KANDARA SUB-COUNTY SECONDARY SCHOOLS FORM 3 2016 JOINT EXAMINATION

Kenya Certificate of Secondary Education (KCSE)

Chemistry (233/1)

Paper 1 (Theory)

October 2016

1. a) i) Phosphorous (III) Oxide ✓1
ii) Phosphorous (IV) oxide ✓1
b) Acidic ✓1

2. a) $\frac{P1V1}{T1} = \frac{P2V2}{T2}$

$\frac{2 \times 10^7}{90} = \frac{10^5 \times V2}{298}$ ✓1

$V2 = \frac{2 \times 10^7 \times 298}{10^5 \times 90}$ ✓½ $= 662.22dm^3$ ✓½

b) Moles of oxygen

$\frac{662.22}{24} = 27.5925$moles ✓½

Mass of oxygen

If 1 mole = 32g

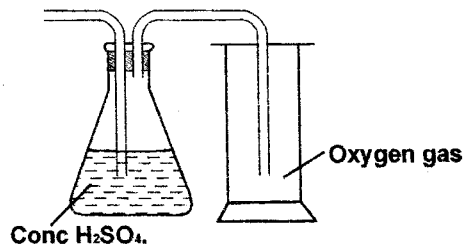
27.592 moles = x

$x = \frac{32 \times 27.5925}{1}$ ✓1

= 882.88g ✓½

3. a) Water ✓½

b)



NB:

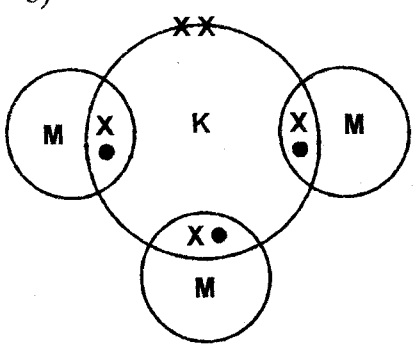
i) Drying agent ✓½

ii) Method of collecting gas ✓½

iii) Workable diagram ✓½

4. a) 2.8✓1

b)



2mks

5. Heat the mixture ✓½, aluminium chloride will sublime.

Add water ✓½ to dissolve potassium chloride ✓½, copper (II) oxide does not.

Filter the mixture to obtain copper (II) oxide ✓½

Evaporate the filter ✓½ to obtain potassium chloride

6. a) Temperature and pressure are directly proportional ✓1

b) When temperature increases ✓½ the gas particles gain more kinetic energy ✓½. They move faster and collide ✓½ with the walls of the container more frequently hence increasing ✓½ pressure.

7. a) CaO is basic ✓½ whereas HCl gas is acidic ✓½, hence they will react together ✓1

b) Conc. H_2SO_4 ✓1

8. a) B ✓½, Has a stable electron ✓½ configuration/Has an octet in the outermost energy level.

b) A and C ✓1

c) $A_{2(g)} + 2C_{(s)} \rightarrow 2CA_{(s)}$ ✓1

9.

C	H	O
37.5	12.5	50
$\frac{37.5}{12}$	$\frac{12.5}{1}$	$\frac{50}{16}$ ✓½
3.125	12.5	3.125
1	4	1 ✓½

E.F = CH_4O ✓½

$(CH_4O)_n = 32$

$(12 + 4 + 16)n = 32$ ✓½

$32n = 32$

$n = 1$ ✓½

M.F = CH_4O ✓½

10. SO_2 dissolves in water to form ✓2 H_2SO_3, which is oxidised by Cl_2 to form H_2SO_4. H_2SO_4 formed react with $BaCl_2$✓1 to form a white ppt of $BaSO_4$.
Accept equations.
$SO_{2(g)} + H_2O_{(l)} \rightarrow H_2SO_3$✓1
$H_2SO_{3(aq)} + (O) \rightarrow H_2SO_{4(aq)}$ //
$H_2SO_{3(aq)} + Cl_{2(g)} \rightarrow H_2SO_{4(aq)}$✓1

$H_2SO_{4(aq)} + BaCl_{2(aq)} \rightarrow BaSO_{4(s)} + 2HCl_{(aq)}$✓1

11. a) The reddish brown solid turns into a grey solid
b) $Ca(OH)_2 + CO_{2(g)} \rightarrow CaCO_{3(s)} + H_2O$✓1
$CaCO_{3(s)} + H_2O_{(l)} + CO_{2(g)} \rightarrow Ca(HCO_3)_{2(aq)}$✓1
c) It is poisonous/toxic/pollutant ✓1

