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Year 9 Overview 2024-25 – *Physics*

Date	Wk	Week	Units Studied & Learning Outcomes	Key Concepts & Assessment
8 weeks (8 Lessons) (38 Days)				
2-Sep 9-Sep 16-Sep 23-Sep 30-Sep 7-Oct 14-Oct 21-Oct	A B A B A B A B	1 2 3 4 5 6 7 8	**Overview of Unit/No. lessons** Particles, radiation and density (8 lessons) **Lesson Sequence of Content**: 1 – Kinetic Theory (1 lesson) 2 – Conduction (1 lesson) 3 – Infrared (1 lesson) 4/5 – Infrared Required Pracitcal (2 lesson) 6 – SI units and converting (1 lesson) 7/8 – Density + required prac (2 lessons)	**Foundational Concepts** Particles, Energy, Waves **WALTs:** • To describe the states of matter in terms of the energy of their particles • Explain how heat is transferred by conduction using particles • Understand how the nature of the surface affects the absorption/emission of radiation • Know how to determine the density of a material **Tier 2/3 Vocabulary** **Key words:** Solid, liquid, gas, kinetic, conduction, vibration, emit, absorb, surroundings, mass, volume, thermal, fixed position, infrared, reflect, dissipate, density **Links to root words (etymology):** • Kinetic – from the word *kinein* – 'to move' • Thermal – from the word *thermē* 'heat' • Density – dense, closely compacted, thick • Dissipate – scatter **History & Culture:** • The particle theory of matter was not so much discovered as it was formulated, and that formulation began in ancient Greece. The person who is credited with having conceived of the idea that the world is composed of tiny, indivisible particles is the philosopher Democritus, who lived from 460 to 370 BCE. • This is a story about how the concept of density was first "discovered." around 250 B.C. The King of Syracuse, where Archimedes lived, thought that he was being cheated by the metal craftsman who made his golden crown **Careers:** Physics engineer, application developer, systems engineer ***Equality Diversity and Inclusion (EDI) links*** • Scientists from different backgrounds, nationalities • Chinese physician Yang Chen-Ning won the 1957 Nobel Prize for Physics, his book *Elementary Particles* was published in 1963 • French scientist Emilie du Châtelet first predicted the existence of IR in 1737 (slide in IR radiation Powerpoint) • Italian Leopoldo Nobili made the first thermopile IR detector in 1830 • German scientist Gustav Kirchoff formulated the blackbody theorem for IR in 1860 **Assessment** (Quiz/Tests/application tasks/ ST: Including foundational concepts, wider disciplinary knowledge, key content.)

Prior	Now	Next
Year 7 – Kinetic theory and energy	Understanding more detail on kinetic theory, thermal energy transfer and calculating density	Year 11+ Continual application of particle theory

Unit Learning Outcomes:

- GW - Draw simple diagrams to model the difference between solids, liquids and gases, Describe the process of conduction in solids, Know that the type of surface can affect the amount of radiation absorbed/emitted, Know how to calculate the density of an object
- BI – Describe the states of matter in terms of the energy of their particles, Explain conduction using particles, Describe which surface is the best/worst at absorbing/emitting, Know how to measure the density of a regular object by an experiment
- EW - Be able to explain the different properties of the states of matter using kinetic theory, Explain why metals are the best conductors, Explain how some things are designed to absorb/emit radiation, Know how to measure the density of an irregular object by an experiment

Recall of knowledge, application of knowledge, identify patterns from observations, interpret data about properties.

Assessment:

