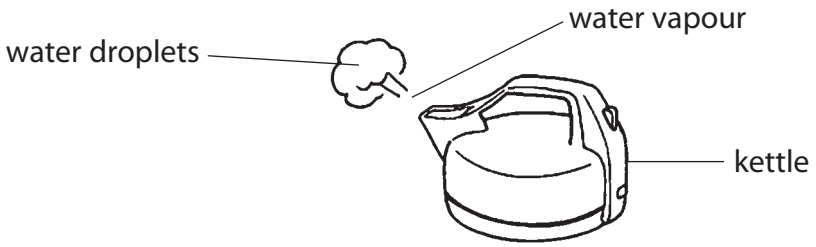
1 The diagram shows a kettle of boiling water.



As the water vapour cools it turns into droplets of liquid water.

(a) The change of state when water vapour changes into liquid water is described as

(1)

☒ **A** boiling

☒ **B** condensation

☒ **C** evaporation

☒ **D** sublimation

(b) Describe what happens when water vapour cools to form liquid water.

Your answer should include the change in the energy, arrangement and movement of the particles.

(3)

change in energy .....

.....

.....

change in arrangement .....

.....

.....

change in movement .....

.....

.....

(Total for Question 1 = 4 marks)

2 In chemistry, the state symbols (s), (l), (g) and (aq) are often used.

(a) The table shows some changes of state.

Complete the table to show the state symbol before and after the change.

(3)

Change of state	State symbol before change	State symbol after change
Water boils in a kettle		
Ethene is converted to poly(ethene)		
Crystals of iodine sublime on heating		

(b) Some marble chips are added to a solution of hydrochloric acid.

Complete the equation for the reaction that occurs by writing the appropriate state symbol after each formula.

(2)

$CaCO_3$(.....) + 2HCl(.....) → $CaCl_2$(.....) + H_2O(.....) + CO_2(.....)

(c) Which state symbol is used most often for the elements of the Periodic Table at room temperature?

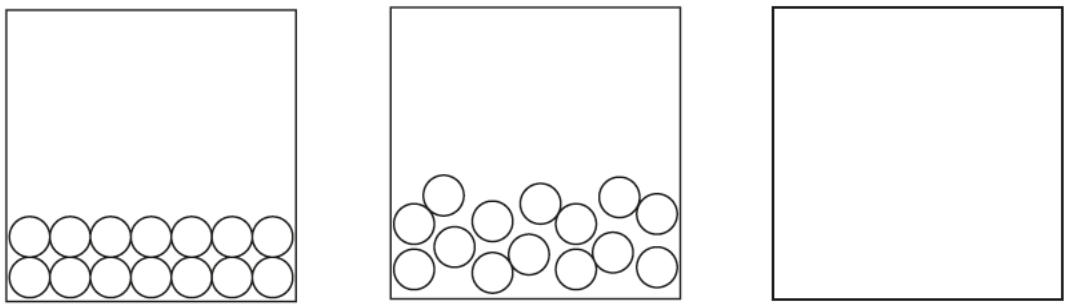
(1)

.....

(Total for Question 2 = 6 marks)

3 This question is about the states of matter.

(a) The diagram shows the three states of matter for a substance.



Each circle represents a molecule of the substance.

(i) Complete the diagram by drawing six circles to represent molecules in the gas state.

(1)

(ii) Which statement is correct about the movement or arrangement of the molecules of this substance?

(1)

☒ **A** They move randomly in the solid state.

☒ **B** They move randomly in the liquid state.

☒ **C** They are arranged in fixed positions in the liquid state.

☒ **D** They are arranged in fixed positions in the gas state.

(iii) Which term is used for a solid changing to a liquid?

