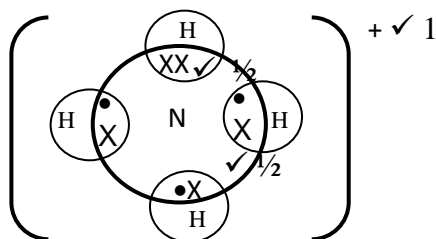


FORM 3 EXAM 2022
CHEMISTRY PAPER 233/1
MARKING SCHEME

1. I: Is impure substance: melting point is lower ✓ ½ than pure substance where as boiling point is higher than ✓ ½ of pure substance.

II. Pure substance ✓ ½; Both melting and boiling points are constant. ✓ ½

2. (a)



(b) (i) Covalent bond ✓ ½

(ii) Co-ordinate bond ✓ ½

3. (i) - He did not collect any of the ammonia gas. ✓ 1

- Ammonia gas reacts with concentrated sulphuric acid ✓ 1

(ii) $2\text{NH}_3(\text{g}) + \text{H}_2\text{SO}_4(\text{l}) \longrightarrow (\text{NH}_4)_2\text{SO}_4(\text{aq})$ ✓ 1

(iii) Anhydrous calcium oxide ✓ ½

4. (a) D and E ✓ 1

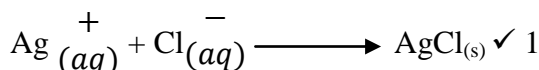
(b) B and C ✓ 1

(c) Pigment A, B, C, D and E ✓ 1

All other pigments other than F. ✓ 1

5. (a) A white solid of silver chloride was seen at the tip of the glass rod where the drop was. ✓ 1

(b) $\text{HCl}(\text{g}) + \text{AgNO}_3 \longrightarrow \text{AgCl}(\text{s}) + \text{HNO}_3$



6. (a) Isotopes; Are atoms of the same element with same number of protons but different numbers of neutrons. ✓ 1

(b) No. of neutrons.

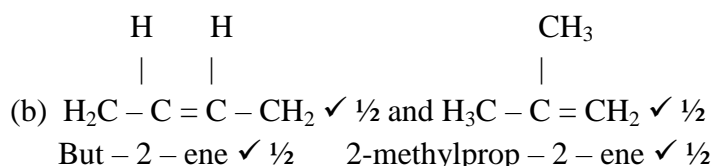
$$18 - 8 = 10 \quad \checkmark 1/2$$

7. (a) - Raises the PH of the soil. ✓ 1

- Lowers the acidity of the soil.

(b) Adds nutrients to the soil. ✓ 1

8. (a) But-1-ene ✓ 1



9. (i) $3\text{Mg}(\text{s}) + \text{N}_2(\text{g}) \longrightarrow \text{Mg}_3\text{N}_2(\text{s})$ ✓ 1

(ii) $2\text{Mg}(\text{s}) + \text{O}_2(\text{g}) \longrightarrow 2\text{MgO}(\text{s})$ ✓ 1

10. (a) Aluminium has more ✓ ½ delocalised electrons in its structure than sodium which has one per atom ✓ ½ forming a stronger metallic bond ✓ ½.

(b) Iodine has a stronger molecules due to strength of van-der – waals forces ✓ ½ increasing down ✓ ½ the group compared to chlorine with weaker ✓ ½ van – der – waals forces.

11. (a) Empirical formula.

Elements	:	Carbon	:	Hydrogen
		C	:	H
% Mass		<u>82.75</u>	:	<u>17.25</u> ✓ ½
R.A.M		12		1
Moles		6.89	:	17.5 ✓ ½
Mole ratio		<u>6.89</u>	:	<u>17.3</u>
		6.89		6.89

$$(1 : 2.5)_2 \checkmark \frac{1}{2}$$

$$\text{E.F } \text{C}_2\text{H}_5 \checkmark \frac{1}{2}$$

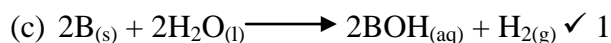
$$(b) \text{M.F} = (\text{E.F})_n$$

$$n = \frac{\text{M.F}}{\text{E.F}} \checkmark \frac{1}{2} = \frac{5.8}{2.9} = 2$$

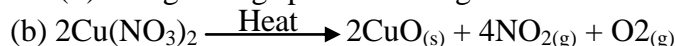
$$\text{M.F.} = \text{C}_4\text{H}_{10} \checkmark \frac{1}{2}$$

12. (a) Element C ✓ 1

$$(b) \text{A and B} \checkmark 1$$

13. (a) (i) Brown fumes of a gas (NO₂) was seen ✓ 1

(ii) The glowing splint was relighted. ✓ 1

14. (a) The gas C₂H₄ decolourised potassium ✓ 1 manganate (VII) where as C₂H₆ did not ✓ 1, but it remained purple in it.

$$(b) (i) \text{Making polythene bags.} \checkmark 1$$

(ii) Ripening of fruits.

