



Write your name here

Surname

Other names

Scholarship Examination

Subject: Chemistry

Time: 45 minutes

You must have:

Calculator
Ruler

Total Marks

/45

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name.
- Answer **all** questions.
- Answer the questions in the spaces provided
 - *There may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 45
- Each multiple choice question is a mark
- The marks for **each** question are shown in brackets
 - *Use this as a guide as to how much time to spend on each question.*

Advice

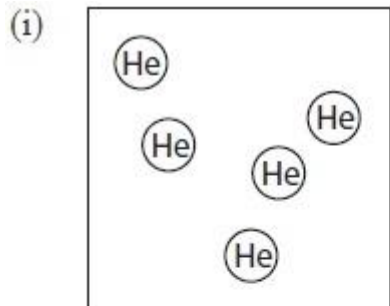
- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer all the questions.

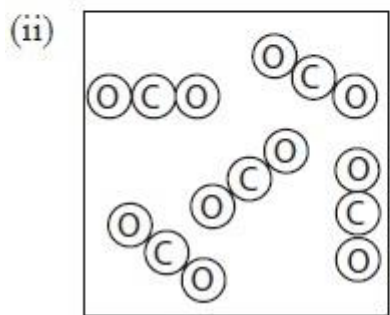
Q1.

Substances can be classified as elements, compounds or mixtures. Each of the diagrams below represents either an element, a compound or a mixture.

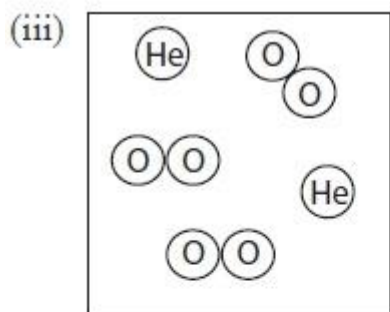
State which one of these is represented by each diagram.



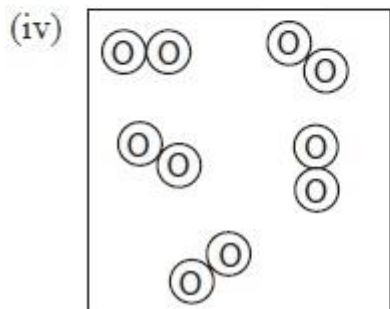
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(1)



.....
(1)



.....
(1)

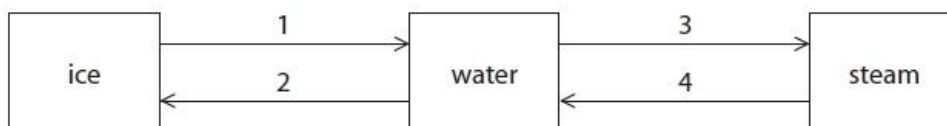


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(1)

(Total for question = 4 marks)

Q2.

