Chapter 1. States of Matter

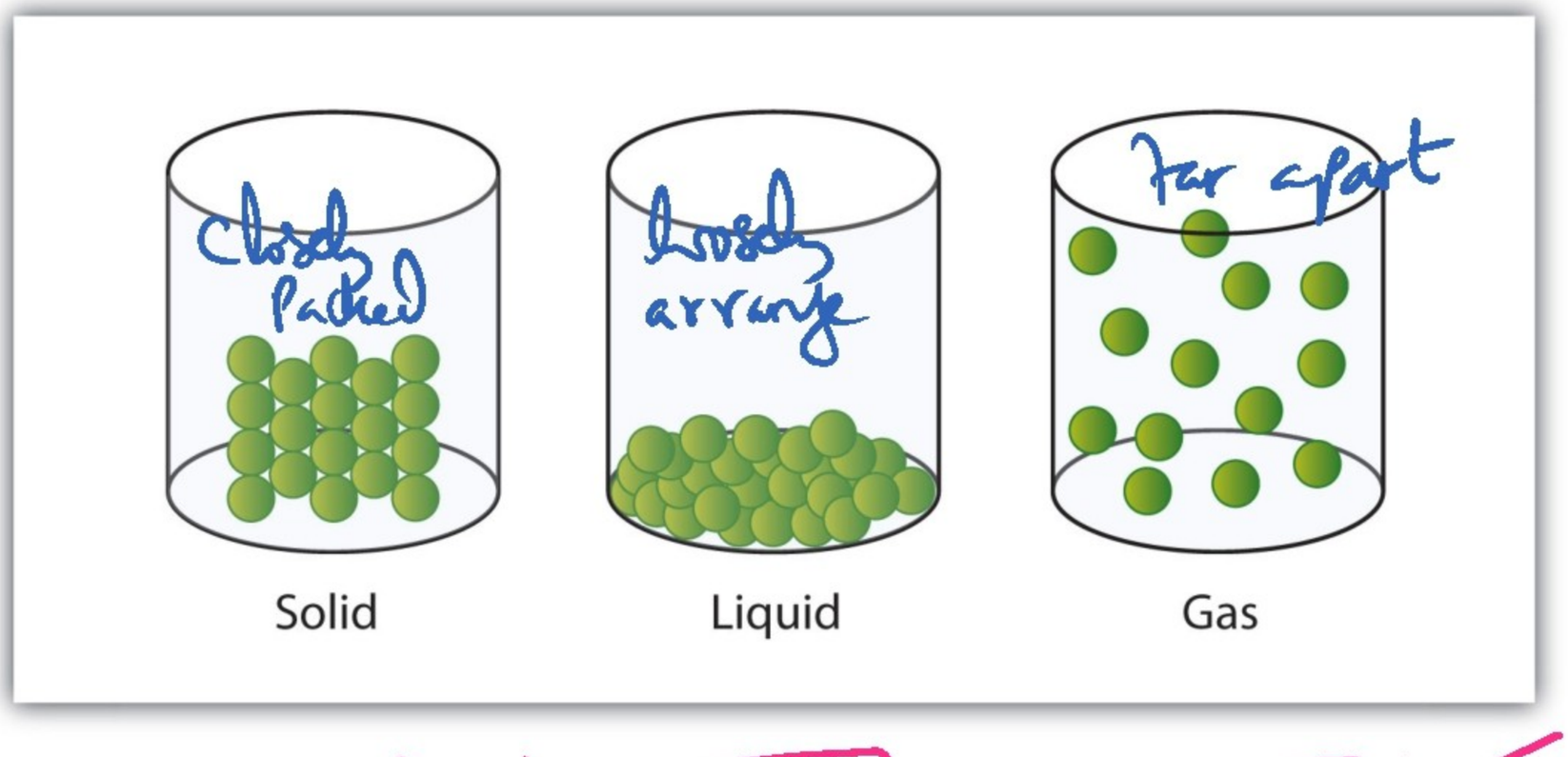
Tuesday, August 15, 2023 10:09 AM

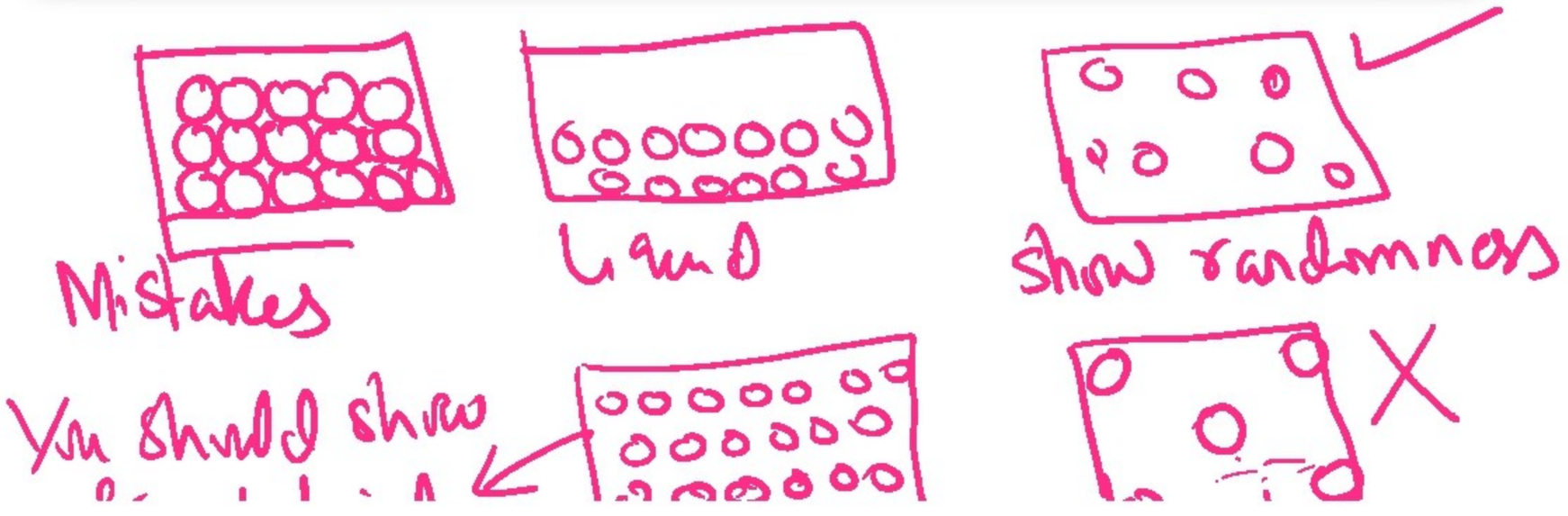
Matter? Anything which occupy space and have weight is called matter.

(1) Computer, phone, pencil, calculator

- Solid — Computer
- Liquid — Water
- Gas — O_2, Air

Property / State	Solid	Liquid	Gas
(1) Shape	fixed	no fixed	no fixed
(2) Volume	fixed	fixed	no fixed
(3) Compressibility	Cannot	Cannot	Yes





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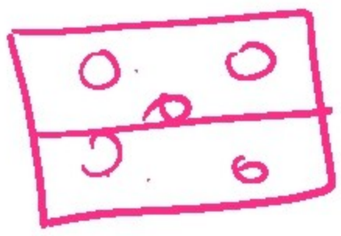


avoid systematic order.
show randomness

1) Arrangement of Particles	⇒ orderly arrange ⇒ closely Packed		⇒ Disorder ⇒ loosely arranged	⇒ Disorder ⇒ far apart
2) Attractive forces b/w the particles	Very strong		Strong	Very weak
3) Kinetic energy of the particles	Very low		low	high
4) Particle Motion	Vibrate and rotate about fixed Position		Slide each other	move about at greater speed