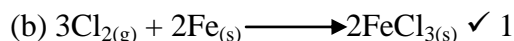
15. (i) Mass of anhydrous barium chloride formed = (40.30 – 36.12)g ✓ ½ = 4.18g ✓ ½

$$(ii) \text{Mass of water of crystallization} = (41.00 - 40.30)\text{g} \checkmark \frac{1}{2} = 0.70\text{g} \checkmark \frac{1}{2}$$

$$(iii) \text{Mass of water of crystallization contained in one mole of hydrated barium chloride} = \frac{20.8 \times 0.7}{4.18} \text{g} \checkmark \frac{1}{2}$$

$$= 34.8\text{g} \checkmark \frac{1}{2}$$

16. (a) Because the reaction is exothermic ✓ 1



17. (a) – Carbon ✓ 1

- Hydrogen ✓ 1

$$(b) \text{– Carbon (IV) Oxide} \checkmark \frac{1}{2}$$

- Water ✓ ½

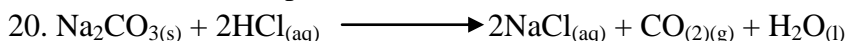
18. Aluminium chloride is made up of molecules ✓ ½ thus makes it soluble in organic solvents ✓ ½

Magnesium chloride is made up of ions ✓ ½ which makes it insoluble in organic solvents. ✓ ½

19. (a) Allotropes are different forms of the same element but in the same physical state ✓ 1

$$(b) \text{– Monoclinic sulphur} \checkmark 1$$

- Rhombic sulphur ✓ 1



5.3g

$$\text{No. of moles of Na}_2\text{CO}_3 = \frac{5.3}{106} = 0.05 \text{ moles} \checkmark \frac{1}{2}$$

Mole ratio Na₂CO₃ : CO₂

$$1 : 1 \checkmark \frac{1}{2}$$

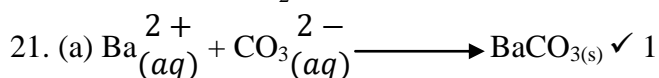
$$\Rightarrow \text{Moles of CO}_2 \text{ produced is } 0.05 \checkmark \frac{1}{2}$$

$$1 \text{ mole of CO}_2 \text{ occupies } - 22.4\text{dm}^3 \checkmark \frac{1}{2}$$

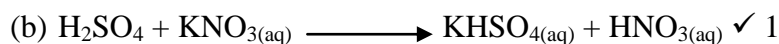
0.05 moles - ?

= 0.05 x 22.4

= 1.12dm³ of CO₂ ✓ ½



22. (a) X – Potassium Nitrate ✓ 1



(c) It is yellow because it has dissolved NO₂ gas. ✓ 1

23. (a) (i) Anode (+) – Bromine gas is produced. ✓ 1

(ii) Cathode (-) – Lead metal is deposited.

(b) – Electroplating

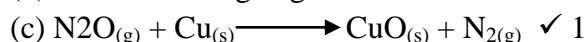
- Purification of metals

- Extraction of metals

(Any one) ✓ 1

24. (a) Brown copper metal changed to black copper (II) oxide.

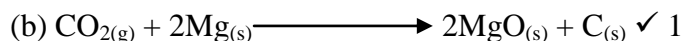
(b) Gas G – Nitrogen gas ✓ 1



25. - Hydrogen gas when ignited in oxygen is explosive. ✓ 1

- Hydrogen gas is not commonly/readily available.

26. (a) A white solid ✓ ½ of magnesium oxide and ✓ ½ black specks of carbon are seen.



27. P₁ = 1 atm P₂ = 2atm

V₁ = 200cm³ V₂ = ?

T₁ = 293k ✓ ½ T₂ = 313k ✓ ½

Combined Gas Law

$$V_2 = \frac{P_1 V_1}{T_1} = \frac{P_1 V_1 T_2}{T_1 P_2}$$

$$= \frac{1 \times 200 \times 313}{293 \times 2} \checkmark 1$$

$$= 106.826\text{cm}^3 \checkmark 1$$

28. (a) (i) X : 2,8,3 ✓ 1

Y: 2,6 ✓ 1

NB: Use commas not dots.

(b) W₂Y ✓ 1

(c) In molten or aqueous state. ✓ 1

29. (a) - Pipette for measuring and transferring fixed volumes. ✓ ½

- Measuring cylinder to measure approximate volumes of liquids ✓ ½

(b) - Round-bottomed: Used where heating is required. ✓ ½

- Flat-bottomed flask used where no heating is required. ✓ ½