4.6 CHEMISTRY (233)

4.6.1 Chemistry Paper 1 (233/1)

1. (a) X is water. √(1) or H_2O

   (b) It is slightly soluble in water. √(1) and denser than air.

   (c)
   - Used in hospitals to resuscitate patients. √(½)
   - Used in welding when mixed with acetylene in the ocy-acetylene flame. √(½)
   - Used by divers and mountaineers.
   - Rocket fuel, hospitals for breathing, steel making.

2. (a) $2NaHCO_{3(s)} \xrightarrow{heat} Na_2CO_{3(s)} + CO_{2(g)} + H_2O_{(g)}$ √(1)

   (b) $2AgNO_{3(s)} \rightarrow Ag_{(s)} + 2NO_{2(g)} + O_{2(g)}$ √(1)

   (c) $2FeSO_{4(s)} \rightarrow Fe_2O_{3(s)} + SO_{2(g)} + SO_{3(g)}$ √(1)

3.
- Crush the seeds in a mortar √(½)using a pestle.
- Add a suitable solvent (acetone / propanone √(½)).
- Filter out the solid matter.√(½)
- Evaporate the filterate to obtain oil. √(½)

4. (a) Aluminium has a stronger metallic √(1) bond because it has more delocalised electrons than sodium. √(½)

   (b) Sulphur has a ringed structure of S_8 √(1) molecules whiles chlorine is diatomic. The forces in sulphur are stronger than chlorine. √(½)

5. (a) It does not sublime. √(1)

   (b) Cut a piece of Sodium √(½) metal, place it on a deflagrating spoon, heat it briefly √(½) then lower it √(½) into a gas jar of chlorine . It will continue burning forming Sodium Chloride. √(½)

6. (a) $Cu^{2+}_{(aq)} + 2e \rightarrow Cu_{(s)}$ √(1)

   (b) 63.5 g require 2 x 96500 C

   $$1.184g = \frac{2 \times 96500 \times 1.184}{63.5}$$

   3598.6 coulombs √(1)

   $Q = 1t$

   $3586.5 = 2 \times t$

   $\frac{3586.5}{2} = t$

   1799.3 s = t √(½)

   $\frac{1799.2}{60} = 29.988$

   ≃ 30 minutes √(½)

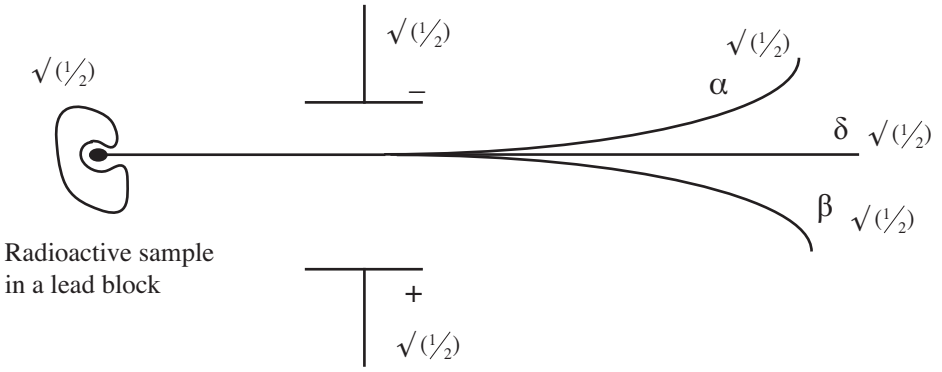
7. (a) (i) X - Calcium carbide √(1) or CaC_2

(ii) Y - $CH_2 = CHCl$ Chloroethene √(1) or vinylchloride

(b)
- Floor tiles √(½)
- Rain coats √(½)
- Plastic bags √(½)

} Any 2

8.



Working diagram, α should be deflected less than β because of its heavier mass.

(Accept any other working diagram)

9. In water, HCl is ionised √(½)into H^+ and Cl^- the Chloride ions are oxidised to chlorine gas by potassium permanganete. √(½)

In methylbenzene, HCl remains in molecular √(½)form i.e HCl. The Chloride is not available for oxidation hence no reaction. √(½)

10. (a) T(1)

(b) 15 g √(1)

(c) Fractional crystallization √(1)

11. (a) $N_2H_{4(g)} + O_{2(g)} \rightarrow N_{2(g)} + 2H_2O_{(g)}$ √(1)

(b) Bond breaking energy

163 + 4 (388) + 496

= 2211 kJ √(½)

Bond making energy

944 + 4 (463)

= -2796 kJ √(½)

Ethalpy change = Bond breaking + Bond making energies.

