ICSE SEMESTER-1 EXAMINATION

Chemistry

Solved Paper - 2021-22

Class-10th

Maximum Marks: 40

Time allowed: One hour

*You will **not** be allowed to write during the first 10 minutes*
This time is to be spent in reading the Question Paper.

ALL QUESTIONS ARE COMPULSORY

The intended marks for questions or parts of questions are given in brackets [].

Select the correct option for each of the following questions.

1. In the Periodic Table, elements of Period 3 are arranged in the increasing order of ionization potential as: **[1]**
(a) B, N, Cl, Ar (b) Mg, Si, S, Ar
(c) Ar, Si, S, Mg (d) Si, Ar, Cl, Mg

2. If Relative Molecular Mass of Butane (C_4H_{10}) is 58 then its vapour density will be: **[1]**
(a) 58 (b) 29
(c) 32 (d) 16

3. Identify one statement that holds true for electrolysis of molten lead bromide: **[1]**
(a) Silver grey metal deposits at the anode
(b) Temperature is not maintained during the electrolysis
(c) Brown vapours of bromine are obtained at the anode
(d) Electrolyte contains H^+ ions along with Pb^{2+} ions

4. The tendency of an atom to attract shared pair of electrons to itself when forming a chemical bond is known as: **[1]**
(a) Electron affinity (b) Electronegativity
(c) Ionization potential (d) Nuclear charge

5. Solid sodium chloride **does not** conduct electricity as: **[1]**
(a) The strength of the bond is weak (b) It contains free ions
(c) It does not contain any free ions (d) It contains free ions as well as molecules

6. Elements A and B have electronic configurations 8 and 13 respectively. The chemical formula formed between A and B will be: **[1]**
(a) AB (b) B_3A_3
(c) A_2B_3 (d) B_2A_3

7. The percentage of hydrogen present in NaOH is: (Relative Molecular Mass of NaOH = 40)
(At. Wt. of H= 1) **[1]**
(a) 2.5 (b) 25
(c) 0.25 (d) 0.025

8. A salt formed by incomplete neutralization of an acid by a base: **[1]**
(a) Basic salt (b) Acid salt
(c) Normal salt (d) Complex salt

9. The colour of the precipitate formed after the addition of a small amount of sodium hydroxide solution to an aqueous solution of ferric chloride is: **[1]**
(a) gelatinous white (b) pale blue
(c) reddish brown (d) dirty green

10. Alkaline earth metals have the same: **[1]**
(a) number of valence electrons (b) number of shells
(c) metallic property (d) ionization potential

11. Which of the following compounds neither dissociate nor ionise in water? **[1]**

(a) Hydrochloric acid (b) Sodium hydroxide

(c) Potassium Nitrate (d) Carbon tetrachloride

12. The table shows the electronic configuration of four elements. **[1]**

Element	Electronic configuration
W	2, 6
X	2, 8
Y	2, 8, 1
Z	2, 8, 7

Which pair of atoms will form a covalent compound?

(a) two atoms of W (b) two atoms of X

(c) an atom of W and an atom of X (d) an atom of Y and an atom of Z

13. Element with an atomic number 19 will: **[1]**

(a) accept an electron and get oxidized (b) accept an electron and get reduced

(c) lose an electron and get oxidized (d) lose an electron and get reduced

14. Which of the following has two sets of lone pair of electrons in them? **[1]**

(a) Ammonia (b) Methane

(c) Water (d) Ammonium ion

15. If the empirical mass of the formula PQ_2 is 10 and the Relative Molecular Mass is 30, then the molecular formula will be: **[1]**

(a) PQ_2 (b) P_3Q_2

(c) P_6Q_3 (d) P_3Q_6

16. Which of the following is a tribasic acid? **[1]**

(a) H_2SO_4 (b) $Al(OH)_3$

(c) H_3PO_4 (d) $Ca(OH)_2$

17. If a solution of an electrolyte mixture has calcium ions, cupric ions, zinc ions and magnesium ions, which of these ions would you see preferentially discharged at the cathode? **[1]**

(a) Calcium ions (b) Zinc ions

(c) Cupric ions (d) Magnesium ions

18. Which of the following ions will readily discharge at the anode during the electrolysis of acidulated water? **[1]**

(a) OH^- (b) SO_4^{2-}

(c) Cl^- (d) H^+

19. If the empirical formula of a compound is CH and its vapour density is 13, then its molecular formula will be: (At. Wt. C = 12, H = 1) **[1]**

