**Chemistry XI**

SET 1

**Time: 3 hrs Full Marks: 75**

**Stream: Science Pass Marks: 27**

Group -A

Attempt any fifteen **questions.** (15×2 = 30)

1. One million silver atoms weigh 1.79×l0–16 gram. Calculate the atomic mass of Ag?
2. State Boyle's law.
3. What are alpha, beta and gamma rays?
4. An oxide of trivalent metal contains 68% of metal. Determine the atomic weight of metal.
5. Define equivalent weight of an element.
6. Prove that one mole of any gas is equal to 22.4 litres at NTP
7. CO is taken as polar molecule but not CO2, why?
8. What are the defects of Rutherford atomic model?
9. What is the cause of periodicity?
10. Define equilibrium. Write its characteristics.
11. Define oxidation and reduction electronically.
12. What happens when the gas obtained by heating powdered potassium permagnate with HC1 is allowed to pass through hot and cone. NaOH? Give chemical reaction.
13. What happens when the gas obtained by heating formic acid with cone, sulphuric acid is allowed to pass through caustic soda? Give chemical reaction.
14. Write the Lewis structure of the compound formed by two element X and Y whose atomic numbers are 8 and 15.
15. Why is position of hydrogen in periodic table still controversial?
16. What is chlorinated lime? What happens when it is treated with dil.HCl?
17. Write the two uses of bleaching powder.
18. Why sodium cannot be extracted from aq. NaCl solution?
19. Write the IUPAC name of the followings compounds

a. (CH3)3CCHICHO b) H2C = C(OH)COC1

1. Define electrophile and nucleophile.
2. Why is ethyne more acidic than ethene?
3. How the presence of chlorine in the organic compound is detected?

Group - B

Attempt any five questions. (5×5 = 25)

1. Explain how Rutherford could not but Bohr could explain the origin of Balmer spectral series of hydrogen atom? Mention the defect of Bohr's atomic model.
2. Consider a chemical reaction

Na2CO3 + HCl NaCl + H2O + CO2

1. How many moles of CO2 are produced when 212 gm of Na2CO3 is completely reacted with hydrochloric acid? (2)
2. How many number of water molecules are produced when 0.5 moles of sodium carbonate is dissolved with hydrochloric acid? (1.5)

c) How many number of moles of sodium carbonate is required to produce 44.8 gm of CO2 gas at NTP? (1.5)

25. Define oxidation and reduction electronically. Balance the following redox reaction by oxidation number method or ion electron method

Br2 + HNO3 HBrO3 + NO2 + H2O

1. Describe the principle and self-explanatory sketch for the manufacture of ammonia by Haber's process.
2. How the bromine is manufactured from carnallite process?
3. Describe the lab preparation of H2S gas in laboratory. Give two reaction to show that H2S is a reducing agent. (3+2) (1)

29. Define homologous series. What are the characteristics features of a homologous series. (2+3)

**Group - C**

**Attempt any two questions** (10×2= 20)

30. a) State and explain the law of reciprocal proportion. (6)

b) Nitric acid contains 36.85% nitrogen and 63.15% oxygen, water contains 11.21% hydrogen and 88.79% oxygen. Ammonia contains 17.78% hydrogen and 82.22% nitrogen. Use these data to verify the law of reciprocal proportion. (4)

31. Write the principle and process involved for the manufactured of nitric acid with a labeled diagram by catalytic oxidation of ammonia. How does cone. HNO3 reacts with:

a) Iron b) Iodine

Why is conc HNO3 is stored in dark place?

