Amherst Regional High School
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DEPARTMENT: SCIENCE	**COURSE TITLE:** PHYSICS REVISED: AUGUST 23, 2011 **COURSE NUMBER:** 244B
GRADE(S): 11 AND 12	**PRE-REQUISITES (IF ANY):** SUCCESSFUL COMPLETION OF GEOMETRY AND ALGEBRA I OR IMP I, OR BY PERMISSION OF DEPARTMENT

UNIT	LENGTH	CONTENT	SKILLS	MAJOR ACTIVITIES AND METHODS OF ASSESSMENT	FRAMEWORK STRAND(S) & STANDARD(S)
1. INTRODUCTION TO PHYSICS (CHAPTERS 1)	**1 WEEKS (5 DAYS)**	**RELATING PHYSICS TO OTHER SCIENCES REPRESENTING PHYSICAL DATA MATH SKILLS**	**STUDENTS WILL:** GRAPH AND INTERPRET PHYSICAL DATA MAKE ESTIMATES AND ROUGH CALCULATIONS TO NEAREST ORDER OF MAGNITUDE REPORT CALCULATED NUMBERS WITH AN APPROPRIATE NUMBER OF SIGNIFICANT FIGURES CONVERT UNITS	GRAPHING LAB MEASURING ACTIVITY ESTIMATING LAB TEXTBOOK READING & PROBLEM SET PORTFOLIO UNIT TEST	**INQUIRY SIS 1, 2, 3, 4** **SCI/MATH ALL 8 CORE + % ERROR, SI UNITS**
2. FORCES AND NEWTON'S LAWS OF MOTION (CHAPTERS 4 AND 5)	**3 WEEKS (15 DAYS)**	**INTRO TO FORCES FORCE EQUILIBRIUM / FORCE VECTORS INERTIA / MASS VS WEIGHT (1ST LAW) STATIC EQUILIBRIUM COMMON FORCES NET FORCE / FB DIAGRAM DYNAMIC EQ. 2ND LAW TERMINAL VELOCITY**	**STUDENTS WILL:** DRAW FORCE VECTOR SCALE DIAGRAMS ADD VECTORS GRAPHICALLY CREATE AND INTERPRET FREE BODY DIAGRAMS, IDENTIFYING EQUALIBRIUM APPLY NEWTON'S LAWS IN A VARIETY OF SITUATIONS DESCRIBE FALLING MOTION IN THE PRESENCE OF AIR RESISTANCE	FORCE EQUILIBRIUM LAB INERTIA ACTIVITIES **BENCHMARK:** INVESTIGATING FORCES LAB TEXTBOOK READING & PROBLEM SET IN-CLASS PROBLEMS PORTFOLIO UNIT TEST	**PHYSICS 1.1, 1.4, 1.5, 1.6** **INQUIRY SIS 2, 3** **SCI/MATH ALL 8 CORE + % ERROR, SI UNITS**