(1)

☒ **A** boiling

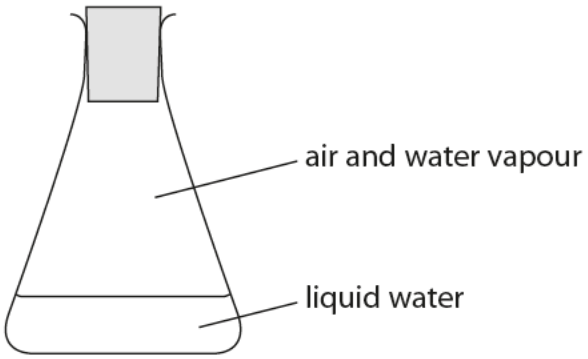
☒ **B** condensing

☒ **C** freezing

☒ **D** melting

(b) Some cold water is poured into a conical flask and a bung inserted.

The diagram shows the flask after a few minutes.



(i) What is occurring in the flask?

(1)

☒ **A** boiling and condensing

☒ **B** condensing and evaporating

☒ **C** evaporating and freezing

☒ **D** freezing and melting

(ii) Which formula represents a substance that is **not** present in the flask?

(1)

☒ **A** $H_2O(g)$

☒ **B** $H_2O(l)$

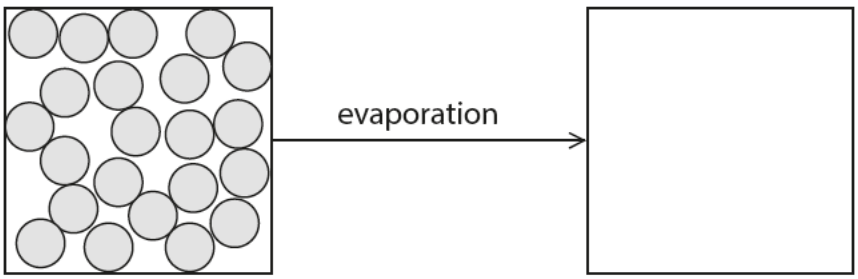
☒ **C** $N_2(g)$

☒ **D** $N_2(l)$

(Total for Question 3 = 5 marks)

4 When a liquid evaporates at room temperature, it changes into a gas.

The diagram shows the arrangement of the particles in a liquid.



(a) Complete the diagram to show the arrangement of four particles in a gas.

(1)

(b) Describe the movement of particles in a gas.

(1)

.....

.....

(c) Explain why heating a liquid causes it to evaporate more quickly.

(2)

.....

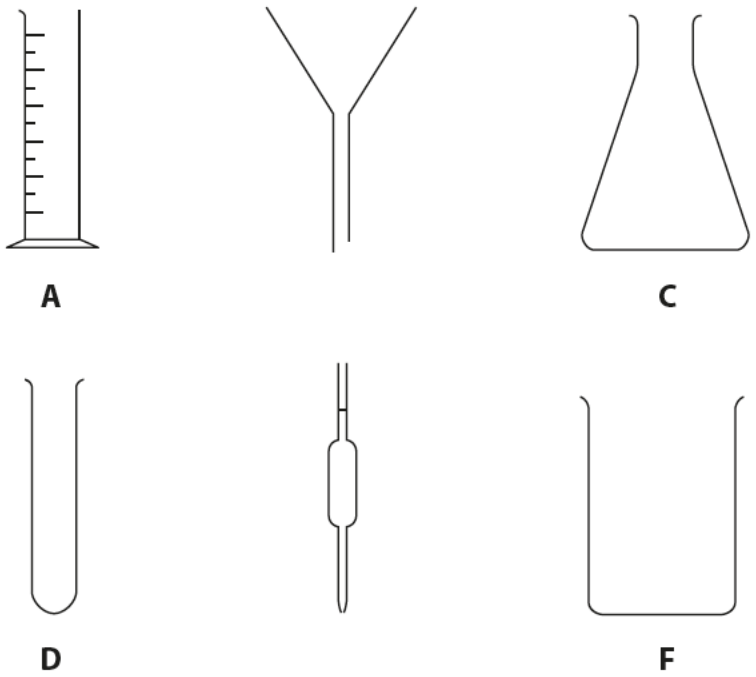
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(Total for Question 4 = 4 marks)

5 The diagram shows some pieces of apparatus that you may find in a laboratory.



(a) Complete the table by giving the name of each piece of apparatus.

