POST MOCK TERM 3 2019

Kenya Certificate of Secondary Education (KCSE)

233/2

CHEMISTRY

Marking scheme

1. (a) halogens √ 1

(b) Electron arrangement 2.8.5 √1

position: group V period 3√1

(c) The atom of R is larger √ ½ // has a larger atomic radius than the ion √ ½ This is because the ion of R is formed when the atom loses the electrons in the outermost energy level √ ½ therefore, the ion has one less energy level than the atom.√ ½

(d) (i) P_2W// WP_2 √ ½

(ii) TY_4//Y_4T √ ½

(e) S has a higher √ ½ melting point than Q √ ½

This is because e S has more valence electrons in its metallic structure hence a stronger metallic bond √ ½ than Q √ ½

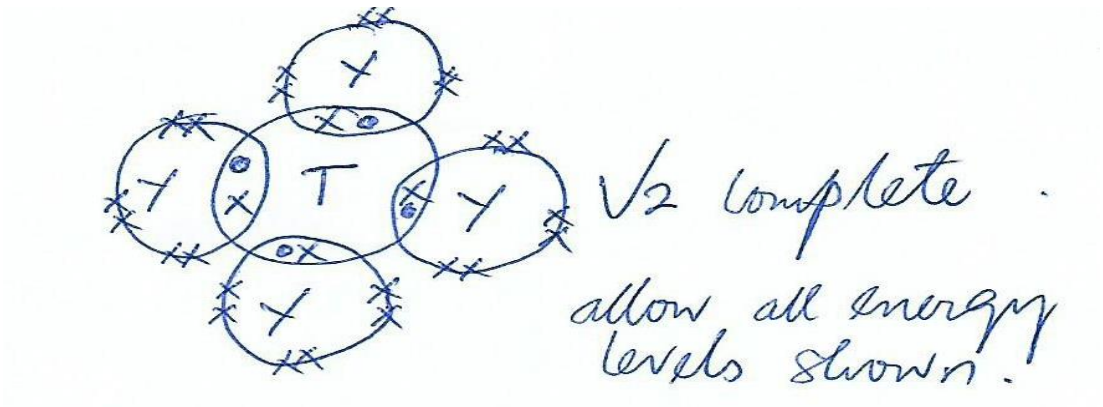
(f) M √1

It has a completely filled outermost energy level √ ½ and therefore, does not need to react with other elements to gain stability √ ½

(g) S has a higher electrical conductivity than Q.

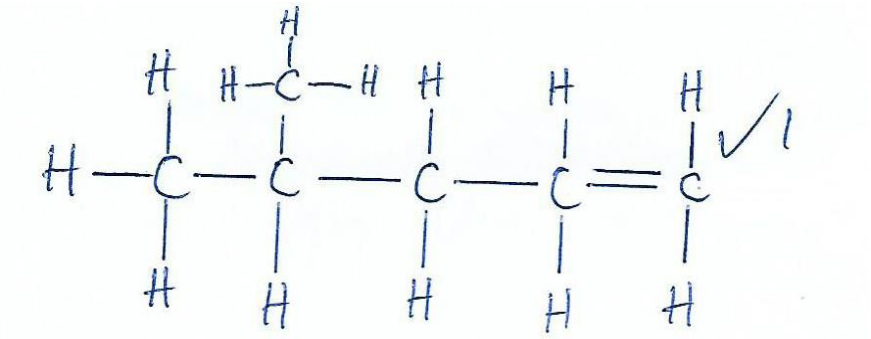
S does not corrode easily like Q.

(h)

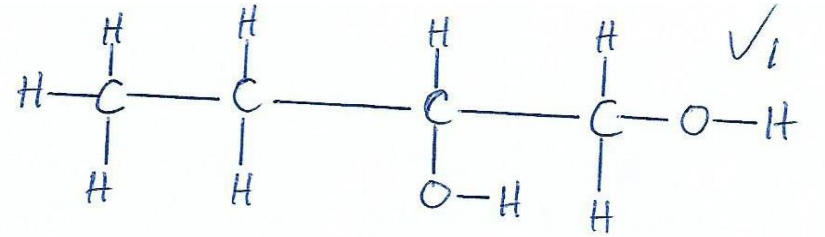


2. (a) (i)

I



II



(ii) I 4-methylpent-i-ene √1
II but-1,2-diol √1
(ii) Alkenes √1
(b) (i) A 1-chloropropane // 2-chloropropane √1
B Propane √1
C polypropene
(ii) Step I thermo//catalytic cracking of alkanes √ ½
Step III Hydrogenation √ ½
Step IV dehydration √ ½
Step VI Combustion // burning in air √ ½
(iii) $2CH_3CH{=}CH_{2\,(g)} + 9O_{2(g)} \longrightarrow 6CO_{2(g)} + 6H_2O_{(g)}$ √ ½ balanced √ ½ state symbols

