2009 KCSE CHEMISTRY PAPER 1 MARKING SCHEME

1. (a) Energy required to remove 1 mole of electrons from 1 mole of gaseous atoms ✓ (1 mark)

   (b) B ✓
   It loses electrons most readily ✓ (2 marks)

2. (a) $Ca(HCO_3)_2 \rightarrow CaCO_{3(s)} + H_2O_{(l)} + CO_{2(g)}$ ✓ (1 mark)
   $Mg(HCO_3)_2$

   (b) Sodium carbonate ✓
   Calcium hydroxide ✓
   $NH_4OH_{(aq)}$
   Accept correct formulae

   $NaAlSiO_2$
   Sodium permutit
   (2 marks)

3. (i) 2.8.8 ✓

   (ii) 2.8.2 ✓ (2 marks)

4. (a) Water ✓

   (b) The second /other product of burning candle is carbon (IV) oxide ✓. It can be prevented from getting into the environment by passing it through a hydroxide solution /alkaline solution e.g. KOH, NaOH or aqueous ammonia ✓ (3 marks)

5. Oxygen exists as diatomic molecules ✓½
   The forces of attraction between the molecules are very weak ✓½ therefore less energy is required to separate them ✓½
   Atoms in sodium are held by strong metallic bonds . These require a lot of energy to break them ✓½ (3 marks)

6. $^{64}_{30}E^{2+}$ (1 mark)

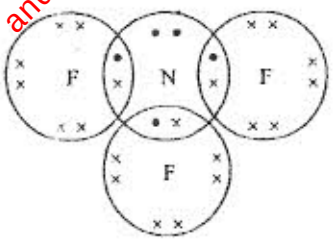
7. (a) $Al^{3+}_{(l)} + 3e \rightarrow Al_{(s)}$ ✓

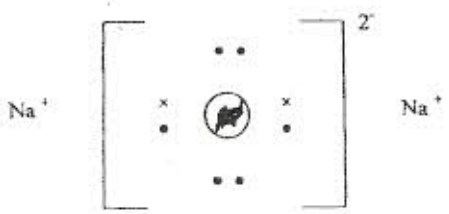
   (b) 27g require 3 Faradays ✓

   1800 × 1000g require $= \frac{3 \times 1800 \times 1000}{27}$ ✓½

   $= 2 \times 10^5$ Faradays ✓½ (3 marks)

8. (2 marks)





9. (a) Heat change when one mole of a solute dissolves in excess of the solvent

(b) (i) $\Delta H_1 = +733 kJ\ mol^{-1}$
$\Delta H_2 = -406 kJ\ mol^{-1}$
$\Delta H_3 = -335 kJ\ mol^{-1}$ ✓

(ii) Molar heat of solution
$733 - (+406 + 335) = 733 - 406$ ✓335
$= -8 kJ\ mol^{-1}$ (3 marks)

10. At anode ✓
$4OH^-_{(aq)} \rightarrow 2H_2O_{(l)} + O_{2(g} + 4e$

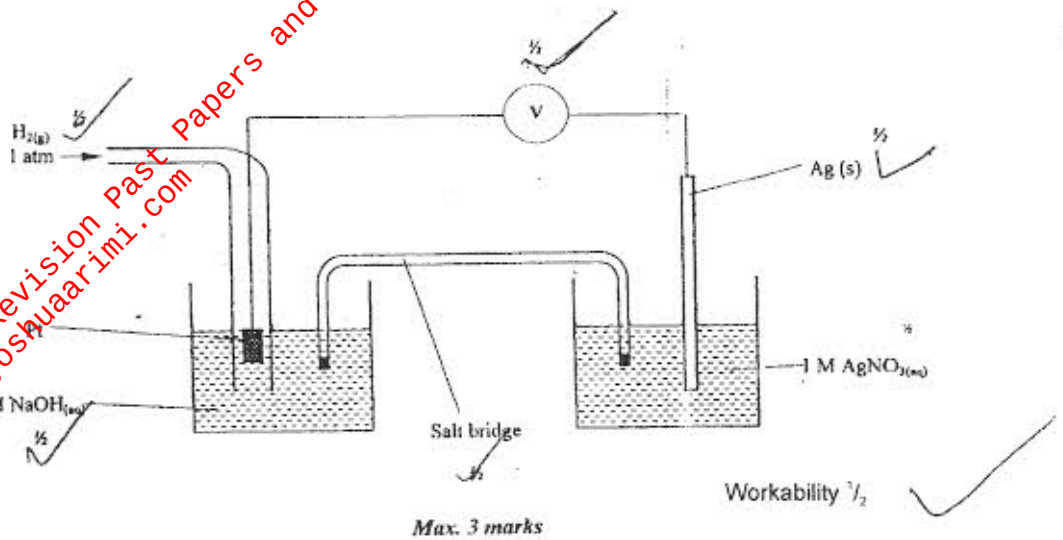
At cathode ✓
$2H^+_{(aq)} + 2e \rightarrow H_{2(g)}$

✓
Alt. $4OH^-_{(aq)} + 4H^+_{(aq)} \rightarrow 2H_2O_{(l)} + O_{2(g)} + 2H_{2(g)}$

Therefore for every one mole of oxygen gas produced, two moles of hydrogen gas are produced
(2 marks)

11. - To $50cm^3$ of 2.8M NaOH, add $25cm^3$ of 2.8 M H_2SO_4 or $50cm^3$ of 1.4M H_2SO_4 ✓
- Heat mixture to concentrate ✓½
- Cool it for crystals to form ✓½
- Filter and dry the residue ✓ (3 marks)

