KANDARA SUB- COUNTY FORM 3 JOINT EVALUATION

1. i) P - hexane ✓1
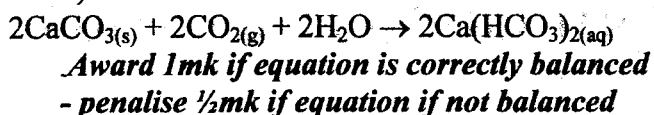   ii) W - water ✓1

2. a) It is very hot ✓1

    b) The upper ✓1 part. Because all the gases undergo complete combustion ✓1

3. a) B^+ has more energy levels than A^+ ✓1

    b) C^+ has got (12) protons pulling the 10 electrons while A^+ has 11 protons pulling 10 electrons ✓1 / C^2 has more protons than A^+ / C^{2+} has higher nuclear charge than A^+

4. a) i) - colourless liquid is seen on the cooler parts of the test tube ✓1
    - blue crystals change to a white powder ✓1
    ii) Water ✓1 which was originally water crystallization
    $$CuSO_4, 5H_2O_{(s)} \rightarrow CuSO_{4(s)} + 5H_2O_{(l)} ✓1$$

    b) $NaOH_{(s)}$ absorbs water from air to form hydrated copper (II) sulphate which is blue but no solution is formed ✓1 it is hygroscopic

5. $$Na_2CO_3 + 2HNO_{3(aq)} \rightarrow 2NaNO_{3(aq)} + CO_{2(g)} + H_2O_{(l)} ✓½$$
    Mole ratio 1 : 2 ✓½

    a) Moles of HNO_3 in $20cm^3$ = $\dfrac{20}{1000} \times 0.25$ ✓½
    = 0.005 moles ✓½

    b) Moles of Na_2CO_3 in $25cm^3$ = ½ of 0.005 moles ✓1
    = 0.0025 ✓1
    c) 0.0025 x 10 x 106 ✓½ = 2.65g ✓½

6. a) R.A.M = $\dfrac{33 \times 2 + 30 \times 1}{3}$ ✓1
    = $\dfrac{66 + 30}{3} = \dfrac{96}{3}$
    R.A.M = 32 ✓1 .
    b) Number of protons of C = 57 - 31 = 26 ✓1

7. a) A red brown solid is formed or brown solid ✓1

    b) $CuO_{(g)} + C_{(s)} \rightarrow Cu_{(s)} + CO_{(g)}$ ✓1

    c) As a fuel in water gas ✓1 / as a reducing agent in extraction of metals

8. a) - copper (II) oxide changes ✓½ from black to brown / red brown ✓½
    - a white ppt forms in the boiling tube ✓1
    b)
    $$CO_{2(g)} + Ca(OH)_{2(aq)} \rightarrow CaCO_{3(s)} + H_2O_{(l)} ✓1$$

    c) Unreacted carbon (II) oxide is poisonous / toxic / pollutant it is converted to the less harmful gas CO_2 ✓½

9. a) The rate of diffusion of a gas is inversely proportional to the square root of its density under the same conditions of temperature and pressure ✓1

    b) Rate of gas V = $\dfrac{1}{5} \times 100cm$
    $\dfrac{10 \text{ sec}}{}$
    = 2m/sec ✓½
    Rate of W = $\dfrac{10cm}{10sec}$
    = 1cm/sec ✓½
    $\dfrac{RV}{RW} = \sqrt{\dfrac{MW}{MV}}$
    $\dfrac{2}{1} = \sqrt{\dfrac{MW}{16}}$ ✓½
    = 4 = $\dfrac{MW}{16}$
    M.W = 16 x 4 = 62 ✓½

b) ✓1

$2CaCO_{3(s)} + 2CO_{2(g)} + 2H_2O \rightarrow 2Ca(HCO_3)_{2(aq)}$

Award 1mk if equation is correctly balanced
- penalise ½mk if equation if not balanced

11. a) To expel air that is the combustion tube so that oxygen in it does not react with hot copper ✓1

b) Brown ✓½ / red brown / copper metal will change to black ✓½

c) Nitrogen ✓1

12. i) They are different physical / structural forms of an element ✓1
ii) Transition temperature ✓1