(a) CH (b) C_2H_2

(c) C_4H_4 (d) C_3H_3

20. Aqueous solution of cupric chloride forms a deep blue solution on addition of: **[1]**

(a) dropwise sodium hydroxide (b) excess sodium hydroxide

(c) dropwise ammonium hydroxide (d) excess ammonium hydroxide

21. Which statement about conduction of electricity is correct? **[1]**

(a) Electricity is conducted in aqueous solution by electrons

(b) Electricity is conducted in a metal wire by ions

(c) Electricity is conducted in a molten electrolyte by electrons

(d) Electricity is conducted in an acid solution by ions

22. If an element has low ionization potential, then it is likely to be a: **[1]**

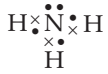
(a) metal (b) metalloid

(c) non metal (d) inert gas

23. Which electron arrangement for the outer shell electrons in a covalent compound is correct? **[1]**

(a) 

(b)

(c) 

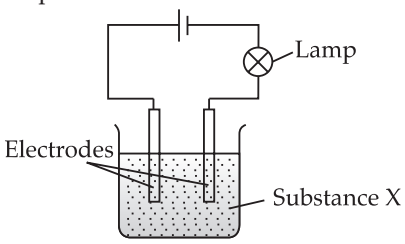
(d)

24. The products formed when an acid reacts with a base is: **[1]**

(a) salt and hydrogen (b) salt and oxygen

(c) salt and water (d) salt and carbon dioxide

25. In the circuit below, the lamp lights up. **[1]**



What could X be?

(a) a solution of alcohol in water (b) a solution of sodium chloride in water

(c) sugar solution (d) solid potassium chloride

26. Which one of the following is a non-metallic cation? **[1]**

(a) K^+ (b) NH_4^+

(c) Cu^{2+} (d) Na^+

27. Type of bonding present in hydrogen chloride: **[1]**

(a) metallic (b) ionic

(c) covalent (d) coordinate

28. The non-metallic properties of elements from left to right in a Periodic Table: **[1]**

(a) increases (b) decreases

(c) remains same (d) first increases and then decreases

29. The aqueous solution that contains both ions and molecules: **[1]**

(a) sulphuric acid (b) nitric acid

(c) acetic acid (d) hydrochloric acid

30. The basic oxide which is an alkali: **[1]**

(a) Copper oxide (b) Sodium oxide

(c) Ferric oxide (d) Zinc oxide

31. If the pH of a solution is '2', then the solution is a: **[1]**

(a) strong acid (b) strong alkali

(c) weak acid (d) weak alkali

32. The acidity of aluminium hydroxide is: **[1]**

(a) 3 (b) 1

(c) 4 (d) 2

33. Hydracids are those acids which contain: **[1]**

(a) Hydrogen with any metal

(b) Hydrogen, a non-metal and oxygen

(c) Hydrogen and a non-metal other than oxygen

(d) Hydrogen and oxygen only

34. The oxidation reaction among the following is: **[1]**

(a) $Fe^{3+} + 3e^- \rightarrow Fe$ (b) $Fe^{2+} - 1e^- \rightarrow Fe^{3+}$

(c) $Cl_2 + 2e^- \rightarrow 2Cl^-$ (d) $Cu^{2+} + 2e^- \rightarrow Cu$

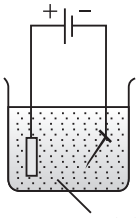
35. A student added excess of sodium hydroxide solution to each of the salt solutions listed below. An insoluble precipitate formed was observed in: **[1]**

(a) Calcium nitrate (b) Zinc nitrate

(c) Lead nitrate (d) Sodium nitrate

36. Which apparatus could be used to electroplate an iron nail with copper? **[1]**

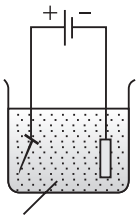
(a)



Aqueous copper (II) sulphate

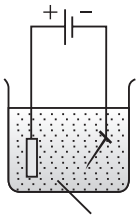
Key
▯ = copper sheet
/ = iron nail

(b)