1) Melting and Freezing

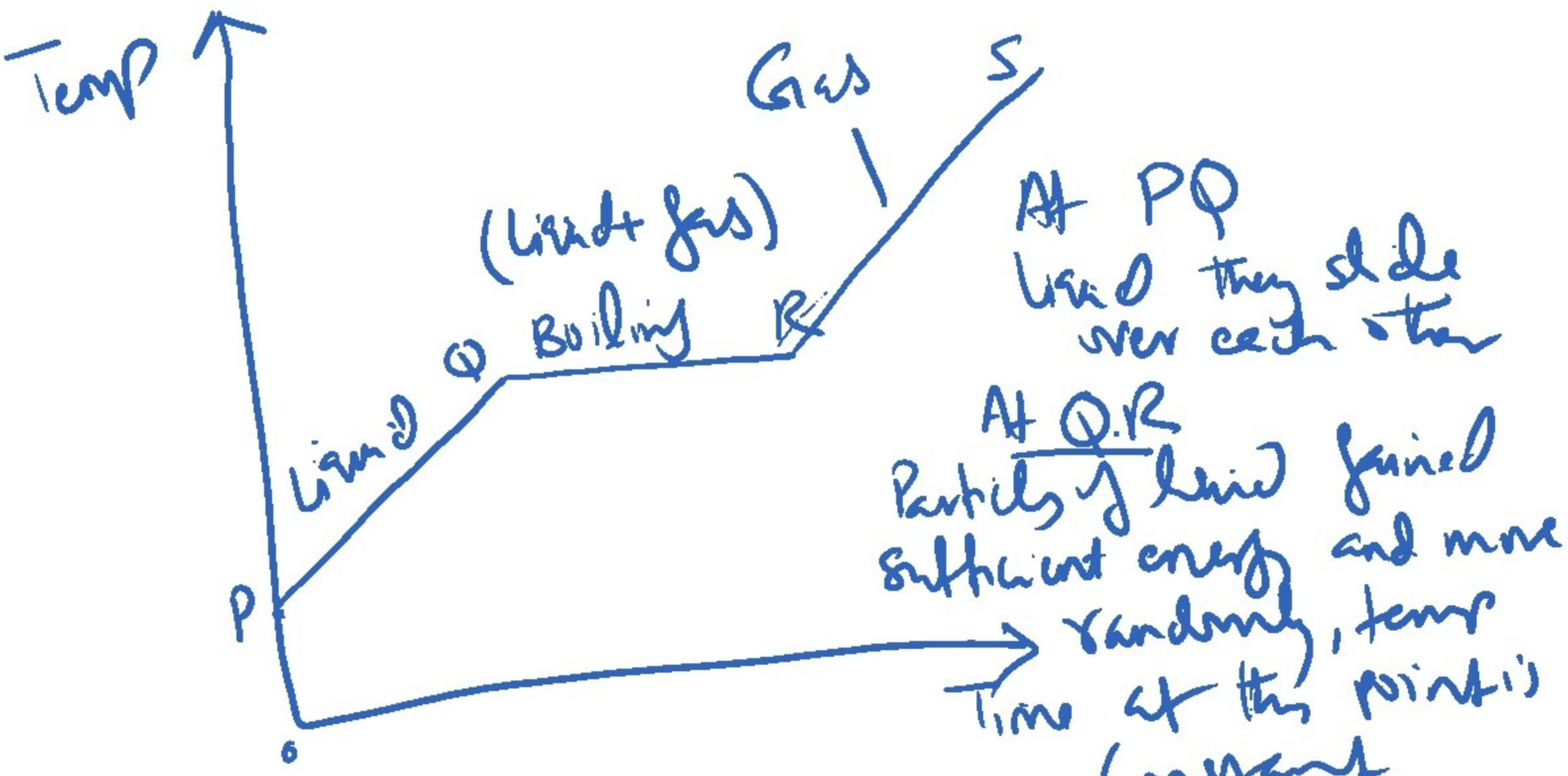
M.P → physical change from solid to liquid

Freezing Point → Physical change from liquid to solid

2) Boiling and Condensation

Boiling → Physical change from Liquid to gas

Condensation → ; ; ; gas to liquid



Exam Tip

Boiling and Melting Points of a Pure substance is fixed. M.P and B.P can be used to determine the Purity of substance

Water Boiling Point 100°C 102°C 103°C
" Melting Point 0°C
-1 -2
not Pure

NaCl

Difference b/w B.P	and evaporation
Boiling point	Evaporation
① occurs throughout the liquid	occurs first from the surface of liquid
② At occurs at a fixed and constant temperature	occurs at any temperature

