



KS3 Science

Particle Theory

Question Paper

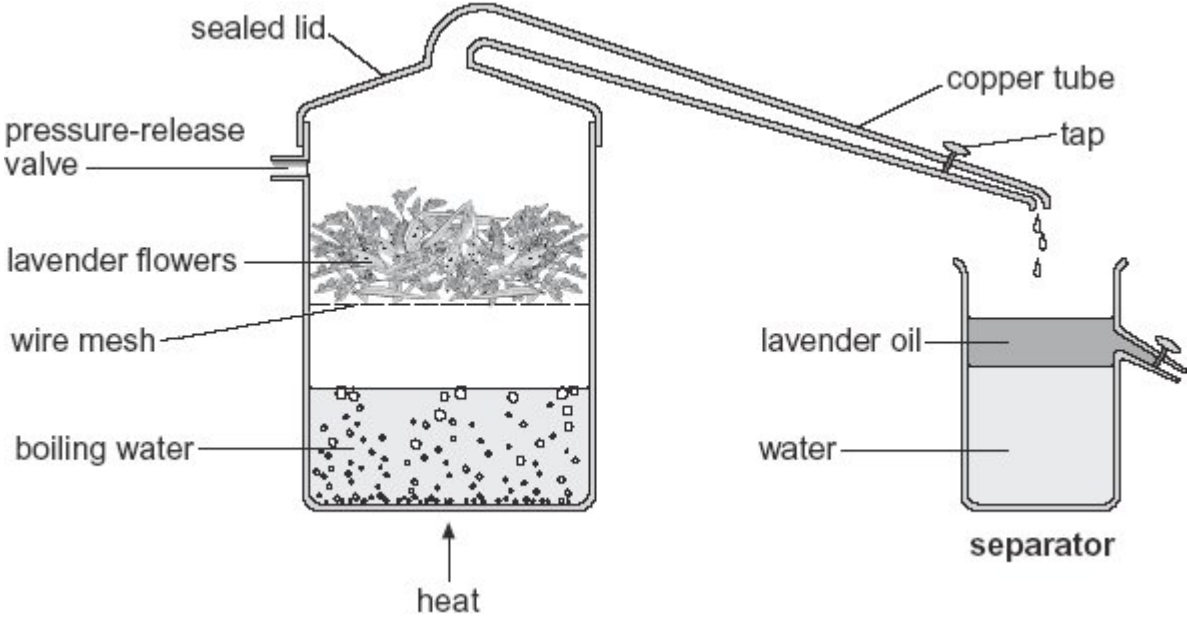
Time available: 29 minutes

Marks available: 37 marks

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1.

Lavender oil is a perfume obtained from lavender flowers. Steam at 100°C is passed through the flowers in the apparatus below.



not to scale

Water vapour and lavender oil vapour pass down a copper tube towards a separator.

(a) (i) The lavender flowers are heated in a container with a sealed lid.

Why must the lid be sealed?

.....
.....

1 mark

(ii) What would happen if the container did **not** have a pressure-release valve?

.....
.....

1 mark

(b) Lavender oil vapour and water vapour cool as they pass down the copper tube. A mixture of lavender oil and water collects in the separator.

(i) What is the change in the physical state of both lavender oil vapour and water vapour as they cool?

from to

1 mark

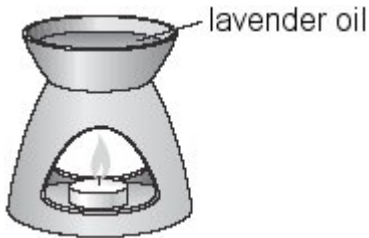
(ii) Look at the separator.

How does this show that the water is denser than lavender oil?