(4)

Letter	Name
A	measuring cylinder
B	
C	conical flask
D	
E	
F	

(b) Give the letters of the **two** pieces of apparatus that could each be used to measure an accurate volume of a liquid.

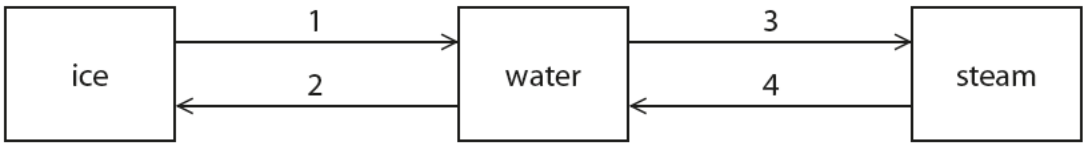
(2)

..... and .....

(Total for Question 5 = 6 marks)

6 The compound with the formula H_2O can exist in three states of matter. The names of these three states are shown in the boxes.

The numbers 1, 2, 3 and 4 represent changes of state.



(a) The particles of H_2O are arranged differently in each state.

(i) In which state are the particles furthest apart?

(1)

.....

(ii) In which state do the particles have the least energy?

(1)

.....

(iii) In which state are the particles arranged in a regular pattern?

(1)

.....

(b) (i) Change of state 1 is called

(1)

- ☒ **A** boiling
- ☒ **B** condensing
- ☒ **C** freezing
- ☒ **D** melting

(ii) Change of state 4 is called

(1)

- ☒ **A** boiling
- ☒ **B** condensing
- ☒ **C** freezing
- ☒ **D** melting

(c) The term sublimation is also used for a change of state.

Sublimation is the change of state from

(1)

- ☒ **A** solid to liquid
- ☒ **B** liquid to gas
- ☒ **C** gas to liquid
- ☒ **D** solid to gas

(d) Heat e gy is released when steam changes to water.

(i) What term is used to describe this type of energy change?

(1)

.....

(ii) Write an equation, including state symbols, for the change of state from steam to water.

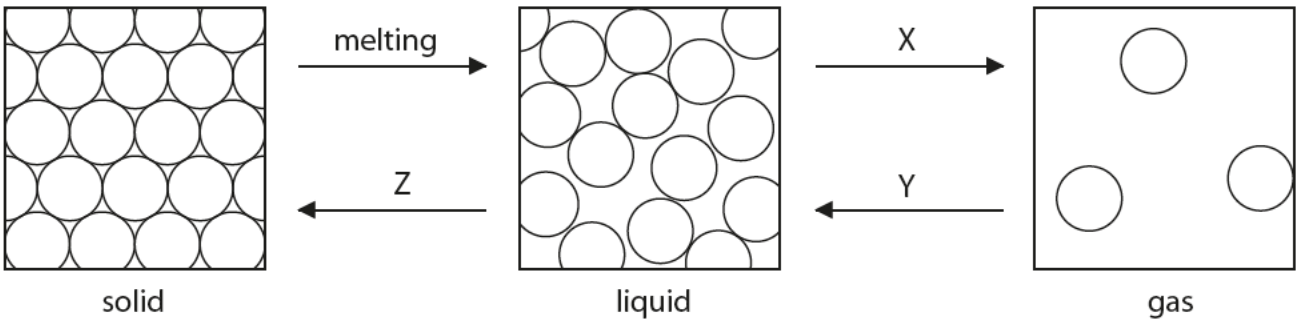
(1)

.....

(Total for Question 6 = 8 marks)

7 The three states of matter are solid, liquid and gas.

The diagram shows how the particles are arranged in each of these states.



(a) Use words from the box to show the changes of state labelled X, Y and Z.

You may use each word once, more than once or not at all.

(3)

boiling	condensing	crystallisation	diffusion	freezing

X .....