Do. ones

3) Salt Process

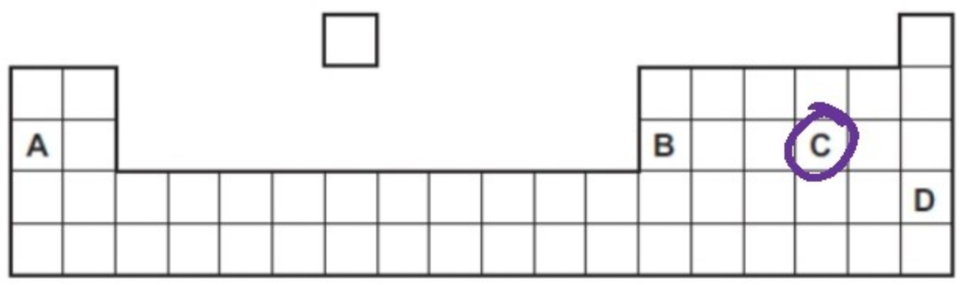
Sublimation Mothballs, I_2

physical change from solid to gas state

Dry ice (solid CO_2)

1 Part of the Periodic Table is shown.

Which element forms an acidic oxide?



2 The oxide of element X forms a solution with pH 4.

The oxide of element Y forms a solution that turns Universal Indicator blue.

Which row correctly classifies elements X and Y?

	element X	element Y
A	metal	metal
B	metal	non-metal
C	non-metal	metal
D	non-metal	non-metal

3 Which statement about oxides is correct?

A A solution of magnesium oxide will have a pH less than 7.

B A solution of sulfur dioxide will have a pH greater than 7.

C Magnesium oxide will react with nitric acid to make a salt.

D Sulfur dioxide will react with hydrochloric acid to make a salt.

acidic oxide acid

acid + acid → Never react

Simple Base + Base → ✗

4 Only two elements are liquid at 20 °C. One of these elements is shiny and conducts electricity.

This suggests that this element is a .....1..... and therefore its oxide is .....2..... .

Which words correctly complete gaps 1 and 2?

	1	2
A	metal	acidic
B	metal	basic
C	non-metal	acidic
D	non-metal	basic

5 Which of the following are properties of the oxides of non-metals?

	property 1	property 2
A	acidic	covalent
B	acidic	ionic
C	basic	covalent
D	basic	ionic

6 Two oxides, X and Y, are added separately to dilute sulfuric acid and dilute sodium hydroxide.

X reacts with dilute sulfuric acid but Y does not react.

Y reacts with aqueous sodium hydroxide but X does not react.

Which type of oxide are X and Y?

	acidic oxide	basic oxide	metallic oxide
A	X	Y	X
B	X	Y	Y
C	Y	X	X
D	Y	X	Y

9 Five elements have proton numbers 10, 12, 14, 16 and 18.

What are the proton numbers of the three elements that form oxides?

A 10, 12 and 14

B 10, 14 and 18

C 12, 14 and 16

D 14, 16 and 18

10 Which property is **not** characteristic of a base?

A It reacts with a carbonate to form carbon dioxide.

B It reacts with an acid to form a salt.

C It reacts with an ammonium salt to form ammonia.

D It turns universal indicator paper blue.

11 Carbon dioxide is an acidic oxide that reacts with aqueous calcium hydroxide.

Which type of reaction takes place?

