ICSE 2024 EXAMINATION

CHEMISTRY

SAMPLE PAPER - 4

Time allowed: Two hours

Max. Marks: 80

Answers to this Paper must be written on the paper provided separately.

You will not be allowed to write charing the first 15 minutes.

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

	on A is compulsory. Attempt ed marks for questions or pa			
		TION A ons from this Section.)		
Question 1 : Choose one co	rrect answer to the questio	ns from the given options	:	[15]
(i) Among the period 2 cl	ements, the element which h	as high electron affinity is		
(a) Lithium	(b) Carbon	(c) Chlorine	(d)	Fluorins
(ii) Among the following of bond).	ompounds identify the comp	ound that has all three bond	is (ioni	ic, covalent and coordinate
(a) Ammonia	(b) Ammonium chloride	(c) Sodium hydroxide	(d)	Calcium chloride
(iii) Identify the statement t	hat is incorrect about alkane	8 2		
(a) They are hydrocari	bons.			
(b) There is single con	valent bond between carbon a	and hydrogen		
(c) They can undergo	both substitution as well as	addition reactions		
(d) On complete comb	sustion they produce carbon	dioxide and water.		
(iv) Which of these will ac	t as non-electrolyte?			
(a) Liquid carbon tetra	achloride	(b) Acetic acid		
(c) Sodium hydroxide	aqueous solution	(d) Potassium chloride a	queous	solution
(v) Which one of the follo	wing will not produce an aci	d when made to react with	water?	
(a) Carbon monoxide	(b) Carbon dioxide	(c) Nitrogen diaxide	(d)	Sulphuric trioxide.
(vi) Identify the metallic oz	tide which is amphoteric in r	sature :		
(a) Calcium oxide	(b) Barium oxide	(c) Zinc oxide	(d)	Copper(II) oxide
(vii) In the given equation is	dentify the role played by co	meentrated sulphuric acid		
	S + 2H ₂ SO ₄	→ 3SO ₂ + 2H ₂ O :		
(a) Non-volatile acid	(b) Oxidising agent	(c) Dehydrating agent	(d)	None of these
(viii) Nitrogen gas can be ob	tained by heating:	A. A	13	
(a) Ammonium nitrate	(b) Ammonium nitrite	(c) Magnesium nitride	(d)	Ammonium chloride.

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(d) A salt prepared by displacement reaction is (ferric chloride / ferrous chloride	
(e) In Period 3, the most metallic element is (sodium / magnesium / aluminium)	
(iv) Identify the following:	[5]
(a) The formula that represents the simplest ratio of the various elements present in one compound.	molecule of the
(b) The substance that releases hydronium ion as the only positive ion when dissolved in water.	
(c) The tendency of an atom to attract electrons towards itself when combined in a covalent c	7 0 le
(d) The process by which certain ores, specially carbonates, are converted to oxides in the abs	
(e) The covalent bond in which the electrons are shared equally between the combining atoms(v) (a) Give the IUPAC name of the following organic compounds:	[5]
	[5]
1. $H - C - C \equiv C - H$ H 2. $H - C - C = H$ H H	
H H	
(b) What is the special feature of the structure of ethyne?	
(c) Name the saturated hydrocarbon containing two carbon atoms.	
(d) Give the structural formula of Acetic acid.	
Section B (Attempt any four questions.)	
Question 3 (i) Identify the anion present in each of the following compounds: (a) A salt M on treatment with concentrated sulphuric acid produces a gas which fumes in more	
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 (i) Identify the anion present in each of the following compounds: (a) A salt M on treatment with concentrated sulphuric acid produces a gas which fumes in modense fumes with ammonia. (b) A salt D on treatment with dilute sulphuric acid produces a gas which turns limewater reffect on acidified potassium dichromate solution. (ii) Write the products and balance the equation: (a) Mg + HNO₃ (dil.) → (b) Cu + HNO₃ (conc.) → (iii) Arrange the following as per the instruction given in the brackets. (a) O₂, N₂, Cl₂ [increasing order of number of covalent bonds] (b) Zn²⁺, Na⁺, Cu⁺² [order of preference of discharge at the cathode] (c) Br, F, Cl [Decreasing order of atomic radius] (iv) Complete the following by selecting the correct option from the choices given: (a) The metal which does not react with water or dilute H₂SO₄ but reacts with concen	ist air and give nilky but has no [2] [3] trated H ₂ SO ₄ i (Fe/Mg/Pb/Al (Al/Na/Mg/K

