

## YEAR 11 Unit 1 and 2 Physics Programme

2015

Week	OUTCOMES	Experiments	Reading	Problem Solving & Calculations	Major Assessment
<p><b>T1</b></p> <p style="font-size: 2em;">1</p>	<p><b>MEASUREMENT</b></p> <ol style="list-style-type: none"> <li>1. Understand the SI system of quantities for units.</li> <li>2. Use correct units, symbols and notation.</li> <li>3. Differentiate between accuracy and precision of data.</li> <li>4. Calculate uncertainty in experimental results.</li> <li>5. Carry out graphical analysis of data.</li> </ol>	<p>“Slide Measurement” Experiment.</p> <p>Watch video “Measurement &amp; Uncertainty”</p>	<p>Chapt 1 Pages 36 - 51</p>		
<p><b>T1</b></p> <p style="font-size: 2em;">2</p>	<p><b>Unit 2</b></p> <p><b>Motion &amp; Forces</b></p> <p>Within motion and forces, students explore motion in one dimension to solve both qualitative and quantitative problems. Student unit learning contexts for motion and forces may include:</p> <ul style="list-style-type: none"> <li>Running, jumping and standing still</li> <li>Toys and simple machines</li> <li>Vehicle safety and collisions</li> </ul> <ol style="list-style-type: none"> <li>1. Distinguish between scalar and vector quantities.</li> <li>2. Add and subtract vectors in one dimension</li> <li>3. Define ‘displacement’ and state its SI unit.</li> <li>4. Distinguish between distance and displacement.</li> <li>5. Define ‘speed’ and ‘velocity’ and state their SI unit.</li> <li>6. Distinguish between speed and velocity</li> </ol>		<p>Chapters 2, 3 &amp; 4</p> <p>Pages 54-59 Pages 60-62</p>	<p><b>Exploring Physics Set 14 page 139</b></p>	

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<p>T1</p> <p>3</p>	<p>7. Calculate constant, instantaneous and average speed and velocity from tabulated and graphical data.</p> <p>8. Define ‘acceleration’ and state its SI unit.</p> <p>9. Calculate constant (average) acceleration for motion in one dimension.</p> <p>10. Draw and interpret graphs of objects moving in one dimension, including the interpretation of slope and area.</p> <p>11. Solve simple problems, including vertical motion under gravity using the equations:</p> $V_{av} = \frac{s}{t}$ $V_{av} = \frac{u + v}{2}$ $a = \frac{v - u}{t}$ <p>for constant acceleration.</p>	<p>Expt 2.1 Going Faster</p>	<p>Pages 63 - 67</p> <p>Pages 68 - 74</p> <p>Pages 75 - 83</p>	<p><b>Exploring Physics</b></p> <p><b>Set 15 page 145-147</b></p>	<p><b>BEGIN “Motion &amp; Forces”</b></p> <p><b>RESEARCH ASSIGNMENT</b></p>

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T1 4	12. Define 'inertia'. 13. Define 'mass' and state its SI unit. 14. Define 'momentum' and state its SI unit. 15. Describe the effects produced by forces.		Pages 97 - 98  Pages 98 - 101	<b>Exploring Physics Set 16 page 154-156</b>	
T1 5	16. State Newton's First, Second and Third Laws of motion. 17. Explain Newton's First Law of motion and account for its apparent failure due to friction. 18. Define 'force' in terms of Newton's First and Second Laws of motion and state its SI unit. 19. Define 'impulse' as the product of force and time and state its SI unit. 20. Use Newton's Second Law to explain the relationship between impulse and change in momentum.	Expt 3.1 Newton's Second Law  Expt 3.2 Friction	Pages 102 - 109  Pages 120 - 124		<b>MID TOPIC TEST</b>



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<p>T1</p> <p>7</p>	<p>29. State that when a force moves its point of application in the direction of the force, work is done.</p> <p>30. State and define the SI unit of work.</p> <p>31. Solve problems using <math>W = Fs</math></p> <p>32. Distinguish between work and energy</p> <p>33. Explain that a system which has energy can be made to perform useful work.</p> <p>34.* State and explain that one form of energy may be converted into another form.</p> <p>35. State the SI unit of energy.</p> <p>36.* Describe the energy changes that occur during energy transformations.</p> <p>37. State and explain the principle of conservation of energy.</p> <p>38. Explain that all forms of energy tend to degrade into thermal energy and relate this to the fact that the efficiency of mechanical systems is never 100%.</p>		<p>Pages 135 – 143</p> <p>Pages 144 – 147</p> <p>Pages 148 - 149</p>		

