

ASSEC 2023  
545/2 CHEMISTRY PAPER 2  
MARKING SCHEME

SECTION A

Q.N	CORRECT ANSWERS AND MARKS ALLOWED	SCORE
1.	<p>(a) (i). Fermentation ✓</p> <p>(ii). Fractional distillation ✓</p> <p>(iii) Difference in boiling Points. ✓</p> <p>EQUIVALENT:</p> <p>(b). Used as disinfectant ✓ and drugs. ✓</p> <ul style="list-style-type: none"> <li>• Manufacture of Perfumes and essences ✓</li> <li>• Solvent in stains and Polishes</li> <li>• Manufacture of methylated spirit.</li> </ul> <p>EQUIVALENT:</p>	<p>1</p> <p>1</p> <p>1</p> <p></p> <p>1</p> <p>1</p>
	TOTAL MARKS ALLOWED	(05)
2.	<p>(a) (i). The black solid turned brown. ✓ White powder / solid formed. ✓</p> <p>(ii). <math>\text{CuO}_{(s)} + \text{Mg}_{(s)} \rightarrow \text{Cu}_{(s)} + \text{MgO}_{(s)}</math> ✓</p> <p>(b). Magnesium being more reactive than copper, displaces copper from copper (II) oxide ✓</p>	<p>1½</p> <p>1½</p> <p>2</p>

EQUIVALENT:

TOTAL MARKS ALLOWED

(05)

3. (a). Ethene ✓

 $\frac{1}{2}$ 

EQUIVALENT

(b). Heat ✓

- Concentrated sulphuric acid to be used. ✓

 $\frac{1}{2}$ 

- Concentrated sulphuric acid to be in excess. ✓

EQUIVALENT:

(c). Bubble / Pass gas Q through bromine liquid, the red colour of bromine is turned colourless. No observable change with  $C_2H_6$ . ✓

 $\frac{1}{2}$ 

EQUIVALENT:

(d)(i). Black solid formed. ✓

 $\frac{1}{2}$ 

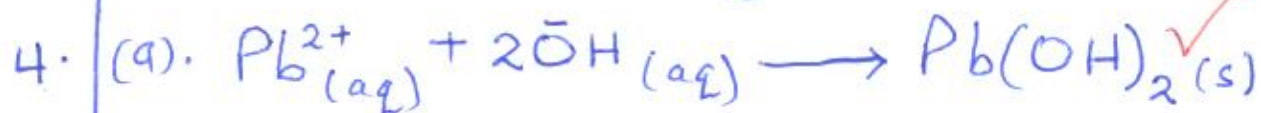
(ii). Concentrated sulphuric acid dehydrates sucrose to form carbon. ✓

1

EQUIVALENT:

TOTAL MARKS ALLOWED

(05)



(b)(i) The White Precipitate dissolves in excess sodium hydroxide solution to form a colourless solution.

(ii). Lead (II) hydroxide being amphoteric, reacts/dissolves with/in excess sodium hydroxide solution to form a soluble complex salt ion. (Plumbate ion).

(ii). Tetraamminecopper(II) ion.



EQUIVALENT:

TOTAL MARKS ALLOWED

05

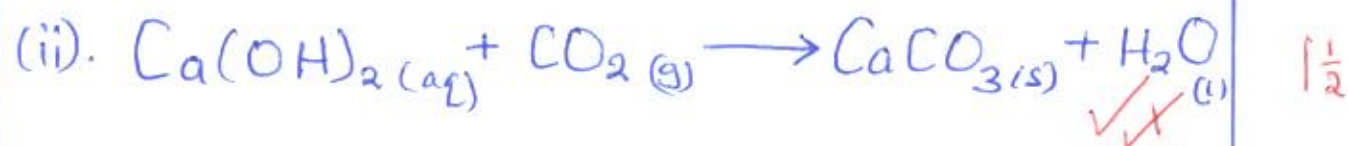
5. (a) (i). The white solid/powder turned yellow when hot and white on cooling



