Science KS4 Blended Learning : P3 – Particle Model of Matter

Stewards Academy

Name:

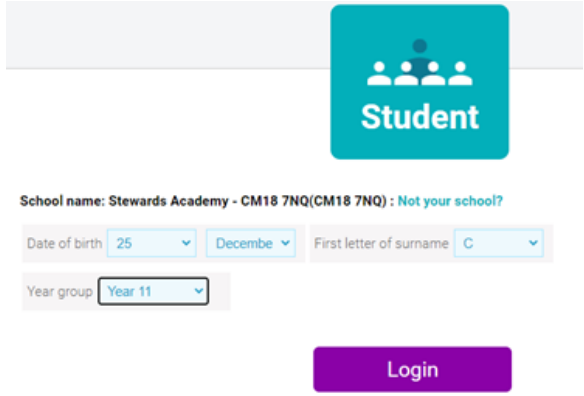
Form:

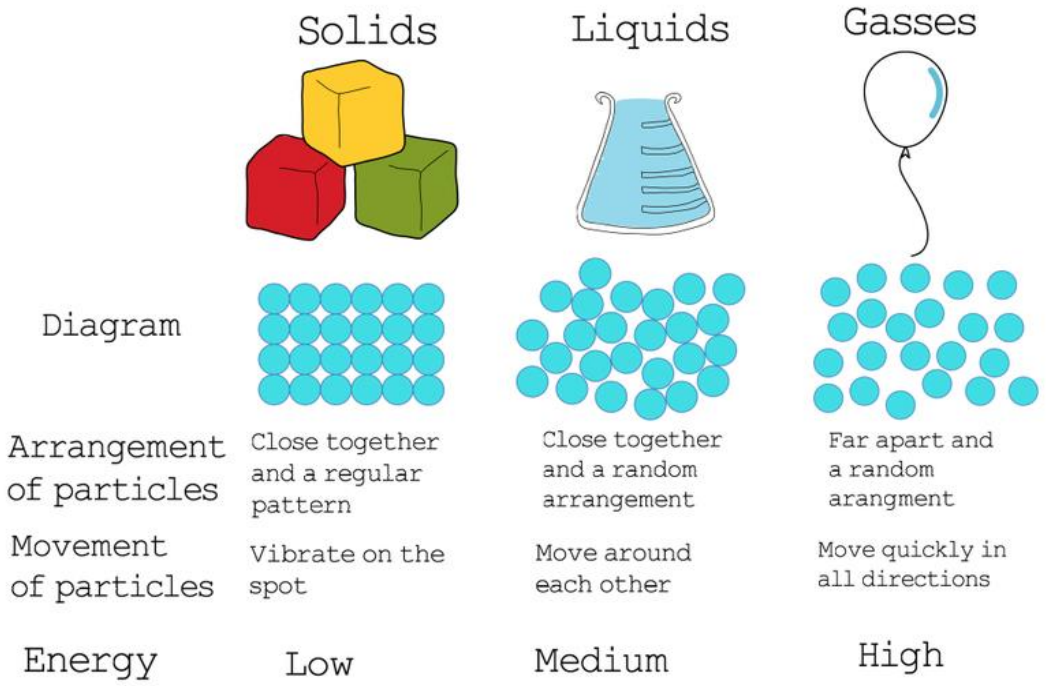
Aim to complete four lessons each week. Watch the videos and follow the four part lesson plan
All video clips are online using the ClassCharts link. Upload all work onto ClassCharts for feedback.
The online textbook has all the key information and vocabulary to help you with this unit

To log on to the online textbook:

https://connect.collins.co.uk/school/defaultlogin.aspx

- Type in "stewards" and select Stewards Academy
- Login using your date of birth, initial of your surname and your academic year





Contents

Contents

(T) = Triple scientists only

Big Picture – Year 9 Overview
Science

Year 9

Atomic Structure

Atoms, element compounds & mixtures

Sub-atomic structure

The periodic table

Groups 1,9, & 0

Transition metals (T)

