GOLDEN ELITE EXAMINTIONS 2020

Kenya Certificate of Secondary Education

233/2
CHEMISTRY
PAPER 2
THEORY

MARKING SCHEME

Question one

(a) A (√*1mk)* elements in group (vi) have 6 electrons in the outermost energy level, they react by gaining 2 electrons.√*1mk*

(b) Amphoteric Oxide √*1mk*

(c) Element E is more reactive than H (√*1mk)* Elements E and H are non - metals in group (VII) and reactivity decreases down the group √*1mk* / E is smaller than H and hence has a higher electron affinity therefore more reactive.

(d) $B_{(s)} + Cl_{2(g)} BCl_{2(s)}$ ~~*1mk*~~

(e) (i) The atomic radius of element F is greater than that of G √*1mk* / Across period number of protons (nuclear charge increases increasing effective nuclear charge.

(ii) The atomic radius of element G is greater than that of B. √*1mk*

(f) Solution of oxide of B changes red litmus paper blue and has no effect on blue litmus paper *1mk* while solution of oxide of D changes blue litmus paper red and has no effect on red litmus paper. *1mk*

(g) $2IOH(aq) + H_2SO_4(aq) \longrightarrow I_2SO_4(aq) + 2H_2O(l)$ √*1mk*

2 : 1

Moles of H_2SO_4 $\longrightarrow$ $\frac{17.5 \times 0.5}{1000} = 0.00875$ moles √½ *mk*

Moles of IOH $\longrightarrow$ 0.00875 ÷ 2 = 0.004375 moles √½ *mk*

Molarity of IOH = $\frac{1{,}000 \times 0.004375}{20}$

= 0.21875M √*1mk*

Concentration = 0.21875 moles/litre √½ *mk*

Question Two

(a) Heating copper (ii) oxide √*1mk*

(b) Black solid would turn brown √*1mk*

(c) $CuO_{(s)} + CO_{(g)} \longrightarrow Cu_{(s)} + Co_{2(g)}$ √*1 ½ mk*

(d) $2CO_{(g)} + O_{2(g)} \longrightarrow 2CO_{2(g)}$ √*1 ½ mk*

(e) It is poisonous √*1mk*

(f) (i) Reducing agent - Carbon(ii) oxide √*1mk*

(ii) Oxidisingagent -Copper (ii) oxide √*1mk*

(g) Hydrogen / ammonia gas (Any one) √*1mk*

(h) There would be no observable change √*1mk*. This is because sodium is higher than carbon in the reactivity series and therefore has higher affinity of oxygen √*1mk*

Question three

a) (i) Crystalline forms of sulphur √*1mk*
Or
Existence of sulphur in more than one form in the same physical state.√*1mk*
(ii) Transition temperature √*1mk*

b) (i) X - dilution chamber √*1 ½ mk*
Y- Heat exchanger √*1 ½ mk*
Z - Burner √*1 ½ mk*
(ii) Vandalism (v) catalyst √*1 ½ mk*
Temperature – 500^0C √*1 ½ mk*
Pressure – 200atm √*1 ½ mk*
(iii)I – To remove dust particles and water vapour that could otherwise poison the catalyst √*1mk*
II- Lose heat and pre-heat incoming gases √*1mk*
(iv) Step 2; $2SO_{2(g)} + O_{2(g)} \longrightarrow 2SO_{3(g)}$ √*1mk*

Step 3: $SO_{3(g)} + H_2SO_{4(l)} \longrightarrow H_2S_2O_{7\,(l)}$ √*1mk*

Step 4: $H_2S_2O_{7(l)} + H_2O_{(l)} \longrightarrow 2\,H_2SO_{4(l)}$ √*1mk*

(v) $H_2SO_{4(l)} + SO_{3(g)} \longrightarrow H_2S_2O_{7(l)}$ √*½ mk*

1 : 1 : 1

1 mole of oleum = $\frac{178,000}{178}$ = 1,000moles
1 mole at s.t.p = 22.4L
1,000moles = ? √*½ mk*
= 1000 x 22.4 = 22,400 litres √*1mk*

