LANY JOINT EXAMINATION 2018
CHEMISTRY
PAPER 2
MARKING SCHEME

1.a) i) Alkali metals✓ 1

ii) Minimum energy required to remove an electron from the outermost energy level of an atom✓ 1 in the gaseous state.

iii) P has the smallest✓ 1 atomic radius. Therefore the outermost electron is strongly attracted✓ 1 to the nucleus hence more energy is required to remove it.

iv) - It melts because heat is produced✓1 during the reaction or reaction is exothermic.
- The hissing sound is due to the large production of hydrogen gas✓1 produced in a stream.
- Moves on the surface of the water due to being propelled✓1 by the escaping hydrogen gas.
- Floats on surface of the water because it is less denser than water.

v) $2Q_{(s)} + 2H_2O_{(1)} \rightarrow 2QOH_{(aq)} + H2_{(g)}$ ✓1

Accept 2Na(s) + 2H2O(1) → 2NaOH(aq) + H2(g)

b) A strong base is fully ionised✓ ½ in water to produce many hydroxide ions eg KOH, NaOH or Na_2O✓ ½ , K_2O while weak base is partially ionised✓ ½ in water to produce few hydroxide ions eg $NH_3(aq)$✓ ½ / CaO/$Ca(OH)_2$/$Mg(OH)_2$/MgO

i) Reaction between a base✓1 and an acid to form salt and water only or reaction between 1 mole of H+ ions and 1 mole of OH- to form 1 mole of water.

ii) Add 200cm3✓ ½ of 2M HNO3 to 200cm3 of 2M Na OH
- Heat / evaporate the mixture until saturation
- Allow the mixture to cool for crystals to form slowly
- Obtain the crystals.

iii) 2NaNO3(s) → 2NaNO2(s) + O2(g)

2. a) - Cost
- Availability
- Effect on environment
- Heavy value
- Ease of storage
- Ease of transportation

b) i) DT = 46.5 - 2.5 = 21.5
DH = 450 x 4.2 x 21.5
= 40635J or 40.635KJ

ii) Mass of ethanol = 125.5 – 124 = 1.5g✓ ½
RMM of ethanol = 46g✓ ½

1.5g of ethanol produces 40635

46g of ethanol produce $40635 \times \frac{46}{1.5}$

$= 1246140$ j/mol

$= -1246.14$kj/mol

c) C2HsOH(1) + 3O2(g) → 2CO2(g) + 3H2O(1)

d) - Heat lost to surrounding air or apparatus
- Error in reading temperature or mass.
- Incomplete combustion of ethanol
- A little of the ethanol evaporates as the burner cools.

$C_2HsOH_{(1)} + 3O_{2(g)}$ (Heat change)

Energy✓ ½ ΔHc ✓ ½ =-1246.14ks/mol

(ks) $2CO_{2(g)}+3H_2O_{(1)}$✓ ½

Reaction path✓ ½

3) (a) carbon → $\frac{12}{44} \times 1.37 = 0.37$

Hydrogen = $\frac{2}{18} \times 1.12 = 0.12$

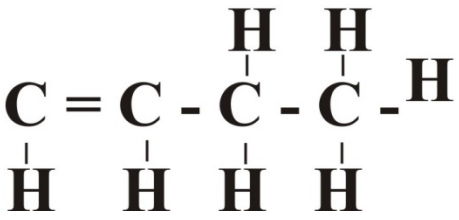
(b) Oxygen

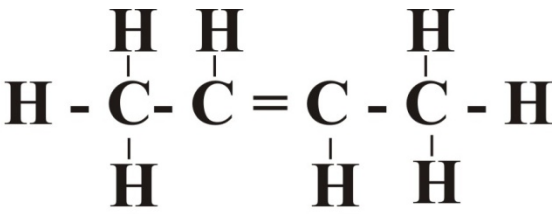
(c)