(b)(i). The solution of calcium hydroxide turned milky

EQUIVALENT:





(c). NO of moles of Zinc carbonate decomposed = NO of moles of ZnO formed

$$= \frac{12.5}{125} \quad \therefore \quad \text{Molar mass of ZnCO}_3 = 65 + 12 + (3 \times 16) \text{g}$$

$$= 0.1 \text{ Moles} \quad = 125 \text{g}$$

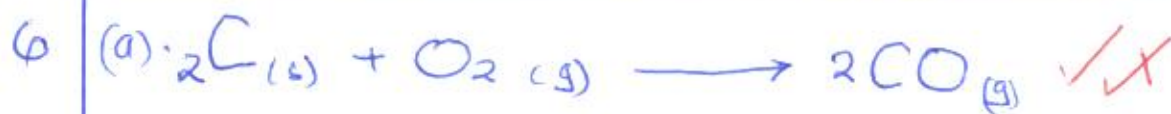
$$\text{Molar mass of ZnO} = 65 + 16 \text{g} = 81 \text{g}$$

$$\therefore \text{Mass of ZnO formed} = (0.1 \times 81) \text{g} = 8.1 \text{g}$$

EQUIVALENT:

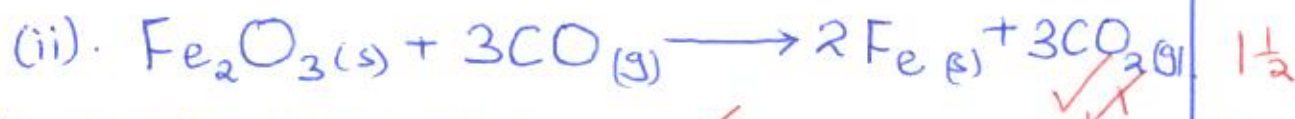
TOTAL MARKS ALLOWED

(06)



EQUIVALENT:

(b)(i) The (reddish) brown solid turned grey.



(c). Extraction of Iron.

TOTAL MARKS ALLOWED

(05)

7 (a). White Precipitate formed. ✓✓ -5-



(c). No of moles of HCl gas reacted =

$$\frac{25}{24,000} = 0.00104 \text{ moles} \quad \checkmark$$

• No of moles of  $Pb^{2+}$  reacted =  $\frac{1}{2} \times 0.00104$   
 $= 0.00052 \text{ moles} \quad \checkmark$

Molar mass of  $PbCl_2$

$$= 207 + (2 \times 35.5) \text{ g} \quad 2\frac{1}{2}$$

$$= 207 + 71$$

$$= 278 \text{ g} \quad \checkmark$$

Mass of  $PbCl_2$  formed =  $(0.00052 \times 278) \text{ g} \quad \checkmark$

$$= 0.145 \text{ g} \quad \checkmark$$

EQUIVALENT:

TOTAL MARKS ALLOWED

(05)

- 8 (a) (i). 22 ✓  
 (ii). 10 ✓  
 (iii). 8 ✓  
 (iv). 32 ✓  
 (b). (i) Z and W ✓ or W and Z  
 (ii). W and X ✓ or Z and X  
 (c) (i). 2:8 ✓ EQUIVALENT  
 (ii). 2:8:6 ✓  
 EQUIVALENT:

$\frac{1}{2}$   
 $\frac{1}{2}$   
 $\frac{1}{2}$   
 $\frac{1}{2}$   
 $\frac{1}{2}$   
 $\frac{1}{2}$   
 $\frac{1}{2}$

TOTAL MARKS ALLOWED

(04)