End of Unit Test

UNIT P1

Energy

Work done & Power

I will be able **to** use a model to represent and atom and explain how the model of an atom was developed. **I will** be able to explain how we can use radioactive atoms in carbon dating and why some elements are more reactive than others based on their atomic structure. ***I will** be able to describe properties of transition metals (T)*

I will be learning about the connections between energy and power, and energy and temperature**. I will** be able explain how energy is transferred and describe how different energy resources have an impact on the environment

Energy

Energy Resources

Energy transfer (T)

Specific heat capacity

UNIT B2

End of Unit Test

Diffusion

Increasing food production

Investigating photo-synthesis

I will be able to explain how plants are adapted to survive and get what they need from the environment**. I will** be able to explain how factors affect photosynthesis . **I will** be able to describe how water moves through a plant and how other substances diffuse in/out of plant cells

Photosynthesis

Transpiration

Translocation

End of Unit Test

UNIT C2

Chemical bond formation

States of matter

Bond properties

Giant covalent structures

Nano particles (T)

I will be able to explain what happens when substances change state and why some substances need a lot of energy for a change of state to occur. **I will** be able to describe different types of chemical bond and how they give different substances different properties.

Chemical Bonds

End of Unit Test

UNIT P2

Static electricity (T)

Series and parallel circuits

Circuit components

Investigating resistance

Electricity in the home

End of Unit Test

UNIT B3

I will be able to explain the difference between diffusion and active transport. **I will** be able to explain why some organisms need organ systems and different organisms move things in different ways. **I will** be able to explain how enzymes work.

Moving materials

I will be able to explain *the principles behind static electricity (T)* and the key concepts in electricity. **I will** investigate and be able to describe the characteristics of electrical components. **I will** be able to explain how electricity is used safely in the home

Electricity

Conservation of mass

UNIT C3

End of Unit Test

Gas exchange

Heart and circulatory system

Plants and minerals

Enzymes and digestion

Osmosis and active transport

I will be able calculate the specific heat capacity of water and be able to describe the difference between the specific latent heat of vaporization and the specific latent heat of fusion. **I will** be able to explain the effect heat energy has on gas particles *and how this is related to volume (T).*

Chemical Quantities

Apparent changes in mass

Amounts of substance (moles)

Percentage yield (T)

Volumes and concentrations (T)

End of Unit Test

UNIT P3

Density

Changing state

Specific heat capacity

Specific latent heat

Particle motion in gases (T)

End of Year Exam

Nest Year

Matter

I will be able to explain and apply the law of conservation of mass. **I will be** able to explain how we measure amounts of substances and how we can use these values to in calculations. ***I will be** able to determine chemical yields (T)*

Cell Biology

I will be able to describe how scientists have developed their understanding cell structure and function. **I will** be able to explain how a fertilized egg develops into a complex organism. **I will** be able to explain how organisms get their energy from food. ***I will** be able to explain how microorganisms are grown in the lab and how their growth is affected by disinfectants and antibiotics (T).*

UNIT B1

Structure and function of cells

Cell division and differentiation

Stem cells

Respiration

Microbes and antibiotics (T)

End of Unit Test

UNIT C1

ZOOM IN...

MY LEARNING JOURNEY:

Subject: Particle model: Year: 9 Unit: P3

AIMS

Students will learn about the role of particles when thinking about density, changes of state, pressure and volume. They will learn how to link their understanding of particle behaviour to the energy in solids, liquids and gases. Students will measure specific heat capacity and consider the effects of specific latent heat, energy required for matter to change from one another. Students will learn some of the theory behind the gas laws. They will investigate how pressure is affected by volume and temperature .

