CHEMISTRY PAPER 1

ANSWERS

KCSE 2011

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Chemistry Paper 1 (233/1)

1. (a) Fermentation. (1 mark)

   (b) Ethane remains in molecular form while ethanol forms hydrogen bonds with water. (2 marks)

2. (a) $^{0}_{-1}e$ (1 mark)

   (b) $50g \longrightarrow 25g \longrightarrow 12.5g \longrightarrow 6.25 \longrightarrow 3.125 \longrightarrow 1.5625g$. (1 mark)

   (c) Instant death, or gene mutation, induce cancer. √ (1 mark)

3. • Heat the mixture to sublime the ammonium chloride. √ (1 mark)

   • Add water to dissolve the sodium chloride √½; copper (ii) oxide does not dissolve (1 mark)

   • Filter √½ and evaporate the filtrate to obtain sodium chloride. √½ (1 mark)

4. (a) • Oxygen is used up. ½

5. (a) • 2.8 (1 mark)

   (b) $3V + Q_2 \longrightarrow V_3Q_2$ (1 mark)

   OR

   $3Mg + N_2 \longrightarrow Mg_3N_2$

   (c) T has a lower ionisation energy than M. √½
   T has an extra energy level and hence electrons is less attracted by the positive nuc (1 mark)

6. $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ √½

   $V_2 = \frac{P_1V_1}{T_1} \times \frac{T_2}{P_2} = \frac{98,658.5 \times 150 \times 273}{293 \times 101,325}$ √1

   $V_2 = 0.136\ dm^3$ √½ (2 mark)

7. (a) $2Pb(NO_3)_2 \longrightarrow 2PbO + 4NO_2 + O_2$ (1 mark)
   (s) (s) (g) (g)

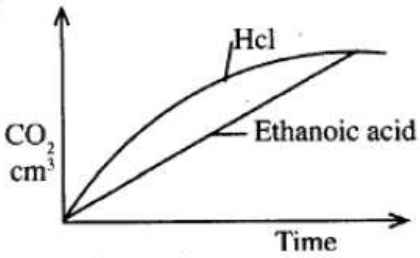
(b) Moles of brown gas (NO_2) $= \frac{0.29}{24} = 0.012$ √½

Moles of lead (II) nitrate $= \frac{1}{2} \times \frac{0.29}{24} = 0.006$ √½ (2 marks)

Mass of lead (II) nitrate $= 0.006 \times 331$ √½
$= 1.9998$ g √½

8. (a) Strong acid ionises fully. (1 mark)

(b)



(2 marks)

9. (a) Hydrogen is expensive.
Hydrogen is explosive. (2 marks)

10. (a)
- Green colour of chlorine disappears.
- Brown gas is produced or black solid is deposited. (1 mark)

(b) $Cl_2 + I^- \longrightarrow 2Cl^- + I$ (1 mark)
(g) (aq) (aq) (s)

Explanation: Iodine oxidation state changes from -1 to 0 hence oxidation while chlorine oxidation state changes from 0 to -1 hence reduction. (1 mark)

11. (a) Carbon (II) oxide is formed in the internal combustion engines when fuel burns under limited oxygen. (1 mark)

(b) Pollutant gas - Carbon (IV) oxide, Nitrogen (IV) oxide and Sulphur (IV) oxide.
(Any two) (2 marks)

12. (a)
- Small piece of sodium metal (pea size) with alot of water.
- Perform the experiment wearing goggles. (1 mark)

(b) Electrolysis. (1 mark)

(c) Manufacture of soap. (1 mark)

13. Deliquescent substance absorbs water from the atmosphere to form a solution, while a fluorescent substance loses water of crystallisation to the atmosphere. (2 marks)

14. P is in alkanol R - OH. The alkanol reacts with sodium metal to produce the colourless gas.
(2 marks)

15. (a) $Ca\ (st)_2$ or $Mg\ (st)_2$ (1 mark)

$Ca^{2+}_{(aq)} + CO_3^{2-}_{(aq)} \longrightarrow CaCO_{3\ (s)}$ (1 mark)

OR

$Mg^{2+}\ CO_3^{2-} \longrightarrow Mg\ CO_{3\ (s)}$

16. By adding Conc. H_2SO_4 as a catalyst. (1 mark)

17. (a) (i) Black solid is deposited. (1 mark)

(ii) The indicator turns red. (1 mark)

(b) The experiment should be done in fume chamber or in open air. (1 mark)