12. i) The yellow/brown solution turns pale green ✓1
ii) A yellow solid is deposited ✓1

13. a) Liquid changes anhydrous $CuSO_4$ from white to blue
OR
Liquid changes anhydrous $CoCl_2$ from blue to pink.

b) Colour changes from red to grey beads ✓1
c) $PbO_{(s)} + H_{2(g)} \rightarrow Pb_{(s)} + H_2O_{(l)}$✓1

14. a) Atoms of the same element with same atomic number but different mass number✓1
b) $63.5 = (^{x}/_{100} \times 63) + (\frac{100 - x}{100}) \times 65$✓½
$= \frac{63x}{100} + \frac{6500 - 65x}{100}$
$\frac{-2x + 6500}{100} = 63.5$✓½
$-2x = -150$

$x = 75\%$✓½
and the other isotope 25% ✓½

15. a) P - I ✓½
Q - II✓½
R - III✓½
S - V ✓½

b) R_2O_3✓1

16. Its inert/unreactive✓1

17. a) $200cm^3$ of solution = 2g NaOH
$100cm^3 = x$
$x = \frac{2 \times 1000}{200}$✓½ = 10g✓½
Molarity of NaOH = $\frac{10}{40}$✓½ = 0.25m✓½

b) $HNO_{3(aq)} + NaOH_{(aq)} \rightarrow NaNO_{3(aq)} + H_2O_{(l)}$
Moles of NaOH = $\frac{0.25 \times 25}{1000} = 0.00625$✓½
Mole ratio of HNO_3:NaOH is 1:1✓½
hence moles of $HNO_3 = 0.00625$
Molarity of $HNO_3 = \frac{0.00625 \times 1000}{28}$✓½
$= 0.223m$✓½

18. a) Solubility in solvent ✓1
b) Stickiness or adsorbility ✓1

19. a) Different forms of an element in the sam physical state ✓1
b) i) Graphite ✓1
ii) One carbon atom is bonded to three other carbon atoms, leaving one electron free/mobile that conducts an electric current. ✓1

20. $RO_2 = {}^{x}/_{20}$ molecules/sec✓½
$Ry = {}^{x}/_{28.3}$✓½ molecules /sec

$$\frac{RO_2}{Ry} = \sqrt{\frac{mmy}{mmo}}$$

$$\frac{\frac{x}{20}}{\frac{x}{28.3}} = \sqrt{\frac{mmy}{32}}$$

$mmy = \frac{28.3^2 \times 32}{20^2}$✓1 = 64.07g✓½

21. a) K and M✓1
b) K✓½ and M✓½ This is because K is acidic and M is basic and aluminium hydroxide being amphoteric would react with both✓1

22. a) To liberate ammonia gas rapidly ✓1
b) Green - yellow ✓1
c) $2NH_{3(g)} + 3O_{2(g)} \rightarrow 2N_{2(g)} + H_2O_{(l)}$ ✓1

23. i) Readily absorbs CO_2✓1
ii) $\frac{b - c}{b} \times 100\%$✓1

24. a) Heat✓1

b) i) $2Br^-_{(aq)} \rightarrow BR_2 - 2e^-$ ✓½

ii) $Pb^{2+}_{(aq)} + 2e^- \rightarrow Pb_{(s)}$ ✓½

c) i) Anode

A reddish brown gas is formed✓½

ii) Cathode

Grey beads of lead metal are deposited ✓½

25. a) i) A yellow powder of sulphur was deposited ✓1

ii) White solid of magnesium oxide was formed ✓1

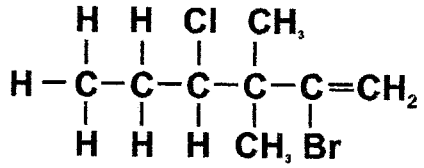
b) $2Mg_{(s)} + SO_{2(g)} \rightarrow 2MgO_{(s)} + S_{(s)}$ ✓1

26. i) Due to increase in the number of energy levels as number of electrons increase✓1

ii) Halogen ion is formed by gaining an electron, this increases the electron repulsion in the outermost energy level hence the size increases✓1

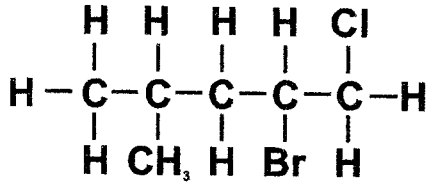
27. a) 3, 3-dimethylhexane✓1

b)



✓1

ii)



✓1

28. a) Luminous ✓1

b) Middle part of flame is not hot✓1 due to unburnt gas while the outer part is hot✓1