

**a** What is the equation linking density, mass and volume?  
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**b** Write the symbols and units for the following:  
density: \_\_\_\_\_  
mass: \_\_\_\_\_  
volume: \_\_\_\_\_

**c** Draw the particle models for solids, liquids and gases.

**d**

State of Matter	Shape	Structure	Movement of Particles
Solid			
Liquid			
Gas			

**e** Describe the displacement technique used to determine the volume of an irregularly shaped object.  
\_\_\_\_\_  
\_\_\_\_\_

**f** When substances change state, their mass is conserved. What does this mean?  
\_\_\_\_\_  
\_\_\_\_\_

**g** Describe how to determine the volume of a regularly shaped object.  
\_\_\_\_\_  
\_\_\_\_\_

**g** What is an internal system?  
\_\_\_\_\_  
\_\_\_\_\_

**h** Define internal energy.  
\_\_\_\_\_  
\_\_\_\_\_

**i** List some factors that affect the increase of temperature of a system.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

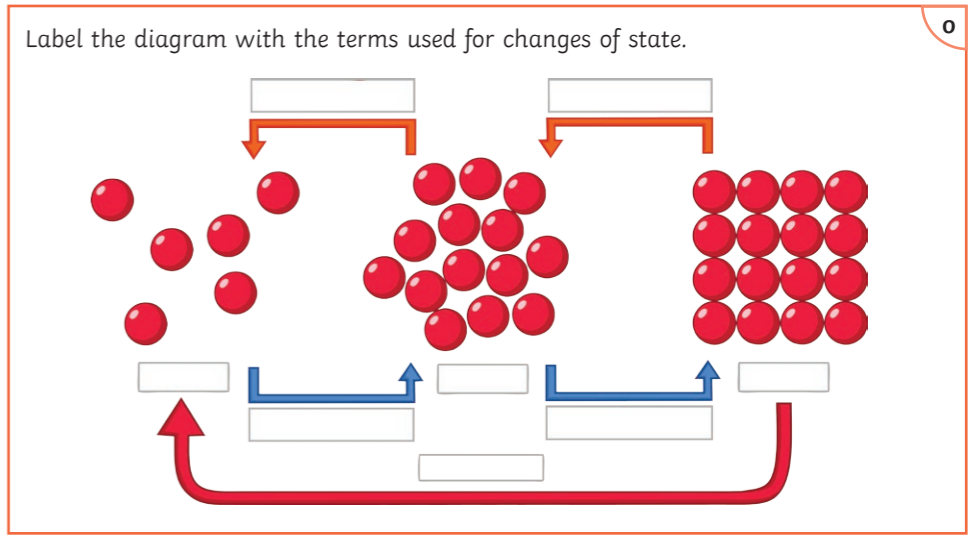
**j** Explain the differences in density of solids, liquids and gases.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**k** Define specific heat capacity.  
\_\_\_\_\_  
\_\_\_\_\_

**l** What is the equation linking change in thermal energy, mass, specific heat capacity and temperature?  
\_\_\_\_\_  
\_\_\_\_\_

**m** Write the units and symbols for the following:  
energy: \_\_\_\_\_  
mass: \_\_\_\_\_  
specific heat capacity: \_\_\_\_\_  
temperature change: \_\_\_\_\_

**n** Fill in the blanks using these words: state, energy, increases, particles, temperature.  
When a substance is heated up, the \_\_\_\_\_ stored in the system \_\_\_\_\_ by increasing the energy of the \_\_\_\_\_. There is either an increase in the \_\_\_\_\_ of the system or there is a change of \_\_\_\_\_.



**p** Why is a change of state referred to as a physical change and not a chemical change?  
\_\_\_\_\_  
\_\_\_\_\_

Define latent heat.

a

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What is the equation linking energy for a change of state, mass and specific latent heat?

b

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Write the symbol and unit for the following:

specific latent heat: \_\_\_\_\_

What is the difference between specific heat capacity and specific latent heat?

c

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What is the equation that links pressure and volume?

d

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List the symbols and units for the following:

pressure: \_\_\_\_\_

volume: \_\_\_\_\_

Explain the effect of an increase in temperature on the pressure of a gas in a container.

e

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For the heating and cooling curve (shown in section i), what are the terms used to describe the changes of state for:

f

B → C \_\_\_\_\_

D → E \_\_\_\_\_

E → D \_\_\_\_\_

C → B \_\_\_\_\_

What is happening to the particles between A-B, C-D and E-F?

g

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How are kinetic energy of particles and temperature related?

