

K.C.S.E 2008 CHEMISTRY PAPER 1

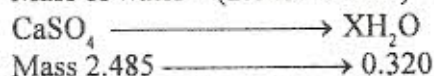
MARKING SCHEME

- Crystal dissolves, purple colour spreads in the water
 - The crystal break into smaller particles of potassium manganate (VII) which moves in all directions. Crystals dissolve through diffusion. Purple colour of KM spread uniformly throughout the water. KMnO_4 diffused from the area of high concentration.

- Mass of hydrated salt = $(33.111 - 30.296) = 2.815\text{g}$
 Mass of anhydrous salt = $(32.781 - 30.296) = 2.485\text{g}$

$$\begin{array}{r} \text{E.F. of } \text{CaSO}_4 \quad 33.111\text{g} \\ - \quad 32.781\text{g} \\ \hline 0.330\text{g} \end{array}$$

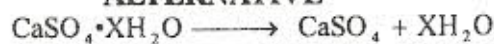
Mass of water = $(2.815 - 2.485) = 0.330\text{g}$



Moles $2.485 = 0.0183 \longrightarrow \frac{0.330}{18} = 0.0183$

Ration $\frac{0.0183}{0.0183} = \frac{0.0183}{0.0183} = 1$

ALTERNATIVE



$$\begin{array}{r} \frac{2.815\text{g}}{\text{CaSO}_4 \cdot \text{XH}_2\text{O}} = \frac{2.485\text{g}}{136} \\ = \frac{2.815}{2.485} \times 136 = 154 \end{array}$$

$$\text{CaSO}_4 \cdot \text{XH}_2\text{O} = 154$$

$$136 + 18X = 154$$

$$18X = 154 - 136 = 18$$

$$X = \frac{18}{18} = 1$$

3.	No	Gas	Test	Observation
	I	Chlorine		The red litmus paper turns white/the litmus paper is bleached.
	II	Acidified must be there	Put a filter paper dipped in acidified potassium dichromate(VI) into the gas.	
	III			The bromine water is decolourised

- a) $\text{C}_{13}\text{H}_{27}\text{COO}-\text{Na}^+$ Regardless of charges i.e. $\text{C}_{13}\text{H}_{27}\text{COONa}$
 b) Soapy detergent/Soaps
 c) $(\text{C}_{13}\text{H}_{27}\text{COO})_2 \text{Ca}$

- RFM of $\text{Ca}_3(\text{PO}_4)_2$

$$\begin{array}{rcl} \text{Ca} & = & 40 \times 3 = 120 \\ \text{P} & = & 31 \times 2 = 62 \\ \text{O} & = & 16 \times 8 = 128 \\ \hline & & 310 \end{array}$$

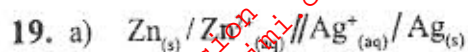
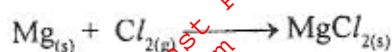
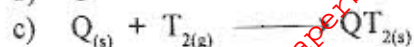
$$\begin{array}{rcl} \text{H} & = & 1 \times 3 = 3 \\ \text{P} & = & 31 \times 1 = 31 \\ \text{O} & = & 16 \times 4 = \frac{64}{98} \end{array}$$

1 mole $\text{CO}_3(\text{PO}_4)_2$ gives 2 moles of H_3PO_4
 310g $\text{CO}_3(\text{PO}_4)_2$ gives $2 \times 98\text{g}$
 $155 \times 100\text{g } \text{CO}_3(\text{PO}_4)_2$ gives $\frac{2 \times 98 \times 155 \times 100}{310}$
 $= 98000\text{g}$
 $= 98\text{kg}$

6. Propanol Propan-1-ol
Butanoic acid
Are elements with the same atomic number but different mass number.
Are different elements with the same atomic number but different mass number.
7. a) Atoms of the same element having different masses or atoms of the same element having different number of neutrons.
b) $18 - 8 = 10$ neutrons
8. a) A black solid
b) $\text{FeS}_{(s)} + 2\text{HCl}_{(aq)} \longrightarrow \text{FeCl}_{2(aq)} + \text{H}_2\text{S}_{(g)}$
c) The powder has a larger surface area than the iron fillings hence the reaction is faster.
9. $\text{Zn}_{(s)} + \text{H}_2\text{SO}_{4(aq)} \longrightarrow \text{ZnSO}_{4(aq)} + \text{H}_{2(g)}$
 $\text{Zn}_{(s)} + 2\text{H}_2\text{SO}_{4(l)} \longrightarrow \text{ZnSO}_{4(aq)} + \text{SO}_{2(g)} + 2\text{H}_2\text{O}_{(l)}$
10. Magnesium burns in air to form MgO and Mg_3N_2 , Mg_3N_2 reacts with water to liberate ammonia gas
 $\text{Mg}_3\text{N}_{2(s)} + 6\text{H}_2\text{O}_{(l)} \longrightarrow 2\text{NH}_{3(g)} + 3\text{Mg}(\text{OH})_{2(aq)}$
11. a) Ionic /electrovalent
b) Has 7 electrons in its outermost energy level and hence easily gains an electron to complete the octet or it is most electronegative.
12. a) Oxygen; O_2
b) The pH decreases
 HOCl decomposes to give more HCl in the mixture
 $2\text{HOCl}_{(aq)} \longrightarrow 2\text{HCl}_{(aq)} + \text{O}_{2(g)}$
13. Pass product E over anhydrous copper (II) sulphate which turns from white to blue or use anhydrous cobalt chloride which turns from blue to pink.
14. a) H
b) A_1 using baseline
15. J – The solubility of the substance decreases with increase with temperature.
It dissolves more in cold water than in hot water.
16. - Heat the metal in air to form the oxide CuO .
- Add excess dilute HCl to the oxide to get CuCl_2 .
- Concentrate the filtrate and leave to crystallize.
- Filter and dry the crystals at room temperature between pieces of filter paper.
- Add excess Cu to nitric acid (dilute concentrate) $\text{K}_2\text{CO}_3/\text{NH}_4(\text{CO}_3)$.
- Filter to remove unreacted copper. Add Na_2CO_3 to the filtrate to ppt CuCO_3 filter and add dilute HCl to residue to obtain CuCl_2 .
- Add nitric acid to obtain $\text{Cu}(\text{NO}_3)_2$. Filter to remove excess Cu .
- Add NaOH .
17. a) Amphoteric
b) lead (II), Zinc and Aluminium (any two)