Question Four

a) (i) Nitrogen √*1 ½ mk*and Hydrogen √*1 ½ mk*
(ii) Platinum √*1mk*
(iii) $4\,NH_{3(g)} + 5O_{2(g)} \xrightarrow{\text{platinum}} 4NO_{(g)} + 6H_2O_{(g)}$ √*1mk*

(iv) Neutralization reaction √*1mk*

(v) $S_{(s)} + 6\,HNO_{3(l)} \longrightarrow H_2SO_{4(l)} + 6NO_{2(g)} + 2H_2O_{(l)}$ √*1mk*

(vi) Any metal above copper in the reactivity series but below sodium √*1mk*

(vii) (a) I - J – NH_4NO_3

(ii) Molar mass of NH_4NO_3= 28 + 4 + 48 = 80g √*1mk*

80g contain 28g of Nitrogen

? = 14g
1
= $\frac{14 \times 80}{28 \times 2}$ = 40g√*1mk*

(b) It is less soluble and therefore not easily leached √*1mk*
Or
It provides the plant with nitrogen and phosphorous *any one*

Question five

a) Concentrated sulphuric (vi) acid √*1mk*
b) It is denser than air √*1mk*
c) It turns red then white. √*1mk*
It turns white / it gets bleached √*1mk*

d) $Cl_{2(g)} + H_2O_{(l)} \longrightarrow HOCl_{(aq)} + HCl_{(aq)}$ √*1mk*

e) PCl_3 √*1mk*
PCl_5 √*1mk*
f) A yellow deposit of sulphur is formed / seen √*1mk*
Chlorine oxidizes sulphideions to solid sulphur √*1mk*

g)
- Manufacture of hydrochloric acid √*1mk*
- Manufacture of bleaching agents such as chlorate used in the cotton and paper industries
- Chlorine is used in the treatment of water and sewage plants
- Manufacture of chloroform as an anaesthetic
- Manufacture of solvents such as trichloroethane

Any one

Question six

a) A - Filtration √*1 ½ mk*
B - Absorption √*1 ½ mk*
M - Isolation of water √*1 ½ mk*
D - Cooling √*1 ½ mk*
b) Liquids – NaOH (aq) / KOH (aq) √*1mk*
Substance T – Ice / water √*1mk*
c) To increase surface area forcooling √*1 mk*
d) (i) Oxygen is used to remove impurities during steel making √*1 mk*
(ii) Is used in cutting and welding of metals √*1 mk*
e) $2H_2O_{2(l)} \xrightarrow{MnO_{2(s)}} 2H_2O_{(l)} + O_{2(g)}$ √*1 mk*

f) (i) R -Rusting occurred √*1 ½ mk* because of air and water being present √*½ mk*
S - No rusting √*½ mk* Water is absent √*½ mk*
T - No rusting √ *½ mk* Air is absent √*½ mk*
(ii) To prevent rusting √*1mk*
To increase aesthetic value of the metal
Any one

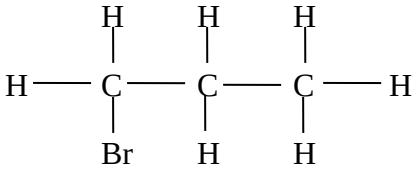
Question seven

(a) Reagent : Hydrogen gas √*1mk*

Conditions: - Nickel catalyst √*1mk*

- I50-250^{0}C (temperature) √*1mk*

(b)



I – Bromopropane √*1mk*

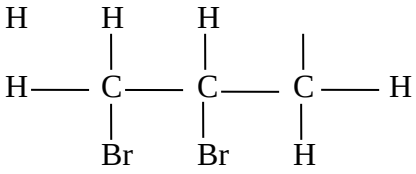
(c) Polypropene √*1mk*

(d) Y decolourisesbromine water √*1mk* while the product formed after step I has taken place does not √*1mk*

(e) Step II – dehydration √*1mk*
Step III – substitution √*1mk*

(f) (i) A hydrocarbon is a compound that contains carbon and hydrogen only √*1mk*

(ii)



√*1mk*