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<p><b>T1</b></p> <p><b>8</b></p>	<p>39. Define ‘kinetic energy’ as energy of motion.  <math display="block">E_k = \frac{1}{2}mv^2</math></p> <p>40. Solve problems using the expression:</p> <p>41. Define ‘potential energy’ as energy of position or state.</p> <p>42. Give examples of potential energy.</p> <p>43. Solve problems using the expression  <math display="block">E_p = mgh</math>                     for gravitational potential energy.</p>	<p>Expt 5.1 Roller Coaster</p>		<p><b>Exploring Physics Set 18 page 172-174</b></p>	

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<p><b>T1</b></p> <p><b>9</b></p>	<p>44. Describe and analyse kinetic and potential energy interchanges in everyday situations.</p> <p>45. Perform calculations involving the transformation of gravitational potential energy to kinetic energy and vice-versa.</p> <p>46. Define ‘power’ as the rate of doing work and state its SI unit.</p> <p>47. Perform calculations using the expression</p> $P = \frac{W}{t}$ <p>48. Draw and interpret graphs involving force, displacement, work, time and power in the chosen context</p>		<p>Pages 150-151</p>		<p><b>MOTION &amp; FORCES TOPIC TEST</b></p>

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T2

**Waves**

- Longitudinal and transverse waves
- Frequency, wavelength, velocity, amplitude
- waves are periodic oscillations that transfer energy from one point to another
- 
- Energy transfer.
- Mechanical mechanism.
- Vibrating particles and mechanical movement.
- 
- mechanical waves transfer energy through a medium; longitudinal and transverse waves are distinguished by the relationship between the directions of oscillation of particles relative to the direction of the wave velocity
- 
- Particle movement
- Ripple tanks or simulators.
- Specific examples of longitudinal and transverse waves.
- Difference between mechanical and non-mechanical electromagnetic waves.
- Energy is transferred without permanent displacement of particles
- 
- waves are periodic oscillations that transfer energy from one point to another.

Exper 20.1  
Observing Wave  
Pulses page 190

**MOTION  
RESEARCH  
ASSIGNMENT  
DUE**

1

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 • mechanical waves transfer energy through a medium,  
 longitudinal and transverse waves are distinguished by  
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 particles relative to the direction of the wave velocity.

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T2  2-3	<p><b>Wave Behaviours</b></p> <ul style="list-style-type: none"> <li>the mechanical wave model can be used to explain phenomena related to reflection and refraction, including echoes and seismic phenomena.</li> </ul>	<p>Exper 19.1 Making Waves page 181</p>			

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<p>T2</p> <p>4</p>	<p><b>Waves &amp; Mediums</b></p> <ul style="list-style-type: none"> <li>the superposition of waves in a medium may lead to the formation of standing waves and interference phenomena, including standing waves in pipes and on stretched strings</li> <li>This includes applying the relationships for</li> <li>strings attached at both ends and pipes open at both ends</li> </ul> $\lambda = \frac{2\ell}{n}$ <p>pipes closed at one end</p> $\lambda = \frac{4\ell}{(2n-1)}$ <ul style="list-style-type: none"> <li>application of the wave model has enabled the visualisation of imaging techniques, for geophysical exploration, such as seismology. (SHE)</li> </ul>	<p>Exper 19.2 Measuring Speed of Sound page 183</p> <p>Exper 19.2 Measuring Speed of Light page 184</p> <p>Exper 20.2 Diffraction &amp; Interference page 192</p> <p>Exper 20.6 Making a Speaker page 207</p>		<p><b>Set 19 page 185-188</b></p>	

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<p>T2</p> <p>4-5</p>	<p>Waves Properties</p> <ul style="list-style-type: none"> <li>• a mechanical system resonates when it is driven at one of its natural frequencies of oscillation; energy is transferred efficiently into systems under these conditions.</li> <li>• noise pollution comes from a variety of sources and is often amplified by walls, buildings and other built structures. Acoustic engineering, based on an understanding of the behaviour of sound waves, is used to reduce noise pollution. It focuses on absorbing sound waves or planning structures so that reflection and amplification do not occur. (SHE)</li> <li>• the intensity of a wave decreases in an inverse square relationship with distance from a point source This includes applying the relationship</li> </ul> $I \propto \frac{1}{r^2}$	<p>Exper 20.3 Resonance in Strings page 195</p> <p>Exper 20.3 Resonance in Air page 195</p>		<p><b>Set 20 page 199-204</b></p>	

