Boutwell, J.Oliver, R.Riola

**Staff Present:** None in attendance

**Citizens Present:** T.Caravella, B.Percoski

**Students Present:** J.Lam, M.Lucey, L.Cassarino

**Student Representatives:** None in attendance

**Others:**

**1.0 BUDGET PRESENTATION TO BOARD OF FINANCE**

Dr. Suffredini presented the Board of Education’s 2010-2011 Budget to the members of the Board of Finance and to the citizens in attendance. Dr. Suffredini and Board of Education members responded to questions from the members of the Board of Finance. Dr. Suffredini will provide the Board of Finance with a copy of the district’s technology plan in response to their questions regarding how money for technology will be used.

**2.0 CALL TO ORDER**

The regular meeting of the Board of Education was called to order at 7:08 p.m. by Chairman Palmer in the Selectman’s Conference Room.

**3.0 PLEDGE OF ALLEGIANCE**

**4.0 APPROVAL OF MINUTES**

**4.1** March 8, 2010 Regular Meeting – It was MOVED (S.Bollinger) SECONDED (B.Devlin) to approve the March 8, 2010 Board of Education regular meeting minutes as presented. PASSED 9-0

**5.0 AUDIENCE TO CITIZENS/STAFF/STUDENTS**

**6.0 CORRESPONDENCE**

Chairman Palmer reported the receipt of correspondence regarding the Somers High School Dance Team.

**7.0 OPPORTUNITY TO ADD/DELETE AGENDA ITEMS**

**8.0 CONSENT AGENDA**

**8.1** Approval of Bills 3/22/10 (\$242,826.86)  
It was MOVED (B.Devlin) SECONDED (A.Kirkpatrick) to approve the 3/22/10 Bills in the amount of \$242,826.86 as presented. PASSED 9-0

- 8.2 Retirement Notification (A.Poitras)**  
It was MOVED (B.Devlin) SECONDED (A.Kirkpatrick) to approve with the Board of Education's appreciation and regret, the retirement notification received from A.Poitras effective at the end of the 2009-2010 school year. PASSED 9-0

**9.0 NEW BUSINESS**

- 9.1 Approval of Science Electives (Anatomy/Physiology Gr. 11 & 12; AP Biology; AP Chemistry Gr. 12; Astronomy Gr. 11 & 12; Biotechnology; Physics; Honors Chemistry Gr. 11 & 12; Marine Science Gr. 11 & 12; Science & Law Gr. 11 & 12)**

A discussion was held as to how students will plan to make sure that an AP course will be available when they need it. Dr. Suffredini and K.Pezza will explore scheduling options and report back to the Board.

Director of Curriculum, K.Pezza, explained that the K-10 Science Curriculum was approved in June of 2008. The nine electives presented for approval are the 11<sup>th</sup> and 12<sup>th</sup> grade electives that have not been previously approved.

It was MOVED (R.Lees) SECONDED (S.Bollinger) to approve the Science Electives (Anatomy/Physiology Gr. 11 & 12; AP Biology; AP Chemistry Gr. 12; Astronomy Gr. 11 & 12; Biotechnology; Physics; Honors Chemistry Gr. 11 & 12; Marine Science Gr. 11 & 12; Science & Law Gr. 11 & 12) as presented. PASSED 9-0

- 9.2 Approval of Curriculum Development Guide**

Director of Curriculum, K.Pezza, explained that the Curriculum Development Guide was revised to ensure that our curriculum and curriculum development process meets the state guidelines for curriculum. UbD units were not included as part of the curriculum in the former Curriculum Development Guide. As the next cycle of curriculum revision begins, subject areas will have unit plans in the official board approved curriculum documents.

Additionally, the revision timeline has been adjusted to ensure that multiple core areas of instruction are not in revision at the same time.

It was MOVED (T.Potrikus) SECONDED (J.Taylor) to approve the Curriculum Development Guide as presented. PASSED 9-0

- 9.3 First Warning of TIDE Textbooks**

Director of Curriculum, K.Pezza, presented the following TIDE Textbooks for the Board's review: *Welding Technology Fundamentals*, *Print Reading for Industry*, *Complete Adobe Photoshop CS4 for Digital Photographers*.

Mrs. Pezza explained that the Tech. Ed. teachers at the high school have requested classroom sets of these three textbooks as part of implementing their approved curriculum.

