

PREPARATION AND DIFFERENTIATION OF MIXTURES AND COMPOUNDS

Preparation of:

- (a) a mixture
- (b) a compound

using iron fillings and sulphur powder and distinction between these on the basis of:

- (i) appearance, i.e., homogeneity and heterogeneity
- (ii) behaviour towards a magnet
- (iii) behaviour towards carbon disulphide as a solvent
- (iv) effect of heat

THEORY :

MIXTURE: A mixture is made up of two or more elements or compound mixed together in any proportion by mass.

COMPOUND: A Compound is a pure substance which is made up of two or more elements chemically combined in definite proportion by mass.

DISTINCTION BETWEEN MIXTURE AND COMPOUND

- (i) A mixture consists of two or more substances present together in any proportion by mass whereas a compound consists of two or more elements in a fixed proportion by mass.
- (ii) A mixture is formed as a result of a physical change whereas a compound is formed as a result of a chemical change.
- (iii) The components of a mixture retain their properties whereas the constituent elements of a compound do not retain their properties.
- (v) The constituents of a mixture can be separated by physical means whereas the constituents of a compound cannot be separated by physical means.

APPARATUS AND CHEMICALS REQUIRED

Magnet, test tube, watch glass, china dish, Bunsen burner, wire gauze, tripod stand, iron fillings, sulphur powder, carbon disulphide.

PROCEDURE

- (a) To prepare a mixture of iron fillings and sulphur, take a little iron fillings and sulphur powder in a pestle and mortar and give the contents and mix them. A mixture of iron and sulphur is formed.
- (b) To prepare the compound iron sulphide take a little of the mixture prepared in (a) above and heat in china dish till a black substance is formed. This is iron sulphide.

Record your observations and inferences in the table given below.

EXPERIMENT	OBSERVATION	INFERENCE
1. Appearance (i) Mixture of iron and sulphur. (ii) Compound iron sulphide.		

2. Action of magnet on (i) Mixture of iron and sulphur. (ii) Compound iron sulphide.		
3. Action of carbon disulphide on. (i) Mixture of iron and sulphur. (ii) Compound iron sulphide.		
4. Action of heat on. (i) Mixture of iron and sulphur. (ii) Compound iron sulphide.		

CONCLUSIONS

1. The component of a mixture retain their properties.
2. The constituent elements of a compound do not retain their properties.

PRECAUTIONS

The mixture of iron and sulphur should be heated carefully.

SECTION - A VERY SHORT QUESTIONS

- Q.1** Why is the heating of iron and sulphur considered to be a chemical change?
- Ans.** It is a chemical change because a new product, with different properties (iron sulphide) is formed.
- Q.2** What type of change occurs when iron and sulphur are mixed but not heated? Give reason.
- Ans.** It is a physical change, because the mixture of iron and sulphur retains the properties of its constituents.
- Q.3** What are the colours of iron sulphide, iron and sulphur?
- Ans.** Iron sulphide is black in colour. Iron is dark grey and sulphur is yellow.
- Q.4** What type of mixture is formed when iron and sulphur are mixed? Give reason.
- Ans.** It is heterogeneous mixture.
This is because the composition of this mixture is not uniform throughout.
- Q.5** What type of mixture is a solution of sulphur in carbon disulphide? Why?
- Ans.** It is a homogeneous mixture.
This is because sulphur dissolves in carbon disulphide to form a solution having uniform composition throughout.
- Q.6** How are mixtures separated?
- Ans.** Mixtures can be separated by using physical methods (e.g., filtration, decantation, evaporation, magnetic separation) based on the properties of the constituents.
- Q.7** How are constituents of a compound separated? What type of change is this?
- Ans.** They are separated by using chemical methods. It involves chemical change.
- Q.8** Iron is attracted towards a magnet. What about iron sulphide and sulphur?
- Ans.** Iron sulphide is not attracted towards a magnet. Sulphur is not attracted by a magnet.
- Q.9** Carbon disulphide is used to dissolve one of these - iron or sulphur?
- Ans.** Sulphur dissolves in carbon disulphide, while iron does not.
- Q.10** Write two examples of compounds soluble in water. What type of mixture is formed? Is this homogeneous or heterogeneous?
- Ans.** Glucose and sodium chloride are soluble in water. A true solution is formed. It is homogeneous.
- Q.11** What is a compound?
- Ans.** A compound is a substance formed by the combination of two or more elements in a fixed proportion by mass.
- Q.12** Name two laws of chemical combination obeyed when a compound is formed.
- Ans.** Law of conservation of mass and law of constant proportions.
- Q.13** Can iron and sulphur be mixed in any proportion to form a mixture? What kind of mixture is this? Why?
- Ans.** Yes. This is a heterogeneous mixture as it does not have uniform composition.