1. Potassium nitrate 2. Copper (iv) Explain the following: (a) Ionic compounds have a high melting point. (b) Inert gases do not form ions. (c) Ionisation potential increases across a period, from left to right. Question 5 (i) Name two soluble nitrates which can be converted into insoluble chlorides by the use of dilute HCI. Support your answer by chemical equations. (ii) Fill in the blanks using the appropriate words given below: (gulphur dioxide, Nitrogen dioxide, Nitric oxide, sulphurie acid) (a) Cold, dilute nitric acid reacts with copper to give (b) Hot, concentrated nitric acid reacts with sulphur to form (iii) Write a balanced chemical equation for each of the following: (a) Burning of ethane in plentiful supply of air. (b) Action of water on Calcium carbide. (c) Heating of Ethanol at 170°C in the presence of cone. sulphuric acid. (iv) State one relevant observation for each of the following: (a) Lead nitrate solution is mixed with dilute hydrochloric acid and heated. (b) Anhydrous calcium chloride is exposed to air for some time. (c) Barium chloride solution is slowly added to sodium sulphate solution. Question 6 (i) If the empirical formula of a compound is CH and it has a vapour density of 13, find the molecular formula of the compound. (ii) Propane burns in air according to the following equation: (2) C ₃ H ₈ + SO ₂ → 3CO ₂ + 4H ₂ O. What volume of propane is consumed on using 1000 cm ³ of air, considering only 20% of air contains oxygen? (iii) Calculate the percentage of: (a) Fluorine (b) Sodium and (c) Aluminium in sodium aluminium fluoride [Na ₃ AlF ₆], to the nearest whole number [Atomic Mass : Na = 23, Al = 27, F = 19] (iv) Give one equation each to show the following properties of sulphuric acid: (a) Dehydrating property (b) Acidic nature (c) As a non-volatile acid Question 7 (i) A gaseous hydrocarbon contains 82.76% of carbon. Given that its vapour density is 29, find its molecular formula. [C-12, H=1] [2) (ii) Identify the term/substance in each of the followi		(b) What property of sulphuric acid is shown	by the reaction of co	ncentrated sulphuric acid when heated w	rith
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[C=12, H=1] [2] (ii) Identify the term/substance in each of the following: (a) The type of reactions alkenes undergo.	Ques	tion 7			
(ii) Identify the term/substance in each of the following: [2] (a) The type of reactions alkenes undergo.	(i)	A gaseous hydrocarbon contains 82.76% of carbo	on. Given that its vapo		ula.
(a) The type of reactions alkenes undergo.					
	(ii)		wing:		[2]
(b) The catalyst used in the conversion of ethyne to ethane.					
		(b) The catalyst used in the conversion of ethy	yne to etnane.		

(iii) (a) With the help of equations, give an outline for the manufacture of sulphuric acid by the contact process. [3]

(iii) Copper sulphate solution is electrolysed using copper electrodes.

Study the diagram given alongside and answer the questions that follow:

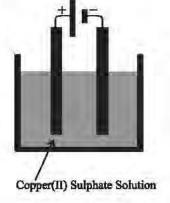
- (a) Which electrode to your left or right is known as the oxidising electrode and why?
- (b) Write the equation representing the reaction that occurs.
- (c) State two appropriate observations for the above electrolysis reaction.

(iv) (a) Give two examples of weak acids.

[3]

[3]

- (b) Give two examples of bases which are not soluble in water.
- (c) The pH of a solution is 5. To this solution is added a liquid when the pH decreases to 3. What is nature of liquid added to the solution?