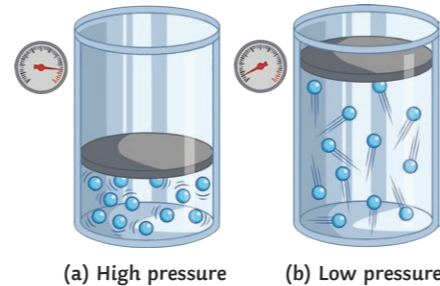
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Using the diagram, explain the effect of an increase of volume on pressure.

h




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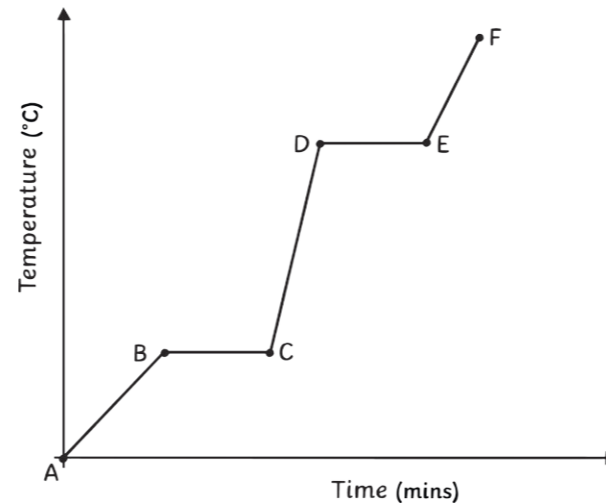
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What are the states of matter for the diagonal sections of the graph? Add labels to the graph below.

i



Fill in the blanks:

j

Specific latent heat of fusion: the amount of energy needed to change \_\_\_\_\_ of a substance from a solid to a \_\_\_\_\_ with no change of temperature.

Specific latent heat of vaporisation: the amount of energy needed to change 1kg of a substance from liquid to \_\_\_\_\_ with no change of \_\_\_\_\_.

My main areas for improvement in this topic are:

k

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What is the equation linking density, mass and volume?

$\text{density} = \text{mass} \div \text{volume}$

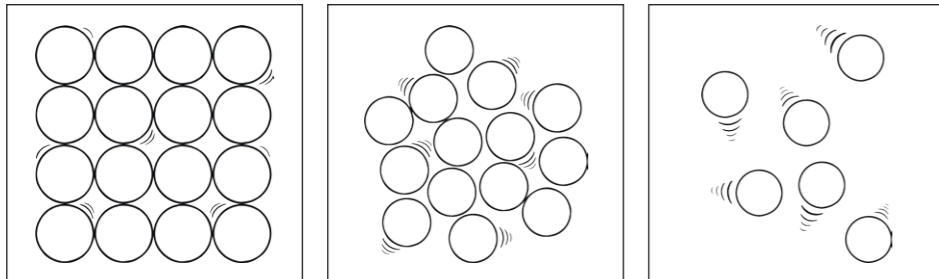
Write the symbols and units for the following:

density: ( $\rho$ ) kilograms per metre cubed,  $\text{kg/m}^3$

mass: ( $m$ ), kilograms,  $\text{kg}$

volume: ( $V$ ), metres cubed,  $\text{m}^3$

Draw the particle models for solids, liquids and gases.



State of Matter	Shape	Structure	Movement of Particles
Solid	Particles are packed close together and have a definite shape.	Regular – fixed pattern and size.	Particles vibrate in a fixed position.
Liquid	Particles are close together and take the shape of the container. No definite shape.	Irregular – fixed size but not a fixed pattern.	Particles vibrate and move over one another.
Gas	Particles are far apart and take the shape of the container. No definite shape.	Irregular – no fixed size or pattern.	Particles move around rapidly.

Describe the displacement technique used to determine the volume of an irregularly shaped object.

Fill a displacement vessel/eureka can with water. Put the spout of the can over a measuring cylinder. Put the irregularly shaped object into the can and measure the volume of water displaced.

When substances change state, their mass is conserved. What does this mean?

The mass of the substance does not change once it has changed state.

Describe how to determine the volume of a regularly shaped object.

$\text{width} \times \text{length} \times \text{height}$

What is an internal system?

An internal system is one in which the energy is stored by the particles within it.

Define internal energy.

This is the total kinetic and potential energy of the particles that make up that system.

List some factors that affect the increase of temperature of a system.

Mass of the substance.

Type of material being heated.

Energy input.

Explain the differences in density of solids, liquids and gases.

Solids are very dense because the particles are so closely packed together and there are strong forces of attraction between them. Liquids are less dense than solids, but more dense than gases because the particles are very close together and attract one another. Gases are the least dense and have very weak forces of attraction only when they collide.

Define specific heat capacity.

The amount of energy needed to cause a  $1^\circ\text{C}$  rise in  $1\text{kg}$  of a substance.

What is the equation linking change in thermal energy, mass, specific heat capacity and temperature?