Q.14 If a magnet is not available, how would you separate a mixture of iron and sulphur?

Ans. To the mixture add carbon disulphide. Sulphur will dissolve in it. Iron will not dissolve in it. Filter this. The residue is iron. Leave the filtrate for evaporation. Carbon disulphide will evaporate leaving behind sulphur.

Q.15 Is rusting of iron a physical or chemical process? Why?

Ans. It is a chemical process. This is because a new substance (rust) is formed.

Q.16 What is the difference between mixtures and compounds on the basis of amount of components?

Ans. Mixtures can have any amount of the individual components, in any proportion. However, the amount and proportion of components of a compound are fixed.

Q.17 What are homogeneous mixtures? Give one example.

Q.20 Complete the blanks A, B, C and D in the table given below:

S. No.	Experiment	Mixture of iron and sulphur	Compound iron sulphide
1.	Appearance	Heterogeneous mixture. Sample consists of yellow powder, in which iron filings are visible.	A
2.	Behaviour towards a magnet	B	There is no effect of magnet.
3.	Behaviour towards carbon disulphide	C	D

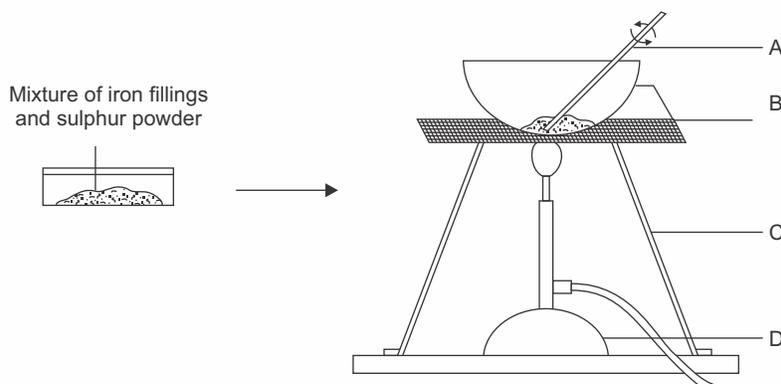
Ans. (A) It is black.

(B) Iron filings get attracted towards the magnet but sulphur does not.

(C) Sulphur gets dissolved in carbon disulphide, leaving iron filings unaffected.

(D) The compound iron sulphide does not dissolve.

Q.21 Label A, B, C and D in the following set up for preparation of iron sulphide from iron and sulphur.



Ans. (A) Glass rod

(B) China dish

(C) Tripod stand

(D) Bunsen Burner.

Q.22 Justify that water is a compound.

Ans. In water, hydrogen and oxygen are present in a fixed proportion by mass 1 : 8. Water has properties entirely different from those of hydrogen and oxygen (its constituent elements).

Q.23 What happens when carbon disulphide is added to sulphur? How would you obtain the sulphur back? Which apparatus would be best suited for this – a test tube or a china dish? Give reason.

Ans. Sulphur dissolves in carbon disulphide to form a yellow solution.

Sulphur can be obtained back by evaporation. A china dish is better suited for this as the liquid would have greater surface area for evaporation.

Q.24 Name the compound formed by heating a mixture of iron and sulphur. Write one property which sulphur loses on forming iron sulphide.

Ans. The compound formed by heating a mixture of iron and sulphur is iron sulphide. Sulphur loses the property of getting dissolved in carbon disulphide upon forming the compound.

Q.25 Justify that iron sulphide is a compound.

Ans. Iron sulphide is a compound because iron and sulphur do not retain their properties in it. Moreover iron and sulphur cannot be separated by physical means from iron sulphide. Iron and sulphur are present in definite proportion by mass in iron sulphide.

Q.26 Justify that a China dish containing iron fillings and sulphur contains a mixture.