(principle-3-marks, diagram-2, description-3) (7 + 3)

1. How is sodium extracted by Down's process? What happens when sodium reacts with ammonia? Convert sodium into sodium carbonate. (7+1+2)
2. Write short notes on (any two) (5×2 = 10)

a) postulates of kinetic theory of gases b) allotropes of carbon

c) Le-chatilier's principle d) Structural isomerism

SET 2

Group -A

Attempt any fifteen **questions.** (15×2 = 30)

1. One drop of water weighs 0.04 gm. Calculate the number of H2O molecules in one drop of water.
2. State Charle's law.
3. The oxide of metal contains 53% of metal the vapour density of its chloride is 66. Calculate the valency and the atomic weight of the metal.
4. What is the capacity of a cylinder when 2gm of CO2 gas enclosed in it exerts a pressure of 2atm. at 0°C?
5. One atom of an element 'A' weighs 6.644×10. Calculate the number of gram atom in 80kg of it.
6. State Dalton's law of partial pressure.
7. Why is solid sodium chloride a non-conductor of electricity?
8. What is co-ordinate covalent bond? Why does such type of bonding arise?
9. Define nuclear reaction with an example.
10. Calculate the oxidation number of sulphur in sodium thiosulphate and Cr in dichromate ion.
11. Why is it the electron does not jump into the nucleus?
12. Why is ionization energy of oxygen less than that of nitrogen?
13. Alkali metals imparts characteristic colour. Give reason.
14. Draw Lewis structure of a) NO2 b) N2O3
15. HF is liquid but HC1, HBr and HI are gases. Explain.
16. The boiling point of ammonia is higher than that of phosphine. Why?
17. What is meant by slag? Why is it important in metallurgy?
18. Give an important uses of each of the following:

i) Boron ii) noble gas

iii) silicon iv) red phosphorus

19. Give the molecular structure of

1. 2-ethyl-3-methylbut-l-ene
2. 3-hydroxy-3-methylhexanal
3. Convert ethene to benzene.
4. Define dehydrohalogenation reaction with an example.
5. How the presence of sulphur in the organic compound is detected?

Group - B

Attempt any five questions. (5×5 = 25)

1. One litre of gaseous mixture containing methane and hydrogen effused in five minutes while one litre of oxygen tooks 10 minutes. Calculate the percentage by volume of gas in the mixture.
2. Consider a chemical reaction

CaCO3 (s) + HCl (s) CaCI2 (s) + H2O + CO2. if reaction is carried out by mixing 80% CaCO3 and 20 gm of molal hydrochloric acid find out

a. The no. of moles of each reactant? (1-5)

b. The number of gm of salt formed. (1-5)

c. The volume of CO2 liberated at 27°c and 770 mm pressure. (2)

25. Define oxidation and reduction electronically. Balance the redox reaction in which zinc is allowed to react with very dilute HNO3 by oxidation number method or ion electron method. [2+3]

26. Describe the principle and self-explanatory sketch for the manufacture of nitric acid by Ostwald's process.

27. Give the chemistry of quick lime and plaster of Paris.

28. What happens when?

a. Concentrated HCI is dropped on powdered KMnO4? (1)

b. A gas obtained by heating the mixture of common salt, conc.H2SO4 and manganese dioxide undergo photochemical reaction with the gas obtained by dropping methanoic acid on the surface of hot and conc. sulphuric acid ?

c. Freshly prepared ferrous sulphate is added to the mixture of cone, nitric acid and cone, sulphuric acid. Give chemical reaction (2)

29. Define isomerism. Give the possible isomers of molecular formula with their IUPAC names a) C2H6O b) C5H12

Group - C

Attempt any two questions. (10×2 = 20)

30. a) State and explain the law of a) multiple proportion b) definite proportion 0.36 gm of a metal when burnt in oxygen yields 0.60gm oxide. The carbonate of that metal contains 28.57% of metal. Assuming the validity of law of definite proportion, determine the weight of oxide formed by heating l gm of that carbonate. (4+3+3)

31. Describe the principle and process for the manufactured of sulphuric acid with a labeled diagram by Contact process. Prove that H2S04 acts as

a) an oxidizing agent b) a dehydrating agent

(principle-3-marks, diagram-2, description-3) (8+2)

1. Explain the principle and process and write a well diagram for the manufactured of washing soda by Solvey ammonia process. Write the molecular formula of baking soda and soda ash. How would you convert NaOH into sodium carbonate?
2. Write short notes on (any two) (5×2 =10)
3. a) Bohr's atomic model b) Law of mass action

c) Homologous series d) inductive effect

SET 3

Group -A

Attempt any fifteen **questions.** (15×2 = 30)

1. What do you mean by gram equivalent mass? How is equivalent mass of an element related to atomic mass?
2. Calculate the mass of

a. i) two atom of nitrogen ii) one molecule of carbondioxide.

