FORM 3 CHEMISTRY PAPER 2 MARKING SCHEME TERM 2 2019

1. a) i) C gains electrons to✓½ form ions, innermost electrons✓½ repels incoming electrons hence larger ionic radius.
ii) It has giant atomic✓½ structures revealed by strong covalent✓½ bonds hence require higher ✓energy to melt.
iii) BCl_2 ✓1
b) U – 2,6✓1
V – 2,8,3 ✓1
c) i) Heating of cotton✓½ wool and magnesium✓½
ii) Wet cotton produced✓½ steam when heated ✓½
Steam reacted with hot✓½ magnesium forming gas C✓½
iii) Potassium is more reactive✓1

2. a) i) A mixture of brine // conc NaCl and ammonia gas✓1
ii) $NaCl_{(aq)} + NH_{3(aq)} + CO_{2(g)} + H_2O_{(l)} \longrightarrow NaHCO_{3(s)} + NH_4Cl_{(aq)}$ ✓1
iii) Filtration ✓1
Fractional crystallization ✓1
b) Manufacture of glass✓1
Cattle licks✓1
Softening of water✓1 *(Any two @ 1mk Total = 2mks)*
c) i) CaO / Calcium oxide✓1
ii) Heating of calcium carbonate to produce $CO_{2(g)}$✓1
Heating of carbon to $CO_{2(g)}$✓ *(Any one)*
d) $2NaHCO_{3(s)} \longrightarrow Na_2CO_{3(s)} + CO_{2(g)} + H_2O_{(l)}$✓1
e) Ammonia✓½ and carbon (IV) oxide✓½
f) Allows slow movement of ammonical brine✓1 inorder for the reaction to occur effectively//
increase surface area for reaction✓1
g) $NaCl_{(aq)} + NH_{3(g)} + CO_{2(g)} + H_2O_{(l)} \longrightarrow NaHCO_{3(s)} + NH_4Cl_{(aq)}$
$2NaHCO_{3(s)} \longrightarrow Na_2CO_{3(s)} + CO_{2(g)} + H_2O_{(l)}$ ✓1
63.6 tonnes.
Mass of Na_2CO_3 = 106g
Moles of $Na_2CO_3 = \frac{63.6 \times 1000 \times 1000}{106}$ ✓½
= 600000 moles✓½
Moles of $NaHCO_3$ = 600000 x 2
= 1200000 moles✓½
1 mol of NaCl produces 1 mol of $NaHCO_3$
Mass of NaCl = 58.5g✓½
58.5g = 1 mol of $NaHCO_3$
1200000 mol ✓½

$$= \frac{58.5 \ x \ 1200000}{1}$$

$$= \frac{70200000}{1000 \ x \ 1000} g$$

$= 70.2$ *tonnes*

$= 70.2$ *tonnes* ✓½

or

Mass of $NaHCO_3 = 23 + 1 + 12 + 48$

$= 84g$✓½

2 x 84g $NaHCO_3$ = 106g Na_2CO_3

63.6 tonnes✓½

$$\frac{2 \ x \ 84 \ x \ 63.6}{106}$$

100.8 tonnes✓½

Mass of NaCl = 58.5✓ ½ mass of $NaHCO_3$ = 84✓½

58.5g NaCl = 84g $NaHCO_3$

100.8 tonnes

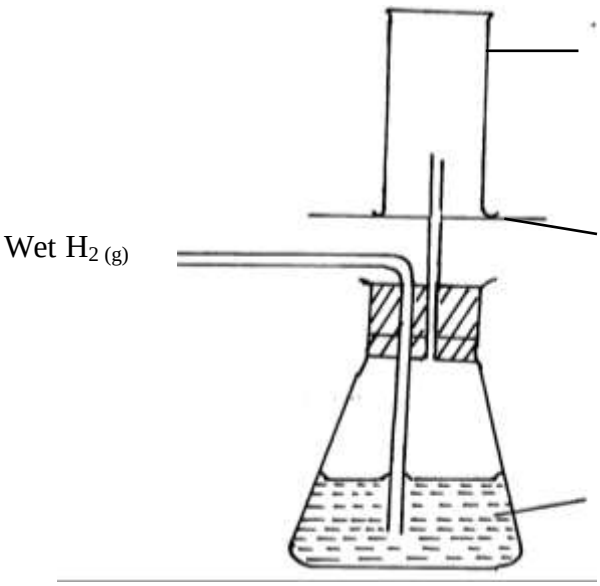
$$\frac{58.5 \ x \ 100.8}{84}$$

= 70.2✓½

3. a) I: The outlet delivery tube should not dip into the Zinc/dilute Sulphuric acid mixture in the round buttoned flask. ✓ 1mk

II: The use of heat is not required ✓ 1mk

b)



c) i) It does not react with conc. H_2SO_4 ✓1 mk

ii) $H_{2(g)} + ½\ O_{2\ (g)} \xrightarrow{ht} H_2O_{(g)}$ ✓ balancing ½ mark
states ½ mark

d) $Zn_{2(s)} + H_2SO_{4\ (aq)} \longrightarrow ZnSO_{4\ (aq)} + H_{2(g)}$ balancing ½ mk
states ½ mk

1vol 1 vol 1vol

$\left[\frac{6.54}{R}\right]$ $\left[\frac{2.4}{24}\right]$

Therefore, $\left[\frac{6.54}{R}\right] = \frac{2.4}{24}$, ✓1mk *where* $R = R.A.M\ of\ Zinc$

$R = \frac{24 \times 6.54}{2.4}$

Or R = 65.4 ✓ 1mk

e) - $H_{2(g)}$ is used in balloons by meteorologists ✓1mk
- It is used as rocket fuel ✓ 1mk
Note: Allow other correct answers.