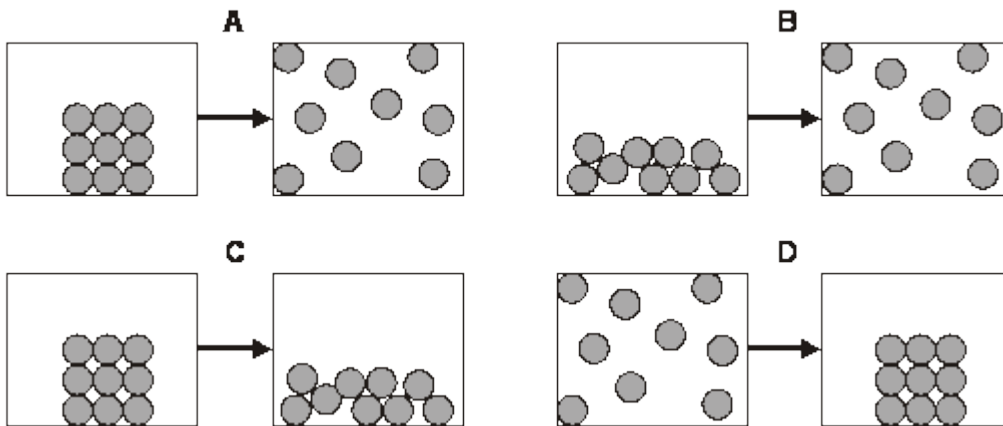
.....
.....

1 mark

(c) Rosie poured some lavender oil into an oil burner.
She heated it with a candle.



The oil changed state.



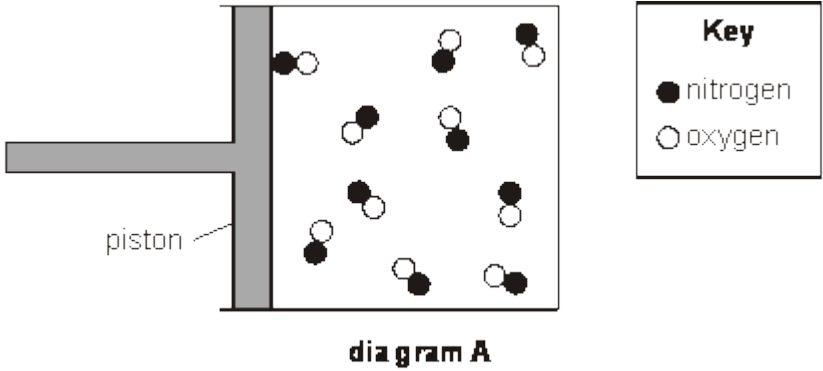
Which diagram represents this change of state?
Write the letter.

.....

1 mark
maximum 5 marks

2.

Diagram **A** represents a gas in a container. The gas can be compressed by moving the piston to the right.



(a) (i) How can you tell that the substance in the container is a gas?

.....
.....

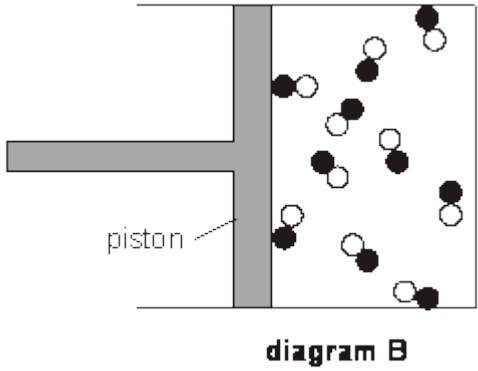
1 mark

(ii) How can you tell from the diagram that the gas is pure?

.....
.....

1 mark

(b) The piston is moved to the right as shown in diagram **B**.



How can you tell, from diagram **B**, that the pressure of the gas has increased?

.....
.....

1 mark

- (c) Diagram **C** shows what happened to the molecules after the gas was compressed more.

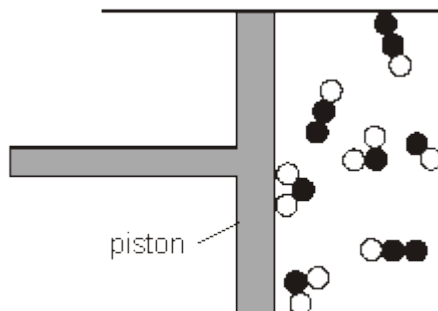


diagram **C**

- (i) How can you tell that a chemical reaction happened when the gas was compressed?