1. Define boiling point and evaporation..
2. Why is 1st ionization of an element smaller than that of second ionization energy?
3. An electron of an atom possesses the quantum numbers n=3, l=0 and m=0. What do they mean?
4. Define hydrogen bond. Give an example of intramolecular hydrogen bond.
5. One mole of a gas occupies a volume of 1000 ml at 27°C. What will be the pressure of the gas?
6. Calculate the oxidation number of following underline atoms

a) K3ASO4 b) HNO3

1. Write down the ground state electric configuration of Cu (Z=29) and   
   Cr (Z = 24) in terms of s, p and d orbitals.
2. How is Kp related to Kc ? What is condition for a gaseous reaction to have Kp = Kc?
3. What are radio isotopes? Write any two examples.
4. Define the term
5. photochemical smog
6. acid rain
7. Differentiate between alloy and amalgam.
8. What do you mean by alumino thermite process? Give an example.
9. What is setting of plaster of paris?
10. What are noble gases? Write any one use of noble gases?
11. Why cannot HI be prepared by the action of cone. H2SO4 on Nal?
12. Write the formula of borax and boric acid? Give their one use.
13. What is functional isomerism? Give an example.
14. What happens when ethene gas is passed through Bayer's reagent? Give chemical reaction.
15. Write the structure of the following organic compounds,

a) Prop-2-ene-l-nitrile b) 2,2,4-trimethylpentanoic acid.

22. State Markovnikov's rule.

Group - B

Attempt any five questions: (5×5 =25)

1. How did Bohr's model explain the origin of spectral lines in hydrogen atom?
2. Define oxidation and reduction in terms of electronic concept. Balance the following equation by ion electron or oxidation number method. (2+3)

Zn + HNO3 Zn(NO3)2 + NO2 + H2O

1. A Ig sample of an alcohol was burnt in oxygen to produce 1.913g of O2 and 1.174 g of H2O. The mol. wt of the alcohol is 46. Find the molecular formula of the alcohol.
2. How is bromine manufactured from carnallite?
3. How is carbon monoxide prepared in laboratory? Write its action on (3+2)
4. nickel b) ferric oxide
5. Write down the chemistry of bleaching powder.
6. Describe the preparation of ethene (ethylene) in laboratory.

Group - C

Attempt any two questions. (10×2 = 20)

30. a) Derive an expression to show that the relationship between Boyle's and Charle's law. [5]

b) A cylinder of 2.5 litre capacity contains 0.44 gm of CO2 gas. Find

i) the pressure exerted by the gas at 25°C

ii) the number of moles of CO2

iii) the numbers of moles of atoms of Oxygen. (2+1.5+1.5)

31. Describe the principle and process for the manufacture of sulphuric acid with a labeled diagram by contact method. Give one chemical equation to show sulphuric acid is

1. a dehydrating agent
2. an oxidizing agent
3. a precipitating agent (7+1+1+1)
4. Describe the extraction of sodium by Down's process. Write the action of sodium with

a) hydrogen b) water c) ammonia

1. Write short notes one any two. (2×5 = 10)

a. Chemistry of bleaching powder.

b. Le-Chatelier's principle.

c. Functional groups

d. Graham's law of diffusion

SET 4

Group -A

Attempt any fifteen **questions.** (15×2 = 30)