Question 8

(i) By drawing an electron dot diagram show the formation of Ammonium Ion

[2]

[Atomic No.: N = 7 and H = 1]

(ii) Answer the following questions:

[2]

- (a) How will you distinguish between Ammonium hydroxide and Sodium hydroxide using copper sulphate solution?
- (b) How will you distinguish between dilute hydrochloric acid and dilute sulphuric acid using lead nitrate solution?
- (iii) Mr. Ramu wants to electroplate his key chain with nickel to prevent rusting. For this electroplating:
 - (a) Name the electrolyte
- (b) Name the cathode
- (c) Name the anode

(iv) Study the table and answer the following questions:

[3]

[3]

Atom	Atom No.
A	11
В	17

- (a) Compare the positions of A and B in the Periodic Table.
- (b) Which is more metallic?
- (c) Write equations for the formation of ions of A and B.



SOLUTION

Time allowed: Two hours

Max. Marks: 80

Answers to this Paper must be written on the paper provided separately.

You will not be allowed to write during the first 15 minutes.

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

Section A is compulsory. Attempt **any four** questions from **Section B**. The intended marks for questions or parts of questions are given in brackets [].

		SECT (Attempt all question					
Ques	stion 1 : Choose one corr	ect answer to the question	ıs fro	om the given options	:		[15]
(i)	Among the period 2 elem	nents, the element which ha	s hig	h electron affinity is			
	(a) Lithium	(b) Carbon	(c)	Chlorine	(d)	Fluorine	
(ii)	Among the following corbond).	mpounds identify the compo	ound	that has all three bonds	s (ion	ic, covalent and coor	dinate
	(a) Ammonia	(b) Ammonium chloride	(c)	Sodium hydroxide	(d)	Calcium chloride	
(iii)	Identify the statement that	at is incorrect about alkanes	:				
	(a) They are hydrocarbo	ns.					
	(b) There is single coval	lent bond between carbon a	nd hy	drogen			
	(c) They can undergo bo	oth substitution as well as a	dditio	on reactions			
	(d) On complete combus	stion they produce carbon d	ioxid	e and water.			
(iv)	Which of these will act a	as non-electrolyte?					
	(a) Liquid carbon tetracl	hloride	(b)	Acetic acid			
	(c) Sodium hydroxide ac	queous solution	(d)	Potassium chloride ac	ueous	s solution.	
(v)	Which one of the following	ing will not produce an acid	d whe	en made to react with	water	?	
	(a) Carbon monoxide	(b) Carbon dioxide	(c)	Nitrogen dioxide	(d)	Sulphuric trioxide.	
(vi)	Identify the metallic oxid	le which is amphoteric in na	ature	:			
	(a) Calcium oxide	(b) Barium oxide	(c)	Zinc oxide	(d)	Copper(II) oxide	
(vii)	In the given equation ide	ntify the role played by cor	ncenti	rated sulphuric acid			
		$S + 2H_2SO_4$ —	→ 3	$SO_2 + 2H_2O$:			
	(a) Non-volatile acid	(b) Oxidising agent	(c)	Dehydrating agent	(d)	None of these	
viii)	Nitrogen gas can be obta	ined by heating:					
	(a) Ammonium nitrate	(b) Ammonium nitrite	(c)	Magnesium nitride	(d)	Ammonium chloride	e.

