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| **Particle model 1 (16 lessons) –** In this unit you will build on your knowledge of atoms from Year 7 and Y8 Chemistry to discover why substances have different properties, why metal metals melt at high temperatures and why nitrogen boils at such a low temperature. You will draw on your practical and numeracy skills to calculate the density of objects leading you to understand why huge ships can float. We will then use our knowledge of energy transfers to experiment on why different parts of pizza are hotter than others. Finally, we will build on lesson on pressure and the human body to explain why submarines and spacecraft need strong hulls for completely different reasons. You will design and present your own ideas for a spacecraft. |
| **Core Questions for the Unit** | **1 – What are the states of matter?**1. Identify the 3 main states of matter
2. Describe the properties of these states of matter
3. Explain why solids, liquids and gases have these properties due to their bond energies

**2- How can we change the states of matter?**1. Identify the definitions for the 6 changes of state
2. Describe how these changes of state can occur
3. Explain These changes of state occur due to bonds and forces strengthening/weakening

**3- How does the amount of energy change when heating and changing states of matter?**1. Identify temperature as a change in internal kinetic energy of particles
2. Identify the equation to calculate specific heat capacity of substances
3. Describe specific latent heat of fusion
4. Describe specific latent heat of vaporisation
5. Explain trends in heating and cooling curves

**4- How do we measure the density of objects?**1. Identify the equation to calculate energy
2. Describe how to calculate the density of a regular object
3. Explain why we cannot use this method to calculate the density of irregular objects
4. Apply your knowledge to calculate the density of irregular objects

**5-What is pressure and how can it change?**1. Describe what pressure is in liquids and gases
2. Explain how pressure is linked to the volume of a liquid and gas
3. Explain how pressure is linked to the temperature of a liquid and gas
4. Explain how atmospheric pressure changes with an increase in height
5. Apply your knowledge to Brownian’s motion
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| **Scientific skills.** | Use practical equipment safely and correctlyWrite a method and evaluate a peer’s method. Plot and analyse data. Explain concept of validity. Use data to input into a physics equation. Rearrange complex equations. |
| **Links to other subjects** | Y7 Chemistry – Particles.Maths – Numeracy section. Technology – Vehicle design.English – Presenting material/ discussion |
| **Development of new knowledge** | **Particles 1** * All substances are made of particles.
* The kinetic energy of a particle is linked to its temperature.
* The energy of particles causes a change in the bond energy and therefore the state.
* Solids, liquids and gases have different properties.
* Different substances require different amounts of energy to heat them or to change their states.
* The above can be investigated and a heating/ cooling curve applied.
* Pressure is linked to volume and temperature.
* Different substances have different densities based on their mass and their volume.
* Atmospheric pressure, decreases with increase of height as weight of air above decreases with height
 | **Strengthening of prior****knowledge** | **Year 7 C1 - Particles*** The properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure
* Similarities and differences, including density differences, between solids, liquids and gases
* Changes of state in terms of the particle model
* conservation of material and of mass, and reversibility, in melting, freezing, evaporation, sublimation, condensation
* Brownian motion in gases
* Diffusion in terms of the particle model
* Diffusion in liquids and gases driven by differences in concentration
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| **Vocabulary:**These are the main words we will be using. | **Tier 2 Words:**Evaluate Conclude CalculateRearrange Resource CompromiseJudgment Covert  Link Decide Efficiency National | **Tier 3 Words:**AmplitudeFrequencyWavelengthTransverseLongitudinalRadiation | **Reading Opportunities** | <https://www.livescience.com/58839-archimedes-principle.html> - The story of Archimedes and his irregular density theories |
| **The activities you are likely to do in lesson.** | **1 – What are the states of matter?*** Retrieval practice –Do it now questions on particles (year 7 chemistry link)
* Decode it now: Rearrange
* Drawing particle diagrams of solids, liquids and gases (removing any misconceptions, especially with liquids – no gaps)
* Active reading on strength of bonds in solids, liquids and gases.
* Pupils use the classroom to act out how particles behave in solid, liquid and gas.
* Thinking map - Cognitive strategy comparing the properties of solids, liquids and gases
* Retrieval practice – Review it now questions based on lesson

**2- How can we change the states of matter?*** Retrieval practice –Do it now questions on particles (year 7 chemistry link) and previous lesson’s content.
* Thinking map- cognitive strategy comparing evaporation, condensation, freezing, melting, deposition and sublimation
* Practical activity, heating ice to liquid, then to gas.
* Video on how bonds and forces change when a substance is heated or cooled.
* Decode it now: Condense
* Retrieval practice – Review it now questions based on lesson