1. What mass of 60% of CaC03 is required to react with 50 gm of hydrochloric acid?
2. Define atomic mass unit. How heavy is one atom of hydrogen?
3. The equivalent weight of magnesium is 12. What does it mean?
4. A carbon dioxide fire extinguisher of 3 litre capacity contains 4.4 kg of carbon dioxide. What volume of gas could this extinguisher deliver at NTP?
5. Define viscosity of a liquid. Why honey is more viscous than water?
6. What is the cause of extra stability of half-filled and completely filled orbital?
7. Distinguish between a covalent bond and coordinate covalent bond.
8. Why do atomic radii decrease across a period and increase in a group with the increase of atomic number?
9. Calculate the oxidation number of

a) chromium in potassium dichromate b) sulphur in sulphate ion

10. How do increase in temperature and pressure affect the equilibrium of the following reactions

SO2(g) + O2(g) 2SO3(g) + Heat

1. Define nuclear fission reaction with an example.
2. Draw the Lewis structure of

a) K2CO3 b) N2O4

1. What happens when the gas obtained by the action of dilute H2SO4 on iron sulphide is allowed to pass through acidified potassium permanganate solution?
2. Give the reaction of chlorine with slaked lime.
3. Why is carbon monoxide extremely poisonous?
4. Distinguish ortho and para hydrogen.
5. Define flux, gangue and slag with an example.
6. Give the method of preparation of plaster of Paris?
7. Give the molecular structure of
8. prop-2-ene-l-nitriIe
9. 2-rnethoxypropan-l-al.
10. Convert methane into ethane
11. The octane number of fuel is 75. What does it mean?
12. State Anti- Markovnikov's rule.

**Group - B**

Attempt any five questions: (5×5=25)

1. State and explain the law of multiple proportion
2. Define redox reaction. Balance the following equation by oxidation number or ion electron method (1+4)

Zn + HNO Zn(NO3)2 + NH4NO3 + H2O

1. Consider a chemical reaction

Na2CO3 + HC1 NaCl + H2O + CO2. If reaction is carried out by mixing 2.12 gms of sodium carbonate and 1.5 gm of hydrochloric acid, find out

a. Which one is limiting reactant and why? (2)

b. The number of excess reagent left over unused. (1)

c. How many grams of NaCl is formed? (1)

d. The volume of CO2 produced at NTP. (1)

1. Describe the lab preparation of acetylene (ethyne) gas in laboratory. (2+3)
2. How the HI is prepared in laboratory? Give its action on conc.H2SO,j. (4+1)
3. How the sodium hydroxide is prepared by Solvay Kellener's process?
4. Explain ozonolysis and Markovnikov's rule with examples. (2.5+2.5)

**Group - C**

Attempt any two questions. (2×10 = 20)

30. i) State Boyle's law and Charle's law. Derive PV= nRT [3+3]

ii) A volume of 95 ml of N2O at 27°C is collected in a graduated tube over mercury the level of mercury inside the tube being 60 mm above outside mercury level when barometers reads750 mm. Calculate the volume of N2O at NTP. [4]

31. Describe the principle and process for the manufactured of ammonia with a labeled diagram by Haber's process. What happens when ammonia reacts with

a) CO2 b) heated copper oxide c) heated sodium.

(principIe-3-marks, diagram-2, description-2) [7 + 3]

32. Describe the extraction of sodium carbonate by Solvey-Kellner process. Describe the action of heat on washing soda. Give the molecular formula of baking soda. [7+2+1]

33. Write short notes on (any two) [5×2=10]

a) Law of mass action b) Bohr's model of an atom

c) inductive effect d) structural isomerism

SET 5

Group -A

Attempt any fifteen **questions.** (15×2 = 30)

