

APEEJAY COMMON ANNUAL EXAMINATION

SESSION 22-23

CLASS: XI SUBJECT: CHEMISTRY

TIME: 3 HOURS

Max Marks: 70

General Instructions:

Read the following instructions carefully.

- There are **35** questions in this question paper with internal choice.
- SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- SECTION B consists of 7 very short answer questions carrying 2 marks each.
- SECTION C consists of 5 short answer questions carrying 3 marks each.
- SECTION D consists of 2 case- based questions carrying 4 marks each.
- SECTION E consists of 3 long answer questions carrying 5 marks each.
- All questions are compulsory
- Use of log tables and calculators is not allowed

SECTION A

The following questions are multiple choice questions with one correct answer.

Each question carries 1mark. There is no internal choice in this section.

- Q1 Chloride ion is isoelectronic with 1
a) Na^+ b) Mg c) Ar d) Al^{3+}
- Q2 Which of the following contains same number of carbon atoms as are in 6.0 g of carbon 1
(C – 12)?
(a) 6.0 g Ethane (b) 8.0 g Methane (c) 21.0 g Propane (d) 28.0 g CO
- Q3 The number of significant figure in 0.0016 is 1
a) 1 b) 2 c) 3 d) 4
- Q4 The atomic number of the element Unbinilium is 1
a) 420 b) 120 c) 123 d) 102
- Q5 The number of sigma bond and pi bond in ethyne is 1
a) 3 sigma two Pi bond b) only 2 Pi bonds
c) one sigma and two pi bond d) Five sigma bonds one pi bonds
- Q6 Which of the following molecule has zero dipole moment 1
a) water b) NH_3 c) NF_3 d) carbon tetra chloride
- Q7 Which is correct about ΔG 1
a. It is negative for non spontaneous process b. It is positive for spontaneous process
c. It is zero for a reversible process d. It is zero for a spontaneous process
- Q8 At what temperature the entropy of perfect crystalline substance is zero 1
a) 0 K b) 273 K c) 0°C d) 250 K

- Q9 The pH of aqueous solution of ammonium acetate is 1
 a) equal to zero b) greater than 7 c) equal to 7 d) 14
- Q10 The Redox reaction in which a single substance undergoes both oxidation as well as 1
 reduction is called
 a) Exothermic reaction b) Combination reaction
 c) Decomposition reaction d) Disproportionation reaction
- Q11 The displacement of electrons in a multiple bond in the presence of attacking reagent is 1
 called
 (a) Inductive effect (b) Electromeric effect (c) Resonance (d) Hyper conjugation.
- Q12 The type of isomerism not found in alkenes is : 1
 (a) Chain isomerism (b) Geometrical isomerism (c) Metamerism (d) Position isomerism
- Q13 The catalyst used in Friedel – Crafts reaction is 1
 (a) Aluminium Chloride (b) Anhydrous Aluminium Chloride (c) Ferric Chloride (d)
 Copper .
- Q14 What is the correct decreasing order of boiling point? 1
 a) NeoPentane>Isopentane>Pentane b)Pentane>Isopentane>NeoPentane
 c)Isopentane>NeoPentane>Pentane d) None of the above
- Q15 Given below are two statements labelled as Assertion (A) and Reason(R) 1
 Assertion (A): An orbit cannot have more than two electrons.
 Reason(R): No two electrons in an atom can have same set of all four Quantum numbers.
 Select the most appropriate answer from the options given below:
 a.Both A and R are true and R is the correct explanation of A
 b.Both A and R are true but R is not the correct explanation of A.
 c.A is true but R is false.
 d.A is false but R is true.
- Q16 Given below are two statements labelled as Assertion(A) and Reason(R) 1
 Assertion (A): Noble gas elements have positive electron gain enthalpy.
 Reason (R): Inert gas elements stable octet configuration .
 Select the most appropriate answer from the options given below:
 a.Both A and R are true and R is the correct explanation of A
 b.Both A and R are true but R is not the correct explanation of A.
 c.A is true but R is false.
 d.A is false but R is true.
- Q17 Given below are two statements labelled as Assertion (A) and Reason(R) 1
 Assertion : The reaction between haloalkanes and sodium metal in presence of
 dry ether alkanes having even number are produced .