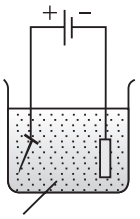
Aqueous copper (II) sulphate

(c)



Aqueous iron (II) sulphate

(d)



Aqueous iron (II) sulphate

37. The table below shows the electronic arrangements of six atoms, A to F.

Atom	A	B	C	D	E	F
Electronic configuration	2, 5	2	2, 6	2, 8, 6	2, 8, 8	2, 8, 3

With respect to the table select the following:

(i) Two atoms from the same group of the periodic table: **[1]**

(a) D and E (b) C and D
(c) E and F (d) C and E

(ii) Two noble gases: **[1]**

(a) A and B (b) E and F
(c) B and E (d) D and E

(iii) The atom which is the most electronegative: **[1]**

(a) A (b) B
(c) C (d) F

(iv) The atom which has the highest ionization potential: **[1]**

(a) A (b) B
(c) E (d) F

ANSWERS

1. (b) Ionization energy generally increases across period 3 because of increasing nuclear charge while shielding of the outer electrons remains relatively same. Thus, correct order will be Mg, Si, S, Ar.

2. (b) $$\text{Molecular mass} = 2 \times \text{vapour density}$$
$$58 = 2 \times \text{vapour density}$$
$$\therefore \quad \text{Vapour density of } C_4H_{10} = \frac{58}{2} = 29$$

3. (c) On electrolysis of molten lead bromide,

At anode:

$$2Br^- \longrightarrow Br_2 + 2e^-$$
(Reddish brown vapours)

At cathode:

$$Pb^{+2} + 2e^- \longrightarrow Pb$$

So, brown vapour of bromine are obtained at anode.

4. (b) electronegativity is a chemical property that describes the tendency of an atom to attract electrons towards itself to from chemical bonds.

5. (c) Solid sodium chloride has closely packed structure due to strong electrostatic force of attraction and the ions are immobile, *i.e.*, it does not contain any free ions, thus conduction of electricity is not possible.

6. (d) Elements A & B have electronic configurations or number of protons 8 & 13 respectively. Therefore, they will have 6 & 3 valence electrons respectively and will form A^{2-} & B^{3+} ion respectively. Thus, molecular formula will be

Symbol: A B
Charge: 2 3

$\Rightarrow A_3B_2$ or B_2A_3

7. (a) $$\text{Molar mass of NaOH} = 23 + 16 + 1 = 40 \text{ u}$$
$$\% \text{ composition of Hydrogen will be} = \frac{1}{40} \times 100 = 2.5\%$$

8. (b) A salt formed by incomplete neutralization of an acid by a base is Acid Salt. an acidic salt contains one replaceable hydrogen and reacts with base to neutralice. Example: $NaHCO_3$, $NaHSO_4$, etc.

9. (c) When small amount of NaOH is added to an aqueous ferric chloride solution, a reddish brown precipitate of furic hydroxide is formeds as given in chemical reaction.

$$3NaOH(s) + FeCl_3(aq) \longrightarrow Fe(OH)_3 \downarrow + 3NaCl(s)$$
(Reddish brown ppt.)

10. (a) Alkaline earth metals have the same number of valence electrons *i.e.*, ns^2.

11. (d) Carbon tetrachloride is a non polar covalent compound and it does not have any positively and negatively charged ions thus, it neither dissociate nor ionise in water.

12. (a) We know that covalent bonds are formed by sharing electrons between the two atoms.

Thus, element W and element Z having 2, 6 & 2, 8, 7 electronic configuration respectively. They accept electrons to form ionic as well as covalent bonds.

While X has inert electronic configuration that form neither ionic nor covalent bonds and element Y is an alkali metal that donates one electron to form ionic compounds hence, it does not form covalent bond.

13. (c) Element with atomic number 19 will have the electronic configuration: $1s^2$, $2s^2 2p^6$, $3s^2 3p^6$, $4s^1$ and it has one valence electron. Thus, it will lose an electron for getting stable electronic configuration and gets oxidised.

14. (c) In water, oxygen has six valence electrons and therefore, it requires two additional electrons from two hydrogen atoms to complete its octet. This also leaves two-pairs of lone pair of electrons.