3. (a) (i) It is the reference // standard half- cell √ 1
(ii) X√ 1 Do not accept X^{2+}
(iii) $X_{(s)} + Y^{2+}_{(aq)}\ Y_{(s)} + X^{2+}_{(aq)}$ √ 1
(iv) $W_{2\,(g)} + 2e^- \longrightarrow 2W^-_{(aq)}$ √ ½ and $X^{2+} + 2e^- \longrightarrow X_{(s)}$
Accept $W2_{(g)}/2W^-_{(aq)}$ // $X_{(s)}/X^{2+}_{(aq)}$
(v) Eθcell =Ered –Eox⇒Ecell = 0.54-(-0.44)√ 1
=0.98V√ 1
(b)(i) Cathode √ 1
(ii) To improve the conductivity of the water √ 1
(ii) Acidifying with hydrochloric acid could lead to chlorine being discharged at the anode √ 1
(iv)$Cu^{2+} + 2e^- \longrightarrow Cu(s)$
1 mole of copper requires $2 \times 96500 = 193000c$

63.5g ⟶ 193000c
48,250c

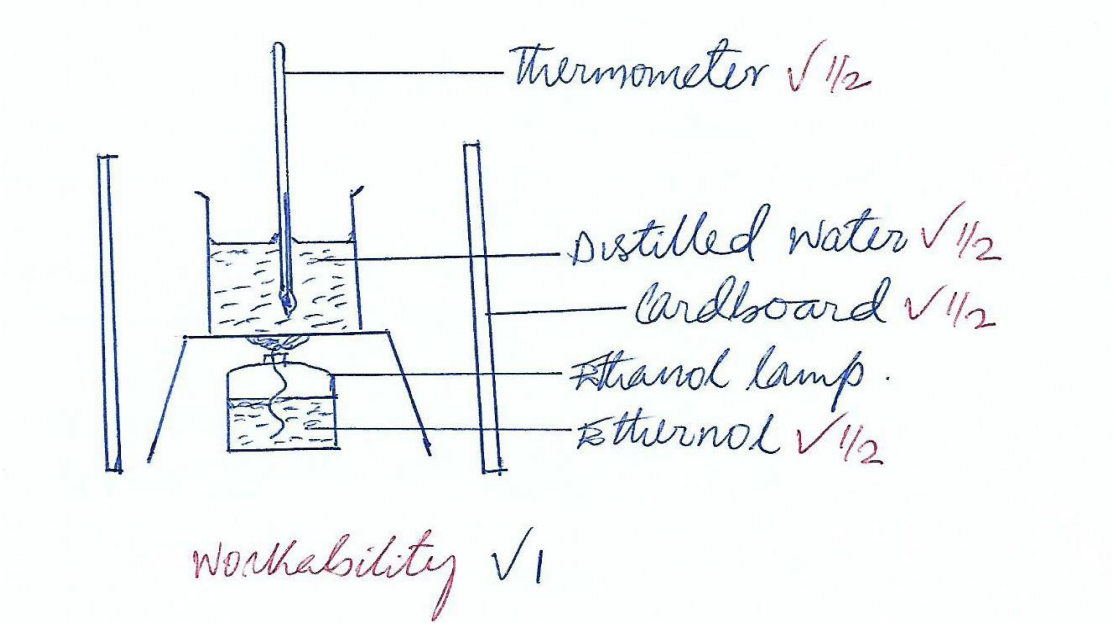
$\frac{48250}{193000}$ √ $1 \times 63.5 = 15.875$ √ 1

4. (a) (i) Fractional distillation of liquefied air √ 1 (reject from air)
(ii) Electrolysis of water//dilute sodium chloride//any dilute √ 1(reject from water etc) Accept cracking of long chain alkane

(b)(i) Platinum-rhodium//platinum√ 1
(ii) $4NH_{3(g)}+5O_{2(g} \longrightarrow 4NO_{(g)} + 6H_2O_{(g)}$ √ 1
(c) (i) $NH_{3(g)} + HNO_3(g) \longrightarrow NH_4NO_{3\,(aq)}$
(ii) As a fertilizer
(d) The haber process
(e) (i) it lowers the yield. This is because lowering pressure favours the backward reaction // equilibrium shift to the left √ 1 and therefore lowering the ammonia yield √ ½
(ii) – manufacture of explosives
- Manufacture of dyes and drugs
- Purifications of metals
- Etching designs on some metals √ any1

(f) $4NO_{2(g)} + 2H_2O_{(l)} + O_{2(g)} \longrightarrow 4HNO_{3(aq)}$ √ 1 accept
$2NO_{2(g)} + H2O \longrightarrow HNO_{3(aq)} + HNO_2(aq)$
$2HNO_{2(aq)} + O_{2(g)} \longrightarrow 2HNO_{3(aq)}$

5. (a)



(b) (i) I ΔT =46.5 -25=21.5K √ ½
$\Delta H = MC\Delta T$
$= 0.45 \times 4.2 \times 21.5$ √ ½

$= 40.635KJ\sqrt{1}$

II mass of ethanol used=125.5-124.0=1.5 Kg

C_2H_5OH =24+5+16+1=46 √ ½

1.5g ⟶ 40.635KJ

46 ⟶ ?