- Quick quiz
- Exam style questions
- Q&A
- Interleaving

				Misconceptions: Thinking cold can be transferred from one object to another; thinking objects that keep warm are sources of heat *Parent and Carers month/Black History month* *3/9 World afro day* *23/9 International day of sign languages* *10/10 world mental health day* *5/10 world teachers day* *6/10 World cerebal palsy day* • **Assessment** (Quiz/Tests/application tasks/ ST: Including foundational concepts, wider disciplinary knowledge, key content.)
Half-Term			**7** weeks (7 lessons) (35 Days)	
4-Nov	A	9	**Overview of Unit/No. lessons** Density, energy and efficiency (7 lessons) **Lesson Sequence of Content:** 1 – Factors affecting heat loss (1 lesson) 2 – House insulation (1 lesson) 3 – Energy stores (1 lesson) 4 – Efficiency (1 lesson) 5 – Increasing efficiency (1 lesson) 6 – Calculating Power (1 lesson) 7 – ST1 revision (1 lesson)	**Foundational concepts:** Particles, Energy **WALTs:** • Understand how we can prevent heat loss and factors affecting heat transfer • Understand how to insulate a house • Know the different types of energy store and that energy is conserved • Know how to calculate energy efficiency • Know how to calculate the power of electrical appliances **Key words:** Efficiency, specific heat, insulation, dissipated, energy store, transfer, pathway **Links to root words (etymology):** • Disipated – from the latin – *dissipat – 'scattered'* • Capacity – capac- that can contain **History & Culture:** • Development of increasingly efficient buildings- reducing heat loss, development of devices that reduces wasted energy stores • When researcher Dale Kleist attempted to create a vacuum seal between two glass blocks, an accidental stream of high-pressured air turned some of the glass into thin fibres. These fibres became the base of fiberglass insulation, which became popular in the 1940s • At some point in this period, double glazing was invented by the Scots and eagerly received. In the 1930s **Careers:** Construction, energy conservation officer, civil engineer, electrical engineer, electrician **EDI:** • Scientists from different backgrounds, nationalities • Scottish scientist William J.M. Rankine (1820-1872); French Nicolas L.S. Carnot (1796-1832) and German Rudolf Clausius (1822-1888), all founders of thermodynamics
11-Nov	B	10		
18-Nov	A	11		
25-Nov	B	12		
2-Dec	A	13		
9-Dec	B	14		
16-Dec	A	15		

Prior	Now	Next
Year 8 – Energy transfers	Applying thermal energy transfer Understanding specific heat Understanding and application of efficiency	Year 12/13 – Thermal physics Year 10 – Kinetic energy and work done

- GW: Recall examples of insulating materials, Know why the insulation is important, Know the different types of energy store
- BI: Plot an accurate graph of your results, Know different methods of insulating a house and calculate their payback time, Be able to give a simple energy transformation and identify pathways
- EW: Write a conclusion based on your evidence, Explain how different methods of insulation work and evaluate which should be installed first, Give a more complex energy transformation

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<table>
<tr>
<td></td><td></td><td></td>
<td>Recall and apply knowledge, interpret data, calculate energy changes.

Assessment:
• Quick quiz
• Exam style questions
• Q&A
Interleaving</td>
<td>Misconceptions:
Believing energy can be created; thinking energy is only associated with movement; believing energy and force mean the same think

kMens health awareness month/disability confident month
1/11 Diwali
12/11 Remembrance Sunday
13/11-19/11 Transgender awareness week
14/11 World Diabetes Day
1/12 World AIDS day
25/12 Christmas Day</td>
</tr>
<tr>
<td colspan="2">Christmas Holiday</td>
<td colspan="3">6 weeks (6 lessons) (30 Days)</td>
</tr>
<tr>
<td>6-Jan</td><td>B</td><td>16</td>
<td rowspan="5"><u>Overview of Unit/No. lessons</u>
ST1 Prep and feedback (4 lessons)
Energy Resources (2 lessons)

<u>Lesson Sequence of Content</u>:
1/2 – Revision for ST1 (2 lessons)
3 – Sit ST1 (1 lesson)
4 – ST1 Feedback (1 lesson)
5/6 – Energy Resources (2 lessons)

<table>
<tr><th>Prior</th><th>Now</th><th>Next</th></tr>
<tr><td>Year 8 – Energy transfers

Year 8 – How power stations work</td><td>Understanding of what specific heat capacity is and how to calculate it

Increasing the efficiency of an object

Understanding the advantages and disadvantages of energy resources</td><td>Year 12/13 – Thermal physics</td></tr>
</table>

• GW: Calculate the specific heat capacity of a material, Know what is meant by efficiency, Know the equation for power, Know the different types of energy store, Know the 2 main types of energy resource

• BI: Know the definition of specific heat capacity, Calculate the efficiency of a device, Use the power equation to answer questions, Know some advantages of renewables sources</td>
<td rowspan="5"><u>Foundational concepts:</u>
Particles, Energy

<u>WALTs:</u>
• Know how to calculate the power of electrical appliances
• Know the different types of energy resources
• Know the advantages and disadvantages of renewable energy sources

<u>Key words:</u>
Efficiency, specific heat , dissipated, generate, renewable, greenhouse gases, reliability, wasted, surroundings

Links to root words (etymology):
• Dissipated – from the latin – dissipat – 'scattered'
• Capacity – capac- that can contain
• Renewable – to renew (resume, revice)

<u>History & Culture:</u>
• Development of increasingly efficient buildings- reducing heat loss, development of devices that reduces wasted energy stores
• When researcher Dale Kleist attempted to create a vacuum seal between two glass blocks, an accidental stream of high-pressured air turned some of the glass into thin fibers. These fibers became the base of fiberglass insulation, which became popular in the 1940s
• At some point in this period, double glazing was invented by the Scots and eagerly received. In the 1930s
• In 1845 James Prescott Joule discovered the link between mechanical work and the generation of heat. These developments led to the theory of conservation of energy, formalized largely by William Thomson (Lord Kelvin) as the field of thermodynamics.