2211 + (-2796) √(1)

= -585 kJ/mol √(1)

12. (a) The acidified permanganete will be decolourised √(½). (purple to colourless)

The permanganate (VII) is reduced to manganese (II) ion. √(½)

(b) (i) A white precipitate forms. √(1)

(ii) $Ba^{2+}_{(aq)} + SO_3^{2-}{}_{(aq)} \rightarrow BaSO_{3(s)}$ √(1)

13. (a) $[Zn(NH_3)]^{2+}_4$ √(1)

(b) $Zn^{2+}_{(aq)} + Mg_{(s)} \rightarrow Zn(s) + Mg^{2+}_{(aq)}$ √(1) $ZnCl_{(2)(aq)} + Mg_{(s)} \rightarrow Zn_{(s)} + MgCl_{2(aq)}$

14. (a) Charles Law

At constant pressure, the volume of a fixed mass of gas is directly proportional to its absolute temperature. √(1)

(b)

$P_1 = 98.39$ kPa
$V_1 = 146$ dμ^3
$T_1 = 18 + 273 = 361$ K

$P_2 = 101$ kPa
$V_2 = 133$
$T_2 = ?$

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

$$T_2 = \frac{P_2V_2T_1}{P_1V_1}$$

$$T_2 = \frac{100 \times 133 \times 361}{98.39 \times 146}$$ √(1)

$$T_2 = \frac{4849313}{14364.94}$$ √(1)

$T_2 = 273.22$ K

15. (a) R and T √(1)

(b) T √(1)

16. X - Zinc granules √(1)
The gradient of the graph is less steep √(1) because there is less surface area. √(1)

17. (a) $N_{2\,(g)} + O_{2(g)} \rightarrow 2NO_{(g)}$ √(1)

(b) Because nitrogen is inert. √(1)

(c) Nitrogen (II) oxide is oxidised to Nitrogen (IV) oxide which is a pollutant. √(1)

18. (a) Water √(1)

(b) Bubbles of gas √(½) and a white ppt √(½)
CO_2. √(½) reacts to give $CaCO_3$ √(½)

19. (a) These are different forms carbon in the same physical state. √(1)

(b) The hexagonal graphite rings have weak Van der Waals forces between the layers that allow the layers to slide over each other √(1) while in diamond the atoms are held by strong Covalent bonds. √(1)

20. (a) The atomic radii increase with increase in atomic number. This is due to increase in energy levels. √(1)

(b) The group II elements have more protons than group I elements √(1) hence this increases the nuclear attraction for the outer electrons. √(1)

21. (a) Cu^{2+} √(1) or copper ions

(b) Cl^- √(1) and OH^- √(1)

22. (a) Copper pyrites √(1) chalcocite, malachite

(b) To concentrate the ore √(1)

(c) - Brass √(½)
- Batteries √(½)

23. (a) 100 - 25 = 75 cm^3 √(1)

(b) $CxHy + O_2 \rightarrow CO_2 + H_2O$

15 cm^3 75 cm^3 45 cm^3 √(1)

1 5 3

$CxHy + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$

x = 3 H = 8

C_3H_8 √(1)

24. $Ca(NO_3)_2 \rightarrow Ca^{2+} + 2NO_3^-$ √(1)

RMM of $Ca(NO)_2$ = 164 √(½)

Concentration of $Ca(NO_3)_2$ = 4.1 g/*l* √(½)

Molarity $= \frac{Conc.\ in\ g/l}{RMM}$

$= \frac{4.1}{164}$

$= 0.025M$ $\surd(\frac{1}{2})$

1 mole $Ca(NO3)2$ $\equiv$ 2 moles Nitrate
0.025 m $\equiv$ 2×0.025
0.05M $\surd(\frac{1}{2})$

25. It would remain unchanged $\surd(1)$
There is no water to form hypochlorous acid $\surd(1)$

26. When aqueous sodium chloride is added to Ca^{2+}. There is no ppt $\surd(1)$ while a white ppt is formed when aqueous sodium chloride is added to a solution containing Pb^{2+}. $\surd(1)$

27. (a) N. $\surd(1)$ being a weak acid provides few H^+ to be neutralised by OH^- hence there is a slight increase in temperature. $\surd(1)$

(b) $CH_3COOH_{(aq)} + KOH_{(aq)} \rightarrow CH_3COOK_{(aq)} + H_2O_{(l)}$ $\surd(1)$

28. (a) Experiments 1 and 3. $\surd(1)$

(b) In experiment 1, the ions in K_2CO_3 are tightly held in position and cannot move $\surd(1)$ while sugar solution does not have ions that can carry a current in solution. $\surd(1)$

29. $^{1}_{1}H$ mass 18 $\surd(1)$

$^{2}_{1}H$ mass 20 $\surd(1)$