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3. DESCRIBING 1-D AND 2-D MOTION (CHAPTER 2 & 3)	**3 WEEKS (15 DAYS)**	**SPEED AND VELOCITY** **ACCELERATION** **DISPLACEMENT AND VELOCITY VECTORS** **FREE-FALL** **PROJECTILES**	**STUDENTS WILL:** DESCRIBE POSITION, VELOCITY AND ACCELERATION DISTINGUISH BETWEEN SPEED AND VELOCITY USE THE "BEARING ANGLE" SYSTEM FOR MOTION VECTORS DESCRIBE CHANGING VELOCITY CALCULATE POSITIONS AND SPEEDS AT DIFFERENT TIMES DESCRIBE AND SOLVE PROBLEMS WITH FREELY FALLING OBJECTS SOLVE KINEMATICS PROBLEMS INCLUDING PROJECTILE PROBLEMS	DISPLACEMENT VECTOR ACTIVITY MAP READING ACTIVITY **BENCHMARK:** MOTION GRAPHING ACTIVITIES PROJECTILE SIMULATION LAB PROJECTILE TARGET LAB TEXTBOOK READING & PROBLEM SET IN-CLASS PROBLEMS PORTFOLIO UNIT TEST	**PHYSICS** **1.1, 1.2, 1.3** **INQUIRY** **SIS 2** **SCI/MATH** **ALL 8 CORE +** **SI UNITS**
4. MOMENTUM AND NEWTON'S 3RD LAW (CHAPTER 6 & 7)	**2 WEEK (10 DAYS)**	**NEWTON'S 3RD LAW** **MOMENTUM** **IMPULSE – MOMENTUM** **CONSERVATION OF MOMENTUM**	**STUDENTS WILL:** INCORPORATE 3RD LAW IN PROBLEM SOLVING DEFINE AND CALCULATE LINEAR MOMENTUM AND IMPULSE CALCULATE CHANGE IN MOMENTUM AND RELATE IT TO IMPULSE OBSERVE AND DESCRIBE DIFFERENT TYPES OF COLLISIONS SOLVE COLLISION PROBLEMS USING CONSERVATION OF MOMENTUM	EGG DROP LAB **BENCHMARK**: OBSERVING COLLISIONS LAB PRECONCEPTIONS ACTIVITIES TEXTBOOK READING & PROBLEM SET IN-CLASS PROBLEMS PORTFOLIO UNIT TEST	**PHYSICS** **1.4, 1.5, 2.5** **INQUIRY** **SIS 1, 2, 3, 4** **SCI/MATH** **ALL 8 CORE +** **SI UNITS**
5. RELATIVE MOTION (CHAPTER 3)	**1 WEEKS (5 DAYS)**	**RELATIVE MOTION**	**STUDENTS WILL:** DESCRIBE MOTION AS OBSERVED FROM MOVING FRAMES OF REFERENCE USE VECTORS TO SOLVE RELATIVE MOTION PROBLEMS SOLVE PROBLEMS INVOLVING MOTION IN WATER OR AIR	RELATIVE MOTION ON THE RIVER ACTIVITIES TEXTBOOK READING & PROBLEM SET IN-CLASS PROBLEMS PORTFOLIO UNIT TEST **BENCHMARK:** TERM EXAM	**PHYSICS** **(1.2)** **INQUIRY** **SIS 2, 3** **SCI/MATH** **ALL 8 CORE +** **% ERROR, SI UNITS**

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6. ENERGY AND SIMPLE MACHINES (CHAPTER 8)	**2 WEEKS (10 DAYS)**	**WORK** **POWER** **MECHANICAL ENERGY** **GRAVATATIONAL POTENTIAL ENERGY** **KINETIC ENERGY** **CONSERVATION OF ENERGY** **SIMPLE MACHINES**	**STUDENTS WILL:** RELATE WORK AND ENERGY DIFFERENTIATE POWER AND ENERGY. CALCULATE POWER USED DOING WORK. IDENTIFY TYPES OF MECHANICAL ENERGY AND CALCULATE VALUES. SOLVE REAL WORLD PROBLEMS USING CONSERVATION OF ENERGY. IDENTIFY SIMPLE MACHINES. CALCULATE AND EXPLAIN THE EFFICIENCY AND MECHANICAL ADVANTAGE OF SIMPLE MACHINES.	HUMAN POWER LAB COST OF POWER LAB ENERGY SKATEPARK VIRTUAL LAB **BENCHMARK:** WORK ON RAMP LAB PULLEY ACTIVITIES IN-CLASS PROBLEMS TEXTBOOK READING & PROBLEM SET PORTFOLIO UNIT TEST	**PHYSICS:** **2.1, 2.2, 2.3, 2.4** **INQUIRY:** **SIS 1, 2, 3, 4** **SCI/MATH** **ALL 8 CORE +** **% ERROR** **SI UNITS**
7. CIRCULAR MOTION AND UNIVERSAL GRAVITATION (CHAPTERS 9 & 12)	**2 WEEKS (10 DAYS)**	**ROTATIONAL VS LINEAR SPEED** **CENTRIPETAL ACCELERATION AND FORCE** **SIMULATED GRAVITY** **ORBIT AND SATELLITE MOTION** **MASSLET MODEL OF GRAVITATION** **NEWTON'S UNIVERSAL LAW OF GRAVITY**	**STUDENTS WILL:** DESCRIBE ROTATIONAL MOTION RECOGNIZE AND CALCULATE FORCES THAT CAUSE ROTATION UNDERSTAND SIMULATED GRAVITY AND MICROGRAVITY PREDICT AND CALCULATE THE EFFECT OF MASS AND DISTANCE ON THE FORCE OF GRAVITY BETEEN 2 OBJECTS	CIRCULAR MOTION ACTIVITIES CENTRIPETAL FORCE LAB ORBIT SIMULATIONS TEXTBOOK READING & PROBLEM SET IN-CLASS PROBLEMS PORTFOLIO UNIT TEST (FINAL EXAM)	**PHYSICS** **(1.4, 1.5) 1.7, 1.8** **INQUIRY** **SIS 1, 2, 3, 4** **SCI/MATH** **ALL 8 CORE +** **% ERROR, SI** **UNITS**
8. ROTATIONAL MECHANICS (CHAPTERS 10 & 11)	**1 WEEK (5 DAYS)**	**CENTER OF GRAVITY** **TORQUE** **BALANCE** **ROTATIONAL INERTIA** **ANGULAR MOMENTUM**	**STUDENTS WILL:** LOCATE CG OF IRREGULAR OBJECTS. GIVE EXAMPLES OF THE EFFECTS OF CG. IDENTIFY UNSTABLE EQUILIBRIUM CALCULATE TORQUE AND SOLVE BALANCE PROBLEMS. DESCRIBE THE EFFECTS OF ROTATIONAL INERTIA. DEFINE ANGULAR MOMENTUM AND THE CONSEQUENCES OF ITS CONSERVATION	CG OF MAP LAB PERSONAL CENTER OF GRAVITY ACTIVITY **BENCHMARK:** TORQUE LAB ROTATION LAB IN-CLASS PROBLEMS TEXTBOOK READING & PROBLEM SET PORTFOLIO UNIT TEST	**PHYSICS:** **1.8; 2.5** **INQUIRY:** **SIS 1, 2, 3, 4** **SCI/MATH** **ALL 8 CORE +** **SI UNITS**