18. (a) Cold ½ and dilute sodium hydroxide. ½ (1 mark)

(b)
- Used in sterilising of water. (1)
- Used as a bleaching agent. (1)

(2 marks)

19. Plot A

Percentage of Nitrogen in $(NH_4)_2\ SO_4$

$= \frac{21}{132} \times 100 = 21.2\%$

Amount Nitrogen in 50 kg $(NH_4)_2\ SO_4 = \frac{21.2}{100} \times 50$

$= 10.6\ kg\ \sqrt{}½$

Plot B

Percentage of Nitrogen in urea $= \frac{28}{60} \times 100 = 46.7\%$ ½

The amount of Nitrogen in 30 kg $= \frac{46.7}{100} \times 30$

$= 14.01\ kg\ \sqrt{}½$

∴ Plot B $\sqrt{}½$ is more enriched with nitrgen since if has higher amount of nitrogen than plot A $\sqrt{}½$.

(3 marks)

20.
- Add water $\sqrt{}½$ to dissolve the anti-acid powder.
- Add universal $\sqrt{}½$ indicator and match the colour of solution with pH chart $\sqrt{}½$ and read the value $\sqrt{}½$

(2 marks)

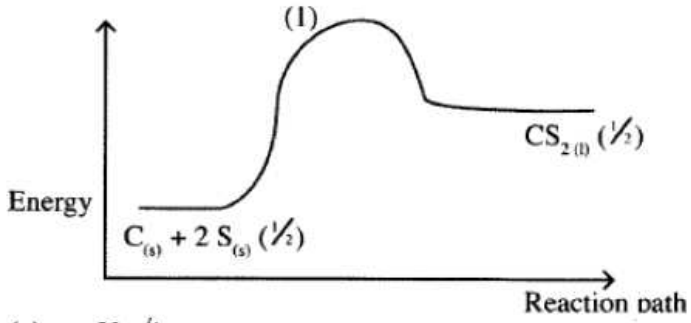
21. (a) Sulphur or phosphorus. (1 mark)

(b) Carbon atoms in graphite are arranged in layers of hexagons which are held by weak van der waal forces. The layers slide over each other when some force is applied on them; hence suitable in making pencil leads. (3 marks)

22. (a)
- Bromine
- At room temperature (25°C), Bromine is liquid since its MP and bP is between -7 and 59.

(b)
- Atomic mass of iodine is higher than that of chlorine.
- Van der waal's forces are stronger in iodine than chlorine hence iodine's bP is higher than that of chlorine. (3 marks)

23.



(2 marks)

24. (a) Y

(b) Y and Z
They have the same number of protons (8) but different atomic masses. (3 marks)

25. (a) When gases combine together at constant temperature and pressure they do so in volumes which bear a simple ratio to each other, and to the volumes of the products if gaseous.

(b) $C_2H_x + 3O_2 \longrightarrow 2CO_2 + 2H_2O_{(g)}$

Vol. 10 : 30 20 20

Mole ratio 1 : 3 2 2

$\therefore X = 4$ (3 marks)

26. (a) (i) Mass of oxygen = 10.400 - 10.352 = 0.048 g

(ii) Mass of M powder = 10.352 - 10.24 = 0.118 g

	M	O
Mole ratio	$\frac{0.112}{56}$	$\frac{0.48}{16}$
	0.0020	0.0030 (1)
Simplest ratio	2	3

Empirical formula M_2O_3 (1) (3 marks)

27. (a) Zinc blende or calamite √1

(b) $ZnO_{(s)} + C_{(s)} \longrightarrow Zn_{(s)} + CO_{(g)}$ √1

(c) Use of Zinc metal:
- dry cells; √½
- galvanising iron sheet. √½
- as electrodes. (3 marks)

28. (a)
- Single covalent bonding √½
- Dative (coordinate) bonding √½ (2 marks)

(b) 7 bonds x 2 = 14 electrons.√1

29. (a) Mg metals have mobile delocalised electrons which carry the current √1

(b) Molten magnesium chloride has Mg^{2+} and Cl^- ions which are free to move √1 (2 marks)

30. Add aqueous ammonia to fill √½ in excess.
A formation of white precipitate which dissolves in excess shows presence of zinc ions. ½

√1

Add aqeous actified Barium Nitrate (3 marks)

Formation of a white precipitate shows

Presence of sulphate ions

31. Alkaline earth metals. (1 mark)