**3- How does the amount of energy change when heating and changing states of matter?**1. **Specific heat capacity part 1**
* Retrieval practice – Do it now questions on energy (year 8 physics link) and previous lesson’s content.
* Learning and rearranging the specific heat capacity equation
* Maths opportunity – Calculating the specific heat capacity of water and other materials
* Exam practice, looking at how SHC can appear in exam questions
* Retrieval practice – Review it now questions based on lesson

**B) Specific heat capacity part 2*** Retrieval practice – Do it now questions on energy (year 8 physics link) and previous lesson’s content.
* Required practical – Finding the specific heat capacity of iron, copper and aluminium
* Maths opportunity – calculating power, work done and specific heat capacity from the practical
* Thinking map – Cognitive strategy, explaining why some substances have higher specific heat capacities than others
* Retrieval practice – Review it now questions based on lesson

**C) Specific latent heat*** Retrieval practice – Do it now questions on energy (year 8 physics link) and previous lesson’s content.
* Decode it now: latent
* Learning and rearranging the specific latent heat equations.
* Maths opportunity - Calculating the specific latent heat of fusion and vaporisation of water
* Maths opportunity – calculating the specific latent heat of fusion and vaporisation of other substances
* Retrieval practice – Review it now questions based on lesson

**D) Heating and cooling curves*** Retrieval practice – Do it now questions on energy (year 8 physics link) and previous lesson’s content.
* Active reading – Why temperature doesn’t increase when a substance goes through a change of state,
* Practical activity – heating and cooling curve of stearic acid
* Maths opportunity – explain trends in heating and cooling curves. Link to energy.
* Retrieval practice – Review it now questions based on lesson.

**4- How do we measure the density of objects?****A) DART on the history of Archimedes and density*** Retrieval practice – Do it now questions on energy (year 8 physics link) and previous lesson’s content.
* Active reading – DART, history of Archimedes
* Comprehension task covering the information from the article
* Retrieval practice – Review it now questions based on density

**B) Density of regular objects*** Retrieval practice – Do it now questions on energy (year 8 physics link) and previous lesson’s content.
* Maths opportunity – Calculating density of objects using d = m/v
* Rearranging the density equation
* Decode it now: Density
* Video on what density is and how it is measured.
* Exam style questions looking at how density can come up in exams
* Retrieval practice – review it now questions based on lesson.

**C) Problem solver on measuring the density of irregular objects (double lesson)*** Retrieval practice – Do it now questions on light/sound and previous lesson’s content.
* Maths opportunity – Calculating the density of objects using d = m/v
* Required practical – measuring the density of an irregular object
* Thinking map – Method for measuring the density of irregular objects
* Literacy – 6 mark question on how to measure the density of both regular and irregular objects
* Retrieval practice – Review it now questions based on lesson

**5- What is pressure and how can it change?****A) Pressure in liquids*** Retrieval practice – Do it now questions on energy (year 8 physics link) and previous lesson’s content.
* Decode it now: pressure
* Video based on explaining how pressure can be increased in liquids
* Thinking map – Brace map on how temperature and volume affect the pressure in a liquid
* Link back to pressure content from the forces unit
* Link back to energy of particles, and how this increases pressure
* Maths opportunity – Calculating the pressure in liquids
* Retrieval practice – review it now questions based on lesson.

**B) Pressure of gases in the atmosphere*** Retrieval practice – Do it now questions on energy (year 8 physics link) and previous lesson’s content.
* Thinking map – How temperature and volume affect pressure in gases
* Active reading or video – looking at how pressure decreases with an increase in height due to less volume of air. Link to thinking map strategy
* Link back to forces changing gas pressure
* Brownian motion – blow up a balloon with a small amount of air, low pressure due to less collisions acting on the balloon (which means less force). Blow up the balloon more to show an increase in pressure.
* Retrieval practice – Review it now questions based on lesson

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| **How you will be assessed.** | You will be assessed by: * A retrieval quiz during the Do It Now of every lesson.
* Mini quizzes and challenges during lesson.
* A progress assessment in the middle of the unit – Here we will reflect and improve on key areas and complete DIRT work.
* An end of unit assessment that assesses your knowledge and skills that you have built in this unit and previous units that we link back to.
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