DEVELOPING COURAGE

C Laws of thermodynamics mean that materials behave in predictable ways

O To consider how substances behave on a particulate level

U Work together to carry out the required practical

R Calculating specific heat capacity for experimental data

A How specific heat capacity s important in heating our homes

G Share our scientif undersatnding of this topic

E Using models to explain how things work

UP NEXT

Atomic structure

- **Radioactive decay**
- **Nuclear equations**
- **Radioactive halh life**
- **Hazards of radiation**
- **Uses in medcine**
- **Fission and fusion**

CAREERS

- Meteroricist
- Geologist
- Materials technician

PREVIOUS LEARNING

Pupils be familiar with changes of state and the need for thermal energy to be added or removed. They will have met gas pressure before in terms of Atmospheric Pressure and will know that the Pascal (1N/m2) is the unit for measuring pressure. They will have an understanding of the particle model the energy in particles in different states and how this links to the movement of their particles. .

WHAT WE KNOW/ REMEMBER

- .....
- .....
- .....
- .....
- .....

RECOMMENDED READING

1. My First Book of Quantum Physics by Sheddad Kaid-Salah Ferrón and Eduard Altarriba,
2. Particle Physics Brick by Brick by Dr Ben Still,
3. The Atom: A Visual by Jack Challoner

PERSONAL OBJECTIVES

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Lesson 1: P3.1 - Density.

Connection

Have a look at the topic overview and the P3 zoom in.

Populate what you know and your personal objectives.

Activation

LI: Calculate density and explain the different states of matter and differences in density.

https://www.youtube.com/watch?v=-EZmXVOSa20

1. Make a note of the title and the LI
2. Read pages 84-and 85
3. List key words and define those you don't know
4. Draw and label figure 3.1

Demonstration

Attempt questions 1-8.
In 10 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Consolidation

Complete and self-assess the relevant past paper question for this topic - From the P3 DIP file

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Answers: P3.1 – Density

Connection

1 NA
2 NA
3 NA

Lesson 3.1 Density

1a solid
1b gas
1c liquid
2 The particles in a solid are usually closer together than they are in a liquid or a gas. Therefore, the same mass of material will occupy a smaller volume which makes the density higher.
3 The particles in a gas are far apart. Therefore, the volume of a certain mass of gas is much bigger than the same mass of liquid and solid. This makes the density small.
4a $\rho = m \div V = 5400 \div 2 = 2700$ kg/m3
4b $m = \rho V = 7700 \times 2 = 15\,400$ kg.
4c Aluminium is less dense than steel. Therefore, aeroplanes made from aluminium are likely to be much lighter.
5 Volume = 5 × 4 × 3 = 60 m3. $m = \rho V = 1.3 \times 60 = 78$ kg.
6 Cork is less dense than water so it floats. Iron is denser than water, so it sinks.
7 The mass of the air stays the same but the volume of the air gets less. Since density = mass volume, this means the density of the air will increase.
8 1 g / cm3 means that each cm3 of the substance will have a mass of 1 g. There are 100 × 100 × 100 = 1000 000 cm3 in 1 m3, so 1 m3 of the substance will have a mass of 1000 000 g. 1000000 g = 1000 kg, so 1 m3 of the substance has a mass of 1000 kg – giving a density of 1000 kg /m3.

Lesson 2 P3.2 – Required Practical – To investigate the densities of regular and irregular solids and liquids.

Connection

Q1. A regular cuboid of copper is 3.35 cm × 2 cm × 1 cm and weighs 60 g. What is its density to two decimal places (d.p.)?
02. Zinc has a density of 7.14 g/cm^3. What volume (to two d.p.) would weigh 40 g?
03. The two metals are formed into an alloy to make brass 6:40. What volume of brass would you expect to be created?

Activation

LI:Plan and carry out an investigation to calculate the densities of different objects and liquids.
https://www.youtube.com/watch?v=ScXOp8Zph28
Make a note of the title and the LI

1. Read pages 86 - 87
2. List the key words and define the ones you don't know
3. Copy the results table above Q.1 and add another column titled "Density in g/cm3" – you will complete this column when you answer Q.3.
4. Watch the video clip.