Reason: Propane can be prepared by Wurtz reaction

- a. Both A and R are true and R is the correct explanation of A
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.

- Q18 Given below are two statements labelled as Assertion (A) and Reason(R) 1
- Assertion (A): Resonance hybrid cannot be presented by a single structure
- Reason(R): Energy of resonance hybrid is equal to the average of energies of all canonical forms.
- a. Both A and R are true and R is the correct explanation of A
 - b. Both A and R are true but R is not the correct explanation of A.
 - c. A is true but R is false.
 - d. A is false but R is true.

SECTION - B

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

- a. What do you mean by limiting reagent.
- Q19 b. Molarity changes with temperature. Give reason 2
- Q20 a. Explain the term entropy. 2
- b. Write the mathematical expression for the first law of thermodynamics.

(OR)

Predict whether entropy change is positive or negative

- a. Heating a substance from 0K to 115K
- b. $\text{H}_2(\text{g}) \rightarrow 2\text{H}(\text{g})$
- Q21 Derive the relation between C_p and C_v for an Ideal Gas. 2
- Q22 The concentration of hydrogen ions in a sample of soft drink is 3.8×10^{-3} M. What is the pH value? ($\log 3.8 = 0.5798$) 2
- Q23 Draw the Newman projection formulae of ethane. Which conformation is stable? 2

(OR)

What are the conditions for aromaticity?

- Q24 a. Write IUPAC name of the following : 2
 $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_2\text{COOH}$.
- b. Draw the bond line structure of 2,4 -dimethylheptane
- Q25 Explain heterolytic cleavage with an example . 2

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

- Q26 a. Commercially labelled sulphuric acid has 49% H_2SO_4 . Its density is 1.40 g/ml. What is the molarity? (At. Mass S=32, O=16 amu) 3
 b. The vapour density of a substance is 34. What is the molar mass?
- Q27 a. What do you mean by dual nature of electron? 3
 b. Calculate the wavelength of an electron moving with the velocity 2.05×10^7 m/s.
- Q28 a. What are transition metals? Write any four characteristics of transition metals. 3
- (OR)
- a. Name the element having the highest electronegativity value.
 b. Write general electronic configuration of inner transition elements.
 c. The ionisation enthalpy of Boron is less than that of Beryllium. Why?
- Q29 Balance the following redox reaction in acidic medium by ion electron method. 3
 $\text{Cr}_2\text{O}_7^{2-} + \text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{Cr}^{3+}$
- (OR)
- a. What is the role of salt bridge in galvanic cell?
 b. Calculate the oxidation number of Manganese in Permanganate ion.
 c. Write the cell notation of the following galvanic cell.
 $\text{Zn (s)} + \text{Cu}^{2+} (\text{aq}) \rightarrow \text{Zn}^{2+} (\text{aq}) + \text{Cu (s)}$
- Q30 Calculate the heat of combustion of ethylene gas to form CO_2 (gas) and H_2O (gas) at 298K and 1 atmospheric pressure. The heats of formation of CO_2 , H_2O and C_2H_4 are -393.7 , -241.8 , $+52.3$ kJ per mole respectively. 3

SECTION - D

- Q31 The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. 4

Read the passage carefully and answer the questions that follow.

According to Arrhenius concept, acids give H^+ ions while bases produce OH^- ions in their aqueous solutions. Bronsted-Lowry defined an acid as a proton donor and a base as a proton acceptor. When a Bronsted – Lowry acid reacts with a base, it produces its conjugate base and a conjugate acid corresponding to the base with which it reacts. Thus, a conjugate pair of acid - base differs only by a proton. The strength of acids and bases can be measured in terms of their dissociation constants K_a (or $\text{p}K_a$) and K_b (or $\text{p}K_b$). Larger value of K_a or lower value of $\text{p}K_a$ corresponds to greater strength of acids.