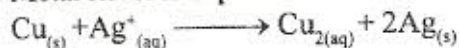
18. a) Position of silicon

b) U



The solution changes to blue because Cu metal is corroded and dissolves to form Cu^{2+} .

Metal silver is deposited on the sides of beaker B. CO_3 silver is deposited on the sides of beaker



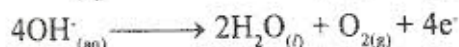
20. a) At constant temperature and pressure, the rate of diffusion of a gas is inversely proportional to the square root of its density.

b) $\sqrt{\frac{RW}{RX}} = \sqrt{\frac{RMMX}{MMWE}} = \sqrt{\frac{44}{16}}$

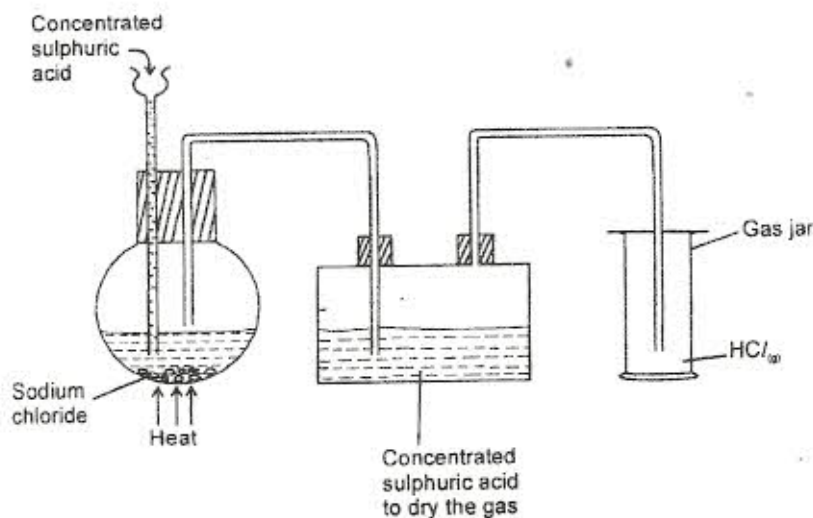
$$\frac{12.0}{RX} = \frac{\sqrt{44}}{4} ; \frac{12.0 \times 4}{\sqrt{44}} = \frac{48}{6.63}$$

$$= 7.24 \text{ cm}$$

21. a) Cu^{2+} moving towards the cathode



22.



23. The brown colour of the mixture intensifies/increases and the green colour of the mixture fades/decreases or the yellow deposit/sulphur decreases.

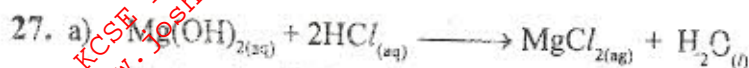
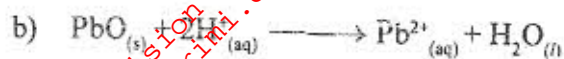
Iron (II) is converted to Fe^{3+}



- b. i) $Z_1 = 235$ $Z_2 = 54$
 ii) Nuclear fission (accept fission)

25. a) cooling
b) latent heat of fusion

26. a) I Pb^{2+}
II CO_3^{2-}



Mole ratio (1:2)
No of moles of acid = $\frac{0.1 \times 23}{1000} = 0.0023$

No of moles of $\text{Mg}(\text{OH})_2 = \frac{\frac{1}{2} \times 0.1 \times 23}{1000} = 0.00115$

Mass of $\text{Mg}(\text{OH})_2$ in anti acid = $0.00115 \times 58 = 0.067\text{g}$

- b) % of $\text{Mg}(\text{OH})_2$ in anti-acid

$\text{Mg}(\text{OH})_2 = \frac{0.67 \times 100}{0.50} = 13.34\%$

28. a) i) Cryolite
ii) Electrolysis

- b) - Good conductor does not rust
- Malleable
- Light
- High m.p
- Does not corrode easily

29. a) Gas syringe/ graduated gas cylinder measuring cylinder.

- b) i) The molecules of the reactants have higher energy marking points.
ii) The reaction is faster / are more effective collisions.

30. It burns to form SO_2/SO_3 which is a pollutant.

Accept any other effect e.g. acid rain, corrosion of buildings, irritation of respiratory systems, yellowing of leaves of plants.

31. a) Neutralization

- b) i) Calcium hydrogen carbonate
ii) drying agent
Extraction of sodium metal