Demonstration

Attempt questions 1- 7.
In 10 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Consolidation

Complete and self-assess the relevant past paper question for this topic - From the P3 DIP file

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Answers: P3.2 - To investigate the densities of regular and irregular solids and liquids.

Connection

1. volume = 3.35 × 2 × 1 = 6.7 cm^3

density = mass ÷ volume = 60 ÷ 6.7 = 8.96 g/cm^3

2. volume = mass ÷ density = 40 ÷ 7.14 = 5.60 cm^3

3. volume = 6.7 + 5.6 = 12.3 cm^3

Demonstration

1 The balance would also be recording the mass of the measuring cylinder.
2 Subtract the mass of the empty measuring cylinder to get the mass of the liquid.
3 Density = mass / volume
Coconut oil: 18.5 / 20 = 0.925 g / cm3
Acetone: 19.6 / 25 = 0.784 g / cm3
Sea water: 51.3 / 50 = 1.026 g / cm3
4 Volume of cork = 2.0 × 2.0 × 3.0 = 12 cm3
Density of cork = mass / volume = 3 / 12 = 0.25 g / cm3
6 Density of oak = mass / volume = 17 / (2.0 × 3.0 × 4.0) = 0.71 g / cm3
Density of tin = mass / volume = 365 / (2.5 × 2.5 × 8.0) = 7.3 g / cm3
7 The data is only measured to 2 significant figures. Therefore, the answer can only be given to two significant figures. It is incorrect to give any more significant figures as this suggests that the calculation is more accurate than it actually is.

Lesson 3: P3.3 – Changes of state

Connection

What is the name of the procedure that uses water to find the volume of an irregular solid?

Explain how it works.

Activation

LI: Describe and explain changes of state in terms of particles.

1. https://www.youtube.com/watch?v=Ku0oTu8ZWqk

2. Make a note of the title and the LI
3. Read pages 88-89
4. List the key words and define the ones you don't know
5. Draw and label Figures 3.7 and 3.8
6. Watch the video clip

Demonstration

Attempt questions 1-8.
In 10 mins answer as many questions as you can.
Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Consolidation

Complete and self assess the relevant past paper question for this topic - From the P3 DIP file

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Answers: P3.3 – Changes of State

Connection

It is called Displacement.

The volume of water that is displaced by the solid is the same as the volume of the solid regardless of its mass, density or shape.

Demonstration

1 Freezing **2** You could place a block of ice in a container and then place the container on a balance. Record the mass and then wait for all of the ice to melt. Record the mass again and see whether the mass has changed. **3** e.g. Dry ice changing from a solid to a gas (sublimating). The material involved is carbon dioxide. (Dry ice is solid CO2) **4** A freezing temperature is not necessarily a cold temperature. Some materials (e.g. tungsten) freeze at thousands of degrees Celsius. We are really only referring to the temperature at which water freezes.
5 This makes the surface area larger and so more evaporation can take place.
6 The fastest moving particles are the ones which evaporate. When they leave the liquid, the average speed of the remaining particles is less(since the fastest ones have left). The temperature is related to the average speed and so the temperature decreases.
7 When you are burned by steam, the steam transfers energy to your skin when it is condensing. This is extra to the energy transferred to your skin when the hot water cools down.
8 Sweat is no colder than your skin. The cooling effect occurs because the sweat evaporates. Not all of the water molecules in the sweat move at the same speed and it is the ones that move the fastest that evaporate. Therefore, the average speed of the molecules decreases as the sweat evaporates and this results in a lower temperature.

Lesson 4: P 3.4 – Internal Energy

Connection

1) What are the 6 processes involved in the changing of state of substances?

2) What is the name of the change of state which " misses out " the liquid stage ?

3) Give two examples of your answer to Q.2.

