231/1 CHEMISTRY (2017)
PAPER 1   *MARKING SCHEME*

1.   a) Cooling curve
        c)   B-C
        d)   The Kinetic energy of molecules decreases as the temperature drops.
        The molecules also move close together.
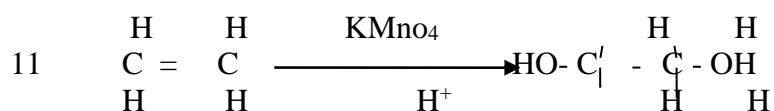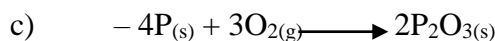
2.   a) No of mol of NaOH = MV
$$= 0.1 \times \frac{25}{1000} = 0.0025$$

b) $H_2X_{(aq)} + 2NaOH_{(aq)} \longrightarrow Na_2X_{(aq)} + 2H_2O_{(l)}$
Molarity = $\underline{\text{No of mol}}$ = $\underline{0.00125}$ = 0.06684492
                  Vol(ltr)   0.0187

3.   a) solid G – $Pb(NO_3)_2$
            b) $PbO_{(s)} + 2H(NO_3)_{2(aq)} + H_2O_{(l)}$
            c) Tetrahydroxo lead(II)ion

4. $HCl_{(g)}$ dissociate in water to form ions hence conduct electricity while in non polar solvent (methylbenzene) remain in molecular form which are covalent.

5. a)   P – Sublimation

      Q – Condensation

  b) Q is exothermic because it involves bond formation.

6. a) Refers to existence of an element in two or more structural forms in same physical state.

   b) Graphite and diamond

c) Used to remove coloured impurities from sugar.

7. a) under the same condition of temperature and pressure the rate of diffusion of gas is inversely proportional to the square root of its density.

b) $\underline{T_B} = \sqrt{} \underline{M_B}$ $\underline{T_{CO_2}} = \sqrt{} \underline{M_{CO_2}}$
   T_A $\sqrt{M_A}$ T_{O_3} $\sqrt{M_{O_3}}$

$T_{CO_2}/96 = \sqrt{44/48} = 91.91$ sec

8. a) copper pyrites
  - Copper glance
  - Malachite
  - Azurite
  - Cuprite   *NB/ any two names or chemical formulas*

b) To concentrate the copper in the ore
c) Brass is used for – to make domestic utensils, condenser tubes, sheets and catridges.

9.   O .x   S .x   O
        xx   xx
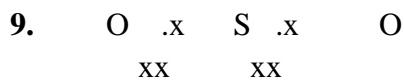
10. a) white/yellow phosphorus

   b) Does not react with water

   - reacts spontaneously with oxygen to form a mixture of oxide.

c) $- 4P_{(s)} + 3O_{2(g)} \longrightarrow 2P_2O_{3(s)}$

   $- 4P_{(s)} + 5O_{2(g)} \longrightarrow 2P_2O_{5(s)}$

11   H   H   KMno$_4$ H   H
     C = C $\longrightarrow$ HO- C$'_|$ - C$^+_|$ - OH
        H   H   H$^+$ H   H

b)   i) Alkyne

   ii) Ester

12 a) - K

   b) – J

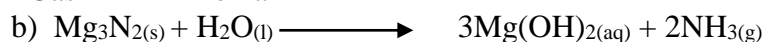13. (i)   Soapy detergent

   (ii) Sodium Chloride

   (iii) To precipitate soap

14. a) The time taken for any amount radioactive nuclides to decay to half the initial amount or number

b) No of $t_{1/2} = {}^{100}/_{25} = 4$ Amount $= 20 \times 2^4 = 320$gm

15. Residue T – Magnesium nitride

   Gas D – Ammonia
   b) $Mg_3N_{2(s)} + H_2O_{(l)} \longrightarrow 3Mg(OH)_{2(aq)} + 2NH_{3(g)}$

16.   a)   i) SO^{2-}_4 □**1**
        ii) Zn^{2+} □**1**
   b) $Pb^{2+}_{(aq)} + SO^{2-}_{4(aq)}$ □ $PbSO_{4(s)}$ □**1**

17. Rmm of $CO_2 = 12 + 2 \times 16 = 44$ □**½**
   Rmm of $NO_2 = 14 + 2 \times 16 = 46$ □**½**   □**1**

   $75cm^3 \text{ of } CO_2 \text{ takes } \frac{75 \times 15}{50} = 22.5 \text{seconds}$

   $\frac{TxSO_2}{TCO_2} = \sqrt{\frac{M_{NO_2}}{M_{CO_2}}}$

   $TNO_2 = 22.5\sqrt{\frac{46}{44}}$

   $= 23.006 \text{seconds}$
                       □**½**

18. a) i) Polyphenylenthene /polystyrene

$$\begin{array}{c} H \\ | \\ C = H \\ \hexagon_{O} \end{array}$$
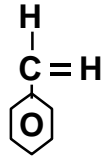
Phenylethene ☐½

b) It pollutes the environment ☐**1** / Non-biodgradable.