Similarly, larger value of K_b or lower value of pK_b corresponds to stronger base. pH finds vital role in cosmetic formulations and buffer solution is used in blood bank. According to Arrhenius concept, acids give H^+ ions while bases produce OH^- ions in their aqueous solutions. Bronsted-Lowry defined an acid as a proton donor and a base as a proton acceptor. When a Bronsted – Lowry acid reacts with a base, it produces its conjugate base and a conjugate acid corresponding to the base with which it reacts. Thus, a conjugate pair of acid - base differs only by a proton. The strength of acids and bases can be measured in terms of their dissociation constants K_a (or pK_a) and K_b (or pK_b). Larger value of K_a or lower value of pK_a corresponds to greater strength of acids. Similarly, larger value of K_b or lower value of pK_b corresponds to stronger base. pH finds vital role in cosmetic formulations and buffer solution is used in blood bank.

a. Write the conjugate acid -base pair for the following

i) NH_3 ii) HSO_4^-

b. What are buffer solutions?

c. What are Lewis acids and Lewis Bases?

(OR)

c. Which of the following are Lewis acid and bases.

: NH_3 , BF_3 , $AlCl_3$, CH_3NH_2 .

Q32 In an organic reaction a covalent bond between two carbon atoms or a carbon and some other atom is broken and a new bond is formed. A sequential account of each step, describing details of electron movement, energetics during bond cleavage and bond formation, and the rates of transformation of reactants into products (kinetics) is referred to as reaction mechanism. A species having a carbon atom possessing sextet of electrons and a positive charge is called a carbocation (earlier called carbonium ion). The CH_3^+ ion is known as a methyl cation or methyl carbonium ion. Carbocations are classified as primary, secondary or tertiary depending on whether one, two or three carbons are directly attached to the positively charged carbon. Some other examples of carbocations are: $CH_3CH_2^+$ (ethyl cation, a primary carbocation), $(CH_3)_2CH^+$ (isopropyl cation, a secondary carbocation), and $(CH_3)_3C^+$ (tert-butyl cation, a tertiary carbocation). Carbocations are highly unstable and reactive species. Alkyl radicals are classified as primary, secondary, or tertiary. Alkyl radical stability increases as we proceed from primary to tertiary: Organic reactions, which proceed by homolytic fission are called free radical or homopolar or nonpolar reactions.

a. Write any two reactive intermediates which are unstable.

b. State the hybridisation of carbonium ion.

c. Arrange tertiary, secondary and primary carbocations in the increasing order of their stability. Justify your answer.

(OR)

c. What are electrophiles and nucleophiles. Give an example for each.

5

SECTION E

The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

- Q33
- Calculate the radius of the first orbit of He^+ .
 - State Heisenberg uncertainty. Give any one significance of it.
 - Write electronic configuration of Cr^{3+} ion. ($Z=24$)

(OR)

- What is the significance of magnetic quantum number?
- If $n=5$, $l=3$ what is the designation of the orbital.
- State Aufbau principle.
- Calculate the wave number of yellow radiation having wavelength 5800 \AA .

- Q34
- Explain types of hydrogen bonding with their examples.
 - Explain the geometry and shape of NH_3 with the help of VSEPR theory.
 - Axial bonds in PCl_5 are slightly elongated than equatorial bonds. Give reason.

5

(OR)

a. Calculate the bond order and compare the relative stability of O_2 , O_2^- , O_2^+ in terms of molecular orbital theory.

b. Write the differences between sigma and pi bond. (any two)

- Q35
- Ethyne in red hot iron tube at 873K gives X. X on reaction with acetyl chloride in the presence of anhyd. AlCl_3 gives Y. Find X and Y in the above sequence of the reactions.

5

b. Explain Markovnikov's rule with an example.

c. Convert phenol to benzene.