Activation

LI: Explain the internal energy of a system and the effect of heating on that system.

1. https://www.youtube.com/watch?v=5WVT5NR0iLA

2. Make a note of the title and the LI
3. Read pages 90 - 91
4. Define the key words/terms
5. Draw and label figure 3.9 and 3.10
6. Watch the video clip

Demonstration

Attempt questions 1-7.
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Consolidation

Complete and self-assess the relevant past paper question for this topic - From the P3 DIP file

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Answers: P3.4 – Internal Energy.

Connection 1)

- **melting**: changing from solid to liquid
- **freezing**: changing from liquid to solid
- **boiling**: changing from liquid to gas at the boiling point
- **evaporating**: changing from liquid to gas when the temperature of the liquid is lower than the boiling point
- **condensing**: changing from gas to liquid
- **sublimating**: changing from solid to gas without going through the liquid state.

2) Sublimation

3) Dry Ice ; Iodine Crystals.

Demonstration

1 They store kinetic energy because they are moving.
2 *Ek* = . *mv2* and the particles have the same kinetic energy at the same temperature. This means that the heavy particles are moving slower than the light particles at the same temperature.
3 The particles store potential energy because they are separated from each other.
4 The internal energy is the total kinetic energy plus the total potential energy of the particles in the object.
5 The internal energy increases.
6 The water cools down, freezes and cools down again. All of this results in a decrease in internal energy.
7a The internal energy of steam at 100 0C is much higher than that of water at the same temperature. The internal energy would also include all of the latent heat of vaporisation.
7b Steam is able to transfer much more energy than water at the same temperature as its internal energy is so much higher.

Lesson 5: P3.5 – Specific heat capacity

Connection

Explain how the internal kinetic and potential energy of substances changes in the following situations.

1 Water is moved from a room temperature environment to a freezer.

02.Air is cooled to −10 °C.

03.Steam condenses on a window sill.

Activation

LI: Explain specific heat capacity

1. https://www.youtube.com/watch?v=TqJFIBODrjM
2. Make a note of the title and the LI
3. Read pages 92-93
4. Define Specific Heat Capacity
5. Draw the table on page 93
6. Watch the video (use link above)

Demonstration

Attempt questions 1-7.
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Consolidation

Complete and self-assess the relevant past paper question for this topic - From the P3 DIP file

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Answers: P3.5

Connection.

01. Both internal energy and kinetic energy decreases. Only potential energy decreases during the freezing process.
02. Kinetic energy decreases greatly; internal energy also decreases but to a lesser extent.
03. Potential energy decreases drastically; kinetic energy does not decrease during condensation.

Demonstration

1 They move faster (gain kinetic energy) and they get further apart (gain potential energy). **2** There is a larger mass of water in the saucepan than there is in the cup. Therefore, more energy is needed. **3** Yes it will. The gain in internal energy of the milk is smaller when it heats up. Therefore, the decrease in internal energy will be smaller when it cools down, so the amount of energy transferred into the surroundings will be less. **4** $\Delta E = mc\Delta\theta = 0.1 \times 4200 \times (40 - 10) = 12\,600$ J **5** e.g. in cooling systems. Water passing through a car engine can stop the engine from heating up by absorbing some of the thermal energy. The water can absorb lots of energy into its thermal energy store without heating up very much. **6a** Energy needed = $mc\Delta\theta$ for the copper + $mc\Delta\theta$ for the water = $(0.5 \times 380 \times 10) + (1 \times 4200 \times 10) = 43\,900$ J $t = E / P = 43\,900 / 2000 = 21.95$ s = 22 s (to 2 s.f.) **6b** I have assumed that all of the energy from the heater has been transferred to the thermal energy stored in the water and in the copper kettle. **7** Copper is a very good conductor of heat – it has a very high thermal conductivity. It also has a low specific heat capacity so not much energy is needed to heat the saucepan up.