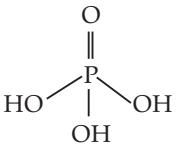
15. (d) $$\text{Relative molecular mass (given)} = 30$$
$$\text{Empirical mass} = 10$$
Since, $$n = \frac{\text{Molecular mass}}{\text{Empirical mass}}$$

$$n = \frac{30}{10} = 3$$

Now, molecular formula of PQ_2 will be $= (\text{Empirical formula})_n$

$= (PQ_2)_3 = P_3Q_6$

16. (c) H_3PO_4 is a tribasic acid because it can donate all the three protons attached to it.



17. (c) As we know that at cathode, reduction takes place. Thus, cupric ions preferentially discharged at cathode as reduction potential of cupric ion is highest.

At cathode: $Cu^{2+} + 2e^- \longrightarrow Cu$

18. (a) During electrolysis of acidulated water, the SO_4^{2-} ions complete with the OH^- ions to release their electrons to the anode. The SO_4^{2-} ions have higher discharge potential while OH^- ions are much better reducing agents and are preferentially released as oxygen gas and water.

$$4OH^- + 4e^- \longrightarrow 2H_2O + O_2$$

19. (b) Given, Empirical formula $= CH$

Vapour density $= 13$

Molecular weight $= 2 \times$ vapour density

$= 2 \times 13 = 26$

Now, $n = \dfrac{\text{Molecular formula mass}}{\text{Empirical formula mass}} = \dfrac{26}{13} = 2$

Thus molecular formula of given compound will be:

$(\text{Empirical formula})_n$

$= (CH_2) = C_2H_2$ or $CH \equiv CH$

20. (d) On adding excess of ammonium hydroxide to a cupric chloride solution, a deep blue solution of $[Cu(NH_3)_4]^{2+}$ ion is formed.

$$CuCl_2 + 4NH_4OH \longrightarrow [Cu(NH_3)_4]Cl_2 + 2H_2O + 2HCl$$

21. (d) Electricity is conducted in an acid solution by ions because in an acid solution, on passing electricity, the H^+ ions reach the cathode and each H^+ ion picks up one electron from cathode to form H_2 gas.

22. (a) Metals have low ionization potential because they can easily lose electrons and become cationic.

23. (c) In nitrogen, there are 5 valence electrons in it's outermost shell in which three electrons are shared with three hydrogen atoms and two lone pair of electrons at top of nitrogen.

24. (c) The reaction of an acid with a base is called a neutralization reaction and the products of this reaction are salt and water.

eg: $NaOH + HCl \longrightarrow NaCl + H_2O$

(Base) (Acid) (Salt) (Water)

25. (b) In the circuit, the Substance X can be a solution of sodium chloride in water because NaCl dissociate in Na^+ and Cl^- ions and these two ions move towards their respective electrodes and on closing the circuit, the lamp lights up.

26. (b) NH_4^+ is a non metallic cation while K^+, Cu^{2+} and Na^+ are metallic cations because NH_4^+ combine with OH^- and Cl^- to form non metallic compound.

27. (c) In hydrogen chloride, hydrogen atom shares an electron with chlorine atom and covalent bond is formed because covalent bond is the bond associated with two non-metals.

28. (a) On moving from left to right in a periodic table, non-metallic characters increase due to increase in ionization enthalpy.

29. (c) Aqueous solution of acetic acid contains both ions and molecules as it is weak electrolyte so it dissociates very less and forms few ions while all others are strong electrolytes so they dissociates completely and forms ions.

30. (b) Sodium oxide in an alkali basic oxide which react with water to form hydroxide.

$$Na_2O + H_2O \longrightarrow NaOH$$

31. (a) If the pH of a solution is 2, then the solution is a strong acid because lower the value in pH scale represent the more strength of acidity.

32. (a) Aluminium hydroxide [$Al(OH)_3$] when reacts with any acid then it required three acidic H^+ ions to neutralize therefore its acidity is 3.

$$Al(OH)_3 + 3HCl \longrightarrow AlCl_3 + 3H_2O$$

Thus, acidity of aluminium hydroxide is 3.

33. (c) An acid that does not contain any oxygen as compered to an oxyacid is known as hydracids which contain hydrogen a a non-metal other than oxygen.

34. (b) The oxidation reaction is a reaction, where oxidation number increased. Thus in option (b), oxidation number increase as $Fe^{2+} - e^- \longrightarrow Fe^{3+}$. While in all other options, oxidation, number decreased thus all other options are reduction reactions.