<u>Careers:</u>
Construction, energy conservation officer, civil engineer, electrical engineer, electrician, environmental studies, energy resources officer, energy engineer, civil engineer, meteorologist, electronic engineer

<u>EDI:</u>
• Scientists from different backgrounds, nationalities</td>
</tr>
<tr>
<td>13-Jan</td><td>A</td><td>ST1</td>
</tr>
<tr>
<td>20-Jan</td><td>B</td><td>ST1</td>
</tr>
<tr>
<td>27-Jan</td><td>A</td><td>19</td>
</tr>
<tr>
<td>3-Feb</td><td>B</td><td>20</td>
</tr>
<tr>
<td>10-Feb</td><td>A</td><td>21</td>
</tr>
</table>

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<td>

EW: Explain every day examples of specific heat capacity, Rearrange the efficiency equation, Explain how the efficiency of a device can be improved, Understand different devices transfer different amounts of energy in the same time, Explain the advantages and disadvantages of fossil fuels, Explain which type of energy source would be most suitable in a given area

Recall and apply knowledge, interpret data, calculate energy changes, efficiency and specific heat capacity.

Assessment:

Quick quiz
Exam style questions
Q&A
Interleaving

</td>
<td>

EJ Zita, openly gay physicist researching renewable energy and sustainability, cofounded Lesbians in Science (1990) (slide in Energy resources lesson)
Dr Steven Chu, co-recipient of the Nobel Prize for Physics 1997 for solutions to climate change
Sri Lankan Hemamala Karunadasa dedicated research towards new materials for applications in clean energy, lead figure at the 2014 Global Climate and Energy Project
Hungarian-American Mária Telkes (1900-1995) one of the founders of solar energy technologies, nicknamed The Sun Queen
American Esther Takeuchi currently pioneering work in energy storage systems

LGBT+ History month
27/1 Holocaust memorial day

1/2 World Hijab Day
6/2-12/2 Children's mental health week.
7/2 Safer internet day
10/2 Chinese New Year
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</tr>
<tr>
<td>Half-Term</td>
<td colspan="4">6 weeks (6 lessons) (29 Days)</td>
</tr>
<tr>
<td>25-Feb
3-Mar
10-Mar
17-Mar
24-Mar
31-Mar</td>
<td>B
A
B
A
B

A</td>
<td>22
23
24
25
26

27</td>
<td>
INSET 24th Feb

<u>Lesson Sequence of Content</u>:
1/2 – Wave basics (2 lessons)
3/4 – Waves required practicals (2 lessons)
5 – EM spectrum (1 lesson)
6 - Uses of the EM spectrum (1 lesson)

<table>
<tr><th>Prior</th><th>Now</th><th>Next</th></tr>
<tr><td>Year 8 – Energy transfers

Y8 – sound as a longitudinal wave</td><td>Understanding the advantages and disadvantages of energy resources

Knowing types of waves, mathematical calculations and applying it practically</td><td>Y12/13 Thermal physics</td></tr>
</table>

GW: Know the 2 main types of energy resource, Be able to label wavelength and amplitude, Know the equipment needed for one of the waves practicals

BI: Give definitions for the two types of energy resource, Know some advantages of renewables sources, Know the different types of waves, Be able to correctly calculate the wavelength/frequency using the wave

</td>
<td>
<u>Foundational concepts:</u>
Waves

<u>WALTs:</u>

Know the different types of energy resources
Know properties and uses of the EM spectrum
Know the advantages and disadvantages of renewable energy sources
Know the different types of waves
Be able to use the wave equation
Know how to measure the wavelength and frequency of a wave
Know how to measure the wavelength and frequency of a wave

<u>Key words:</u>
Energy, generate, renewable, greenhouse gases, reliability, wasted, surroundings, frequency, wavelength, hertz, transverse, longitudinal, amplitude

Links to root words (etymology):

Renewable – to renew (resume, revice)
Frequency – from latin, frequential, crowded, frequent
Amplitude – from latin, amplus – large, abundant
Transverse – from latin, transversus – turned across (trans = across)
Longitudinal – from latin, longitudal, length of duration

<u>History & Culture:</u>

In 1845 James Prescott Joule discovered the link between mechanical work and the generation of heat. These developments led to the theory of conservation of energy, formalized largely by William Thomson (Lord Kelvin) as the field of thermodynamics.