A decomposition

B fermentation

C neutralisation

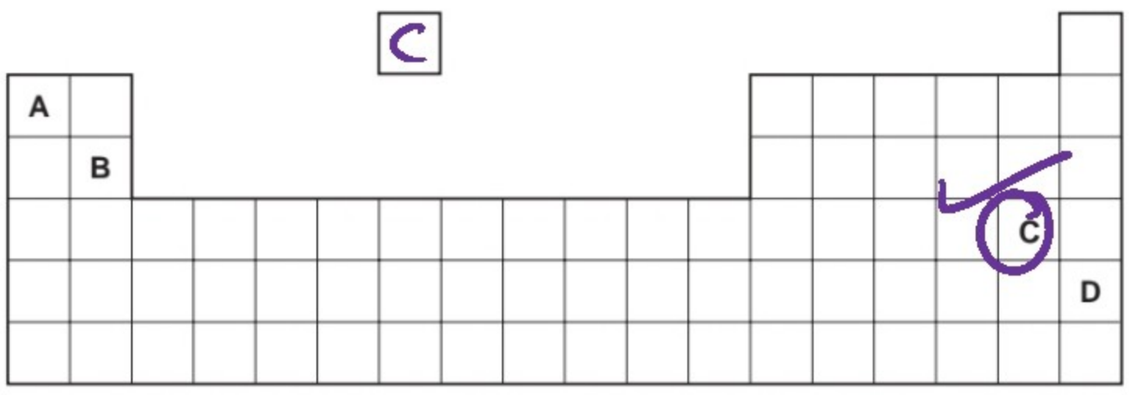
D oxidation

acid + Base → salt + H_2O

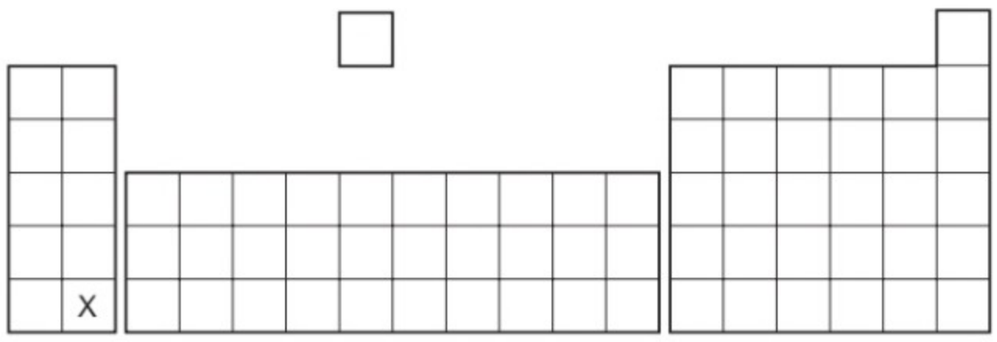
Neutralisation reaction

12 The positions in the Periodic Table of four elements are shown.

Which element is **most** likely to form an acidic oxide?



13 The diagram shows the position of an element X in the Periodic Table.



What is the correct classification of element X and its oxide?

	X	oxide of X
A	metal	acidic
B	metal	basic
C	non-metal	acidic
D	non-metal	basic

1 A method used to make copper(II) sulfate crystals is shown.

1 Place dilute sulfuric acid in a beaker.

2 Warm the acid.

3 Add copper(II) oxide until it is in excess.

4 Filter the mixture.

5 Evaporate the filtrate until crystals start to form.

6 Leave the filtrate to cool.

What are the purposes of step 3 and step 4?

	step 3	step 4
A	to ensure all of the acid has reacted	to obtain solid copper(II) sulfate
B	to ensure all of the acid has reacted	to remove excess copper(II) oxide
C	to speed up the reaction	to obtain solid copper(II) sulfate
D	to speed up the reaction	to remove excess copper(II) oxide

2 What is the correct sequence of steps for the preparation of a pure sample of copper(II) sulfate crystals from copper(II) oxide and sulfuric acid?