35. (a) When excess of NaOH solution added to each of salt solutions given in the options, then with calcium nitrate, an insoluble precipitate was formed and with others, soluble precipitate was observed.

36. (a) In option (a), on closing of circuit, copper will be deposited at iron nail as migration of metal ions via a solution from a positive electrode to a negative one.

37. (i) (b) Because in atom C and D, the no. of valence electrons are same *i.e.*, 6, which indicate the same group of periodic table.

(ii) (c) B and E atoms represent noble gas configuration as their outermost shell having complete their duplet (in case of Helium) and octet.

(iii) (c) Electronegativity means ability of an atom to attract shared electrons to itself. Thus, option (c) is most electronegative because in a period an moving from left to right, electronegativity increases and on moving down in a group, electronegativity decreases.

(iv) (d) Atom B is an inert gas element, has highest ionization potential because it has small size and having complete duplet thus, it's very hard to remove an electron from outermost shell.

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ICSE SEMESTER-2 EXAMINATION

Chemistry

Solved Paper - 2021-22

Class-10th

Maximum Marks: 40

Time allowed: One and a half hours

Answers to this Paper must be written on the paper provided separately.
You will not be allowed to write during the first 10 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.

*Attempt **all** questions from **Section A** and **any three** questions from **Section B.***

The marks intended for questions are given in brackets [].

SECTION-A

*(Attempt **all** questions)*

1. Choose the correct answers to the questions from the given options. (Do not copy the question. Write the correct answer only.) **[10]**

(i) The ore of Aluminium is:
(a) Calamine (b) Haematite
(c) Magnetite (d) Cryolite

(ii) Hydrogen chloride gas is not collected over water, as:
(a) It is highly soluble in water. (b) It is less soluble in water.
(c) It is lighter than air. (d) It is heavier than air.

(iii) An aqueous solution of ammonia is:
(a) Neutral (b) Acidic
(c) Basic (d) Amphoteric

(iv) The acid which is least volatile is:
(a) Hydrochloric acid (b) Nitric acid
(c) Dilute sulphuric acid (d) Concentrated sulphuric acid

(v) The gas formed, when calcium bisulphite reacts with dilute HNO_3:
(a) Sulphur trioxide (b) Hydrogen
(c) Sulphur dioxide (d) Hydrogen sulphide

(vi) The IUPAC name of formic acid:
(a) Propanoic acid (b) Methanoic acid
(c) Ethanoic acid (d) Butanoic acid

(vii) The metallic oxide which when reacts with HCl forms salt and water:
(a) Carbon monoxide (b) Nitrous oxide
(c) Ammonium hydroxide (d) Sodium oxide

(viii) Vanadium pentoxide is used as a catalyst in the preparation of:
(a) Nitrogen gas (b) Nitrogen dioxide gas
(c) Sulphur trioxide gas (d) Carbon dioxide gas

(ix) The catalyst used for the conversion of ethene to ethane:
(a) Iron (b) Nickel
(c) Cobalt (d) Molybdenum

(x) Substance which helps to lower the fusion point of the mixture in Hall Heroult Process:
(a) Coke (b) Concentrated sodium hydroxide
(c) Fluorspar (d) Concentrated potassium hydroxide

SECTION-B

*(Attempt **any three** questions from this Section.)*

2. **(i)** Define: **[2]**
(a) Isomerism
(b) Ores

(ii) Name the following: **[2]**
(a) The property by which carbon links with itself to form a long chain.
(b) The saturated hydrocarbons having general formula C_nH_{2n-2}.

(iii) Draw the structural diagram of: **[3]**
(a) pentanal (b) propanol
(c) 2-butene

(iv) Complete and balance the following chemical equations: **[3]**
(a) $H_2C = CH_2 + Cl_2 \rightarrow$
(b) $C_2H_6 + O_2$ (excess] $\rightarrow$
(C) $CH_4 + O_2$ [excess] $\rightarrow$

3. **(i)** State the following: **[2]**
(a) A compound formed when excess ammonia gas reacts with chlorine.
(b) A substance added to water, to manufacture sulphuric acid in Contact process.

