233/2
CHEMISTRY
PAPER 2
FORM 4

Kenya Certificate of Secondary Education

END OF TERM II EXAMINATION
MARKING SCHEME

1. (a) Hydrogen (1mk) and carbon (1mk)
   i) It extinguishes because CO_2 will accumulate around it putting it off (2mks)

   ii) Mass increases since water vapour reacts with CaO and forms $Ca(OH)_2$ which reacts with CO_2 gas to produce $CaCO_3$ and so the mass increase (3mks)

   iii) Nitrogen or helium or neon or argon. (2mks)

   iv) It absorbs moisture which is produced from burning candle. (1mk)

   v) Sodium hydroxide (1mk)

2. (a) (i) H. its outer electron can be lost easily since its far from the nucleus hence not held strongly. (2mks)

   ii) B (1mk)
   iii) D (1mk)
   iv) A. It has a small radius hence its outer electron is held strongly by the protons (2mks)

   b) (i) $CaCl_2$ and $MgCl_2$ consists of ions which are free to conduct electricity in molten or aqueous state unlike CCl_4 and $SiCl_4$ which exists or consists of molecules. (2mks)

   ii) Neon diffuses faster since its mono atomic hence lighter unlike Fluorine which is diatomic thus heavy.
3. (a) A neutron is a sub-atomic particle with no charge while a proton is sub-atomic particle with a positive charge. (1mk)
   b) A radioactive substance is that with unstable nucleus hence undergoes spontaneous disintegration emitting radiations.(1mk)

c) Nuclear fussion is the splitting process a heavy nuclide undergoes when bombered by a fast moving neutron. Nuclear fusion is the fusing of light nuclei combine together when they are made to collide at high velocity. (2mks)

d) - Gauging the thickness of thin metal and paper sheets.
- Manufacture of nuclear weapons and atomic bombs.
- Sterilization of surgical instruments using gamma radiation.
- Detecting leakages in underground water or oil pipes without digging them.

e) (i) I (2+3) – 1 = 4 (1mk) II 91+1) – 0 = 2. (1mk)

ii) Nuclear fusion (1mk)

iii) Is the time taken for a radio active substance to decay to a half of its original amount. (1mk)

f) 288g _1____144g _2_____ 72g _3_____36g _4_____ 18g _5_____ 9g _6_____
5 half life → 40 days
1 half life → $\frac{40\,x\,1}{5}$ = 8 days. (2mks)

4. (i) Channel or pump sea water into shallow ponds. Evaporation of water occur at the ponds and sodium chloride crystallizes out. (2mks)

ii)
I. $NH_{3(g)} + CO_{2(g)} + H_2O_{(l)} \rightarrow NH_4HCO_{3(aq)}$ (1mk)
II. $NH_4HCO_{3(aq)} + NaCl_{(aq)} \rightarrow NaHCO_{3(s)} + NH_4Cl_{(aq)}$ (1mk)
III. (I) Filtration (1mk)
(II) Heating (1mk)
IV. $Na_2SO_{4(aq)} + H_2O_{(l)} + CO_{2(g)}$ (1mk)
Moles of H_2SO_4 = $\frac{40\,x\,0.5}{1000}$ = 0.02 moles = moles of Na_2CO3 (1mk)
Mass of $NaCO_3$ = 0.02 x 106 = 2.12 (1mk)

ii) Percentage purity = $\frac{2.12\,x\,100}{2.15} = 98.6\%$ (1mk)

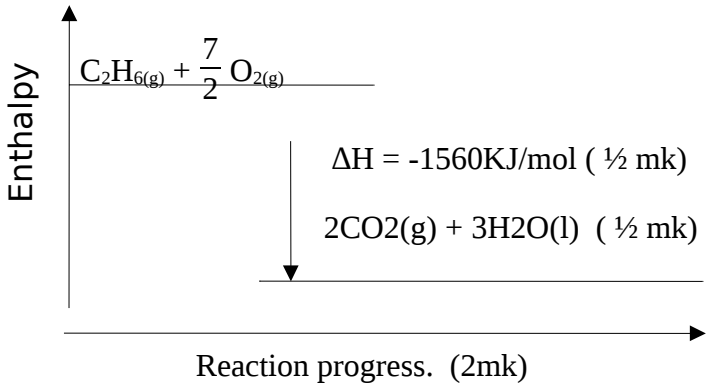
b) Used in:
- Textile industries
- Manufacture of glass
- Photography
- Making of acid drugs
- paper industries
- Making of detergent
- Softening hard water.