C	H	O
0.37	0.12	0.51
16	1	16
0.03	0.12	0.03
0.03	0.03	0.03
1	4	1
e.f C H_4O		

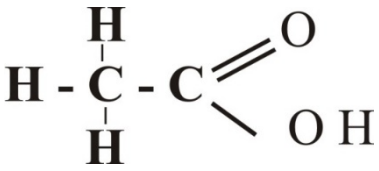
(d) Is the existence of an organic compound with a movable functional group

e.g





(e)



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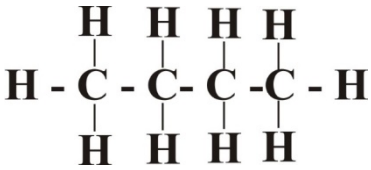


(f) **I** (i) H_2

(ii) Ni , high temp

II Manf. of margarine

4). (a) (i) Dissolve carbon (IV) oxide in NaOH or KOH solution. ✓1

(ii) Air is cooled to -200^{0}C and compressed ✓1 under high pressure to change it into liquid. The liquid air is then warmed ✓1 and nitrogen having the lowest melting point distils out first at

-196^{0}C.

(b) (i) M = Hydrogen gas ✓1

(ii) To oxidize all ammonia to nitrogen (II) oxide ✓1

(iii) $NH_{3(g)} + HNO_{3(aq)} \rightarrow NH_4NO_{3(aq)}$ ✓1

(iv) (I) Since the reaction is exothermic, increasing the temperature to 600^0C✓1 lowers the yield of

Ammonia gas; High temperature decompose Ammonia ✓1 to Nitrogen and hydrogen

(II) – Manufacture of fertilizers ✓1

- Manufacture of Nitric Acid ✓1

Conditions if more than 2 and one is wrong penalise (1mk)

(c) $S_{(s)} + 4HNO_{3(aq)} \rightarrow SO_{2(g)} + 4NO_2 + 2H_2O_{(l)}$

- Brown fumes evolved ✓1. Concentrated Nitric (V) Acid oxidizes Sulphur to Sulphur (IV) Oxide

and itself reduced to Nitrogen (IV) Oxide. ✓1

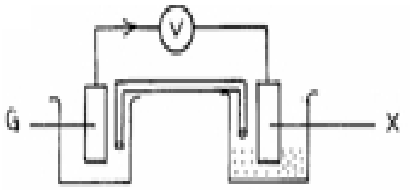
5) (a) (i) Y ✓½

(ii) Has the highest reduction potential/is the weakest reducing gent ✓½

(b) (i) $X^{2+}_{(aq)} + 2e^- \rightarrow X_{(s)}$ ✓1

$G_{(s)} \rightarrow G^{2+} + 2e^-$ ✓1

(ii)



(ii) Complete the circuit.

Maintain the balance of charge in the two half cells.