(ii) Identify the gas **P** and **Q** in the reactions given below: **[2]**
(a) A compound reacts with an acid to form gas P which has no effect on acidified $K_2Cr_2O_7$ solution but turns lime water milky.
(b) A metallic nitrate reacts on heating gives oxygen gas along with a coloured gas Q.

(iii) State the observation for the following: **[3]**
(a) Dry ammonia gas reacts with oxygen in the presence of a catalyst
(b) Excess chlorine gas reacts with ammonia gas.
(c) Carbon reacts with hot concentrated nitric acid.

(iv) Write **balanced equation** for the following conversions: **[3]**
(a) Carbon from cane sugar and concentrated sulphuric acid.
(b) Ferric nitrate from ferric hydroxide and nitric acid.
(c) Ammonium sulphate from ammonium hydroxide and sulphuric acid.

4. **(i)** State the **relevant reason** for the following: **[2]**
(a) Concentrated alkali is used for the concentration of bauxite ore.
(b) Fused alumina is reduced to aluminium by electrolysis.

(ii) State **one use** of the given alloys: **[2]**
(a) Magnalium
(b) Duralumin

(iii) Complete the table given below which refers to the Laboratory preparation of **Ammonia gas**: **[3]**

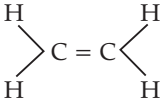
Laboratory preparation	Reactants used	Products formed	Drying agent	Method of collection
Ammonia gas	(a)	Calcium chloride + water + ammonia	(b)	(c) .....

(iv) Identify the terms for the following: **[3]**
(a) The process used to purify Alumina by electrolytic reduction.
(b) The experiment used to demonstrate the high solubility of HCl gas.
(c) The chemical property of sulphuric acid to form two types of salts with an alkali.

5. **(i)** Write the balanced chemical equation for the following: **[2]**
(a) Action of heat on manganese dioxide and concentrated hydrochloric acid.
(b) Zinc reacts with dilute hydrochloric acid to form zinc chloride.

(ii) Select the right answer from the brackets and complete the statements: **[2]**
In electrolysis of fused Alumina, the anode is made of (a) ..... [gas carbon/graphite] and the product formed at cathode is (b) ..... [oxygen/aluminium].

(iii) Give the IUPAC name for the following: **[3]**

(a)


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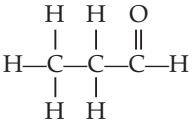
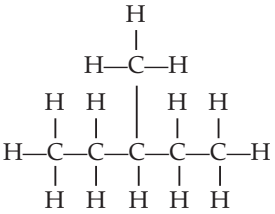
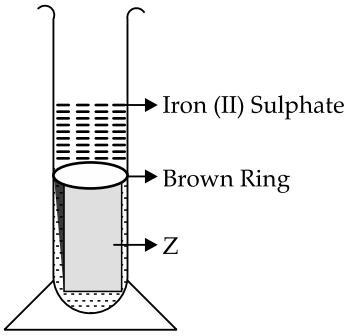


(c)


(iv) Study the diagram, which shows the Brown Ring Test and answer the questions given below: **[3]**



Brown Ring Test

(a) Which ion is determined by Brown Ring Test?

(b) Why is freshly prepared iron[II] sulphate used in the test?

(c) Name the substance Z.

6. (i) Distinguish between the following as directed: **[2]**

(a) Sodium sulphite solution and sodium sulphate solution.
[using dilute H_2SO_4]

(b) Lead salt solution and zinc salt solution.
[using NH_4OH solution in excess]

(ii) Give one word for the following statements: **[2]**

(a) The compounds of various metals found in nature with earthly impurities.

(b) A homogeneous mixture of two or more metals or a metal and a non-metal in specific ratios.

(iii) Identify **the acid** in each case: **[3]**

(a) The acid formed when sulphur reacts with concentrated nitric acid.

(b) An acid, which on adding to lead nitrate solution produces a white precipitate which is soluble on heating.

(c) The acid formed when potassium nitrate reacts with a least volatile acid.