Second Warning/Adoption will be scheduled for the April 12<sup>th</sup> BOE meeting.

The textbooks are available for review in the Curriculum Office.

- 9.4 Second Warning/Adoption of DBS Code 4122: Student Teachers**

It was MOVED (J.Taylor) SECONDED (A.Kirkpatrick) to adopt DBS Code 4122: Student Teachers as presented. PASSED 9-0

**9.5** Open Choice Student Enrollment 2010-2011

Dr. Suffredini explained that the CSDE Commissioner requested that we increase our number of seats for Choice students for the 2010-2011 school year by 17 students. Dr. Suffredini stated that given the uncertainty of our budget and the potential for significant increases in class sizes over the next few years, the Commissioner's request would dramatically impact the district's class size problem. Dr. Suffredini recommends that the district maintain the number of Choice seats in the district at 24.

It was MOVED (J.Taylor) SECONDED (B.Devlin) to approve the Superintendent's recommendation that we limit the number of Choice seats in the district at 24 while allowing the Superintendent discretion in accepting siblings of children already enrolled in our program. PASSED 9-0

**9.6** Nonrenewals

Dr. Suffredini stated that in accordance with the provisions of Connecticut General Statutes Section 10-151 applicable to the nonrenewal of nontenured teachers, the law requires that nontenured teachers be notified prior to April 1<sup>st</sup> that their contracts will not be renewed at the end of the school year.

It was MOVED (B. Devlin) SECONDED (J.Taylor) that pursuant to Connecticut General Statutes Section 10-151, the Somers Board of Education nonrenew the teaching contract of Susan Atwood at the end of the 2009-2010 school year as recommended by the Superintendent.

I further move that the Superintendent be directed to communicate this action of the Board in writing to Susan Atwood and that the Superintendent of Schools be authorized to respond on behalf of the Board to any requests for a hearing, if required by law, or for other data which may be forthcoming from the teacher and/or his/her representative pursuant to applicable provisions of Connecticut General Statutes Section 10-151; and that the Superintendent be directed that any response for a hearing, if a hearing is required by law, indicate that such hearing is to be before the Board of Education. PASSED 9-0

**10.0 OLD BUSINESS**

**11.0 ADMINISTRATIVE REPORTS**

**11.1** Somers Public Library Update

Dr. Suffredini reported that he has been in touch with Somers Library Director, Francine Aloisa, and she reported that things are going much better. They have limited the number of teens allowed in the teen room and they are using volunteers from the Library Board to monitor the room.

**11.2** Bus Accident

Dr. Suffredini reported that there was a bus accident this afternoon on Hall Hill Road. A car drove into the back of a bus that was stopped to let off a child. The school's emergency protocol was followed and the police responded. Parents were notified. No injuries were reported and all the students were home by 5:00 p.m. Somers Elementary School administration will follow-up with the families on Tuesday.

The Board commended all those who responded to this emergency situation.

**11.2 Dance Team Advisor**

Dr. Suffredini reported that the Dance Team Advisor would like to speak to the Board of Education in Executive Session. Chairman Palmer would like clarification as to whether or not this person is considered personnel because she is a volunteer. Dr. Suffredini will discuss this with the Board's attorney and request from this individual what she would like to speak to the Board about.

**12.0 COMMITTEE REPORTS**

**12.1 Budget**

A copy of the district's Technology Plan will be sent to the Board of Finance.

**12.2 Curriculum**

Second Warning/Adoption of the TIDE textbooks is scheduled for the April 12<sup>th</sup> BOE meeting.

**12.3 Policy**

A meeting will be scheduled.

**12.4 Salary & Negotiations**

A mediation session is scheduled for March 25<sup>th</sup>.

**12.5 Planning Committee – No report**

**12.6 Other Committees**

**13.0 OTHER**

**13.1** The Board will make reservations to have dinner at the Horizon's Café.

**14.0 ADJOURNMENT**

It was MOVED (B.Devlin) and SECONDED (J.Taylor) to adjourn the regular meeting of the Somers Board of Education at 8:10 p.m. PASSED 9-0

Respectfully submitted,

Rick Lees, Jr., Secretary  
Joan Jaquith, Recording Secretary

These minutes are not official until approved at a subsequent meeting.