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

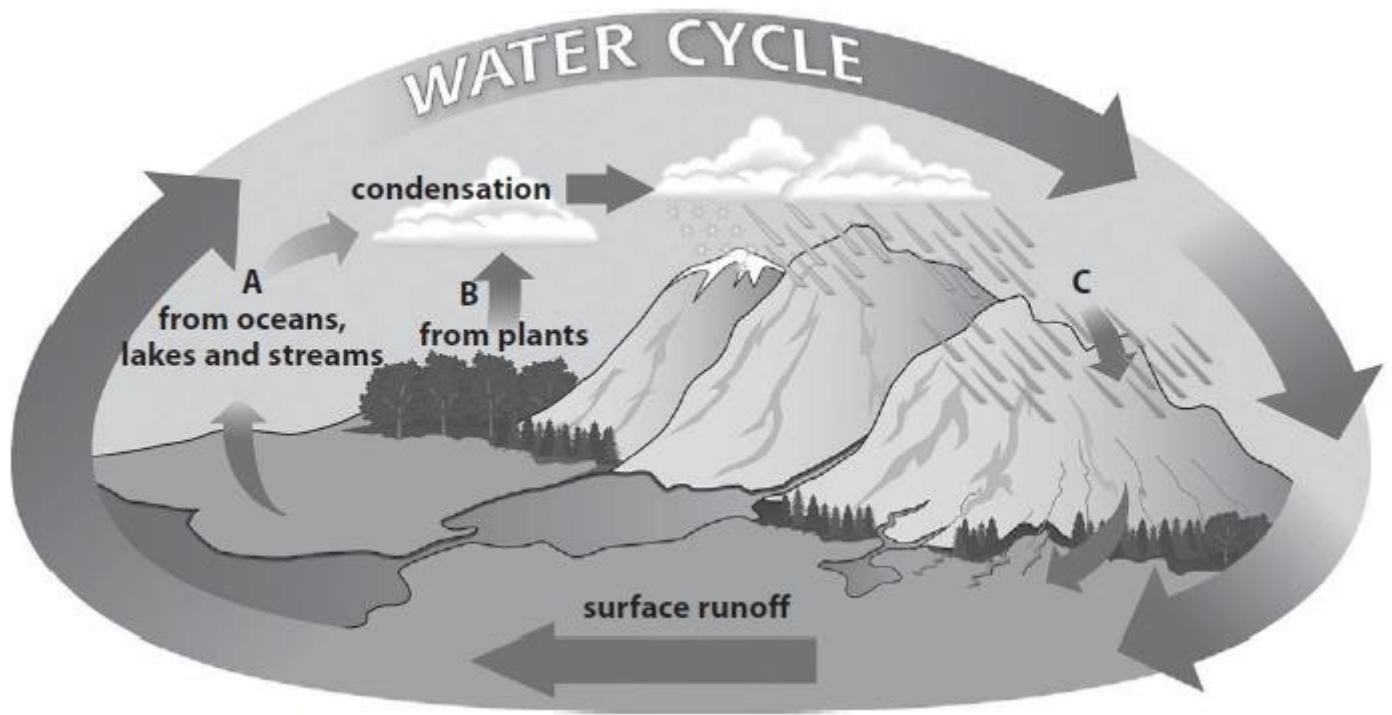
D solid to gas

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

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

(1)

(e) The diagram shows the water cycle.



Name the processes A, B and C shown in the diagram.

(3)

A.....