(iv) Match column A with column B: **[3]**

Name (A)	Functional group (B)
1. Aldehyde	(a) —OH
2. Carboxylic acids	(b) —CHO
3. Alcohol	(c) —COOH

ANSWERS

SECTION-A

1. **(i)** **(d)** Cryolite
(ii) **(a)** It is highly soluble in water
(iii **(c)** Basic
(iv) **(d)** concentrated Sulphuric acid
(v) **(c)** Sulphur dioxide
(vi) **(b)** Methanoic acid
(vii) **(c)** Ammonium hydroxide
(viii) **(c)** Sulphur trioxide gas
(ix) **(b)** Nickel
(x) **(c)** Fluorspar

2. **(i)** **(a)** **Isomerism:** Those substances which have the same molecular formula but different structural formula within a molecule or substances having a similar number of atoms but differ in their physical and chemical properties is called isomerism.
(b) **Ores:** A naturally occurring mineral having a high concentration of a certain element is called an ore.
(ii) **(a)** Catenation
(b) Alkyne
(iii) **(a)** $CH_3CH_2CH_2CH_2CHO$
(b) $CH_3CH_2CH_2OH$
(c) $CH_3 - CH = CH - CH_3$
(iv) **(a)** $CH_2 = CH_2 + Cl_2 \longrightarrow CH_2(Cl) - CH_2(Cl)$
(b) $2C_2H_6 + 7O_2$ [excess] $\longrightarrow 4CO_2 + 6H_2O$
(c) $CH_4 + 2O_2$ [excess] $\longrightarrow CO_2 + 2H_2O$

3. **(i)** **(a)** When excess ammonia gas reacts with chlorine a vigorous reaction takes place and produces hazardous compounds such as nitrogen trichloride and hydrochloric acid.

$$NH_3 + Cl_2 \longrightarrow NCl_3 + 3HCl$$

(b) A substance added to water in the Contact process is Oleum ($H_2S_2O_7$) as Sulphur trioxide when reacts with sulphuric acid forms oleum since it is a highly exothermic reaction. The catalyst used is Vanadium oxide.
(ii) **(a)** **P** is metal carbonates or metal bicarbonates which react with an acid to form metal sulphate, water and carbon dioxide which has no effect on acidified potassium dichromate but turns lime water milky.
(b) **Q** is Nitrogen dioxide (NO_2) is a coloured gas liberated when metal nitrate reacts on heating giving oxygen a coloured gas that is nitrogen gas.
(iii) **(a)** Dry ammonia gas when reacts with oxygen in presence of a catalyst platinum form nitric oxide and water vapour.

$$4NH_3 + 5O_2 \longrightarrow 4NO + 6H_2O + \text{Heat}$$

(b) When excess ammonia gas reacts with chlorine a vigorous reaction takes place and produces hazardous compounds such as nitrogen trichloride and hydrochloric acid.

$$NH_3 + Cl_2 \longrightarrow NCl_3 + 3HCl$$

(c) When concentrated hot nitric acid reacts with the carbon atom to form carbon dioxide gas, nitrogen dioxide gas and water.

$$C + 4HNO_3 \longrightarrow CO_2 + 2H_2O + 4NO_2$$

(iv) **(a)** Reaction of carbon in cane sugar with conc. sulphuric acid gives sugar charcoal.

$$C_{12}H_{22}O_{11} + \text{conc. } H_2SO_4 \longrightarrow 12C + 11H_2O + SO_2$$

(b) $Fe(OH)_3 + 3HNO_3 \longrightarrow Fe(NO_3)_3 + 3H_2O$
(c) $NH_4OH + H_2SO_4 \longrightarrow (NH_4)_2SO_4 + H_2O$

4. **(i)** **(a)** Concentrated alkali is used for the concentration of bauxite ore because it is soluble only in hot concentrated sodium hydroxide (NaOH) solution. Thus, impurities can be easily filtered out as they are insoluble in nature. This process of removing impurities is called Leaching.

(b) Fused Alumina is reduced to aluminum by electrolysis because alumina is highly stable. Thus, aluminium is obtained at the cathode and oxygen at the anode and also solid carbon or graphite at the anode only.

Ionization of Alumina: $2Al_2O_3 \longrightarrow 6O^{-2} + 4Al^{+3}$

(ii) **(a)** **Magnalium:** It is an alloy of aluminium and magnesium used in making parts for aircraft.

(b) **Duralumin:** It is an alloy of aluminium and copper used in making parts for aircraft, trucks, rivets, etc.