$\text{change in thermal energy} = \text{mass} \times \text{specific heat capacity} \times \text{temperature change}$

Write the units and symbols for the following:

energy: ( $E$ ), Joules,  $\text{J}$

mass: ( $m$ ), kilograms,  $\text{kg}$

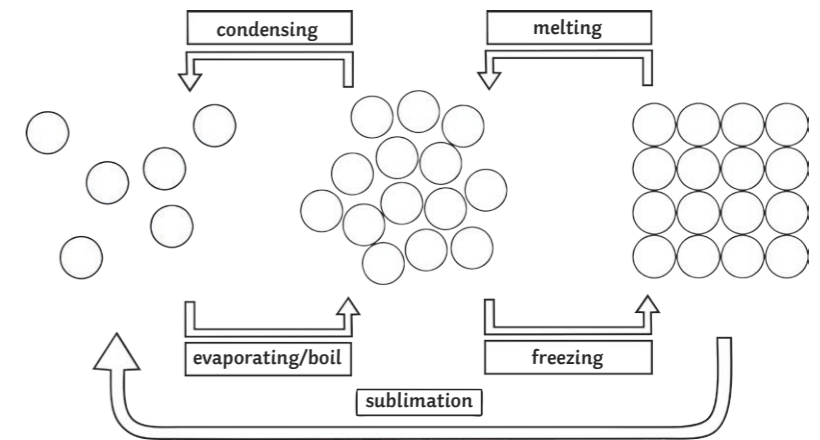
specific heat capacity: ( $c$ ), Joules per  $\text{kg}$  per degree Celsius,  $\text{J/kg } ^\circ\text{C}$

temperature change: ( $\Delta$ ), degrees Celsius,  $^\circ\text{C}$

Fill in the blanks using these words: state, energy, increases, particles, temperature.

When a substance is heated up, the energy stored in the system increases by increasing the energy of the particles. There is either an increase in the temperature of the system or there is a change of state.

Label the diagram with the terms used for changes of state.



Why is a change of state referred to as a physical change and not a chemical change?

If the changes are reversed then the material will recover its original properties.

Define latent heat.

**Latent heat is the energy required for the change of state of a substance.**

a

For the heating and cooling curve (shown in section i), what are the terms used to describe the changes of state for:

B → C **Melting**

D → E **Evaporating/Boiling**

E → D **Condensing**

C → B **Freezing**

f

Fill in the blanks:

Specific latent heat of fusion: the amount of energy needed to change **1kg** of a substance from a solid to a **liquid** with no change of temperature.

Specific latent heat of vaporisation: the amount of energy needed to change 1kg of a substance from liquid to **gas** with no change of **temperature**.

j

What is the equation linking energy for a change of state, mass and specific latent heat?

**Energy for a change of state = mass x specific latent heat**

Write the symbol and unit for the following:

specific latent heat: **(L), joules per kilogram, J/kg**

b

What is happening to the particles between A-B, C-D and E-F?

**They are gaining kinetic energy and spreading out more.**

How are kinetic energy of particles and temperature related?

**As the temperature increases the kinetic energy of the particles increases.**

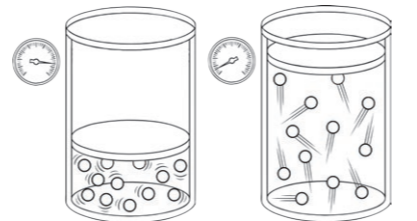
g

What is the difference between specific heat capacity and specific latent heat?

**Specific heat capacity is the amount of energy required to increase the temperature of a substance, whereas specific latent heat is the energy needed to change the state of a substance with no temperature change.**

c

Using the diagram, explain the effect of an increase of volume on pressure.



(a) High pressure (b) Low pressure

h

**An increase in volume causes the particles to spread out more and so the number of collisions on the walls of the container decreases. So, there is less force exerted on the container over a certain area and therefore a lower pressure.**

What is the equation that links pressure and volume?

**pressure x volume = constant**

List the symbols and units for the following:

pressure: **(p), pascals, Pa**

volume: **(V), metres cubed, m<sup>3</sup>**

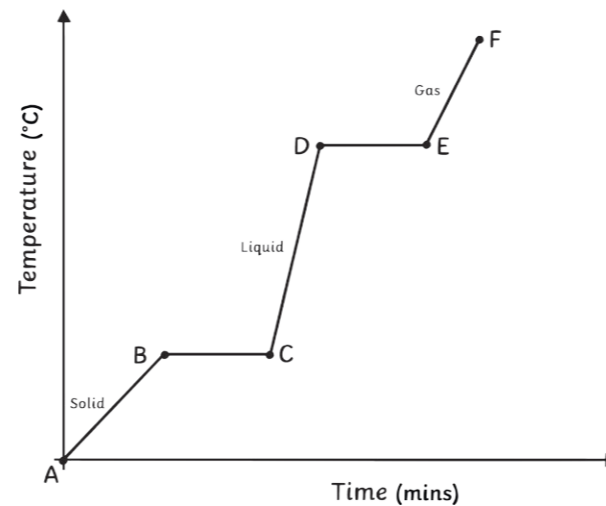
d

Explain the effect of an increase in temperature on the pressure of a gas in a container.

**An increase in temperature causes more collisions of the gas particles with the walls of the container. This causes an increase in the force on the walls of the container over a particular area and so increases the pressure.**

e

What are the states of matter for the diagonal sections of the graph? Add labels to the graph below.



i

My main areas for improvement in this topic are:

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