13. Q - 2,3-dichloropentane ✓1
R - pent-1,3-diene ✓1

14. i) A - aluminium chloride ✓1

ii) $2Al_{(s)} + 3Cl_{2(g)} \rightarrow 2AlCl_{3(s)}$ ✓1
Penalise ½mk for wrong state symbols

iii) To absorb any incoming moisture ✓1
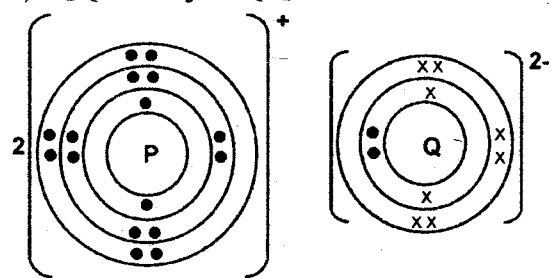
15. a) i) 11 protons ✓1
ii) 16 protons ✓1

b) Formula of compound = T_2Z
Mass number of T = 11 + 12 = 23 ✓½
Mass number of Z = 16 + 16 = 32 ✓½
Formula mass of T_2Z
= (23 x 2) + 32 = 78 ✓1

c) - When molten ✓½
- when in aqueous solution ✓½

16. a) Q ✓1
b) R ✓1

17. a) P_2Q ✓½ reject QP_2

✓1 (2 charged ions of P)
✓1 (1 charged ion of Q)

18. a) Dust particles ✓1

b) They readily solidify hence may block the pipes ✓1

c) Argon ✓1

19. i) Steam ✓1

ii) $Mg_{(s)} + H_2O_{(g)} \rightarrow MgO_{(s)} + H_{2(g)}$ ✓1
(state of steam (g))

iii) Heating should continue until delivery tube is removed from water ✓1

20. a) A is anode ✓1
B is cathode ✓1

b) Bromine gas ✓1

c) $2Br^{-1}_{(l)} - 2e^- \rightarrow Br_{2(g)}$
/ $2Br^-_{(l)} \rightarrow Br_{2(g)} + 2e^-$

21. i) Efflorescence ✓1

ii) $Na_2CO_3.10H_2O$ (if letters are joined no mark)

22. a) i) Step 2 : carbon (IV) oxide ✓1
Step 4 : dilute hydrochloric acid ✓1

ii) $Mg(HCO_3)_{2(aq)} \rightarrow MgCO_{3(s)} + H_2O_{(l)} + CO_{2(g)}$ ✓1

iii) Add sodium carbonate / any soluble carbonate (named) solution ✓1
Filter ✓½
Dry the residue between two filter papers ✓½

23. If $24000cm^3$ = 1 mole
$150cm^3$ = ?
= $\dfrac{150 \times 1}{24000}$ = 0.00625 moles of CO_2 ✓½

$Na_2CO_3.XH_2O_{(s)} + 2HCl_{(aq)} \rightarrow 2NaCl_{(aq)} + H_2O_{(l)} + CO_{2(g)} + XH_2O_{(l)}$
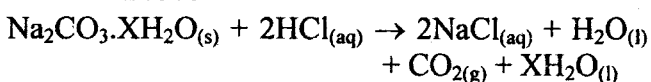
Since the ratio of $Na_2CO_3 : CO_2$ produced is 1 : 1 the mass of Na_2CO_3 = 0.00625 x 106 = 0.6625g ✓½

Na_2CO_3	H_2O
Mass 0.6625g	1.0125g
RFM 106	18
Moles $0.6625 = \underline{0.0625}$ 106	$\underline{1.0125} = 0.05625$ 18
Ratio $\underline{0.00625}$ 0.00625 $= 1$	0.05625 ✓½ 0.00625 $= 9$

$Na_2CO_3.9H_2O$

Moles of water = 9 ✓1

24. a) A - downward delivery / upward displacement of air ✓1
B - over water ✓1

25. a) i) Z ✓1
ii) Y ✓1

iii) Amphoteric ✓1

b) - aluminium oxide ✓1
- zinc oxide ✓1
- lead (II) hydroxide
- zinc hydroxide
- aluminium hydroxide
- lead (II) oxide
- aluminium oxide
any two