Lesson 6: P3.6 – Latent Heat

Connection

01. Calculate the mass of these objects: **a).** An aluminium ball (c = 880 J/Kg °C) that requires 10 000 J to increase its temperature by 10 °C. **b).** A copper wire (c = 380 J/Kg °C) that transfers 300 J when its temperature decreases by 5 °C. **c).** A cup of water (c = 4200 J/Kg °C) that requires 84 000 J to increase its temperature by 20 degrees celsius.

Activation

LI: Explain what is meant by latent heat and perform latent heat calculations.

1. https://www.youtube.com/watch?v=8VmkdzRE8sQ
2. Make a note of the title and the LO
3. Read pages 94 - 95
4. Define the key words on page 94 using the glossary.
5. Draw and label figure 3.12
6. Watch the video (use the link above)

Demonstration

Attempt questions 1-7.
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Consolidation

Complete and self-assess the relevant past paper question for this topic - From the P3 DIP file

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Answers: P3.6 – Latent heat

Connection

1.**a**. 1.14 kg. **b**. 0.15 kg.

c. 1 kg

Demonstration

1 The material is changing state. **2** As water turns into steam the particles get further apart. The particles therefore gain potential energy and so they need energy to do this. **3** The particles are only gaining potential energy. The energy in their kinetic energy store remains constant so the temperature remains the same.

4 When particles move from a solid into a liquid they don't move apart from each other very much. However, when they move from the liquid state to a gas they move apart from each other a great deal and gain much more potential energy.

5 $E = mL = 0.1 \times 340\,000 = 34\,000$ J

6a Melt the ice at 0 0C: $E = mL = 0.2 \times 340\,000 = 68\,000$ J

Heat the water to 100 0C: $E = mc\Delta\theta = 0.2 \times 4200 \times 100 = 84\,000$ J

Boil the water at 100 0C: $E = mL = 0.2 \times 2260000 = 452\,000$ J

Total energy transferred = 68000 + 84000 + 452000 = 604 000 J

7 Energy is needed to heat the ice up to 0 0C, melt the ice,

Lesson 7: P3.7 Particle motion in gases

Connection

Use the table to complete the questions.
1Calculate how much energy is required to melt the following amounts of material at their respective melting points.
a. 1 kg of water
b. 0.5 kg of carbon dioxide
c. 100 g of ethyl alcohol
d. 3 kg of lead

Substance	Latent Heat of Fusion (kJ/kg)	Melting Point (˚C)	Latent Heat of Vaporisation (kJ/kg)	Boiling Point (˚C)
Water	340	0	2260	100
Carbon dioxide	180	−78	574	−57
Ethyl alcohol	108	−114	855	78
Lead	23	330	871	1750

Activation

LI : Relate the temperature of a gas to the kinetic energy of its particles

1. https://www.youtube.com/watch?v=hKO3DpgiISk
2. Make a note of the title and the LO
3. Read pages 96 - 97
4. Define “eukaryotic”
5. Draw and label figures 3.15 and 3.16
6. Watch the video (use the link above)

Demonstration

Attempt questions 1- 6.
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Consolidation

Complete and self-assess the relevant past paper question for this topic - From the P3 DIP file

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Answers: P3.7 Particle motion in gases.

Connection

a. 340 kJ

b. 90 kJ

c. 10.8 kJ

d. 69 kJ

Demonstration

1 The molecules move faster.
2 The temperature is related to the average kinetic energy of the molecules. The faster the molecules move, the higher the temperature.
3 The particles collide with the walls of their container. During the collision they exert a force on the walls. Since pressure = force / area, the force exerted by the particles produces a pressure on the container.
4 When you pump more air in a bicycle tyre there are more air particles. Therefore, there are more collisions between the particles and the walls of the tyre, which increases the pressure.
5 No gas can pass in or out of the container.
6 If the gas gets hotter, then the average kinetic energy of the particles increases. This means that the particles will move faster. This makes them collide with the container with a larger force and more often. Therefore, the pressure increases.