1. How many atoms of hydrogen and oxygen are there in 9 gram of water?
2. Calculate the mass of

a. 1 ml of oxygen gas at NTP. b) 3 gram atom of nitrogen

1. P-orbital contains 6 electrons and d orbital contains 10 electrons. Why?
2. Write down the isotopes of hydrogen. Which is radio isotope?
3. What mole percent of O2 must be supplied to a space capsule in which the pressure is 0.3 atm., if the partial pressure of O2 is equal the partial pressure of O2 in air at sea level? (partial pressure of O2 = 0.21atm.)
4. What is an ideal gas? Under what condition gases will behave nearly like an ideal gas?
5. Define surface tension. Give its unit.
6. How is dipole moment is originated in a molecule? Why its value is zero in CO2 molecule?
7. What are the values of n, 1 and m for the 2Py orbitals ?
8. How is Bohr's atomic model originated?
9. Write the formula of the substances containing Nitrogen which shows the following oxidation state: -1/3, -3 , +3 and +4
10. State the law of mass action.
11. What is dead burnt plaster?
12. What happens when the gas obtained by heating iron sulphide and dil.sulphuric acid is allowed to pass through acidified potassium dichromate solution? Give rxn
13. Draw the resonance structure of ozone.
14. Define the term

a) BOD b) COD

1. What is meant by Froth-flotation process? What types of ores are subjected to this process?
2. How is plaster of Paris prepared?
3. Define the terms gasoline additives and cracking.
4. Write the IUPAC name of the fallowings compounds

a) (CH3)3 CC(CH3)3 b) H2C = C(OH)CH2COOH

1. What happens when water is dropped on calcium carbide?
2. Why is sodium extract solution alkaline in nature?
3. How the presence of sulphur in the organic compound is detected?

Group - B

**Attempt any five questions: (5×5 = 25)**

23. When 2.035 gms of slaked lime and 2.675gms of salammoniac react, calcium chloride, ammonia and water are formed. Find out

a) limiting reactant.

1. the wt of CaCl2 formed.
2. the number of gms of unreacted reagent left over.
3. the volume of dry ammonia produced at NTP.
4. the number of water molecules formed.

24. Define re-dox reaction. Balance the following redox reaction by oxidation number method or ion electron method

Zn + KOH + KNO3 K2ZnO2 + NH3 + H2O

25. In four experiment, the following % composition of hydrocarbons were obtained

|  |  |  |
| --- | --- | --- |
| Hydrocarbon | carbon | hydrogen |
| A | 75% | 25% |
| B | 80% | 20% |
| C | 85.7% | 14.3% |
| D | 92.3% | 7.7% |

Show that these data are in agreement with law of multiple proportion.

1. Describe the principle and self-explanatory sketch for the manufacture of ammonia by Haber's.
2. Describe ozone layer and its depletion.
3. What happens when?

a. Dilute nitric acid is treated with Mg ribbon (1)

b. SO2 gas is passed through chlorine water (1)

c. H2S is passed through acidified KMnO4 solution. (1.5)

d. Ammonia is passed through heated copper oxide (1.5)

29. How can you detect the presence of nitrogen and halogen in the organic compound. Write the chemical reaction involved. (3+2)

Group - C

**Attempt any two questions. (2×10 = 20)**

30. i) State and explain Graham's law of diffusion. [6]

ii) Ammonia gas and hydrochloric acid gas are allowed to diffuse from the opposite ends of a tube of 200cm length; at what distance from Hydrochloric acid gas and the white ring of ammonium chloride is formed. [4]

31. Describe the principle and process for the manufactured of sulphuric acid with a labeled diagram by Contact process. How does cone. H2SO4 reacts with:

a) barium chloride b) hydrogen sulphide

(principle-3-marks, diagram-2, description-3) (8+2)

1. Write the principle and procedure on the manufacture of caustic soda (NaOH) by Caster-Kellner process. What happens when caustic soda is:
2. Heated with Sulphur ii) treated with zinc
3. Write short notes on (any two) (5×2 = 10)

a) Le -Chatelier's principle

b) Modern periodic table

c) Detection of nitrogen in the organic compound

d) Allotropes of carbon