Ans. It is a mixture because both sulphur as well as iron retain their properties. Iron retains its property of getting attracted towards a magnet and sulphur retains its property of getting dissolved in carbon disulphide.

Q.27 In a solution of sulphur in carbon disulphide, name the solute and the solvent.

Ans. The solute in this case is sulphur and the solvent is carbon disulphide.

Q.28 In a mixture containing iron, sulphur and iron sulphide, which component will dissolve in carbon disulphide? What does this tell about the nature of mixtures?

Ans. Sulphur will dissolve in carbon disulphide. This

shows that the components of a mixture retain their properties.

Q.29 Justify that a compound is formed when iron and sulphur are heated together in a china dish.

Ans. When iron and sulphur are heated together a black substance is formed. This black substance has properties entirely different from those of iron and sulphur. This compound formed does not get - attraction towards a magnet like iron does. This compound does not dissolve in carbon disulphate like sulphur does. This compound is iron sulphide.

Q.30 How would you prove that a physical change takes place when iron fillings and sulphur powder are mixed together?

Ans. A physical change takes place when iron fillings and sulphur powder are mixed together. Both iron as well as sulphur retain their dark grey and yellow colour respectively. Iron retains its property of getting attracted towards a magnet and sulphur retains its property of getting dissolved in carbon disulphide.

Q.31 How would you prove that a chemical change takes place when iron and sulphur are heated together?

Ans. A chemical change is a change in which a new substance is formed which has properties entirely different from those of the starting substances. In this case the substance formed is iron sulphide. If a magnet is brought near it, it does not get attracted towards it like iron does. Moreover if a little iron sulphide is added to carbon disulphide, it does not dissolve. This proves that a chemical change has taken place.

Q.32 A student added some water to a mixture of iron fillings and powdered sulphur in an attempt to separate the mixture. He does not have a magnet but has organic solvents. How should he proceed to separate iron and sulphur?

Ans. The student should first remove the water by filtration. The residue obtained will consist of a mixture of iron and sulphur. A magnet should be run over it. Iron particles will get attracted towards the magnet and the sulphur will be separated. Both iron and sulphur will be left open to let them dry.

Q.33 Complete the blanks A, B, C and D in the table given below.

S. No.	Substance	Element/ Mixture/ Compound	Behaviour toward magnet
1.	Iron	A	attracted
2.	Sulphur	B	No attraction
3.	Iron sulphide	C	D

Ans. (A) Element (B) Element (C) Compound
(D) Not attracted towards a magnet.

Q.34 A student has to study the behaviour of a mixture of iron and sulphur and also that of the compound iron sulphide. Name the apparatus required by him to prepare the compound iron sulphide from iron and sulphur?

Ans. He would require the following apparatus:
China dish
Glass rod for stirring

Wire gauge
Tripod stand
Bunsen burner

Q.35 Complete the blanks A,B,C and D in the table given below.

Ans. (A) Yellow (B) Yellowish grey
(C) Insoluble (D) Soluble

S. No.	Substance Mixture	Colour	Behaviour in carbon disulphide
1.	Iron fillings	dark grey	C
2.	Sulphur powder	A	D
3.	Mixture of iron fillings and sulphur powder	B	Sulphur dissolves but iron does not

SECTION -B MULTIPLE CHOICE QUESTIONS

Q.1 Which of the following will result in formation of a compound?

- Grinding together iron filings and sulphur powder.
- Adding alum to boiling water.
- Strongly heating iron filings and sulphur powder.
- Mixing carbon disulphide with sulphur powder.

Q.2 When a magnet is made to move over a mixture of iron filings and sulphur powder, we observe that:

- sulphur gets attracted
- iron gets attracted
- both iron and sulphur get attracted
- none of them gets attracted

Q.3 A student is given a mixture of iron filings and sulphur powder. The teacher gives him a solvent, that dissolves the sulphur on adding to the

mixture, but leaves iron unaffected. The solvent doesn't have a label on it. Can you identify it?

- Cold water
- Boiling water
- Hydrochloric acid
- Carbon disulphide

Q.4 Which of the following is not a property of a mixture?

- It is heterogeneous.
- It has a constant composition.
- Its components can be separated by physical means.
- All are correct

Q.5 Which of the following results in the formation of a mixture?