(ix)				not a typi	cal property of	an io	nic comp	ound?				
		High melt		.1 1.	1		1					
			-		en and in the a	queou	s solution	1 state				
			insoluble in		d ions even in	the co	lid state					
(v)		-			in the alloy:	ine so	nu state.					
(A)		Solder	c and tin a	(b) Brass	-	(c)	Bronze		(d)	Duraluı	min	
(xi)	` ′		neriod-3 w	` /	, on affinity is z		Bronze		(u)	Durana		
(A1)		Neon	period 5 w	(b) Sulpl			Sodium		(d)	Argon		
(xii)		alkaline ear	rth metal	(c) 24.p.	1441	(•)	20010111		(4)	1118011		
()		Potassium		(b) Calci	um	(c)	Lead		(d)	Copper		
(xiii)	The	vapour de	nsity of car		e [C = 12, O =	= 16]				• • •		
	(a)	_		(b) 16			44		(d)	22		
(xiv)	Iden	tify the we	eak electrol	yte from th	e following:							
	(a)	Sodium C	hloride solu	ıtion		(b)	Dilute I	Hydrochloric	acid			
	(c)	Dilute Sul	phuric acid			(d)	Aqueou	s acetic acid	l			
(xv)	Whi	ch of the f	following m	netallic oxid	des cannot be a	educe	d by norr	nal reducing	g agents'	?		
	(a)	Magnesiur	n oxide	(b) Copp	er(II) oxide	(c)	Zinc ox	ide	(d)	Iron(III) oxide	
					ANS	SWER	RS					
(i)	(d)	(ii) (b)	(iii) (c)	(iv) (a)	(v) (a)	(vi) (c)	(vii) (b)	(viii)	(b)		
(ix)	(c)	(x) (c)	(xi) (d)	(xii) (b)	(xiii) (d)	(x	iv) (d)	(xv) (a)				
0	4	2										
Ques			1		.ii 4. 1.h			C I I J	1. 1 .			F.5.1
(1)				-	aining to labora tory preparatio		-		gen chio	ride:		[5]
			drying age		nory preparatio	11 01 1	ryurogen	Cilioriae.				
					Hydrogen Chlo	oride 2	as.					
			t to identify		rrjarogen eme	71140 8	,40.					
Ans.				_	°C → NaHSO	. + H	C1 (g)					
7 11130		Conc. H ₂ S)	7 Tulibo	4	Cr (g)					
		_	isplacement	of air								
		_	_		nonia solution r	near th	e mouth	of the gas ja	r. Forma	ation of	dense wl	nite fumes
		around the	glass rod	confirms th	nat gas jar is co	omplet	ely filled	with the Ho	Cl gas.			
					$NH_3 + HO$	$C1 \rightarrow$	NH ₄ Cl					
(ii)		-			to the solution		_		ioned in	n List X	. List Y	_
	detai	ils of the p	recipitate.	Match the	ions with their	colou	red precij	pitates.			_	[5]
				List X				List Y				
		((a) Pb ²⁺			1	. Reddish	Brown				
		((b) Fe ²⁺			2	. Dirty gr	een				
		<u> </u>	(c) Zn ²⁺					oluble in ex	cess			
			(d) Fe^{3+}			_		oluble in ex				
		-	(e) Cu ²⁺			_	. Blue	orable in ex				
			C) Cu			i					j	
Ans.	(a)	$Pb^{2+} - 3$.	(b)	Fe^{2+} — 2.	(c) Zn	2+	4.	(d) Fe^{3+} —	1.	(e)	Cu ²⁺ —	- 5.

- (iii) Complete the following by choosing the correct answers from the bracket: [5] (a) Conversion of ethanol to ethene by the action of concentrated sulphuric acid is an example of (dehydration / dehydrogenation / dehydrohalogenation) (b) When sodium chloride is heated with concentrated sulphuric acid below 200°C, one of the products formed is . (sodium hydrogen sulphate / sodium sulphate / chlorine) (c) Ammonia reacts with excess chlorine to form ______. (nitrogen / nitrogen trichloride / ammonium chloride) (d) A salt prepared by displacement reaction is ______. (ferric chloride / ferrous chloride / silver chloride). (e) In Period 3, the most metallic element is _______. (sodium / magnesium / aluminium) (b) sodium hydrogen sulphate (c) nitrogen trichloride (d) ferrous chloride (e) sodium **Ans.** (a) dehydration (iv) Identify the following: [5] (a) The formula that represents the simplest ratio of the various elements present in one molecule of the compound. (b) The substance that releases hydronium ion as the only positive ion when dissolved in water. (c) The tendency of an atom to attract electrons towards itself when combined in a covalent compound. (d) The process by which certain ores, specially carbonates, are converted to oxides in the absence of air. (e) The covalent bond in which the electrons are shared equally between the combining atoms. Ans. (a) Empirical formula (b) Acid (c) Electronegativity (d) Calcination (e) Non-polar covalent compound (v) (a) Give the IUPAC name of the following organic compounds: [5] 1. $H - C - C \equiv C - H$ 2. H - C - C - H
 - (b) What is the special feature of the structure of ethyne?
 - (c) Name the saturated hydrocarbon containing two carbon atoms.
 - (d) Give the structural formula of Acetic acid.
- Ans. (a) 1. Propyne
- 2. Ethanal
- (b) Ethyne is the first member of alkyne series. It is characterised by the presence of a triple covalent bond $(-C \equiv C -)$ between two carbon atoms.
- (c) Ethane (C_2H_6)