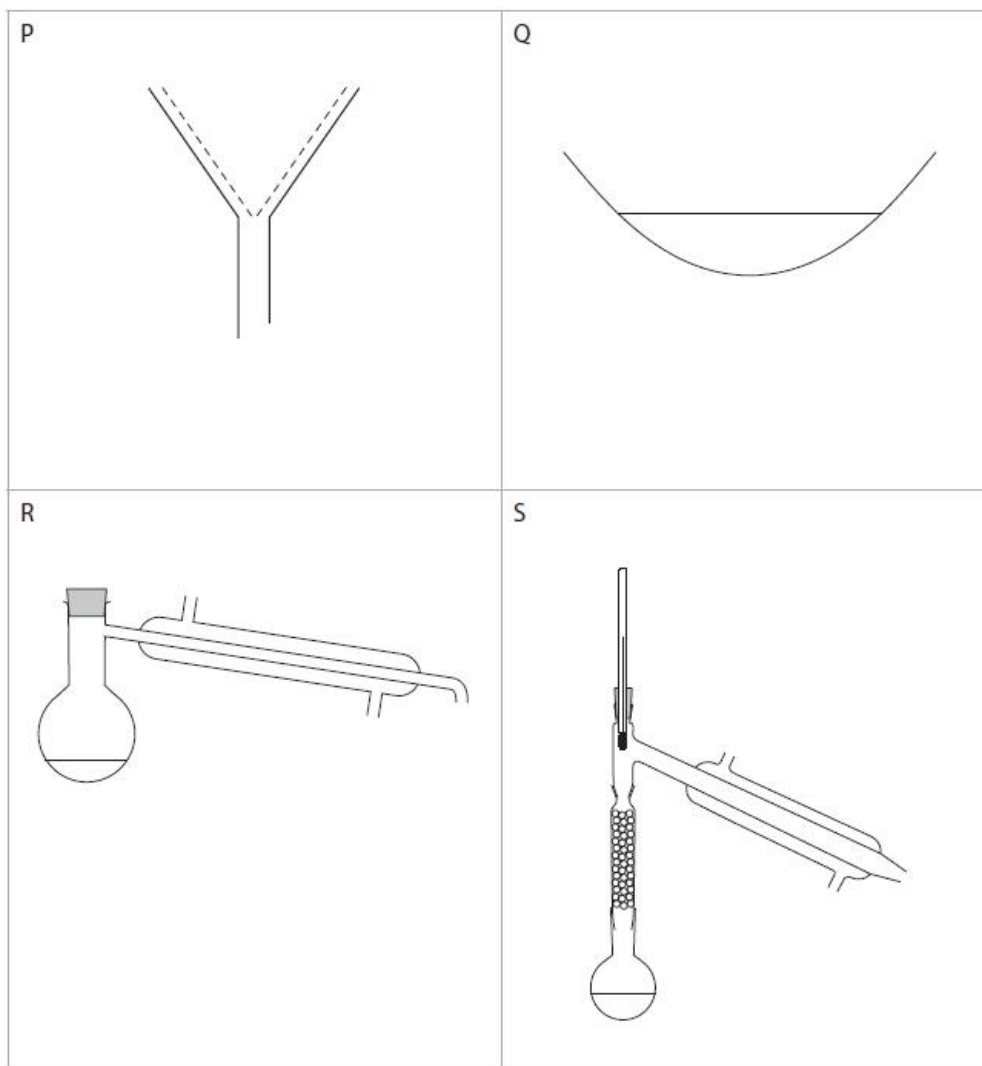
B.....

C.....

(Total for question = 10 marks)

Q3.

The diagram shows four pieces of apparatus used in the separation of mixtures.



(a) (i) The apparatus labelled P is used for

(1)

- A crystallisation
- B filtration
- C fractional distillation
- D simple distillation

(ii) The apparatus labelled S is used for

(1)

- A crystallisation
- B filtration
- C fractional distillation
- D simple distillation

(b) (i) Which method of separation should be used to obtain sand from a mixture containing salt, sand and water? (1)

- A crystallisation
- B filtration
- C fractional distillation
- D simple distillation

(ii) Which method of separation should be used to obtain pure water from a mixture containing salt, sand and water? (1)

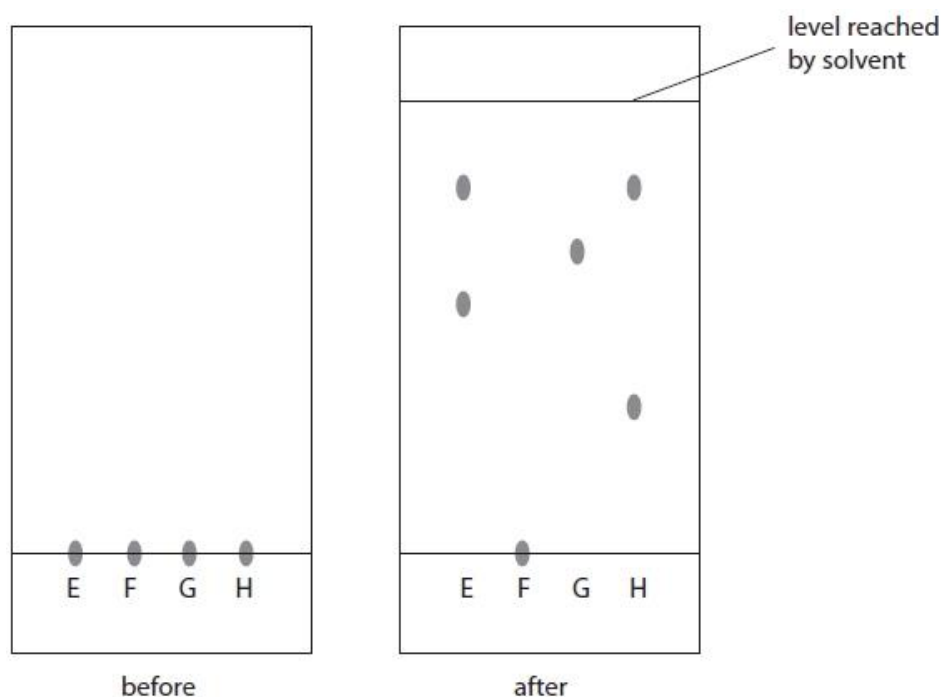
- A crystallisation
- B filtration
- C fractional distillation
- D simple distillation