(c) (i) $Cu^{2+}, H^+, OH^-, SO_4^{2-}$ ✓2

(ii) Electrode C ✓½

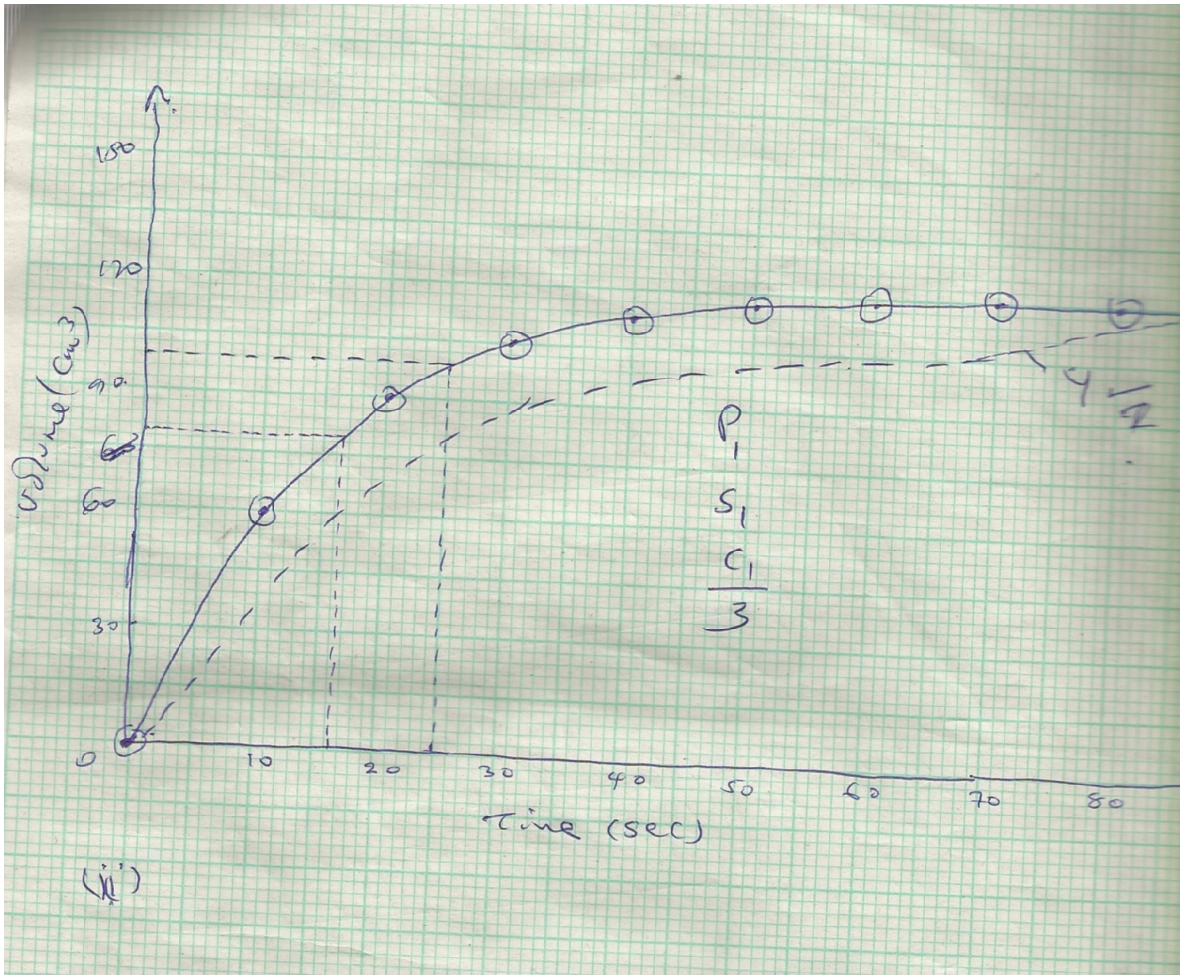
(iii) Intensity of blue colour decrease ✓1, As Cu^{2+} are oxidised to copper metal ✓1

6a)i) P_1 (2mks)

C_1

$S_{1/2}$

A1/2



ii) II from the graph 99 ± 1 √1 (1mk)
16.5 secs ± 0.5
iii) All hydroxide peroxide has been decomposed /reaction has stopped.√
(1mk)
iv) on the graph /oxide
(2makes)
v) The solid acted as a catalyst
(1mk)

7) (a) (i) Graphite is inert and does not react with the chlorine gas produced.
(2mks)

(ii) By using a diaphragm of iron gauze screen.
(1mk)

(iii) $2Cl^{-}_{(g)} \rightarrow Cl_{2(g)} + 2e^-$
(1mk)

(b) Calcium chloride
(1mk)

(ii) To reduce the cost of production by lowering electricity cost.
(2mks)

(c) Hydrogen gas would be discharged at cathode instead of sodium because it has

a greater tendency to gain etc.
(2mks)

(d) Na_2O, Na_2O_2

- Sodium vapour is used in light bulbs to produce yellow glow.

- A mixture of sodium and potassium is used as a coolant in nuclear reaction. (2mks)