4	a) (i) 2 – bromobutane ✓½ (ii) Sulphuric (VI) acid ✓ b) (i) X – Concentrated sulphuric (VI) acid✓½ Y – Concentrated sodium hydroxide / potassium hydroxide✓½ (ii) To absorb CO_2 / SO_2 formed during the reaction✓½ (iii) Heating ✓ (iv) Its density is almost the same as that of air✓ (v) $C_2H_5OH \xrightarrow[160^0C - 180^0C]{Conc H_2SO_4} C_2H_{4\ (g)} + H_2O_{(l)}$ c) (i) Nickel✓ (ii) A – Ethane ✓ B – Chloroethene ✓ (iii) - Not biodegradable hence pollutants✓ - Produce toxic gases when burnt✓ (iv) III – Polymerisation✓ IV – Substitution ✓ (v) By hydration of K✓ at 900^0C using phosphorous (V) acid as✓ a catalyst OR Hydrolysis of K by adding ✓conc H_2SO_4 followed by water and then warmed ✓ d) C_3H_6✓	1 1 1 1 1 1 1 1 1 1 1 2 1	

5(a) Allotropy is the existence of an element in more than one form without a change of state (

(b) (i) D – Graphite (1)

(ii) E _ Diamond (1)

(ii) In electrolysis as an electrode or used as a lubricant Lead pencils or Atomic piles (any one) (1)

(iii) E or Diamond (1); all its 4 outermost electrons are involved in bonding (½) Thus it has no free/mobile electron to conduct electricity. (½)

(c) (i) $CO_{2(g)}$ is denser than air (1)

$CO_{2(g)}$ does not support combustion (1)

$CO_{2(g)}$ does not burn (1) (any two)

(d) (i) $CO_{2(g)} + C_{(s)} \longrightarrow 2CO_{(g)}$ (1)

(ii) Sodium hydroxide (1)

(iii) pass a sample of each gas ($CO_{2(g)}$ and $CO_{(g)}$)in a boiling tube containing $Ca(OH)_{2(aq)}$. Carbon(IV) Oxide (1) forms a white precipitate with Calcium Hydroxide (lime water. Carbon(II) Oxide has no reaction with Calcium Hydroxide solution (1) (2mks)

OR

Carbon(IV) Oxide turns litmus paper pale red while Carbon(II) Oxide has no effect on litmus paper (any other correct description)

(iv) Reduction of metal oxides

6. a) I isolation of nitrogen from air

ii)concentrated sodium hydroxide or $KOH_{(aq)}$

iii)Burns to produce white residue or solid

iv)to remove the water vapour or to dry the gas

v)rare gases – neon and argon

b)it is hygroscopic and absorbs water from air, the water reacts explosively with concentrated sulphuric acid

ii)Nitric(vi) acid decomposes to form NO_2 and O_2 on heating the NO_2 is the brown gas.

c) % of acid can be increased through fractional distillation.

7a) $2NaNO_3(s) \xrightarrow{heat} NaNO_2(s) + 0_2(g)$

b) Slightly soluble in water

c) No effect on the litmus paper because the gas produced is neutral.

7B)when the circuit is completed the bulb lights(1/2) brown substance(1/2)formed grey(1/2)substance formed on cathode:because $pbBr_2$ acts as an electrolyte(1/2):lead ions gain electrons to form pb(1/2) and loses electrons to form (Br) ½mk

A-- cathode
B—anode

8. i) $2NaHCO_3$ (s) $\rightarrow$ Na_2CO_3 (s) + CO_2 (g) + H_2O (g) (2mks)

ii)168 g of $NaHCO_3$ yield 106g of Na_2CO_3
8.4g……$\frac{106 \times 8.4}{168}$ =5.3g of $Na_2CO_{3(2mks)}$

iii)22.4 liters at s.t.p 168 g of NaHCO3 evolve 22.4 liters at s.t.p 8.4g of $NaHCO_3$ evolve $\frac{22.4 \times 8.4}{168}$
=1.12 litres(2mks)

b)

Element	Cu	O
Composition	3.2	0.8
Reacting moles	3.2/64=0.05	0.8/16=0.05
Mole ratio	0.05/0.05=1	0.05/0.05=1

Emphirical formula CuO 1:1
(4mks)

c)boyles law $p_1v_1 = p_2v_2$
p_1=20 atm
v_1=375cm^3
p_2 = 15 atm
v_2 =?

$20 \times 375 = 15 \times v_2$
$v_2 = \frac{20*375}{15}$
v_2= 500cm^3 (3mks)