A dissolving → crystallisation → evaporation → filtration

B dissolving → evaporation → filtration → crystallisation

C dissolving → filtration → crystallisation → evaporation

D dissolving → filtration → evaporation → crystallisation

3 Salts can be made by adding different substances to dilute hydrochloric acid.

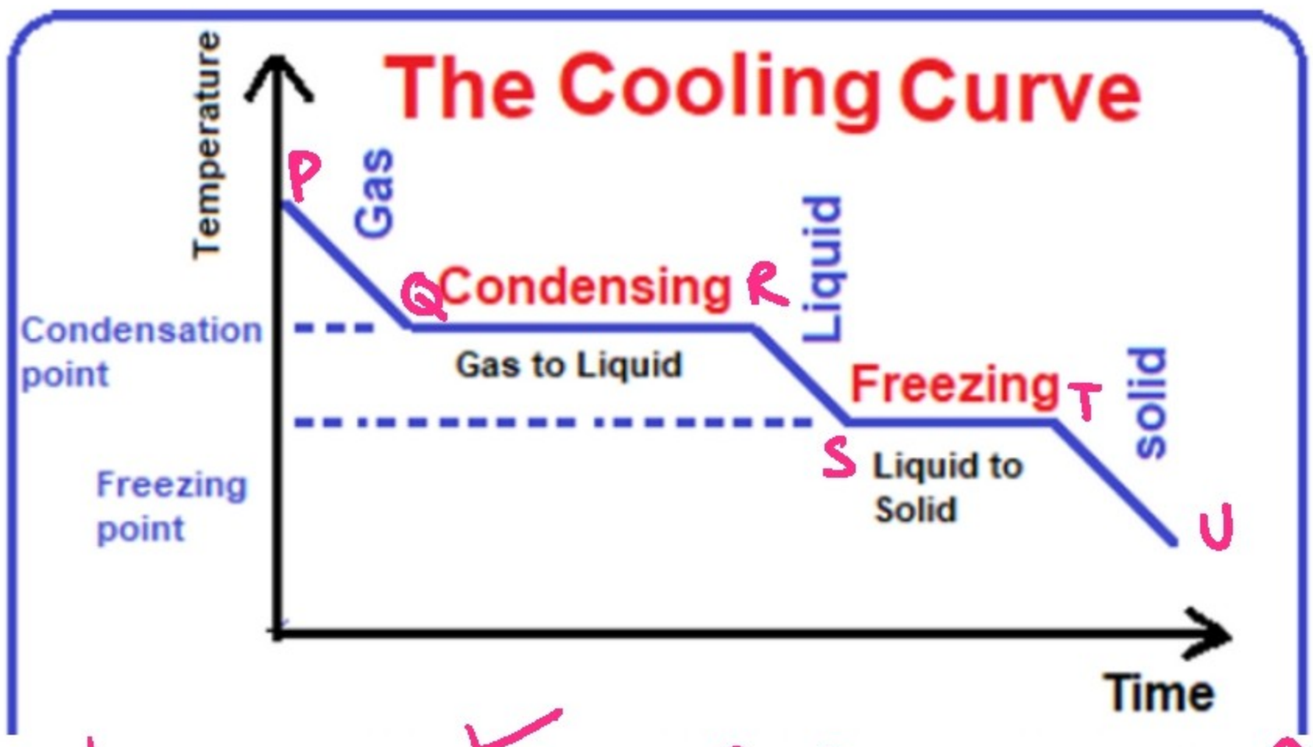
For which substance could any excess **not** be removed by filtration?