(iii) Which method of separation should be used to obtain copper(II) sulfate from a mixture containing copper(II) sulfate and water? (1)

- A crystallisation
- B filtration
- C fractional distillation
- D simple distillation

(c) Food colourings contain one or more food dyes.

A student used paper chromatography to separate the dyes contained in food colourings. She placed spots of three known food colourings (E, F and G) and one unknown food colouring (H) on the chromatography paper. The diagram shows the appearance of the paper before and after her experiment.



(i) Describe how the student should complete the experiment after placing the four spots on the paper.

(3)

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(ii) Suggest why food colouring F did not move during the experiment.

(1)

.....

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(iii) How many food dyes are there in food colouring E?

(1)

.....

(iv) How many known food dyes are there in food colouring H?

(1)

.....

(v) Dyes are often identified by their R_f values.

$$R_f = \frac{\text{distance moved by dye}}{\text{distance moved by solvent}}$$

Record the results for the dye in G and calculate its R_f value.

(3)

distance moved by dye in mm	
distance moved by solvent in mm	
R_f value of G	

(Total for question = 14 marks)

Q4.

This question is about hydrochloric acid.

Dilute hydrochloric acid, HCl(aq), reacts with many metals.

A student observes the reaction of dilute hydrochloric acid with four metals, P, Q, R and S.

She uses the same amount of metal in each case.

The table shows her observations.

Metal	Observations
P	very few bubbles produced very slowly
Q	many bubbles produced very quickly
R	many bubbles produced quickly
S	few bubbles produced slowly

(a) Use the information in the table to place the four metals in order of reactivity.

Place the most reactive first.

most reactive

least reactive

(2)

(b) Give the names of the two products formed when magnesium reacts with dilute hydrochloric acid.

(2)

Product 1

Product 2

(Total for question = 4 marks)

Q5.

Air is a mixture of gases.

The two main gases present are the elements nitrogen and oxygen.

(a) Another element that is present in air is

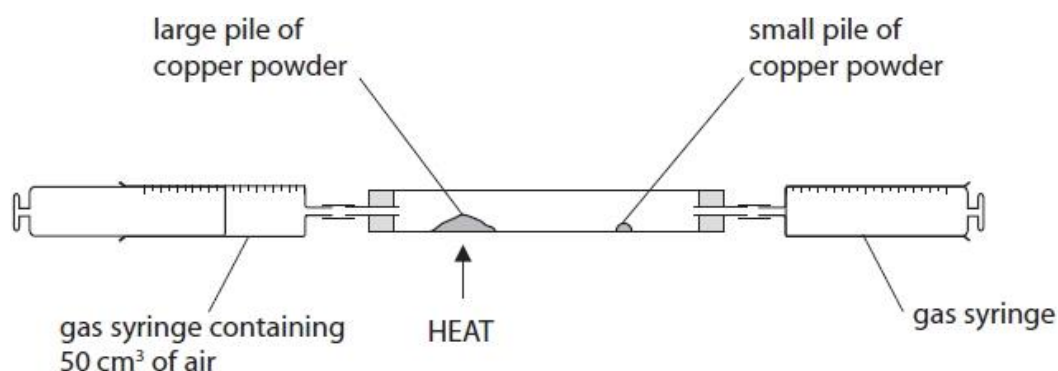
(1)

- A argon
- B carbon dioxide
- C hydrogen
- D sulfur dioxide

(b) Give the formula of a compound that is found in unpolluted air.