Y .....

Z .....

(b) Which statement best describes the movement of the particles in a gas?

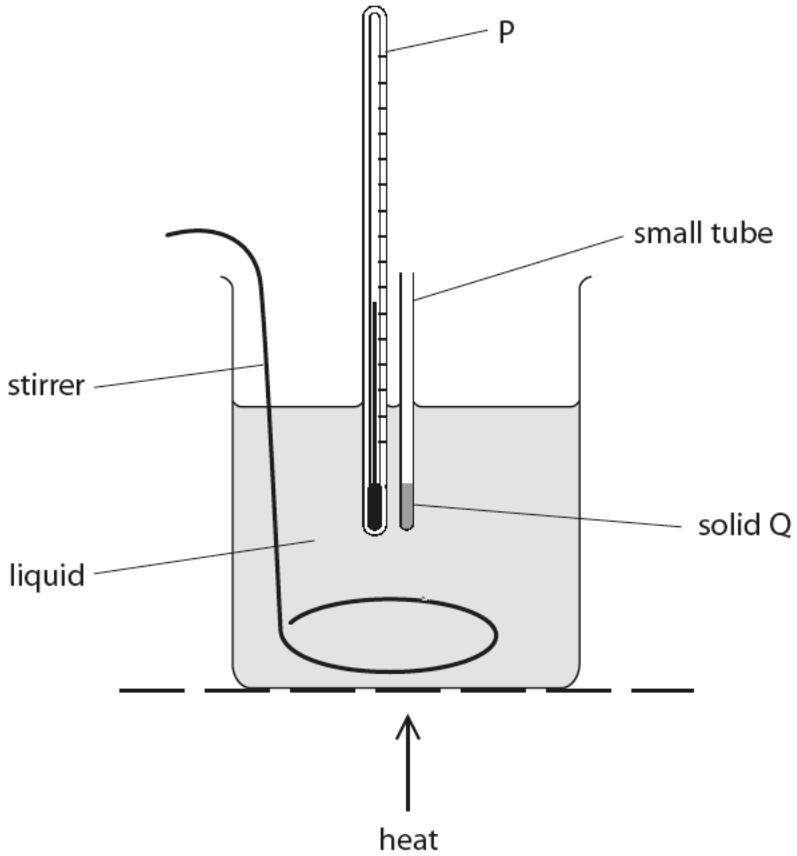
(1)

- ☐ **A** The particles vibrate about fixed positions.
- ☐ **B** The particles slide past one another.
- ☐ **C** The particles move freely.
- ☐ **D** The particles do not move at all.

(c) The diagram shows apparatus that can be used to measure the melting point of a solid.

The solid is placed in a small tube. The small tube is then put into a liquid contained in a beaker.

The liquid is gently heated and the temperature at which solid Q melts is recorded.



(i) Give the name of the apparatus labelled P.

(1)

.....

(ii) Solid Q melts at 140 °C.

Explain why water is not a suitable liquid to use in this experiment.

(1)

.....

.....

(iii) Suggest why the liquid in the beaker needs to be stirred constantly.

(1)

.....

.....

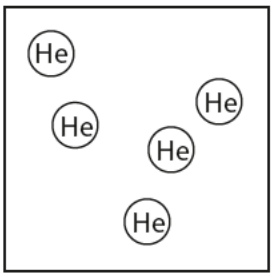
(Total for Question 7 = 7 marks)

8 (a) Substances can be classified as elements, compounds or mixtures.

Each of the diagrams below represents either an element, a compound or a mixture.

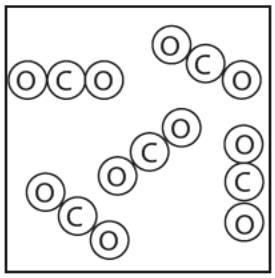
State which one of these is represented by each diagram.