$$(d) \ H - \begin{matrix} H & O \\ | & || \\ C - C - OH \\ | & H \end{matrix}$$

Section B

(Attempt any four questions.)

Question 3

- (i) Identify the anion present in each of the following compounds:
 - (a) A salt M on treatment with concentrated sulphuric acid produces a gas which fumes in moist air and gives dense fumes with ammonia.

[2]

- (b) A salt D on treatment with dilute sulphuric acid produces a gas which turns limewater milky but has no effect on acidified potassium dichromate solution.
- **Ans.** (a) M has chloride (Cl⁻) anion.
 - (b) D has carbonate (CO_3^{2-}) or bicarbonate (HCO_3^{-1}) anion.

(ii)	Write the products and balance the equation:	[2]
	(a) $Mg + HNO_3$ (dil.) \longrightarrow (b) $Cu + HNO_3$ (conc.) \longrightarrow	
Ans.	(a) $Mg + 2HNO_3$ (dil.) $\longrightarrow Mg(NO_3)_2 + H_2$	
	(b) $Cu + 4HNO_3$ (conc.) $\longrightarrow Cu(NO_3)_2 + 2NO_2 + 2H_2O$	
(iii)	Arrange the following as per the instruction given in the brackets.	[3]
	(a) O ₂ , N ₂ , Cl ₂ [increasing order of number of covalent bonds]	
	(b) Zn ²⁺ , Na ⁺ , Cu ⁺² [order of preference of discharge at the cathode]	
	(c) Br, F, Cl [Decreasing order of atomic radius]	
	(a) $Cl_2 < O_2 < N_2$ (b) $Na^+ < Zn^{2+} < Cu^{2+}$ (c) $Br > Cl > F$	
(iv)	Complete the following by selecting the correct option from the choices given:	[3]
	(a) The metal which does not react with water or dilute H_2SO_4 but reacts with concentrate (Al/Cu/Zn/Fe)	
	(b) The metal whose oxide, which is amphoteric, is reduced to metal by carbon reduction	
	· ·	e/Mg/Pb/Al)
	(c) The divalent metal whose oxide is reduced to metal by electrolysis of its fused salt is	
A ~		Al/Na/Mg/K)
	(a) Cu (Copper) (b) Pb (Lead) (c) Mg (Magnesium)	
-	tion 4 For each of the substances listed below, describe the role played in the sytraction of aluminium	[2]
(1)	For each of the substances listed below, describe the role played in the extraction of aluminium. (a) Cryolite (b) Sodium hydroxide	[2]
.		1 4
Ans.	(a) Cryolite lowers the melting point of alumina from 2050°C to 950°C. This in turn increases the of electrolyte and saves electricity, which is the main source of energy in the reduction of alum	•
	(b) Sodium hydroxide dissolves the alumina (Al ₂ O ₃), but not the impurities to form sodium aluminate is treated with carbon dioxide to form purhydroxide. Alumina is recovered from sodium hydroxide by strong heating.	
(ii)	Which property of sulphuric acid is shown by the reaction of concentrated sulphuric acid with:	[2]
	(a) Ethanol? (b) Carbon?	
Ans.	(a) Dehydrating property. (b) Oxidising property.	
	(a) With the help of equations, give an outline for the manufacture of sulphuric acid by the contact	process. [3]
()	(b) What property of sulphuric acid is shown by the reaction of concentrated sulphuric acid when	
	1. Potassium nitrate 2. Copper	
Ans	(a) $S + O_2 \xrightarrow{\text{burning}} SO_2 \qquad 2SO_2 + O_2 \longrightarrow 2SO_3$	
AIIS.	$SO_3 + H_2SO_4 \text{ (Conc)} \longrightarrow H_2S_2O_7 \text{ (Oleum)} \qquad H_2S_2O_7 + H_2O \longrightarrow 2H_2SO_4$	
	(b) 1. In case of KNO ₃ , the property shown is least volatile acid	
	2. In case of Copper, the oxidising property is shown.	
(iv)	Explain the following:	[2]
(10)	(a) Ionic compounds have a high melting point.	[3]
	(a) forme compounds have a high menting point. (b) Inert gases do not form ions.	
	(c) Ionisation potential increases across a period, from left to right.	
Ans.		static forces
×113.	Thus, a large amount of heat energy is required to snap the electrostatic bonds, before the ions co	