9. (a) (i).  $\text{OH}^-_{(aq)} + \text{H}^+_{(aq)} \longrightarrow \text{H}_2\text{O}_{(l)}$  ✓✓  
 (ii). Molar mass of NaOH =  $23 + 16 + 1 \text{ g/mol}$   
 $= 40 \text{ g/mol}$ .  
 $\therefore$  No. of moles of NaOH in  $500 \text{ cm}^3$  of solution =  $\frac{2.0}{40} = 0.05 \text{ moles}$  ✓  
 $\therefore$   $500 \text{ cm}^3$  of solution contains 0.05 moles of sodium hydroxide.  
 $1000 \text{ cm}^3$  of solution contains  $\frac{1000 \times 0.05}{500}$  ✓  
 moles of NaOH  
 $= 0.1 \text{ moles}$  ✓

 $1\frac{1}{2}$  $1\frac{1}{2}$

Volume of Sodium hydroxide used in the reaction:

$$\text{From: } \frac{\text{Volume of NaOH}}{\text{Concentration of NaOH}} = \frac{\text{Volume of HCl}}{\text{Concentration of HCl}}$$

$$\Rightarrow \frac{\text{Volume of NaOH}}{0.1} = \frac{12.5}{0.2}$$

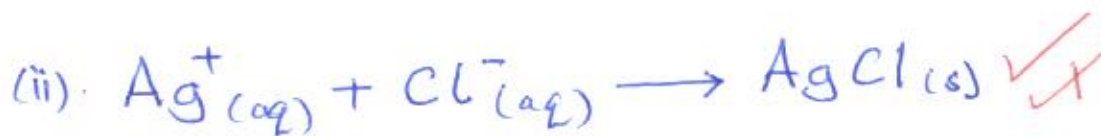
$$\text{Volume of NaOH used} = \left( \frac{0.1 \times 12.5}{0.2} \right) \text{ cm}^3$$

$$= 6.25 \text{ cm}^3$$

$$\text{Allow: } 6.3 \text{ cm}^3.$$

EQUIVALENT:

(b). (i). White Precipitate formed.



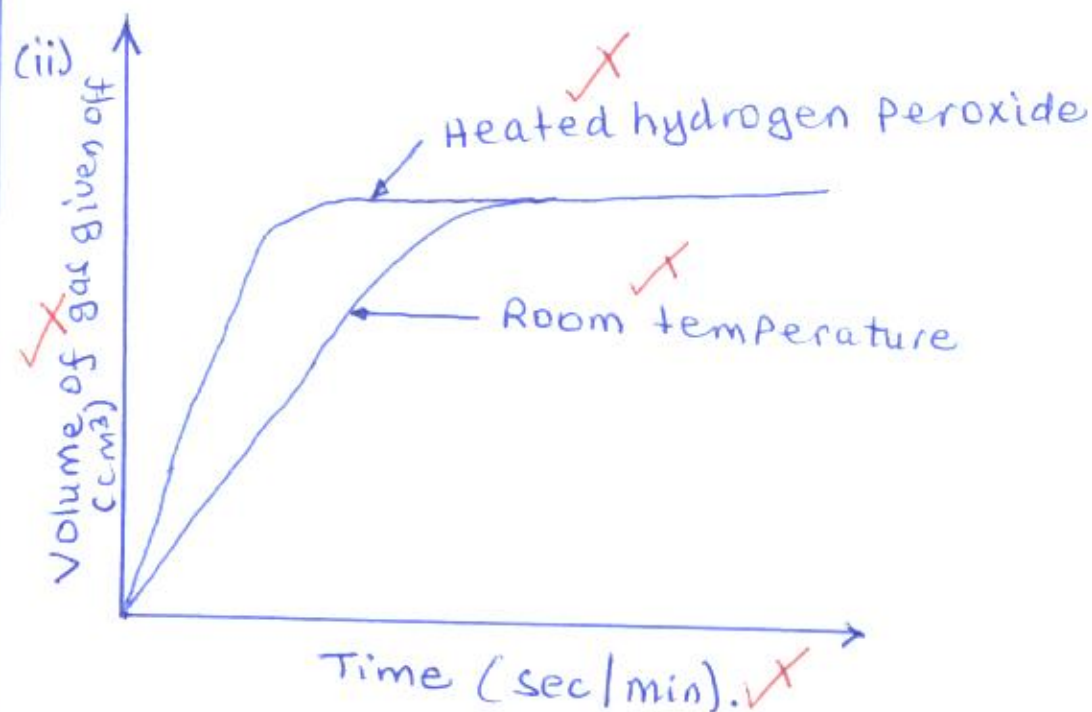
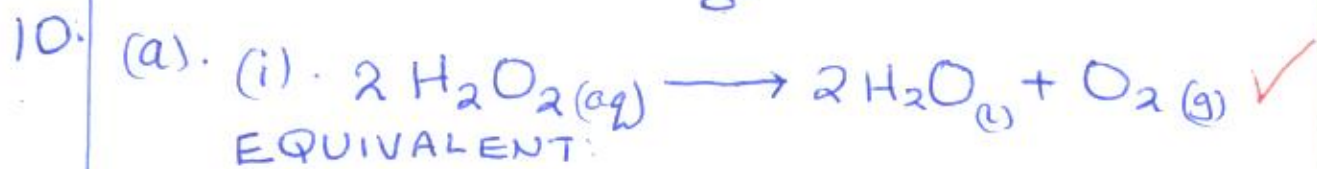
TOTAL MARKS ALLOWED