(1)

(c) This apparatus in the diagram is used to find the percentage of oxygen in air.



The large pile of copper powder is heated, and the air in the syringe is passed several times from one gas syringe to the other.

The large pile of copper powder turns black. The remaining gas is allowed to cool and its volume is measured.

(i) Explain why the large pile of copper turns black.

(2)

(ii) Why is the gas allowed to cool before its volume is measured?

(1)

(iii) The small pile of copper powder is then heated and the remaining gas is passed several times over the hot copper. The copper does not turn black.

Suggest why the small pile of copper does not turn black.

(1)

(d) In another experiment, the total volume of air in the apparatus before heating is 150 cm^3 . At the end of the experiment the volume of gas remaining is 125 cm^3 .

Use this information to calculate the percentage of oxygen in this sample of air.

(2)

percentage of oxygen = %

(Total for question = 8 marks)

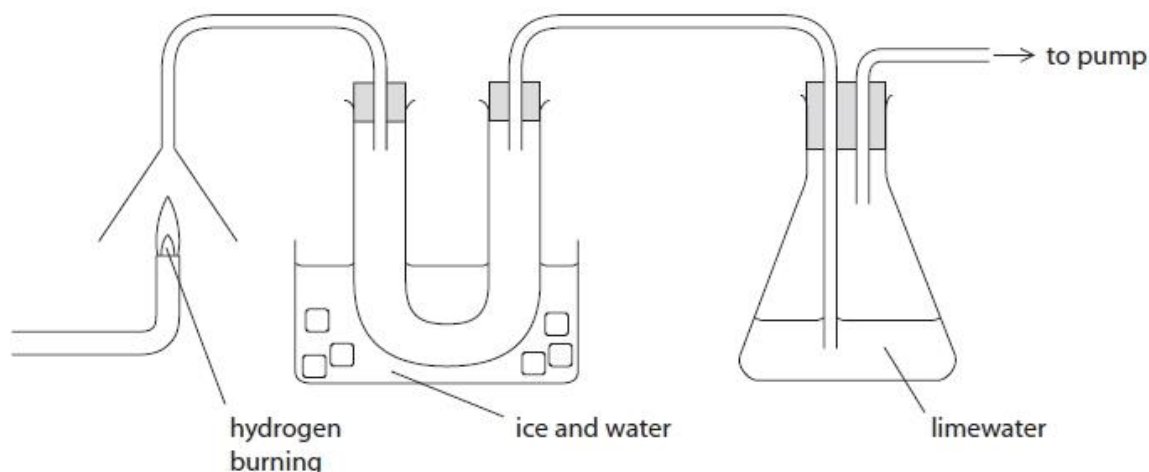
Q6.

This question is about tests for some elements and compounds.

(a) What is the test for hydrogen?

(1)

The diagram shows hydrogen burning in air, and how some of the gases passing through the apparatus are collected and tested.



A colourless liquid collects in the U-shaped tube and the limewater turns cloudy **very** slowly.

(b) Describe a test to show that the colourless liquid contains water.

(2)

Test

Result

(c) A reaction involving carbon dioxide causes the cloudiness in the limewater.

Place crosses in **two** boxes to show the correct statements about this reaction.

(2)

- carbon dioxide forms when the hydrogen burns
- carbon dioxide from the air reacts to cause the cloudiness
- the cloudiness is caused by the formation of calcium hydroxide
- the cloudiness is caused by the formation of a white precipitate
- the reaction in the limewater is an example of oxidation

(Total for question = 5 marks)