- Crushing a marble tile into small particles.
- Breaking ice cubes into small pieces.
- Agitating a detergent with water in a washing machine.
- Adding sodium metal to water.

Q.6 A student is given two samples, marked X and Y, containing iron and sulphur. She conducts the following experiments:

S. No.	Sample/Experiment	Sample X	Sample Y
1.	Moving a magnet over the sample	No effect	One of the components sticks to the magnet.
2.	Solution of carbon disulphide	No effect	Colourless solution is formed, with dark residue.
3.	Heating	Sample becomes hot	Colour changes from yellow to black.

According to her observation, what conclusion can you draw?

- (a) Sample X is a mixture and sample Y is a compound.
 (b) Sample Y is a mixture and sample X is a compound.

- (c) Both samples are compounds.
 (d) Both samples are mixtures.

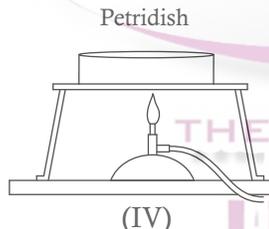
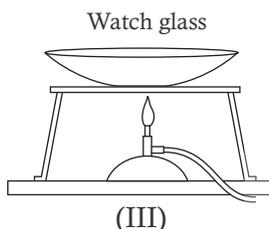
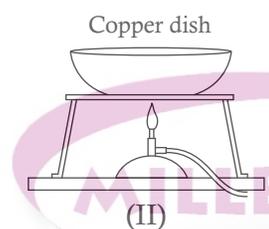
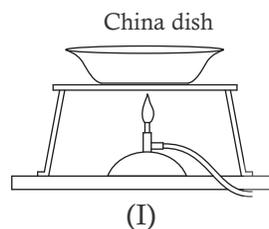
Q.7 The colours of iron filings and sulphur powder are, respectively:

- (a) black, colourless (b) colourless, black
 (c) black, yellow (d) yellow, black

Q.8 What happens to the colour of mixture of iron filings and sulphur powder when it is heated strongly?

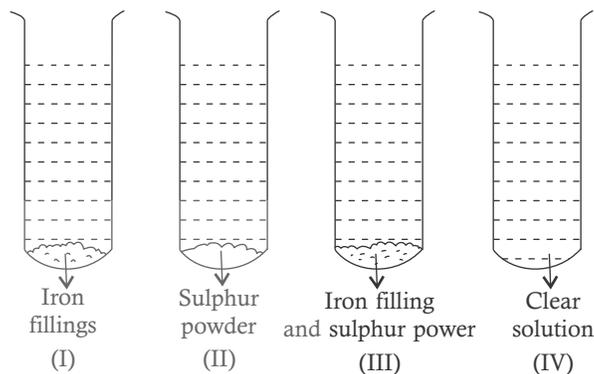
- (a) Changes from colourless to yellow
 (b) Changes from yellow to black
 (c) Changes from black to yellow
 (d) No effect on colour

Q.9 The correct procedure for heating a mixture of iron filings and sulphur powder is:



(a) I (b) II
 (c) III (d) IV

Q.10 A mixture of iron filings and sulphur was added to a test tube containing carbon disulphide and stirred. It would appear as:



- (a) I (b) II
 (c) III (d) IV

ANSWER KEY (MCQ's)

Q.No.	Ans.	Explanation
1.	(c)	On strong heating, iron and sulphur combine in a fixed ratio to form iron sulphide.
2.	(b)	Only iron gets attracted towards a magnet.
3.	(d)	Sulphur dissolves in carbon disulphide while iron does not.
4.	(b)	Mixture does not have a constant composition.
5.	(d)	Sodium reacts with water to form NaOH. Crushing marble and ice cubes will not change the structure of the material. Detergent will ionise in water but will not form a compound.
6.	(b)	Sample X does not retain properties of components and is a compound. Sample Y is a mixture as it exhibits properties of components.
7.	(c)	Iron filings are black and sulphur powder is yellow.
8.	(b)	The mixture gets its yellow colour from sulphur powder. FeS is a black mass.
9.	(a)	The mixture should be heated in a China dish.
10.	(a)	Iron is insoluble in carbon disulphide but sulphur is soluble in carbon disulphide.