.....

1 mark

- (ii) The mass of the gas in both diagrams **B** and **C** was 0.3 g.

Why did the mass of the gas **not** change when it was compressed?

.....

1 mark

- (iii) Complete the table below with the correct chemical formula of each substance. Use the key to help you.

substance	formula
●○	
●●○	
●○○	

Key

● nitrogen

○ oxygen

1 mark

- (iv) What is the **name** of the substance represented by the symbol ●○?

.....

1 mark
 maximum 7 marks

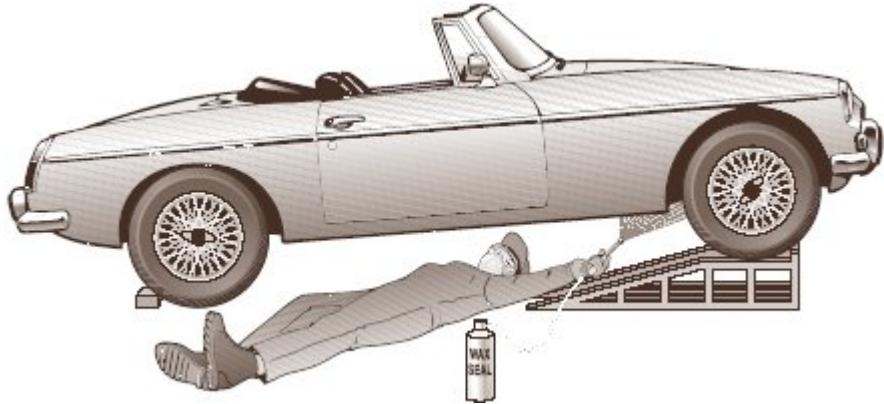
3.

Jill bought a can of Wax Seal to spray the parts underneath her car.



Wax Seal helps to prevent these parts rusting.

It is a mixture of wax and a liquid called white spirit.



(a) (i) The body of Jill's car is made from steel. Steel contains iron.

Give **two** substances that are needed for iron to rust.

1.

1 mark

2.

1 mark

(ii) How does Wax Seal help to protect the car from rusting?

.....
.....

1 mark

(iii) Wax Seal can also be used on the upper parts of a car.

What else protects parts such as the doors from rusting?

.....

1 mark

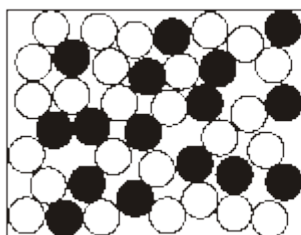
(b) The metal parts of a car may corrode.

What type of air pollution could cause corrosion?

.....

1 mark

(c) The diagram below shows the mixture of particles of wax and white spirit in Wax Seal.



key

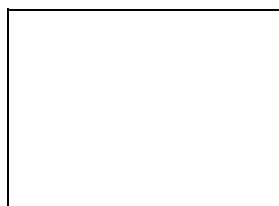
○ = particle of white spirit

● = particle of wax

not to scale

After Jill sprays the car, the white spirit evaporates leaving a layer of solid wax on the surface.

(i) In the box below, draw **eight** circles, ○, to show the arrangement of particles in a gas.



particles in a **gas**

1 mark

(ii) In the box below, draw **eight** circles, ●, to show the arrangement of particles in a solid.



particles in a **solid**

1 mark

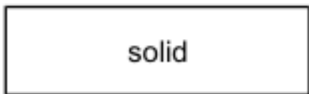
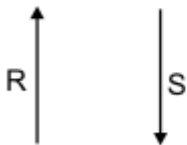
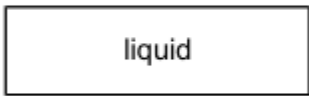
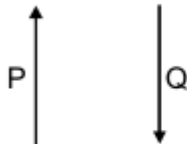
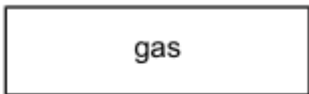
maximum 7 marks

4.