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9. ELECTROSTATICS (CHAPTERS 32 & 33)	**1 WEEK (5 DAYS)**	**ELECTRIC FORCES AND CHARGE** **COULOMB'S LAW** **CONDUCTORS, INSULATORS** **CHARGING BY FRICTION & CONTACT** **INDUCTION & POLARIZATION** **ELECTRIC SHIELDING** **ELECTRIC POTENTIAL** **CAPACITORS AND ENERGY STORAGE**	**STUDENTS WILL:** DESCRIBE THE EFFECTS OF CHARGE AND DISTANCE ON ELECTRICAL FORCE. DEMONSTRATE AND EXPLAIN CHARGING BY CONTACT, FRICTION AND INDUCTION. DISTINGUISH BETWEEN CONDUCTORS AND INSULATORS. DESCRIBE HOW TO MEASURE AND SKETCH ELECTRIC FIELDS. DESCRIBE HOW OBJECTS CAN BE SHIELDED FROM ELECTRIC FIELDS. DISTINGUISH BETWEEN ELECTRICAL POTENTIAL ENERGY AND ELECTRIC POTENTIAL. DESCRIBE HOW ELECTRICAL ENERGY CAN BE STORED IN A CAPACITOR.	BALLOON ACTIVITIES ELECTROSCOPE LAB ELECTROSTATICS SIMULATIONS TEXTBOOK READING & PROBLEM SET PORTFOLIO UNIT TEST	**PHYSICS:** **5.1; 5.4** **INQUIRY:** **SIS1; SIS2; SIS3;SIS4** **SCI/MATH** **ALL 8 CORE +** **SI UNITS**
10. CIRCUITS (CHAPTERS 34 & 35)	**1 WEEKS (5 DAYS)**	**ELECTRIC CURRENT** **RESISTANCE** **OHM'S LAW AND SHOCK HAZARDS** **DIRECT AND ALTERNATING CURRENT** **ELECTRIC POWER** **SERIES AND PARALLEL CIRCUITS** **HOUSEHOLD WIRING AND OVERLOADING** **SEMICONDUCTORS AND DIODES**	**STUDENTS WILL:** DEFINE ELECTRIC CURRENT. USE A DVM TO MEASURE VOLTAGE, CURRENT AND RESISTANCE. IDENTIFY FACTORS THAT EFFECT RESISTANCE. CALCULATE POWER USED BY HOUSEHOLD APPLIANCES. ASSESS ELECTRICAL HAZARDS. DISTINGUISH BETWEEN SERIES AND PARALLEL. DRAW SCHEMATIC CIRCUITS DIAGRAMS. EXPLAIN THE CAUSE OF OVERLOADING HOUSEHOLD CIRCUITS. DISTINGUISH BETWEEN AC AND DC AND IDENTIFY COMMON USES. DESCRIBE THE FUNCTION OF A DIODE IN SIMPLE DC AND AC CIRCUITS.	OHM'S LAW LAB ELECTRIC POWER AND HEATING ACTIVITY **BENCHMARK:** SERIES AND PARALLEL CIRCUITS LAB 3-WAY SWITCH ACTIVITY DIODE ACTIVITY IN-CLASS PROBLEMS TEXTBOOK READING & PROBLEM SET PORTFOLIO UNIT TEST	**PHYSICS:** **5.2; 5.3; 5.5** **TECH/ENG** **5.1; 5.2; 5.3; 5.4; 5.5** **INQUIRY:** **SIS1; SIS2; SIS3;SIS4** **SCI/MATH** **ALL 8 CORE +** **SI UNITS** **% ERROR**