5. (a) The heat change when mole of substance is formed from its constituent elements in their standard state. (1mk)

b) (i) Heat of combustion of hydrogen (1mk)

Heat of formation of water. (1mk)

ii)



iii) $2CO_{2(g)} + 3H_2O_{(l)} \rightarrow C_2H_6 + \frac{7}{2} O_2$ ΔH = -1560KJ/mol (½ mk)

$2C_{(s)} + 2O_{2(g)} \rightarrow 2CO_{2(g)}$ ΔH = -788 (Multiply equation by 2) (½ mk)

$3H_{2(g)} + \frac{3}{2}O_{2(g)} \rightarrow 3H_2O_{(g)}$ ΔH = -858KJ (½ mk)

$2C_{(s)} + 3H_{2(g)} \rightarrow C_2H_6$ ΔH = -86KJ/mol (½ mk)

iv) (I) Heat produced = $\frac{500 x 4.2 x 21.5}{1000}$ = 45.15KJ (1mk)

(II) Moles of ethane = $\frac{45.15}{1560}$ = 0.02894 moles (1mk)

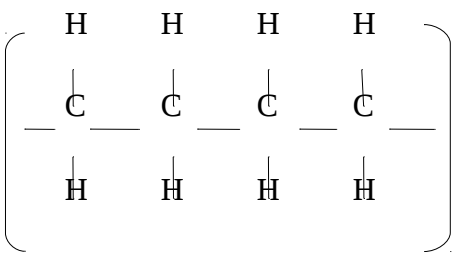
Mass = 0.2894 x 3.0 = 0.868g (1mk)

6. (a) (i) 2, 2 – dimethylpropane or dimethylpropane. (1mk)
ii) pent – 2 – yne (1mk)

b) Add acidified KMnO4 solution to both separately. Pent-2-yne will turn KMnO4 from purple to colourless while dimethylpropane will have no effect. (2mks)

c)(i) (I) lethylethanoate (½ mk) (II) N-ethane (½ mks)

ii)

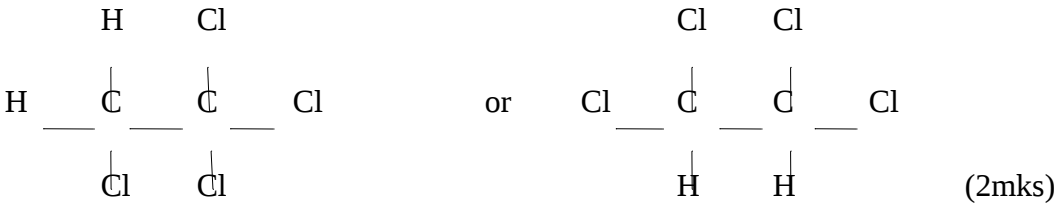


(1mk)

iii) Reagent – water condition (1mk) Concentrated sulphuric (VI) acid.

iv) I Step 2 – esterification (1mk)
II Step 3 – Substitution

d)



(2mks)

7. (a) To remove impurities which can poison the catalyst.
b) A – Air (½ mk) B – Ammonia gas (½ mk)
c) D, E and F
D – Catalystic chamber (1mk)
E – Cooling chamber (1mk)
F – Absorption tower. (1mk)

d) Chamber D
$4NH_{3(g)} + 5O_{2(g)} \rightarrow 4NO_{(g)} + 6H_2O_{(g)}$ (1mk)

Chamber F
$4NO_{2(g)} + O_{2(g)} + 2H_2O_{(l)} \rightarrow 4HNO_{3(aq)}$ (1mk)

e) Pressure 9 atm or catalyst (platinum – rhodium) (1mk)

f) Fractional distillation (1mk)

g)- Manufacture of nitrogenous fertilizer. (1mk)
- Etching of metals
h) There is production of NO gas which is oxidized by air to NO_2 gas which is brown. (1mk)