12. ks)



Max. 3 marks

13. Moles of Oxygen $= \frac{0.83}{32} = 0.0259$

$= 0.026$

Moles of $NaNO_3$ $= 2 \times 0.026$ or 2×0.0259

$= 0.052$ ✓½ $= 0.0518$

R.M.M of $NaNO_3 = 85$ ✓½

Mass of $NaNO_3$ converted $= \frac{0.052 \times 85}{4.41}$ ✓½ ✓½

$$\% = \frac{4.41}{8.53}$$

$= 51.8\%$ ✓½ (51.7) (3 marks)

RFM of $NaNO_3 = 85$ ✓½

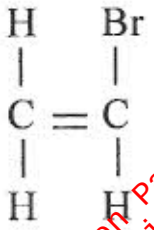
Moles of $NaNO_3$ $= \frac{8.53}{85} = 0.1004$ ✓½

$\frac{0.83}{32} = 0.0259 \times 2$ ✓½

$$\% = \frac{0.0518}{0.1004} \times 100$$ ✓½

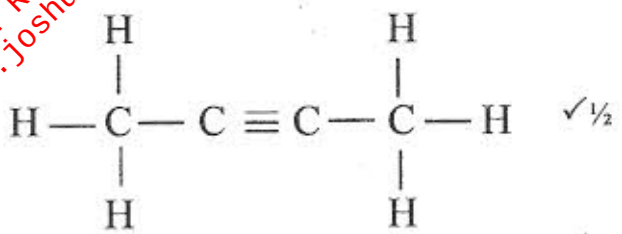
$= 51.793\%$ ✓½

14. (a)

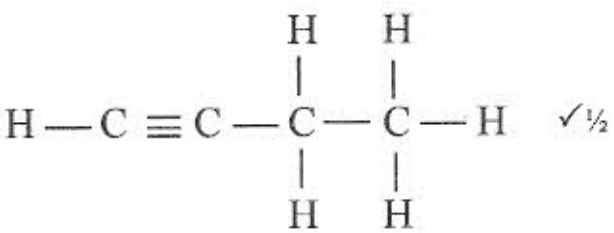


Bromoethene ✓ (2 marks)

(b)



✓½



✓½ (1 mark)

15. (a) The gas burns with a blue flame ✓

(b) (i) The iron is less reactive than magnesium ✓

(ii) Heat the iron powder ✓ (3 marks)

16. (a) To be read from graph (x) = 79g /100g water (78 ±1) (1 mark)

(b) R.F.M of KNO_3 = 101 ✓½

$$\text{Molar concentration} = \frac{79}{101} \times 10 \quad ✓$$

$$= 7.82M \quad ✓½$$

17. 10 electrons ✓

Single bonds constitute 2 electrons
Double bond 4 electrons } ✓ (2 marks)

18. Bottle | Correct label
    1 | Sodium chloride
    2 | Sugar
    3 | Sodium carbonate (3 marks)

19. (a) Catalyst ✓

    (b) Add bromine water or acidified potassium manganate (VII) ✓ if they decolourise, ✓½ then gas is either an alkene or an alkyne ✓½ (3 marks)

20. (a) Chemical change
    (b) Physical change
    (c) Chemical change (3 marks)

21. Magnesium phosphide (1 mark)

22. Test 2 ✓½ and 3 ✓½ for test 2 iron is above hydrogen in the reactivity series hence it displaces hydrogen ✓. For test 3, dilute sulphuric acid is not an oxidising agent ✓ (3 marks)

23. (a) Pale green ✓½ solution turns yellow ✓½
    (b) Sodium hydroxide ✓
    (c) Water ✓ (3 marks)

24. (a) (Silane) S_1H_4 it has a higher boiling point ✓

    (b) No hydrogen bonding in CH_4 and S_1H_4 ✓ while the hydrogen bond in H_2O is stronger than that in H_2S ✓ (3 marks)

25. (a) Colourless ✓½ solution becomes brown /black ✓
    $I_{2(aq)}$ /S

    (b) Blue PPt ✓½ dissolving to form a deep blue ✓½ solution ✓ $Cu(NH_3)_4^{2+}$ ✓ (3 marks)

26. (a) Temperature and pressure are directly proportional ✓

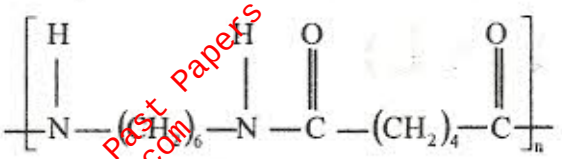
    (b) With increase in temperature, the gas particles gain more Kinetic energy ✓
    They move faster and collide with the walls of the container more frequently hence increasing pressure ✓ (3 marks)

27. The amount of hydrogen would reduce ✓ increase in pressure shifts the reaction to the side with fewer molecules ✓ (2 marks)

28. (a) Energy of the activated /intermediate complex of the uncatalysed reaction ✓

    (b) Catalyst lowers the activation energy ✓ therefore more molecules will take part in effective collision ✓ (3 marks)

29. (a)



(b) Making synthetic fibres such as for - ropes
- blouses
- stockings (2marks)

30. (a) Crush the roses with a suitable solvent ✓½. Filter to obtain pigment ✓½

(b) Add pigment to an acid ✓. It turns red ✓ (3 marks)