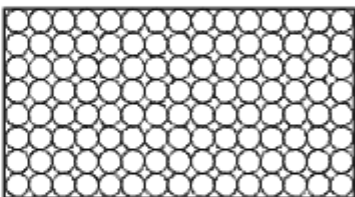
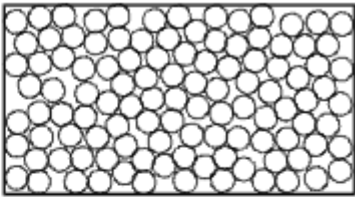
(a) Methane can be a gas, a liquid or a solid. In the diagram below, arrows P, Q, R and S represent changes of state.

The boxes on the right show the arrangement of particles of methane in the three different physical states. Each circle represents a particle of methane.

physical state of methane



arrangement of particles



(i) Draw a line from each physical state of methane to the arrangement of particles in that physical state. Draw only **three** lines.

1 mark

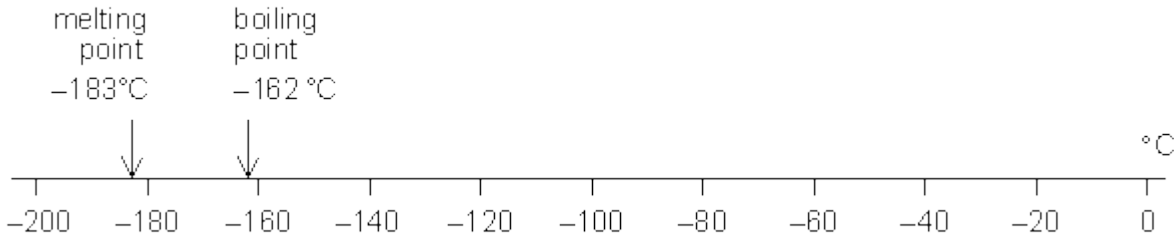
(ii) Arrows P, Q, R and S represent changes of state. Which arrow represents:

evaporation?

melting?

2 marks

(b) Methane is the main compound in natural gas. The scale below shows the melting point and the boiling point of methane.



Methane has three physical states: solid, liquid and gas.

(i) What is the physical state of methane at -170°C ?

.....

1 mark

(ii) The formula of methane is CH_4 . The symbols for the two elements in methane are C and H.

Give the names of these two elements.

element C

element H

2 marks

(iii) When methane burns, it reacts with oxygen.
One of the products is water, H_2O .

Give the name of the other product.

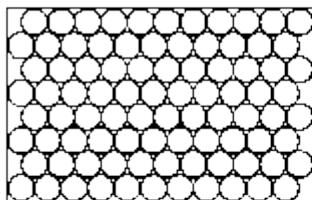
.....

1 mark

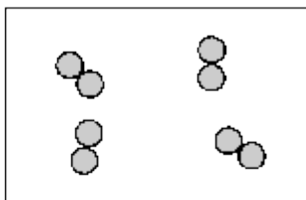
Maximum 7 marks

5.

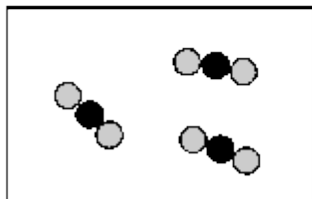
The diagrams represent the arrangement of atoms or molecules in four different substances, A, B, C and D.



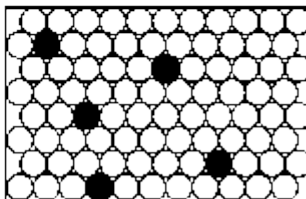
A



B



C



D

not to scale

Each of the circles, ,  and  represents an atom of a different element.

(a) (i) Which substance is a compound?

... ..

1 mark

(ii) Which substance is a mixture?

... ..

1 mark

(iii) Which **two** substances are elements?

... .. and

1 mark

(iv) Which **two** substances could be good thermal conductors?