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<p>T2</p> <p>6</p>	<p>Applications of waves: ultrasound, seismology</p> <p>Acoustic engineering applied to noise pollution</p> <p>Application of the wave model has enabled the visualisation of imaging techniques. These can include: medical applications, such as ultrasound, geophysical exploration, such as seismology</p> <p>Noise pollution comes from a variety of sources and is often amplified by walls, buildings and other built structures. Acoustic engineering, based on an understanding of the behaviour of sound waves, is used to reduce noise pollution. It focuses on absorbing sound waves or planning structures so that reflection and amplification do not occur.</p>	<p>20.5 Beat Patterns</p>			<p><b>COMPREHENSION ASSESSMENT</b></p> <p><b>WAVES TOPIC TEST</b></p>

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<p>T2</p> <p>9</p>	<p><b>Unit 1</b></p> <p><b>Heating and Cooling</b></p> <p>Students gain insight into temperature measurement, conduction, convection and radiation to develop understandings about how energy is transferred through different types of materials. They also examine the thermal properties of substances, including thermal expansion, specific heat capacity and latent heat.</p> <p>Contexts for heating and cooling may include:</p> <ul style="list-style-type: none"> <li>Temperature control</li> <li>Heat and Motor Vehicles</li> <li>Food preparation and preservation</li> <li>Climate change</li> </ul> <ol style="list-style-type: none"> <li>1. Explain the ways by which heat is transferred: conduction, convection and radiation.</li> <li>2. Explain that heat is the flow of energy from one object to another because of a difference in temperature.</li> <li>3. Explain the difference between heat, internal energy and temperature.</li> <li>4. State that temperature is related to the average kinetic energy of the molecules.</li> <li>5.* Explain how properties which change with temperature may be used to measure and control temperature.</li> <li>6. State the fixed points on the Celsius (0°C and 100°C) and Kelvin (0 K, 273 K) scales.</li> </ol>	<p>Exper 2.1 Convection Currents page 18</p> <p>The Power of a Bunsen Burner</p> <p>Exper 2.3 Coffee Cup Lids page 20</p>	<p>Page 229</p> <p>Pages 257 - 265</p> <p>Pages 235 - 239</p>	<p><b>Exploring Physics Set 1 page</b></p> <p>Exploring Physics Set 2 pages 21-22</p>	<p><b>Start:Heat efficiency building evaluation and analysis</b></p>

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T2  10	7.* Describe the experimental evidence which supports the kinetic theory. 8. Explain the relationship between pressure, volume and temperature using the kinetic theory. 9. Apply the kinetic theory to explain qualitatively physical phenomena related to the chosen context.		Pages 233 – 234  Pages 240 - 241		
T2  1	10. Explain and apply the principles involved in the effective operation of heating, cooling and insulation systems in contextual situations. 11. Use terms ‘specific heat capacity’ and ‘latent heat’ in explaining contextual situations. 12. Use $Q = mc\Delta T$ and $Q = mL$ for simple calorimetry problems (excluding the method of mixtures).	Expt 3.1 The specific Heat Capacity of a Liquid	Pages 243 – 244  Pages 248 - 250	Exploring Physics Set 3 pages 30-31	

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<p>T3</p> <p>1/2</p>	<p>13. Methods of mixtures calculations.</p> <p>14. Use the principles of heat storage and transfer to evaluate and explain the operation of common devices.</p> <p>15. State the principle of conservation of energy and explain the implications of energy degradation.</p>	<p>Expt 4.2 Melting Ice</p>	<p>Pages 245 - 246</p>	<p>Exploring Physics Set 4 pages 41-43</p>	<p><b>INVESTIGATION VALIDATION TEST</b></p> <p><b>The specific heat capacity of a metal or Lf of ice</b></p> <p><b>Complete:Heat efficiency building evaluation and analysis</b></p> <p><b>HEATING &amp; COOLING TOPIC TEST</b></p>

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<p>T3</p> <p>2</p>	<p>Unit 1</p> <p><b>Nuclear Physics</b></p> <p>Students learn about atomic structure and subatomic particles to understand the emission of nuclear radiation, and nuclear energy.</p> <p>Learning contexts may include:</p> <ul style="list-style-type: none"> <li>Nuclear energy</li> <li>Radioisotopes</li> <li>Medical imaging and therapies</li> </ul> <ol style="list-style-type: none"> <li>1. Understand the structure of the atom.</li> <li>2. Define the terms ‘atomic number’ and ‘mass number’, and be able to use them, together with a chemical symbol, to define a nuclide.</li> <li>3. Define the term ‘isotope’.</li> <li>4. Define an ‘atomic mass unit (u)’.</li> <li>5. Explain that many nuclides are unstable and that these nuclides decay.</li> </ol> <p>Describe the basic differences and similarities between the nature and properties of <math>\alpha</math>, <math>\beta</math> and <math>\gamma</math> radiation.</p>		<p>Pages 160 – 173</p>		