Connection

Describe, with the aid of diagrams, the motion of the air particles inside a sealed bag of potato crisps in each of the following situations. Think about how the bag might appear in each situation.

- 1) Bag is sat on a table at room temperature.
- 2) Bag is placed in an oven and warmed to 40 °C.
- 3) Bag is placed in a freezer overnight.

Lesson 8 : P3.8 Increasing the pressure of a gas

Activation

LI : Describe and explain the relationship between the pressure and volume of a gas. Also explain how doing work on a gas can increase it's temperature.

1. https://www.youtube.com/watch?v=RuoZqmNiMEo
2. https://www.youtube.com/watch?v=m19-8Vtewkw
3. Make a note of the title and the LI
4. Read pages 98 – 99
5. Define the word "compress"
6. Draw and label figure 3.17.
7. Watch the 2 videos (use the links above)

Consolidation

Complete and self-assess the relevant past paper question for this topic - From the P3 DIP file

Demonstration

Attempt questions 1- 8b.
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Answers: P3.8 Increasing the pressure of a gas.

Connection

You should clearly show that the air particles are moving fastest in situation two, and slowest in situation three, due to the respective higher and lower kinetic energies.

Be aware that particles should be the same size in all diagrams.

Pressure, temperature and average kinetic energy are greatest in situation two.

Pressure, temperature and average kinetic energy are lowest in situation three.

Diagrams may show that the bag has ‘inflated’ in situation two and ‘deflated’ in situation three. A slightly wrinkled bag may be shown in situation one.

Demonstration

1)The pressure decreases. 2) The pressure should double. 3) There are more collisions with the walls in a given time because the particles have a smaller distance to travel between each collision. This results in a larger average force on the walls and a higher pressure. 4) p1× V1= p2× V2200 × 4 = p2× 3P2= 800 / 3 = 267 kPa. 5) p1 V1= p2× V21.8 × 105× 80 = 1.2 × 105× V2V2= 144 × 105/ 1.2 × 105= 120 cm3. 6) When you move the move the pump, the particles of gas colliding with the pump will end up moving faster. This increases the kinetic energy of the particles and so the internal energy increases. 7) The pump is doing work on the gas which heats up the gas. Since gas is not a very good conductor of heat, the region of the gas that gets hot remains near the pump. 8a) The internal energy of the gas must decrease since the gas is doing work as it expands. Therefore the temperature must decrease. 8b) An expanding gas reduces the temperature. So you can make the gas expand inside a fridge to reduce the temperature of the fridge.

Lesson 9 P3.9 Particle Model and Changes of State

Connection

1).Calculate the missing values.

	P_1 (kPa)	V_1 (cm^3)	T_1 (°C)	P_2 (kPa)	V_2 (cm^3)	T_2 (°C)
a	100	24	22.5	200		22.5
b	50		−8	100	50	−8
c	12	1000		50	240	24
d		750	18	1500	200	18
e	90	50	10		225	10
f	34	43	6	100		6
g	300	1000	33		6000	33
h	200		30	100	48	30

Activation

LI: Use the particle model to explain states of matter and the relationship between temperature and energy.

1. https://www.youtube.com/watch?v=xYU7RSoOZ0U
2. Make a note of the title and the LI
3. Read pages 100 - 101
4. Define the key words using the glossary.
5. Draw and label figures 3.19, 3.20, 3.21 and 3.22.
6. Watch the video (use the link above)

Demonstration

Attempt questions 1-5.
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
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Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Consolidation

Complete and self-assess the relevant past paper question for this topic - From the P3 DIP file