A copper(II) oxide

B magnesium

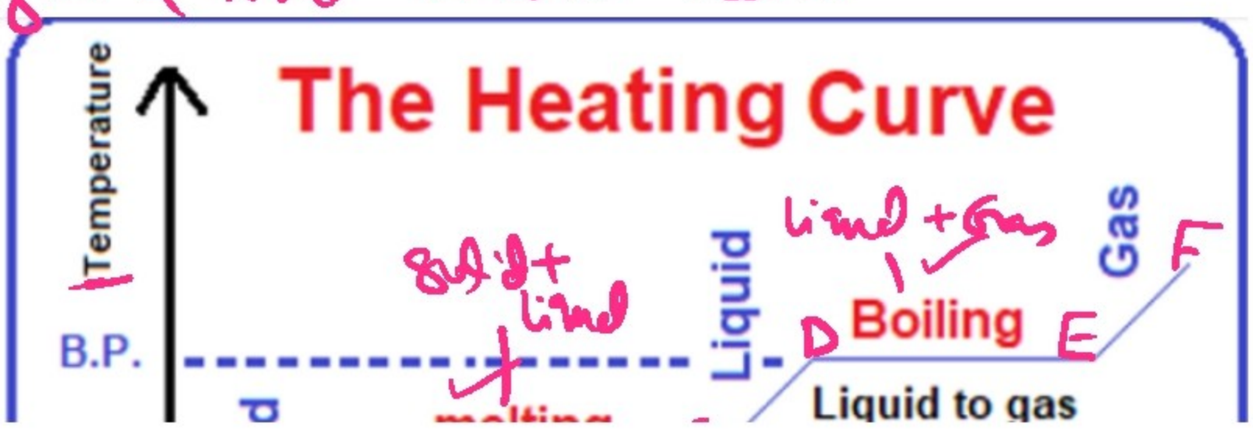
C sodium hydroxide

D zinc hydroxide

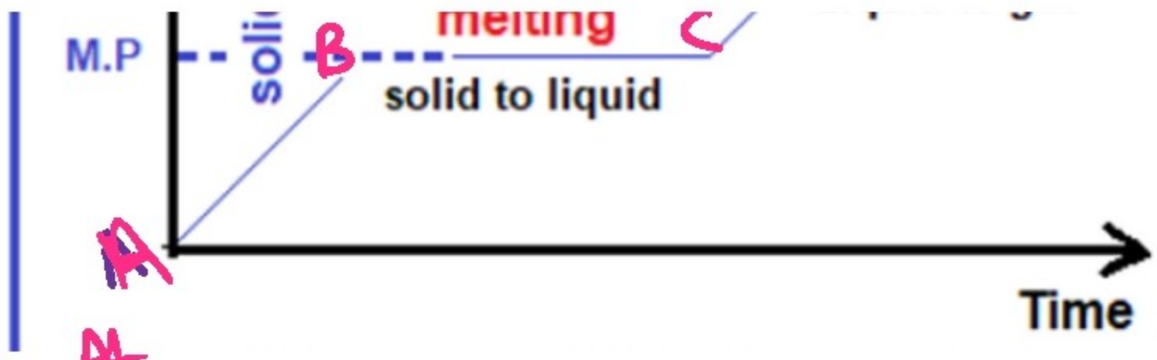


Why temp at QR and ST are constant or not decreasing?

→ At QR heat energy is released as the particles are attracted to each other to form liquid. This heat energy is completely given out to the surroundings. A mixture of solid + liquid exists here.



