JINJA JOINT EXAMINATION BOARD

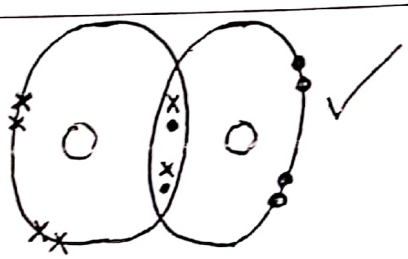
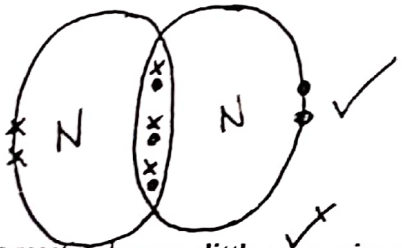
CHEMISTRY PAPER 2

545/2

JULY/AUGUST – 2019

PROPOSSED MARKING GUIDE

Nos.	SECTION A (50 MARKS)	MARKS
1.	(i) Ammonium chloride and sodium chloride or equivalent (ii) Water and sand or equivalent (iii) Ethanol and water or petroleum or equivalent (iv) Iron and Sulphur or equivalent (v) Sodium chloride and potassium chlorate or equivalent	1 mark 1 mark 1 mark 1 mark 1 mark
		5 marks
2. (a)	**Heated** magnesium, **steam**	1 mark
(b)	(i) $Mg(s) + H_2O(g) \longrightarrow MgO(s) + H_2(g)$ (ii) $MgO(s) + H_2O(l) \longrightarrow Mg(OH)_2(aq)$	$1\frac{1}{2}$ marks $1\frac{1}{2}$ marks
(c)	Turns red litmus paper to blue	1 mark
		5 marks
3. (a)	(i) The yield of ammonia **decreases** because the forward reaction is **exothermic.** (ii) The yield of ammonia **increases** because the forward reaction proceeds by **decrease in volume/ number of moles.** (iii)The yield of ammonia **increases because** iron acts as a **catalyst.**	1 mark 1 mark 1 mark
(b)	(i) volume of ammonia $= \frac{2}{3} \times 120 = 80cm^3$ (ii) Volume of nitrogen $= \frac{1}{3} \times 120 = 40\ cm^3$	1 mark 1 mark
		5 marks
4. (a)	(i) F (ii) D (iii) A and C (iv) B or E	$\frac{1}{2}$ mark $\frac{1}{2}$ mark 1 mark $\frac{1}{2}$ mark
(b)	(i) FD_2, ionic or electrovalent (ii) HD, covalent	1 mark 1 mark
		$4\frac{1}{2}$ marks
5. (a)	$CO_2(g) + Cs) \longrightarrow 2CO(g)$	$1\frac{1}{2}$ marks
(b)	(i) To absorb carbon dioxide gas (ii) The **black** solid turns to **brown**	$\frac{1}{2}$ mark
(c)	(i) Cu: moles $\frac{0.48}{64} = 0.0075$; mole ratio $\frac{0.0075}{0.00375} = 2$ O: moles $\frac{0.06}{16} = 0.00375$; mole ratio $\frac{0.00375}{0.00375} = 1$ formula Cu_2O (ii) Copper (I) oxide	1 mark $\frac{1}{2}$ mark $\frac{1}{2}$ mark $\frac{1}{2}$ mark $\frac{1}{2}$ mark
		5 marks