start interchanging their positions.

- (b) Because helium has a duplet structure in its valence shell, whereas all other inert gases have octet structure in their valence shells. A duplet or an octet configuration of electrons in the valence shell is most stable and will be in the minimum state of energy. So they are inactive.
- (c) Across a period from left to right, the nuclear charge continues to increase. So, the nuclear attraction on the electrons in the valence shell increases. Thus, more energy is required to pull out the electrons from the valence shell and hence, ionisation potential increases.

Question 5

- (i) Name two soluble nitrates which can be converted into insoluble chlorides by the use of dilute HCl. Support your answer by chemical equations. [2]
- Ans. (a) Silver nitrate solution on treating with dilute HCl, forms insoluble silver chloride.

$$AgNO_3(sol) + HCl \longrightarrow HNO_3 + AgCl(s)$$

(b) Lead nitrate solution on treating with dilute HCl, forms insoluble lead chloride.

$$Pb(NO_3)_2(sol) + 2HCl \longrightarrow 2HNO_3 + PbCl_2(s)$$

(ii) Fill in the blanks using the appropriate words given below:

(Sulphur dioxide, Nitrogen dioxide, Nitric oxide, sulphuric acid)

- (a) Cold, dilute nitric acid reacts with copper to give
- (b) Hot, concentrated nitric acid reacts with sulphur to form _____.
- Ans. (a) Nitric oxide
- (b) Sulphuric acid
- (iii) Write a balanced chemical equation for each of the following:

[3]

[2]

- (a) Burning of ethane in plentiful supply of air.
- (b) Action of water on Calcium carbide.
- (c) Heating of Ethanol at 170°C in the presence of conc. sulphuric acid.
- **Ans.** (a) $2C_2H_6 + 7O_2 \longrightarrow 4CO_2 + 6H_2O$.
 - (b) $CaC_2 + 2H_2O \longrightarrow Ca(OH)_2 + C_2H_2$
 - (c) $C_2H_5OH + H_2SO_4(conc) \xrightarrow{170^{\circ}C} C_2H_4(g) + H_2SO_4.H_2O$
- (iv) State one relevant observation for each of the following:

[3]

- (a) Lead nitrate solution is mixed with dilute hydrochloric acid and heated.
- (b) Anhydrous calcium chloride is exposed to air for some time.
- (c) Barium chloride solution is slowly added to sodium sulphate solution.
- Ans. (a) A thick white precipitate of lead chloride is formed. The precipitate dissolves on heating.
 - (b) Anhydrous calcium chloride absorbs moisture from the air then dissolves in the absorbed moisture to change into liquid state.
 - (c) A thick white precipitate of barium sulphate is formed, which rapidly settles down.