... .. and

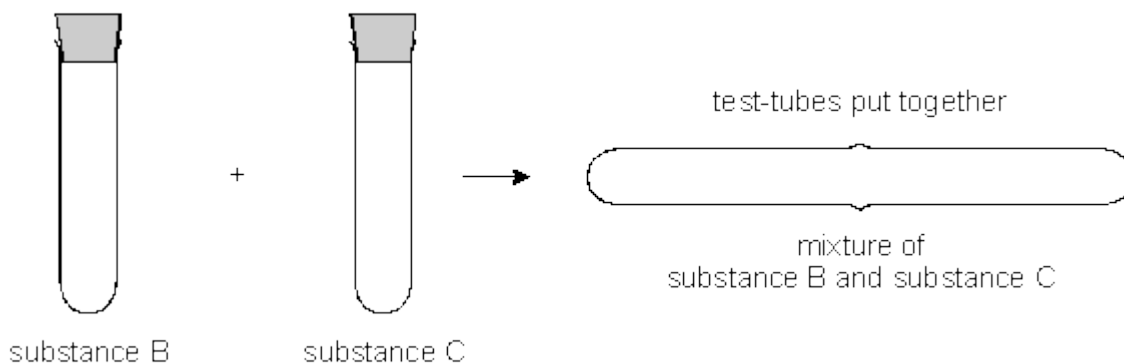
1 mark

(v) Which substance could be carbon dioxide?

... ..

1 mark

(b) The following experiment was set up. Test-tubes containing substances B and C were placed together as shown. The substances did **not** react. They were left for five minutes.

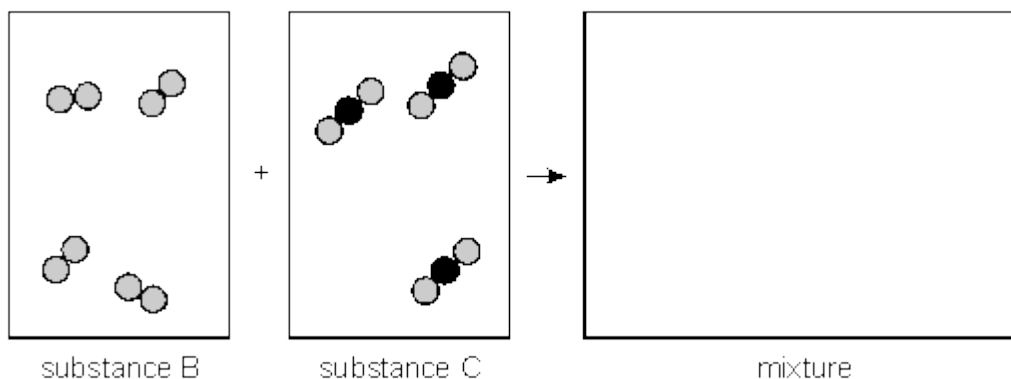


(i) How many molecules are there in the mixture compared to the total number in substances B and C?

... ..

1 mark

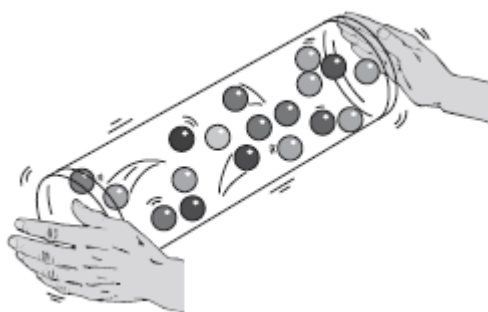
(ii) Complete the diagram which is a model of this experiment.



1 mark
Maximum 7 marks

6.

A student shakes a tube containing small balls to model the movement of particles in a gas.



(a) Why is this a good model for the movement of particles in a gas?

Tick (✓) **two** boxes.

The balls move slowly.

The balls are far apart from each other.

The balls are different colours.

The balls move randomly.

(2)

(b) For a given material, in which state of matter:

are the particles in a regular arrangement?

.....

do the particles have the most kinetic energy?

.....

(2)
(Total 4 marks)