6. (a)	(i) Ethanol (ii) $CH_3CH_2OH(l) \longrightarrow CH_2=CH_2(g)$	½ mark 1 mark
(b)	(i) A compound which contains double bonds between the carbon atoms (ii) Acidified potassium permanganate or *equivalent*, it turns from purple to colourless	1 mark 1½ mark
(c)	(i) Polymerization (ii) marking polythene papers or *equivalent*. (iii) - It pollutes the environment, - It affects soil fertility or *equivalent*. Accept one correct answer	½ mark ½ mark ½ mark 5½ marks
7. (a)	(i) 	1 mark
	(ii) 	1 mark
(b)	Oxygen is more reactive because **little energy** is required to break the **double bond** between the oxygen atoms. Nitrogen is unreactive because **a lot / high energy** is required to break the **strong triple bond** between the nitrogen atoms.	1 mark 1 mark
(c)	(i) Manufacture of ammonia by the Haber process (ii) Cutting and welding of metals, making of steel or *equivalent*	1 mark 5 marks
8. (a)	Iron (II) sulphide is a compound Iron and Sulphur is a mixture or *equivalent*	1 mark
(b)	(i) $FeS(s) + H_2SO_4(aq) \longrightarrow H_2S(g) + FeSO_4(aq)$ (ii) $Fe(s) + H_2SO_4(aq) \longrightarrow FeSO_4(aq) + H_2(g)$	1½ marks 1½ marks
(c)	(i) Hydrogen sulphide (ii) It is poisonous	1mark 5 marks
9. (a)	(i) Zinc carbonate (ii) Zinc chloride	
(b)	$ZnCO_3(s) + 2HCl(aq) \longrightarrow ZnCl_2(aq) + CO_2(g) + H_2O(l)$ Moles of carbon dioxide gas $= \frac{501.76}{22,400} = 0.0224$ moles Moles of Zinc carbonate that reacted $= 1 \times 0.0224 = 0.0224$ moles Molecular mass of $ZnCO_3 = 65 + 12 + 48 = 125$gm Mass of $ZnCO_3$ that reacted $= 0.0224 \times 125 = 2.8$gm Mass of $ZnCl_2$ in the mixture $= 5.0 - 2.8 = 2.2$gm Percentage of $ZNCl_2 = \frac{2.2}{5.0} \times 100 = 44\%$	1 mark 1mark 1 mark 1 mark 1 mark 5 marks

10. (a) Q is Oxygen gas
R is Hydrogen gas — 1 mark

(b) (i) $4OH^-(aq) \longrightarrow O_2(g) + 2H_2O(l) + 4e$ — $1\frac{1}{2}$ marks

(ii) $2H^+(aq) + 2e \longrightarrow H_2(g)$ — $1\frac{1}{2}$ mark

(c) Gas R – Haber process — $\frac{1}{2}$ mark
- Hydrogenation
- Manufacture of hydrochloric acid — $\frac{1}{2}$ mark

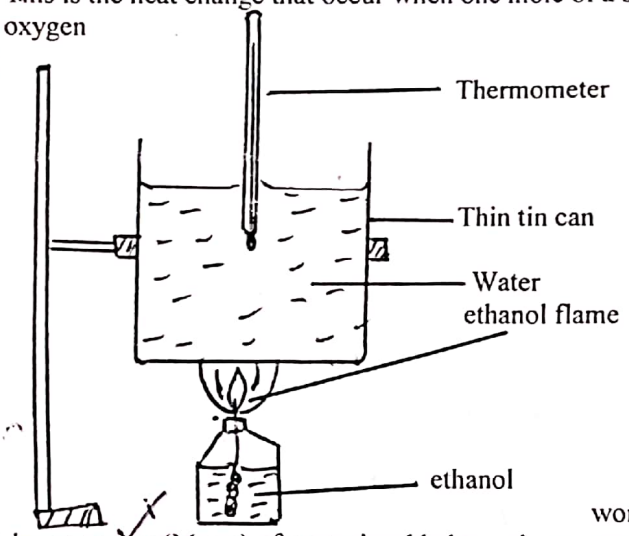
(d) Platinum

5 marks

SECTION B (30 MARKS)

11. (a) (i) This is the heat change that occur when one mole of a substance is burnt completely in oxygen — 1marks

(ii)



working apparatus 1 mark

- A known mass (M gm) of water is added to a tin can and its initial tempt. Noted t_1°C.
- the total mass of ethanol and the lamp is determined, W_1gm.
- the lamp is lit and whose heat is used to heat water, the water is stirred
- the maximum temperature of heated wateris measured and the flams put off
- the mass of ethanol and lamp is again determined as W_2(g).

3 marks

RESULTS

Mass of ethanol burnt = $W_1 - W_2 = W$gm

Temperature change $t_2 - t_1 = \Delta T$

Specific heat capacity = C

Molecular mass of ethanol = W_R

Quantity of heat produced = $(M \times C \times \Delta T)$ Joules

Wgm of ethanol produced $(M \times C \times \Delta T)$ Joules of heat = H

$W_R$gm of ethanol will produce $\frac{H \times W_R}{W}$ Joules

Heat of combustion = $-\frac{H \times W_R}{W}$ Joules/ mole

6 marks

(b) Heat change = $200 \times 4.2 \times 30 = 25{,}200$Joules

Molecular mass of ethanol = 46gm

1120KJ of heat requires 46gm of ethanol

25.2KJ of heat will require $\frac{46 \times 25.2}{1120}$ gm of ethanol

$= 1.035$gm

3 marks

(c)
- It provides information about energy content of food material.
- It provides information about effectiveness of fuel.