(06)

$\frac{1}{2}$

$1\frac{1}{2}$





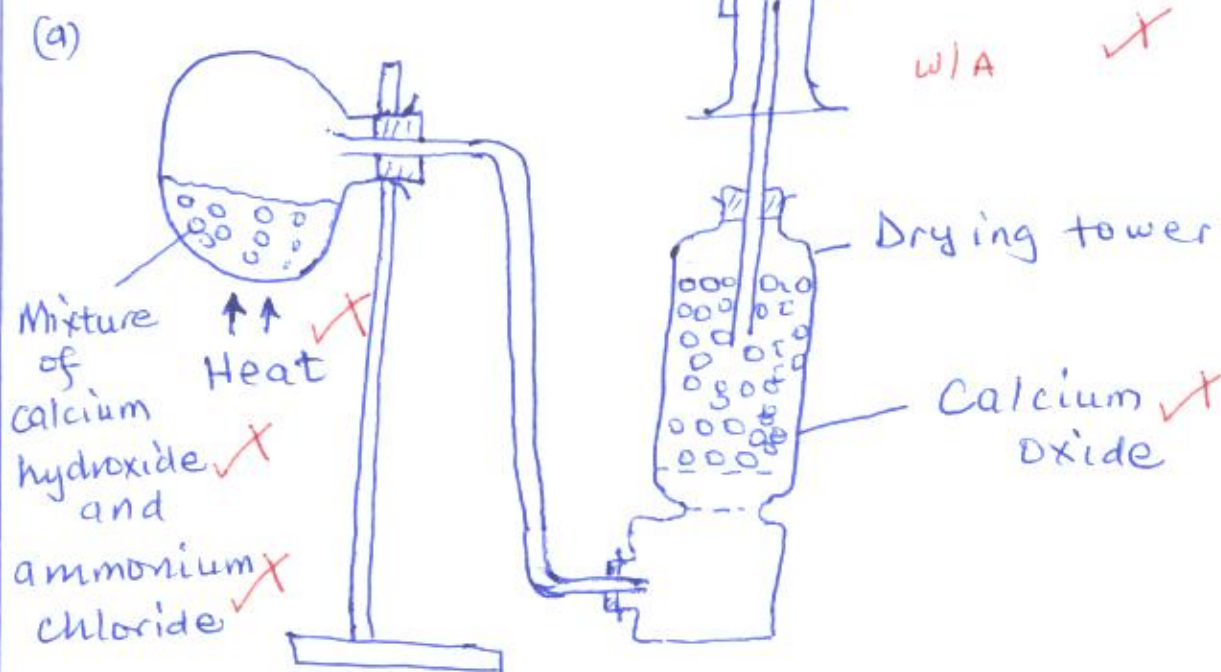
(b). Increase in temperature increases the rate of reaction. This makes the particles gain kinetic energy which increases the frequency of more energetic collisions. ✓