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Answers: P3.9

Connection

	P_1 (kPa)	V_1 (cm^3)	T_1 (˚C)	P_2 (kPa)	V_2 (cm^3)	T_2 (°C)
a	100	24	22.5	200	12	22.5
02. b	50	100	−8	100	50	−8
c	12	1000	24	50	240	24
d	400	750	18	1500	200	18
e	90	50	10	20	225	10
f	34	43	6	100	14.62	6
g	300	1000	33	50	6000	33
h	200	24	30	100	48	30

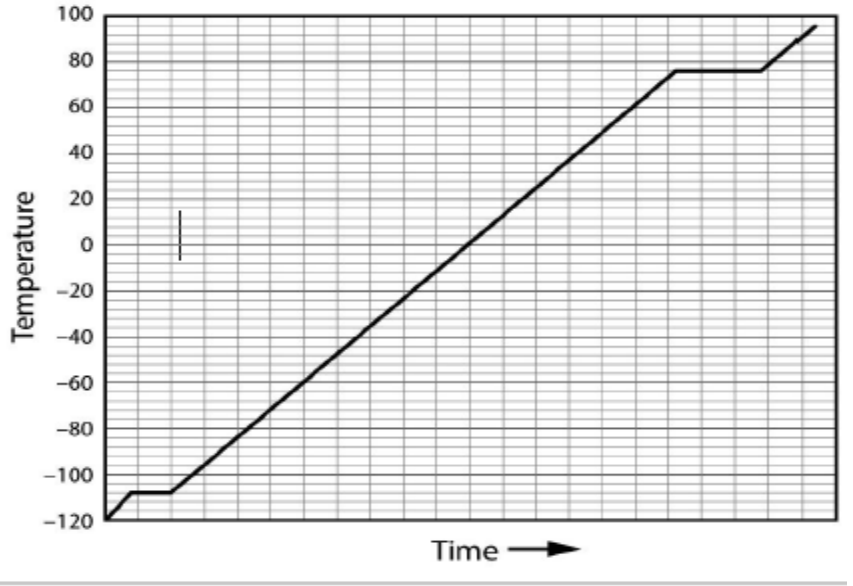
Demonstration

1) In a solid, the atoms and molecules vibrate around a fixed point. In a liquid the atoms and molecules can move past each other.

2) The particles vibrate with a larger amplitude. Therefore, their average separation increases.

3) The internal energy increases. This is because the potential energy increases from the particles getting further apart and the kinetic energy increases from the particles vibrating with a greater speed.

4)



5) The material is cooling down.

Science Department

Stewards Academy

ASSESSMENT FEEDBACK Year 9 Combined Science (PHYSICS)

Attainment Band :	**P3 Particle model of matter (AQA)** **Knowledge and Understanding**
Yellow Plus/ Yellow	Link the particle model for solids, liquids and gases with density values in terms of the arrangements of the atoms or molecules. Explain how changes of state conserve mass. Explain that internal energy is the total kinetic energy and potential energy of all the particles that make up a system. Use the specific heat capacity equation to calculate mass, specific heat capacity or temperature change. Use the particle model to explain why the latent heat of vaporisation is much larger than the latent heat of fusion. Describe that the temperature of a gas is related to the average kinetic energy of the molecules.
Blue	Use particle diagrams to communicate ideas about relative densities of different states. Use the density equation to calculate mass and volume. State that mass is conserved when substances change state. Explain that changes of state are physical, not chemical, changes because the material recovers its original properties if the change is reversed. Describe that heating raises the temperature or changes the state of a system but not at the same time. Use the specific heat capacity equation to calculate the energy required to change the temperature of a certain mass of a substance. Describe the latent heats of fusion and of vaporisation. Use the equation $E = mL$ Use the particle model to explain the effect on temperature of increasing the pressure of a gas at constant volume.
Green	Use density = mass/volume to calculate density. Describe changes of state as physical changes. Describe how heating raises the temperature of a system. Describe the effect of an increase in temperature on the motion of the particles. State that when an object changes state there is no change in temperature. State that in the particle model the higher the temperature the faster the molecules move.
White	Some elements of the above have been achieved