2 marks

15 marks

12. (a) In the solid state, the lead (II) and bromide ions are strongly attracted by strong electrostatic force of attraction and are not free and mobile. In the molten state, the heat breaks the force of attraction between the ions, they are free and mobile to conduct electricity. — $3\frac{1}{2}$ marks

(b) Water being a polar solvent causes hydrochloric to ionize forming hydrogen ions and chloride ions in solution.

$HCl(aq) \longrightarrow H^+(aq) + Cl^-(aq)$

The hydrogen ions react with magnesium to form hydrogen gas

$Mg(s) + 2H^+(aq) \longrightarrow Mg^{2+}(aq) + H_2(g)$

Methyl benzene is a non-polar solvent, it doesn't cause ionization of hydrogen chloride gas, hence no hydrogen ions in solution. — 4 marks

(c) The reaction produces insoluble calcium sulphate,

$CaCO_3(s) + H_2SO_4(aq) \longrightarrow CaSO_4(s) + CO_2(g) + H_2O(l)$

This form a coating on calcium carbonate which prevents the sulphuric acid from getting into contact with calcium carbonate, hence the reaction stops. — 3 marks

(d) The white precipitate is due to the formation of insoluble zinc hydroxide,

$Zn^{2+}(aq) + 2OH^-(aq) \longrightarrow Zn(OH)_2(s)$

In excess ammonia, the zinc hydroxide dissolves forming a soluble complex which is colourless — $4\frac{1}{2}$ mark

15 marks

13. (a) (i) A normal is a compound formed when all the ionizable hydrogen of an acid is replaced by a metal or ammonium ions. Sodium sulphate or *equivalent* — $1\frac{1}{2}$ mark

(ii) A acid salt is a compound formed when part of the ionizable hydrogen of an acid is replaced by a metal. Sodium hydrogen sulphate or *equivalent* — $1\frac{1}{2}$ mark

(b) (i) **To warm dilute nitric acid** in a beaker is added lead (II) oxide and the mixture **stirred.** Lead (II) nitrate is formed by the reaction.

$PbO(s) + 2HNO_3(aq) \longrightarrow Pb(NO_3)_2(aq) + H_2O(l)$

Lead (II) oxide is added until in excess.

The excess lead (II) oxide is **filtered off,** the filtrate is heated to **saturation point,** the saturated solution is **cooled to form crystals.** The crystals **filtered, washed &dried** — 5 marks

(ii) – lead (II) carbonate
Lead (II) hydroxide — 1 mark

(c) (i) A white precipitate — 1 mark

(ii) Preparation of insoluble salts. — 1 mark

(d) (i) Moles of sulphate ions = $\frac{25}{1000}$ x 1 = 0.025 moles

Moles of lead (II) ions = $\frac{40}{1000}$ x 0.1 = 0.02 moles

Mole ratio 1 : 1

Moles of sulphate ions that reacted = 0.02 moles — $1\frac{1}{2}$ mark

(ii) Moles of lead (II) sulphate formed = 0.02 moles

Molecular mass of lead (II) sulphate = 207 + 32 + 64 = 303gm

Mass of lead (II) sulphate = 0.02 x 303 = 6.02 gm — $2\frac{1}{2}$ mark

15 marks

14. (a)	(i) Iron (II) carbonate, $FeCO_3$	1 mark
	(ii) To convert Iron (II) carbonate to Iron (II) oxide	1 mark
(b)	(i) Coke burns in hot air to form carbon dioxide gas $C(s) + O_2(g) \longrightarrow CO_2(g)$ Carbon dioxide gas is reduced by hot coke to carbon monoxide. $2CO_2(g) + C(s) \longrightarrow 2CO(g)$ Carbon monoxide reduces the hot iron ore to iron, $Fe_2O_3(s) + 3CO(g) \longrightarrow 2Fe(l) + 3CO_2(g)$	6 marks
	(ii) Heated limestone decomposes to form calcium oxide and carbon dioxide gas. $CaCO_3(s) \longrightarrow CaO(s) + CO_2(g)$ Calcium oxide reacts with silica to form calcium silicate $CaO(s) + SiO_2(s) \longrightarrow CaSiO_3(l)$	4 marks
(c)	(i) Carbon, Chromium, Nickel	1 mark
	(ii) It does not easily rust It has high strength	1 mark
		15 mark

END