$\frac{46}{1.5} \times 40.635$

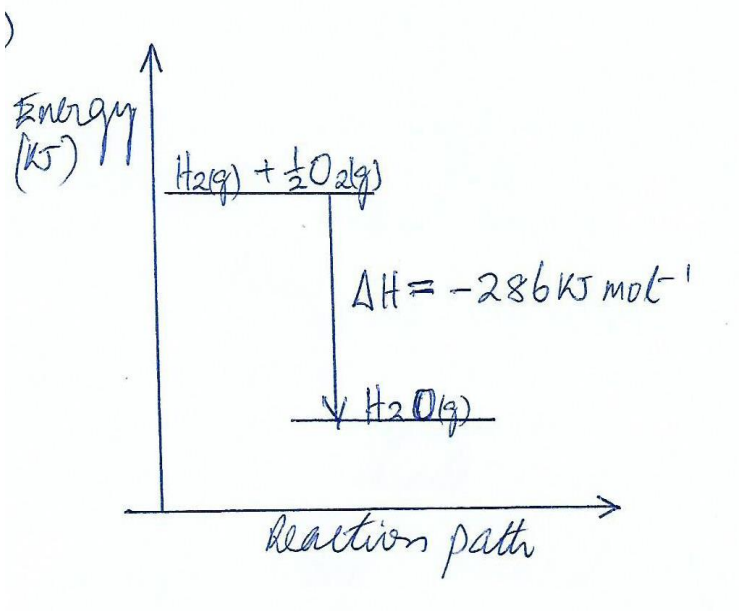
=1,246.14KJ mol^{-1}√ 1(penalize ½ if mol^{-1} is missing)

(ii)the calculation of the theoretical value assumes an ideal situation √ 1

However in an experiment, some heat is always lost to the to the surrounding √ 1

(c) (i)H2(g) + ½ O2(g) ⟶ H2O(g) √ $1\Delta H = -286KJmol^{-1}$√ ½

ii)



(d)(i) A fuel is a substance that produces useful energy when it undergoes a chemical or nuclear reaction √ 1

(ii) causing global warming//green house effect √ ½

6. (a) (i)N: lead (II) carbonate //$PbCO_3$

P: zinc sulphate/$ZnSO_4$

(ii) $BaSO_4$

(iii)

Test	Observation
1. To a sample of solid N in a test tube add dilute nitric acid. √ ½ filter the mixture and retain the	Effervescence occurs √ ½ //bubbles produced A colourless solution is formed √ ½

filtrate for test 2 below √ ½	
2. To a little of the filtrate in a test tube add 2-3 drops of sodium chloride solution //HCL √ ½ warm the mixture √ ½	A white precipitate is formed √ ½ Which dissolves on warming√ ½

(b)- To about 50cm^3 of 2M sulphiric (VI) acid add copper (II) oxide a little at a time stirring until there is no further change. √ ½
- filter the mixture and retain the filtrate √ ½
- Put the filtrate in an evaporating dish and heat it over a water bath until it is ready to crystalize √ ½
- Stop heating the filtrate and let it cool slowly√ ½
- After crystals have formed filter the mixture and retain the residue√ ½
-Dry the crystals between filter papers √ ½ to obtain dry crystals of copper (II) sulphate

7. (a) Carbon (IV) oxide√ 1 + Carbon (II) oxide√ 1// CO_2,CO

(b) (i) when heated it produces carbon (iv) oxide which is necessary in the process√ 1

(ii) Reduces carbon (IV) oxide to Carbon (II) oxide √ ½ which in turn reduces iron one to iron

(c) Slag √ 1

$CaO(s) + SiO(s) \longrightarrow CaSiO_3(l)$ √ 1

$CaO(s) + Al_2O_3(s) \longrightarrow$ CaAL2O4√ 1

(d) $2Fe2O_3(s) + 3C(s) \xrightarrow{Heat} 4Fe(l) + 3CO_2(g)$ //

√ 1any one (1)

$Fe2CO_3(s) + 3CO(g) \longrightarrow 2Fe(l) + 3CO_2(g)$

(e) –Construction of buildings
-Making of vehicle parts and other machines
-Making of stainless steel
-Making of iron sheets √ 1any