EQUIVALENT:

TOTAL MARKS ALLOWED

06





3

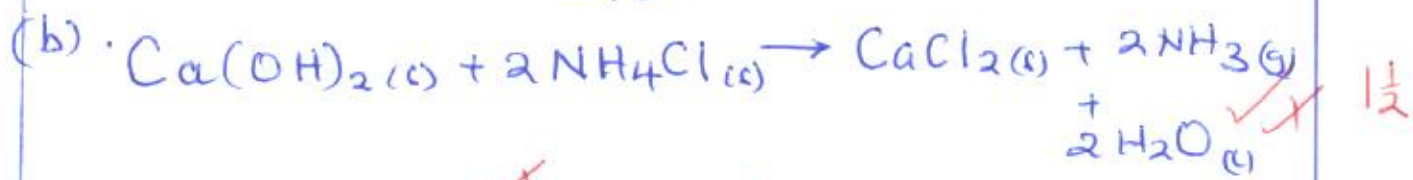
- The mixture of calcium hydroxide and ammonium chloride is ground into fine powder in order to increase the surface area for the reaction. ✓
- The mixture is then put in a round bottomed flask fitted with a rubber cork containing a delivery tube. ✓
- The mixture is then heated and ammonia gas is formed. ✓

 $\frac{1}{2}$ 

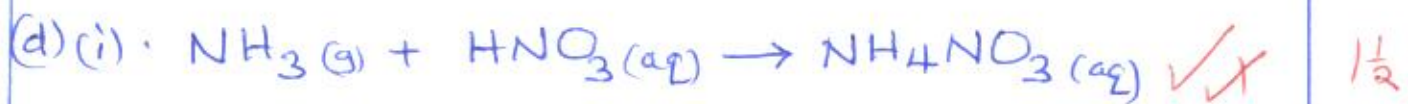
- The ammonia is then passed through a drying tower containing calcium oxide to dry the gas. ✓
- Dry ammonia is collected by upward delivery method since it is less dense than air. ✓

 $\frac{1}{2}$ 

1



(c) (i) Dense white fumes produced. ✓✓ 1



(ii) Used as fertilizer. ✓ 1

TOTAL MARKS ALLOWED

(15)

12. (a) (i) Green powder / solid turned black. A colourless gas that turned moist blue litmus paper pink evolved. ✓✓ 1½

EQUIVALENT:



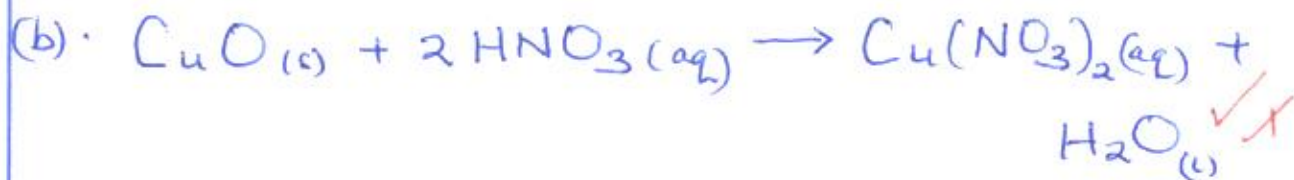
(iii) Molar mass of  $\text{CuCO}_3 = 64 + 12 + (3 \times 16)\text{g}$   
 $= (64 + 12 + 48)\text{g}$   
 $= 124\text{g}$  ✓ 1

From the equation, one mole of  $\text{CuCO}_3$  when decomposed produced 1 mole of  $\text{CO}_2$  at room temperature.