AB → Solid
BC → Melting (Solid + Liquid)
C → Melting Point



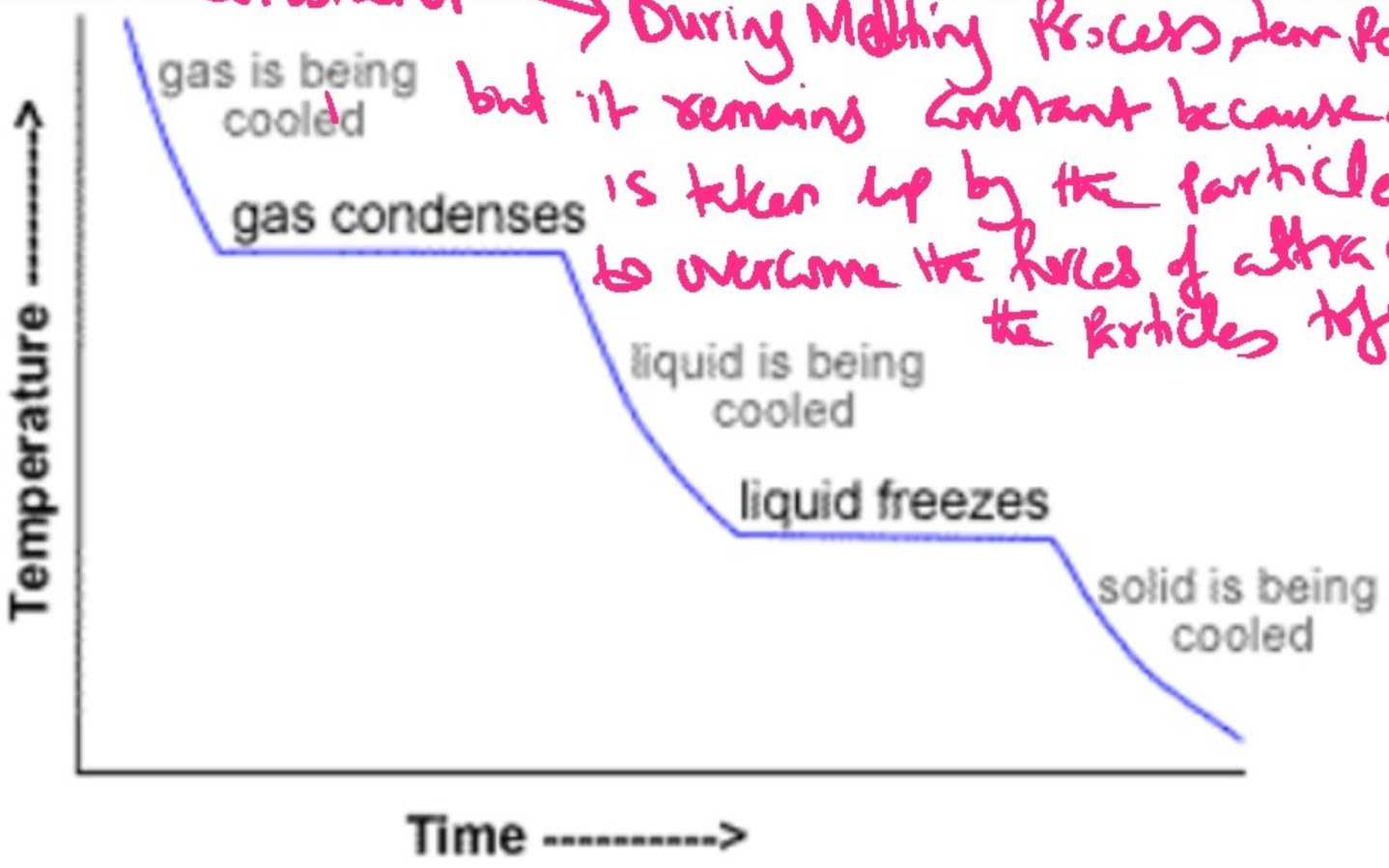
CD → Pure liquid state

DE → Boiling started (liquid + Gas)

E → Boiling Point

EF → Gas

BC, DE) At Both Points temp will be Constant → During Melting Process, temperature do not rise but it remains constant because all the heat is taken up by the particles is used to overcome the forces of attraction holding the particles together.



1) Solid

According to K.P.T, solid are closely Packed
Why solid have fixed shape and fixed volume
because particles of solid are tightly packed together by very strong forces of attraction
They cannot move freely. They just vibrate or move about their fixed position. For this reason solid has fixed shape.

→ Then cannot be compressed so solid have

Fixed volume.

Liquid — Why liquid have no fixed shape.

According to K.P.T, the force of attraction b/w the particles are weak. It means particles of liquid are not on their fixed position. They are arranged in disorderly and liquid can move by sliding over one another, thats why liquid have no fixed shape

Why liquid have a fixed volume?

Still liquid particles are closely packed, thus they cannot be compressed and thus they have fixed volume.

Gas

Why Gas have no fixed shape?

According to K.P.T, gas particles have high K.E, so they move freely and not on their fixed position so they have no fixed shape.

Why gas have no fixed volume?

because they can be compressed, as there are large spaces b/w the gas particls Applying the pressure make the particls come closer together so that easily they have no fixed volume

Diffusion — Movement of Particles from higher Concentration towards lower

Very slow in Solid

slow in liquid

fast in Gas

Diffusion depends on

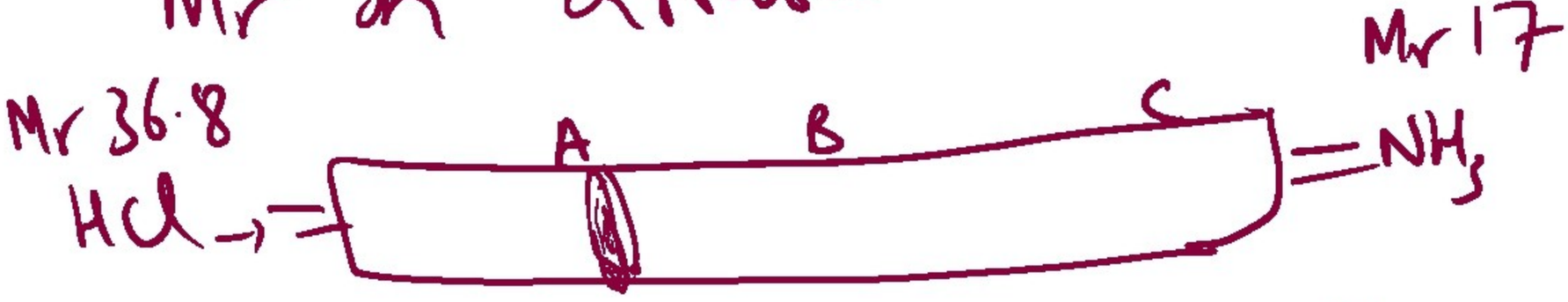
① Temp Diffusion ∝ Temp

② Molecular Mass Mr or density

$$\text{Diffusion} \propto \frac{1}{Mr}$$

$$\text{Diffusion} \propto \frac{1}{d}$$

Experiment to check the effect of Mr on diffusion



$HCl + NH_3 \longrightarrow NH_4Cl$ (white fumes)

NH_3 diffuses faster because it is lighter than HCl