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T3  4	10. State that radioactive decay is a random process. 11. Estimate the half-life from a graph of activity plotted against time. 12. Perform calculations involving activity, half-life and time, but not the decay constant. 13. Describe how radioactive materials may be used in contextual applications 14. Describe how the properties of radiation may be used to detect their presence in a simple device such as a Geiger counter or scintillation counter.	Expt 7.1 Radiation and Distance		<b>Exploring Physics Set 7 pages 73 – 75</b>	
T3  5	15. Define the terms ‘mass defect’ and ‘binding energy’. 16. Solve simple problems involving binding energy and mass defect using $E = mc^2$ . 17. Use the variation in binding energy per nucleon of nuclides to explain the release of energy by fission and fusion processes. 18. Explain the principle of a neutron-induced chain reaction and critical mass configuration.	Exper 8.1 Simulating a Chain Reaction	Pages 179 - 184	<b>Exploring Physics Set 8 pages 83 - 84</b>	



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<p>T3</p> <p>8</p>	<p>Unit 1</p> <p><b>Electrical Fundamentals</b></p> <p>Students learn to apply the concepts of charge and energy transfer to situations involving both electrostatics and current electricity. They construct and study characteristics of electric circuits; learn how to work safely with electricity; and gain an understanding of the relationship between electricity and magnetism.</p> <p>Contexts for Electrical Fundamentals may include;</p> <ul style="list-style-type: none"> <li>Car electrical systems</li> <li>Domestic power</li> <li>Electrical safety</li> <li>Direct current devices</li> </ul> <ol style="list-style-type: none"> <li>1. Explain that atoms can gain or lose electrons so gaining a net charge.</li> <li>2. State that like charges repel and unlike charges attract.</li> <li>3. Describe, using diagrams, electric field distributions around simple combinations of charged points, spheres and plates.</li> </ol>	<p>Expt 9.1 Creating &amp; Storing Electric Charge</p>	<p>Pages 270 – 282</p>		

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T3  9/10	4. Define ‘electric current’ as the rate of flow of electric charge. 6. State the SI unit of electric current. 7. Define the SI unit of electric charge and solve problems using the expression $q = It$ 8. State that the direction of conventional current is that in which the flow of positive charge takes place. 9. Explain the connection between work, charge and potential difference. 10. State that the SI unit of electrical potential is the volt. 11. Explain and use the formulae for electrical work and power $Work = qV = VIt$ $P = VI$	Expt 10.1 Measuring Electrical Energy	Pages 283 – 289	<b>Exploring Physics Set 9 pages 94-95</b>	
T4  1	14.* Be able to calculate the energy consumed by and the cost of operating common electrical appliances. 15. Draw and interpret simple circuit diagrams including the use of standard symbols for resistor (fixed and variable), light bulb, switch, ammeter, voltmeter, dry cell and power supply. 16. Describe the flow of electrical current through series and parallel circuits.		Pages 297 – 300  Pages 304 – 305	<b>Exploring Physics Set 10 pages 101 - 102</b>	

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	17. State Ohm's Law and state the conditions under which it applies 18. Define 'resistance' and state its unit. 19. State the factors that affect electrical resistance. 20. Perform calculations using the relationship $V = IR$ 21. Describe the effect of having resistors connected in series.	Expt 11.1 Potential difference, current & resistance  Expt 12.1 Resistors in Series	Pages 290 – 296	<b>Exploring Physics Set 11 pages 109 - 110</b>	

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T4  2	22. Perform simple calculations using the relationship: $R_t = R_1 + R_2 + \dots$ 23. Describe the effect of having resistors connected in parallel. 24. Perform simple calculations using the relationship: $\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$ 25. Perform calculations to determine I, V and R in different parts of simple and compound circuits. 26. Connect components in simple circuits and measure values of current and potential difference using ammeters and voltmeters.	Expt 12.2 Resistors in Parallel	Pages 306 – 311	‘CIRCUIT INTERACTIONS’ HANDOUT QUESTIONS DUE  Exploring Physics Set 12 pages 119 - 123	Determine the resistance of an unknown resistor
T4  3	27. Explain the operating principles of commonly encountered electrical devices in contextual applications. 28. Identify sources of electrical energy in simple circuits. 29. Identify energy transformations which occur in electrical devices. 30. 34 Describe the cause of electric shock and identify hazardous situations and safety precautions in everyday uses of electrical energy.	Expt 13.1 Fuses  Expt 13.2 Short Circuits	Pages 313 - 319	Exploring Physics Set 13 pages 129 - 130	ELECTRICITY TOPIC TEST

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T4 4	CONSOLIDATION & REVIEW				
T4 5	YEAR 11 EXAMS				