19. $Cu^{2+} + 2e^- \rightarrow Cu_{(S)}$ ☐**1**

1mole 2mol   1mol

$63.5g = 2 \times 96500$

$1.48g = ?$

$$= \left(\frac{1.48 \times 2 \times 96500}{63.5} \right) C$$

$I = \frac{4498.2677}{9000}$ ☐½

$= 0.499A$ 98.268 ☐½

$= 0.5A$ 14498.26

☐½

$$\left(\tfrac{1}{4} \times 16 \right) + \left(\tfrac{3}{4} \times 18 \right)$$

$$= 4 + 13.5 = 17.5$$

20. a) Magnesium would react with air in the combustion tube since nitrogen gas has not yet been produced. **1 mark**
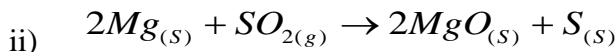
b) i) Nitrogen gas   **1 mark**

   ii) $3Mg_{(S)} + N_{2(g)} \rightarrow Mg_3N_{2(S)}$ **1 mark**
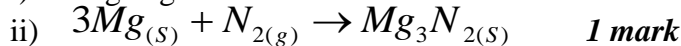
21.

a) i) A yellow powder of sulphur was deposited ☐**1**

   A white solid of magnesium oxide was formed. ☐**1**

   ☐**1**

   ii) $2Mg_{(S)} + SO_{2(g)} \rightarrow 2MgO_{(S)} + S_{(S)}$

22.

<u>Enthalpy of reactants</u> <u>Enthalpy of products</u>

$(4 \times 388) + 163 + 496$ $-944 + 2(-463)$

$=+2211$ ☐**1** $=-1870$ ☐**1**

Enthalpy change = Enthalpy of reactant + enthalpy of product

$= (+2211 - 1870)$

$= +341kJ$ ☐**1**

$CaCO_{3(S)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + H_2O_{(l)} + CO_{2(g)}$
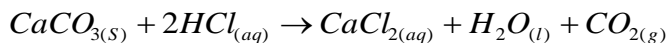
23. 5.0g   2.5cm³

Moles of HCl $= \dfrac{25 \times 1.0}{1000}$ ☐½

$I = \dfrac{4498.2677}{9000}$

$= 0.499A$

$= 0.5A$

$=- 0.025$moles

Moles of CaCO$_3$ = ½ × 0.025 ☐½

$= 0.125$ moles

0.125 moles $= x$

x $= 0.0125 \times 100$

$$= 1.25g$$

Mass of unreacted $CaCO_3 = 5.00 - 1.25$

$$= 3.75g \quad \square½$$

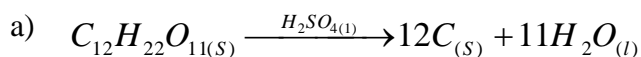24. i) Provides / form calcium oxide which removes impurities in form of slag $\square 1$

   ii) Carbon (IV) oxide $\square½$

   Carbon / coke $\square½$

   iii) Lowering temperature
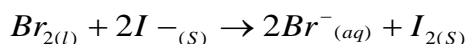
   Makes it more delicate *(any one for 1 mark)*

25.

a) $C_{12}H_{22}O_{11(S)} \xrightarrow{H_2SO_{4(1)}} 12C_{(S)} + 11H_2O_{(l)}$

b) What name is given to the type of reaction above?

   dehydration $\square 1$

c) ***2 + x - 6 = 0*** $\square½$

   x = + 4 $\square½$

   $Br_{2(l)} + 2I^-_{(S)} \rightarrow 2Br^-_{(aq)} + I_{2(S)}$

26. a)

   b) Emf = $E_{red} - E_{ox}$

   = 1.09 - 054 $\square½$

   = +0.45V $\square½$

   c) $Br_{2(l)}$

27.

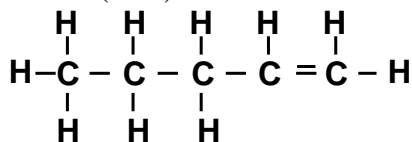|	C	H
	$\frac{85.7}{12}$	$\frac{14.3}{1}$
Moles	7.14	14.3
mole ratio	$\frac{7.14}{7.14}$	$\frac{14.3}{7.14}$

E.F. = CH_2 $\square½$

ii) $\frac{22.4dm^3}{2.24dm^3} \times 7 = 70g$

$n = \frac{70}{14}$

$= 5$

M.F. : $(CH_2)_5 = C_5H_{10}$

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     H   H   H   H   H
     |   |   |   |   |
 H—C — C — C — C = C — H
     |   |   |
     H   H   H
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28. Electroplating

   Purification of metals

   Extraction of metal *any one for 1 mark*

29. -Add excess Zinc powder to dilute nitric (v) acid solution

   - Filter and collect the filtrate

       - Dissolve the solid sodium carbonate in water, stir to form a solution

       - Add the filtrate into the sodium carbonate solution and shake

       - Filter to collect the white residue and dry it between filter paper as the zinc carbonate