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11. ELECTRICAL ENERGY (CHAPTERS 36 & 37)	**2 WEEKS (10 DAYS)**	**MAGNETIC POLES AND FORCE FIELDS** **ELECTRIC CURRENT AND MAGNETIC FORCES** **GALVANOMETERS AND DC MOTORS** **ELECTROMAGNETIC INDUCTION & FARADAY'S LAW** **GENERATORS** **TRANSFORMERS** **POWER TRANSMISSION AND THE ELECTRIC GRID** **ELECTROMAGNETIC WAVES**	**STUDENTS WILL:** CONTRAST MAGNETIC POLES AND ELECTRIC CHARGES SKETCH MAGNETIC FIELDS. PREDICT THE MAGNETIC FIELD PRODUCED BY A CURRENT BUILD ELECTROMAGNETS AND MOTORS. DESCRIBE HOW A MAGNETIC FIELD EXERTS A FORCE ON A WIRE. COMPARE HOW GALVANOMETERS, MOTORS, GENERATORS, AND TRANSFORMERS WORK AND THEIR TECHNOLOGICAL APPLICATIONS. DESCRIBE THE CAUSE OF E-M WAVES.	MAGNETIC FIELD MAPPING ELECTROMAGNET LAB DC MOTOR LAB POWER GRID FIELD TRIP TEXTBOOK READING & PROBLEM SET PORTFOLIO UNIT TEST **BENCHMARK:** (FINAL EXAM)	**PHYSICS: 5.6; 6.1** **INQUIRY: SIS1; SIS2; SIS3;SIS4** **SCI/MATH ALL 8 CORE + SI UNITS**
12. FLUIDS (CHAPTERS 19 & 20)	**2 WEEKS (10 DAYS)**	**PRESSURE** **BUOYANCY** **ARCHIMEDES' PRINCIPLE** **FLOATATION** **PASCAL'S PRINCIPLE** **ATMOSPHERIC PRESSURE** **BAROMETERS** **BUOYANCY OF AIR** **BERNOULLI'S PRINCIPLE** **LIFT**	**STUDENTS WILL:** CALCULATE PRESSURE IN A LIQUID. EXPLAIN THE CAUSE OF BUOYANT FORCE AND ITS RELATIONSHIP TO DISPLACEMENT. CALCULATE IF AN OBJECTS FLOATS. APPLY PASCAL'S PRINCIPLE TO HYDRAULIC PRESS PROBLEMS. EXPLAIN THE SOURCE OF ATMOSPHERIC PRESSURE. BUILD AN ANEROID BAROMETER. APPLY BERNOULLI'S PRINCIPLE TO COMMON SITUATIONS. EXPLAIN WHY AN AIRPLANE FLIES.	BUOYANCY ACTIVITY ANEROID BARAMETER LAB BERNOULLI ACTIVITIES TEXTBOOK READING & PROBLEM SET IN-CLASS PROBLEMS PORTFOLIO UNIT TEST	**PHYSICS: 1.4** **TECH/ENG: 2.3;** **INQUIRY: SIS1; SIS2; SIS3;SIS4** **SCI/MATH ALL 8 CORE + SI UNITS**

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Unit	Length	Content	Skills	Major activities and Methods of Assessment	Framework Strand(s) & Standard(s)
13. Temperature and Heat (Chapters 21, 22, 24)	**2 weeks (10 days)**	**Temperature** **Heat and thermal equalibrium** **Heat Capacity** **Conduction, Convection & Radiation** **The greenhouse effect** **1st Law of Thermodynamics and Adiabatic processes** **2nd Law of Thermodynamics and heat engines** **3rd Law of Thermodynamics and entropy**	Students will: Define temperature in terms of KE. contrast heat and temperature. Describe how heat is measured. Solve heat transfer problems. Relate heat capacity to climate. Distinguish between conduction and convection. Explain how heat is transferred through empty space. Describe the greenhouse effect in terms of heat radiation. Relate the 1st Law to conservation of energy. Define an adiabatic process. Calculate Heat engine efficiency. Give examples of the role entropy in everyday situations.	Temperature and Heat Lab Heat Capacity Lab Energy transformation Lab Textbook reading & problem set in-class problems Portfolio (Final Exam)	Physics: 3.1; 3.2; 3.3; 3.4 Tech/Eng 4.1; Inquiry: SIS1; sis2; sis3;sis4 Chemistry: 6.5 Sci/Math All 8 core + SI Units % error C and K scales

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