Question 6

(i) If the empirical formula of a compound is CH and it has a vapour density of 13, find the molecular formula of the compound. [2]

Ans. Empirical formula weight of CH = 12 + 1 = 13

Vapour density of the compound of CH = 13

 \therefore Molecular weight of the compound = $2 \times 13 = 26$

$$\therefore \qquad n = \frac{\text{Molecular weight}}{\text{Empirical formula weight}} = \frac{26}{13} = 2$$

Thus, Molecular formula of the compound = $n \times (Empirical formula weight)$

$$= 2 \times (CH) = C_2H_2$$

$$C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O_2$$

What volume of propane is consumed on using 1000 cm³ of air, considering only 20% of air contains oxygen?

Ans. Amount of oxygen in 1000 cm³ of air = $1000 \times \frac{20}{100} = 200 \text{ cm}^3$

$$C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$$

For 5 volumes of oxygen, the propane consumption = 1 Vol

 \therefore 200 cm³ of oxygen, the propane consumption = $\frac{200}{5}$ = 40 cm³.

(iii) Calculate the percentage of :

[3]

[2]

(a) Fluorine

in sodium aluminium fluoride [Na3AlF6], to the nearest whole number

[Atomic Mass :
$$Na = 23$$
, $Al = 27$, $F = 19$]

Ans. Molecular weight of sodium aluminium fluoride [Na₃AlF₆]

$$= 3 \times 23 + 27 + 6 \times 19 = 69 + 27 + 114 = 210$$
 amu

(a) Mass of fluorine in sodium aluminium fluoride $(Na_3AlF_6) = 114$ amu

Thus, percentage of fluorine =
$$\frac{114 \text{ amu}}{210 \text{ amu}} \times 100 = \frac{380}{7} = 54.29\%$$

(b) Percentage of sodium =
$$\frac{69 \text{ amu}}{210 \text{ amu}} \times 100 = \frac{230}{7} = 32.86\%$$

(c) Percentage of aluminium =
$$\frac{27 \text{ amu}}{210 \text{ amu}} \times 100 = \frac{90}{7} = 12.86\%$$

(iv) Give one equation each to show the following properties of sulphuric acid:

[3]

- (a) Dehydrating property
- (b) Acidic nature
- (c) As a non-volatile acid

Ans. (a)
$$C_6H_{12}O_6 + 6H_2SO_4$$
 (conc.) \longrightarrow 6C + $6H_2SO_4 \cdot H_2O$. Glucose

(b)
$$2\text{NaOH} + \text{H}_2\text{SO}_4$$
 (dil.) \longrightarrow $\text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$.

(c)
$$2\text{NaNO}_3 + \text{H}_2\text{SO}_4$$
 (conc.) $\xrightarrow{>200^{\circ}\text{C}}$ $\text{Na}_2\text{SO}_4 + 2\text{HNO}_3$.

Question 7

(i) A gaseous hydrocarbon contains 82.76% of carbon. Given that its vapour density is 29, find its **molecular formula**.

$$[C=12, H=1]$$
 [2]

Ans.

Element	Percentage At. Weight	Atomic weight	Relative number of moles	Simple ratio of atoms
C	82.7	12	$82.7 \div 12 = 6.9$	$6.9 \div 6.9 = 1 \text{ or } 2$
Н	17.3	1	$17.3 \div 1 = 17.3$	$17.3 \div 6.9 = 2.5 \text{ or } 5$

- \therefore Empirical formula of compound = C_2H_5 .
- :. Empirical formula weight of compound = $2 \times 12 + 5 \times 1 = 29$

Vapour of density of compound = 29

 \therefore Molecular weight of compound = 2 × V.D. = 2 × 29 = 58.

Now, Molecular weight = $n \times \text{empirical weight}$

$$58 = n \times 29$$

$$n = 2$$

 \therefore Molecular formula of compound = $n \times$ Empirical formula

$$= 2 \times C_2H_5 = C_4H_{10}.$$

- (ii) Identify the term/substance in each of the following:
 - (a) The type of reactions alkenes undergo.
 - (b) The catalyst used in the conversion of ethyne to ethane.

Ans. (a) Addition reaction

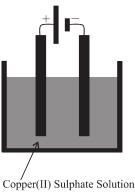
- (b) Nickel
- (iii) Copper sulphate solution is electrolysed using copper electrodes.