<u>Careers:</u>
</td>
</tr>
</table>

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<table>
<tr>
<td></td><td></td><td></td>
<td>equation, Be able to describe how to measure the wavelength of a wave

• EW: Explain the advantages and disadvantages of fossil fuels, Explain which type of energy source would be most suitable in a given area, Be able to explain the difference between the different waves, Know when to substitute in prefixes in equations, Be able to describe how to measure the wavelength and frequency of a wave in both practicals

Recall and apply knowledge, evaluate information, compare and contrast, carry out practical, calculations using practical data, write methods

Assessment:
• Quick quiz
• Exam style questions
• Q&A
Interleaving</td>
<td>Engineering, environmental studies, astronomy, energy resources officer, energy engineer, civil engineer, meteorologist, electronic engineer

<u>EDI:</u>
• Scientists from different backgrounds, nationalities
• Swedish scientist Hannes Alfvén won 1970 Nobel Prize in Physics for wave studies
• Pakistani-American astrophysicist first observed gravitational waves
• French scientist Jean-Baptiste le Rond d'Alembert devised a formula for obtaining solutions to the wave equation (slide in wave basics lesson)

Misconception: thinking waves carry matter from one place to another rather than energy
Women's history month
Ramadhan begins 1/3
21/3 World Down Syndrome day
31/3 Transgender day of visibility</td>
</tr>
<tr>
<td colspan="2">Easter Holiday</td><td colspan="3">5 weeks (?? lessons) (23 Days)</td>
</tr>
<tr>
<td>22-Apr</td><td>B</td><td>28</td>
<td rowspan="5">Easter Monday 21st
Early May bank hol 6/5

<u>Overview of Unit/No. lessons</u>
EM spectrum and refraction (2 lessons)
<u>Lesson Sequence of Content</u>:
1 – Refraction (1 lesson)
2 – Mass and weight (1 lesson)
3 – Contact and non-contact forces (1 lesson)
4-/5 – ST2 revision

<table>
<tr><th>Prior</th><th>Now</th><th>Next</th></tr>
<tr><td>Y8 – Sound as a longitudinal wave

Wave properties</td><td>Knowing types of waves, mathematical calculations and applying it practically

Know the properties and uses of EM Waves</td><td>Year 12 – Photon model of electromagnetic radiation

Gamma as part of the EM Spectrum</td></tr>
</table>
• GW: Know some parts of the EM spectrum and their uses

• BI: Know the correct order of the EM spectrum, describe the features of different types of wave</td>
<td rowspan="5"><u>Foundational concepts:</u>
Waves

<u>WALTs:</u>
• Know properties and uses of the EM spectrum

<u>Key words:</u>
Transverse, longitudinal, electromagnetic, wavelength, frequency, energy, refraction

Links to root words (etymology):
• Refract – broken up

<u>History & Culture:</u>
• Links to nuclear radiation and understanding of gamma radiation, real-world applications of refraction, space travel
• The first discovery of electromagnetic radiation other than visible light came in 1800, when William Herschel discovered infrared radiation. He was studying the temperature of different colors by moving a thermometer through light split by a prism. He noticed that the highest temperature was beyond red.

<u>Careers:</u>
Communications, nuclear physics, energy resources officer, energy engineer, civil engineer, meteorologist, electronic engineer

<u>EDI:</u>
• Scientists from different backgrounds, nationalities
• J. Virginia Lincoln (1915-2003), ionospheric research and radio communications
• Canadian Donna Strickland won 2018 Nobel Prize in Physics for groundbreaking inventions in the field of laser physics; only the fourth woman to win the prize</td>
</tr>
<tr><td>28-Apr</td><td>A</td><td>29</td></tr>
<tr><td>5-May</td><td>B</td><td>30</td></tr>
<tr><td>12-May</td><td>A</td><td>31</td></tr>
<tr><td>19-May</td><td>B</td><td>32</td></tr>
</table>

<table>
<tr><td></td><td></td><td></td><td>

- EW: Know which part of the EM spectrum has the longest wavelength, explain the different properties of EM waves. Recall and apply knowledge, use equations to calculate data, carry out practical, interpret and explain data.