(i)



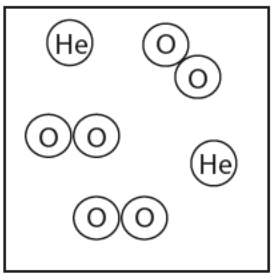
(1)

(ii)



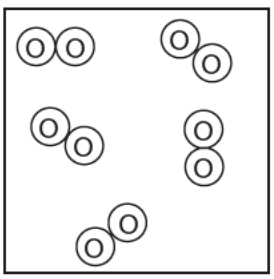
(1)

(iii)



(1)

(iv)



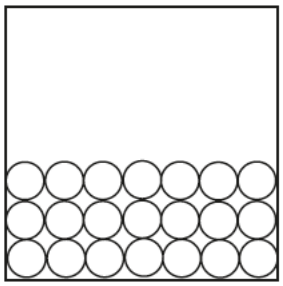
(1)

(b) Substances can also be classified as solids, liquids or gases.

Each of the diagrams below represents either a solid, a liquid or a gas.

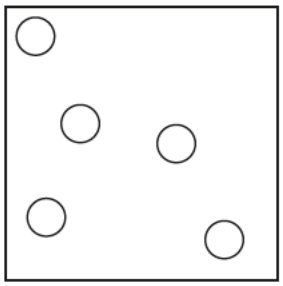
State which one of these is represented by each diagram.

(i)



(1)

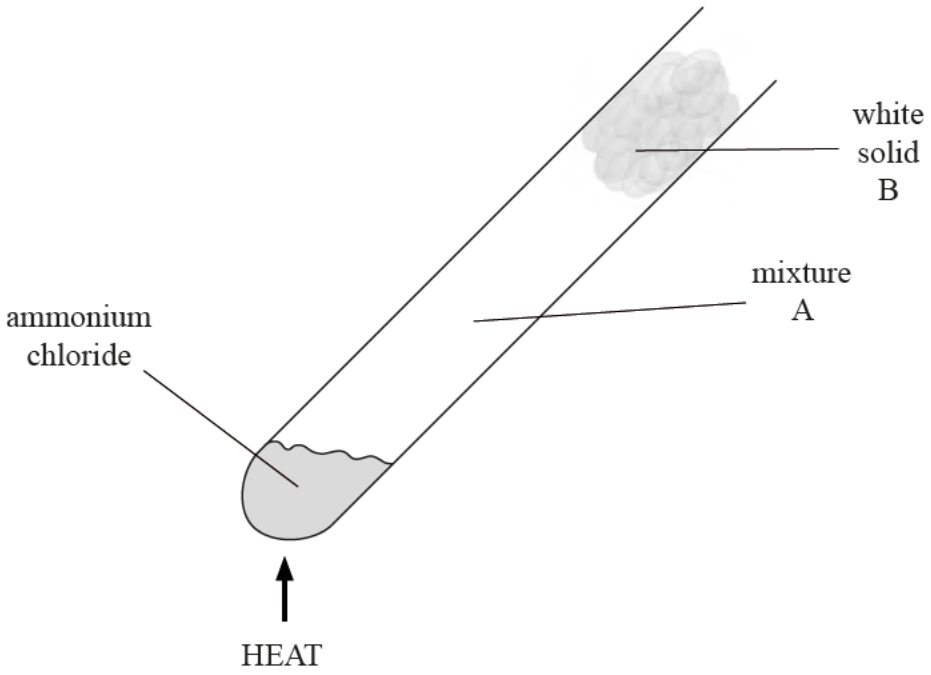
(ii)



(1)

(Total for Question 8 = 6 marks)

9 The diagram shows ammonium chloride being heated in a test tube.



(a) The formula of ammonium chloride is NH_4Cl.

How many different elements are there in ammonium chloride?

(1)

(b) Identify the two gases in mixture A.

(2)

and

(c) Identify the white solid B.

(1)

(d) Place crosses (☒) in **two** boxes to identify the processes that occur in the test tube.

(2)

boiling ☐

decomposition ☐

melting ☐

neutralisation ☐

(Total for Question 9 = 6 marks)