$\Rightarrow 124\text{g}$  of  $\text{CuCO}_3$  decomposed to give  $24.0\text{dm}^3$  of  $\text{CO}_2$  at r.t.p.

18.4 g of  $\text{CuCO}_3$  would decompose to give  
 $\left(\frac{18.4}{124} \times 24.0\right) \text{ dm}^3$  of  $\text{CO}_2$  at r.t.p.

EQUIVALENT:  $= 3.6 \text{ dm}^3$  of  $\text{CO}_2$  at r.t.p.



(c). A blue precipitate dissolved / soluble in excess aqueous ammonia to form a deep blue solution.

(d). (i) The calcium hydroxide solution first turned milky (or white precipitate). In excess of the gaseous product, a colourless solution formed.



(e). Hard Water.

TOTAL MARKS ALLOWED

(15)



- 13 (a). The carbon in the mixture burns completely in excess air supplied into the Blast furnace to form carbon dioxide.



- As the carbon dioxide rises up the Blast furnace, it is reduced by hot carbon to form carbon monoxide.



- The carbon monoxide formed then reduces Iron (III) oxide to Iron.



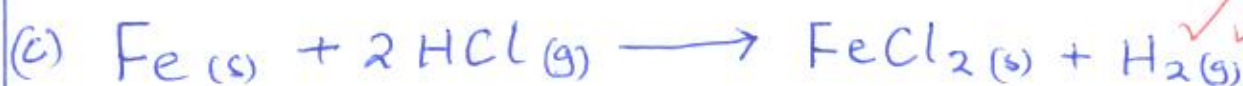
- (b). Calcium carbonate decomposes to form calcium oxide and carbon dioxide.



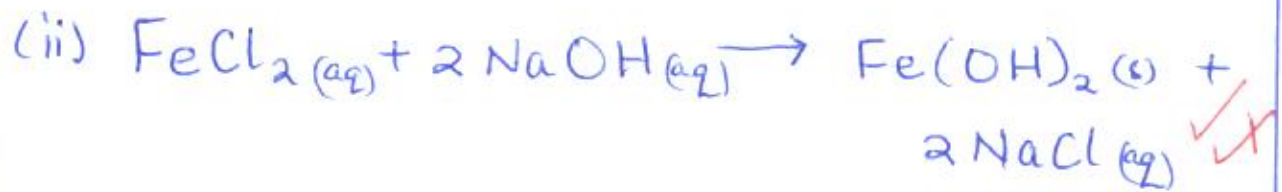
- The calcium oxide formed reacts with silicon dioxide (sand); the main impurity in the iron ore to form calcium silicate (slag).



- The calcium silicate formed floats on top of molten iron preventing it from oxidation.



(d) (i). Green Precipitate formed insoluble in excess Sodium hydroxide Solution and turned to brown Precipitate on standing for some time.



TOTAL MARKS ALLOWED

15

14. (a). Polymers are long-chain molecules of high molecular mass formed by repeatedly joining together smaller molecules called monomers.

- (b)(i).
- Cotton - making clothes / fabric / linen
  - Sisal - making thread / ropes
  - Proteins - Building and repair of body structures.

EQUIVALENT

- (ii).
- Polyethene - making packaging materials
  - Polychloroethene - making water tanks / water pipes and water gutter

- Nylon - making clothes and threads

EQUIVALENT



- (c). Synthetic polymers are non-biodegradable.  
• They cause air, water and soil pollution.

- (d). Natural rubber latex is mixed with sulphur and heated a process called Vulcanization

- During Vulcanization, sulphur atoms add across the double bonds in the rubber latex forming a cross-linked carbon-sulphur covalent bonds.

- (e) (i). Introducing toxic / harmful substances into water making it unsafe for use.

EQUIVALENT:

- (ii).  
• Sewage disposal in water  
• Oil spillage on water  
• Disposal of fertilizers in water.

EQUIVALENT

TOTAL MARKS ALLOWED

15