Assessment:
- Quick quiz
- Exam style questions
- Q&A

Interleaving
</td><td>

- German scientists Wilhelm Röntgen discovered X-rays (1895) and Heinrich Hertz researched the production and reception of radio waves, unit of frequency named after him (slide in electromagnetic spectrum uses lesson)

Good Friday 18/4
Easter Sunday 20/4
Autism and stress awareness month.
25/4 World Malaria Day
26/4 Lesbian visibility day
UK national walking month.
1/5-7/5 Deaf awareness week
23/05 Vesak
</td></tr>
<tr><td colspan="5">Half-Term 7 weeks (7 lessons) (34 Days)</td></tr>
<tr><td>2-Jun</td><td>A</td><td>33</td><td rowspan="8">SJBF INSET 4/7

<u>Overview of Unit/No. lessons</u>

<u>Lesson Sequence of Content</u>:
1 – ST2 revision (1 lesson)
2 – Sit ST2 (1 lesson)
3 – ST2 feedback (1 lesson)
4/5 – Hooke’s Law and required practical (2 lessons)

<table>
<tr><th>Prior</th><th>Now</th><th>Next</th></tr>
<tr><td>Y7 – Concepts of mass, weight and forces

Y8 – refraction (in light topic)</td><td>Further understanding of mass

Greater detail on what is happening in refraction</td><td>Year 10 – Calculating GPE

Applications of refraction</td></tr>
</table>

- GW: Be able to draw a diagram showing refraction of light through a glass block, Know the difference between mass and weight, Know the type of energy stored in a spring

- BI: Be able to explain why refraction occurs, Know the difference between contact and non-contact forces and give examples, Know what the limit of proportionality is

- EW: Be able to describe and explain an example of where we “meet” refraction, Understand the difference between a scalar and a vector quantity, Use the equation linking force, extension and spring constant</td><td rowspan="8">

<u>Foundational concepts:</u>
Waves, Force and Motion

<u>WALTs:</u>
- Know what refraction is and how to draw a wave front diagram
- Know the difference between mass and weight, and some contact and non-contact forces
- Know how force and extension are linked in a spring

<u>Key words:</u>
Wavelength, frequency, application, mass, weight, gravity, the normal, direction, density, substance, spring constant, force, extension, directly proportional, elastic limit

Etymology –
- Refract – broken up
- Extension; how much longer
- Constant – standing firm

<u>History & Culture:</u>
- Robert Hooke’s original experiment
- Robert Hooke discovered Hooke's law while working in designs of a portable clock
- Hooke’s law is important because it helps us understand how a stretchy object will behave when it is stretched or compacted.

<u>Careers:</u>
Communications, engineering, applications engineer, design engineer, accelerator operator

<u>EDI:</u>
- Scientists from different backgrounds, nationalities
- Christiane Bonnelle, French physicist and pioneering spectroscopist
- Lucy Wilson (1880-1980), theories of vision, optics and spectroscopy
- Huang Lu (1769-1829), Chinese optics inventor
- French scientist Gaspard-Gustave de Coriolis, defined the Coriolis effect of forces
- Swiss Leonhard Euler first developed ideas about Young’s modulus in 1727

Misconceptions:
Belief that mass and weight are the same thing
LGBTQ+ pride month.
Gypsy, Roma and Traveller history month.
12/6 world day against child labour</td></tr>
<tr><td>9-Jun</td><td>B</td><td>ST2</td></tr>
<tr><td>16-Jun</td><td>A</td><td>ST2</td></tr>
<tr><td>23-Jun</td><td>B</td><td>36</td></tr>
<tr><td>30-Jun</td><td>A</td><td>37</td></tr>
<tr><td>7-Jul</td><td>B</td><td>38</td></tr>
<tr><td>14-Jul</td><td></td><td></td></tr>
<tr><td></td><td>A</td><td>39</td></tr>
</table>

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			Recall and apply knowledge, use equations to calculate data, carry out practical, interpret and explain data. Carry out practical, write method, identify variables, apply knowledge of equation, apply data to real-world context (springs). **Assessment:** • Quick quiz • Exam style questions • Q&A Interleaving	*18/6 autistic pride day* *20/6 World refugee day*
(Total: 189 Days)				

Prompt Questions

Now that the revised curriculum has been taught, please consider the Implementation and Impact of the curriculum you taught. What changes might need to be made to the Curriculum Intent (See Curriculum Map and Overviews) in light of this year's experiences?

Please revisit the prompts from last year:

- What are the Key concepts for this unit?
- How will it link to wider disciplinary knowledge/cultural capital: history, culture, authentic artefacts, music, art, literature?
- How does it build on prior knowledge and link to other units, concepts, years, GCSE?
- What is it intended students will have learned?
  - For each Unit? By the end of the Year?
    - GW: ; BI: ; EW
- Is it worth summarising in a knowledge organiser?
- **Assessment: how do you know they have learned the foundational concepts, curriculum and wider disciplinary knowledge? Does assessment look like GCSE light? Should it?**
- Skills used/learned
- Tier 2/3 vocabulary ((Etymology e.g. of Greek/Latin)