(iii) **(a)** Ammonium chloride (NH_4Cl) and Calcium hydroxide ($Ca(OH)_2$)

(b) Calcium oxide(CaO)

(c) Method used for the collection of ammonia gas is downward displacement of air or in an inverted funnel because ammonia gas is soluble and lighter than air.

(iv) **(a)** Hall-Heroult process or Hoope's process is used to purify Alumina by electrolytic reduction.

(b) Fountain experiment is used to demonstrate the extreme solubility of hydrochloric acid.

(c) Dibasic property of sulphuric acid is used to form two types of salts with an alkali.

5. **(i)** **(a)** When manganese dioxide reacts with concentrated hydrochloric acid forms magnesium chloride and water.

$$MnO_2 + 4HCl \longrightarrow \underset{\text{Manganese chloride}}{MnCl_2} + 2H_2O\pm + Cl_2$$
(HCl: Conc.)

(b) When zinc reacts with dilute hydrochloric acid forms zinc chloride and releases hydrogen gas. This reaction is called displacement reaction,

$$Zn + \underset{\text{Dilute}}{2HCl} \longrightarrow \underset{\text{Zinc chloride}}{ZnCl_2} + \underset{\text{Hydrogen gas}}{H_2\uparrow}$$

(ii) **(a)** graphite

(b) aluminium

Explanation: Reaction at Cathode: $4Al^{+3} + 12e^- \longrightarrow 4Al$

Anode: $6O^{-2} \longrightarrow 3O_2 + 12e^-$, $C + O_2 \longrightarrow CO_2$

(iii) **(a)** Ethene

(b) Propanaldehyde

(c) 3-methyl Pentane

(iv) **(a)** Nitrate ion or NO^{3-} is used to determine Brown Ring Test.

(b) A freshly prepared iron sulphate or ferrous sulphate is used in the test because when it is exposed to the atmosphere, it is oxidised to give ferric sulphate which as a result will not give Brown rings.

(c) Z is a mixture of concentrated sulphuric acid and nitric acid.

6. **(i)** **(a)**

Sodium Sulphite	**Sodium Sulphate**
Sodium Sulphite (Na_2SO_3) is an inorganic salt of sulphurous acid	Sodium Sulphate (Na_2SO_4) is an inorganic salt of sulphuric acid.
It gives an effervescence when reacts with dilute acids due to the release of a colourless choking gas sulphur dioxide, which when further treated with acidified dichromate solution gives green colour.	When sodium sulphate reacts with dilute sulphuric acid no reaction will takes places as an acid do not react with its own salt due to the presence of same anion.
When sodium sulphite reacts with dil. H_2SO_4 liberates SO_2 gas. $Na_2SO_3 + H_2SO_4 \longrightarrow Na_2SO_4 + H_2O + SO_2$	When sodium sulphate reacts with dil. sulphuric acid, it will simply dissolve and form a clear solution.

(b)

S. No.	Lead salt solution	Zinc salt solution
	A white insoluble precipitate will form when lead salt reacts with NH_4OH is taken in excess.	A gelatinous white precipitate will form when zinc salt reacts with NH_4OH is taken in excess.
	$PbCO_3 + NH_4OH \longrightarrow Pb(OH)_2\downarrow + 2NH_4NO_3$ (excess) white ppt.	$ZnCO_3 + NH_4OH \longrightarrow Zn(OH)_2\downarrow + 2NH_4CO_3$ (excess)gelatinous ppt.

(ii) (a) Minerals

Explanation: Thus, minerals are those substances that are found on earth and formed naturally by various geological processes with certain earthly impurities.

(b) Alloys

Explanation: Thus, alloys are the homogeneous mixture of metal and a non-metal or any two or more metals in a specific ratio. For example, steel, bronze, etc.

(iii) (a) Sulphuric acid (H_2SO_4)

$$S + \text{conc. } 6HNO_3 \longrightarrow H_2SO_4 + 6NO_2\uparrow + 2H_2O$$

(b) Sulphuric acid (H_2SO_4)

$$Pb(NO_3)_2 + H_2SO_4 \longrightarrow 2HNO_3 + PbSO_4$$

(c) Nitirc acid (HNO_3)

$$KNO_3 + H_2SO_4 \longrightarrow HNO_3 + KHSO_4$$

(iv) 1. Aldehyde – (b) –CHO

2. Carboxylic acids – (c) –COOH

3. Alcohol – (a) –OH

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