Study the diagram given alongside and answer the questions that follow:

- (a) Which electrode to your left or right is known as the oxidising electrode and why?
- (b) Write the equation representing the reaction that occurs.
- (c) State two appropriate observations for the above electrolysis reaction.

Ans. (a) The electrode on the right hand side donates electrons and hence is oxidising electrode.

- (b) $Cu^{2+} + 2e^{-} \rightarrow Cu$
- (c) The size of anode gradually decreases and that of cathode gradually increases. However, there is no change in the colour of copper sulphate solution.



(iv) (a) Give two examples of weak acids.

[3]

[2]

- (b) Give two examples of bases which are not soluble in water.
- (c) The pH of a solution is 5. To this solution is added a liquid when the pH decreases to 3. What is nature of liquid added to the solution?

Ans. (a) (1) Carbonic acid (H_2CO_3)

- (2) Sulphurous acid (H_2SO_3) .
- (b) (1) Copper hydroxide [Cu(OH)₂]
- (2) Iron (II) hydroxide [Fe(OH)₂]
- (c) Liquid is acidic in nature and has pH less than 3.

Question 8

(i) By drawing an electron dot diagram show the formation of Ammonium Ion

[2]

[2]

[Atomic No.: N = 7 and H = 1]

Ans. $H \times \stackrel{\overset{\overset{}}{\circ}}{\overset{\overset{}}{\circ}} + H \xrightarrow{\overset{}{}} + H \xrightarrow{\overset{\overset{}}{\circ}} + H \xrightarrow{\overset{\overset{}{\circ}} + H \xrightarrow{\overset{\overset{}}{\circ}} + H \xrightarrow{\overset{\overset{}{\circ}} + H \xrightarrow{\overset{\overset{}}{\circ}} + H \xrightarrow{\overset{\overset{}}{\circ}} + H \xrightarrow{\overset{\overset{}}{\circ}} + H \xrightarrow{\overset{\overset{\overset{}}{\circ}}} + H \xrightarrow{\overset{\overset{\overset{}}{\circ}} + H \xrightarrow{\overset{\overset{}}{\circ}} + H \xrightarrow{\overset{\overset{}}{\overset{\overset{}}{\circ}} + H \xrightarrow{\overset{\overset{}}{\circ}} + H \xrightarrow{\overset{\overset{}}{\circ}}$

- (ii) Answer the following questions:
 - (a) How will you distinguish between Ammonium hydroxide and Sodium hydroxide using copper sulphate solution?
 - (b) How will you distinguish between dilute hydrochloric acid and dilute sulphuric acid using lead nitrate solution?
- Ans. (a) Sodium hydroxide forms a pale blue precipitate which is insoluble in excess of sodium hydroxide.

Ammonium hydroxide forms a pale blue precipitate which dissolves in excess of ammonium hydroxide to form deep blue coloration.

- (b) Hydrochloric acid forms a white precipitate with lead nitrate solution. This precipitate dissolves on warming the reaction mixture so as to form clear solution. Sulphuric acid forms a white precipitate with lead nitrate solution. This precipitate does not dissolve on warming the reaction mixture.
- (iii) Mr. Ramu wants to electroplate his key chain with nickel to prevent rusting. For this electroplating: [3]
 - (a) Name the electrolyte
- (b) Name the cathode
- (c) Name the anode

[3]

(iv) Study the table and answer the following questions:

Atom	Atom No.
A	11
В	17

- (a) Compare the positions of A and B in the Periodic Table.
- (b) Which is more metallic?
- (c) Write equations for the formation of ions of A and B.

Ans. Electronic configuration of A = 2, 8, 1

Electronic configuration of B = 2, 8, 7

- (a) Position of A in the Periodic TableGroup 1(IA) and Period 3Position of B in the Periodic TableGroup 17 (VIIA) and Period 3
- (b) A is more metallic
- (c) $A e^- = A^+$ and $B + e^- = B^-$

