CLASS-XI

ANNUAL EXAMINATION 2024-25

SUBJECT-CHEMISTRY

SET B1

Time:-3 hours **MM=70**

No. of printed pages=8

General Instructions:

a) There are **33** questions in this question paper with internal choice.

b) SECTION A consists of 16 multiple-choice questions carrying 1 mark each.

c) SECTION B consists of 5 very short answer questions carrying 2 marks each.

d) SECTION C consists of 7 short answer questions carrying 3 marks each.

e) SECTION D consists of 2 case- based questions carrying 4 marks each.

f) SECTION E consists of 3 long answer questions carrying 5 marks each.

g) All questions are compulsory.

h) Use of log tables and calculators is not allowed.

SECTION A

1.A and B are two solutions that are mixed. Calculate the resultant solution's molarity.

Initial Solutions	Molarity	Volume
A	1.3	100ml
B	0.8	500ml

a) 0.8 mol/L
b) 0.88 mol/L
c) 1.3 mol/L
d) 1.05 mol/L

2.What is the shape the orbital, whose "l" is 1?
a) Spherical
b) Dumbbell
c) Double dumbbell
d) Complex

3.As per Heisenberg's principle of uncertainty, the relation between relative momentum and relative position is _____
a) independent
b) equal
c) directly proportional
d) inversely proportional

4.The number of electrons in bonding orbital and anti-bonding orbital of Lithium molecule are _____ and _____ respectively.
a) 4, 4
b) 2, 2
c) 2, 4
d) 4, 2

5.The pH of neutral water at 25°C is 7.0. As the temperature increases, ionisation of water increases, however, the concentration of H^+ ions and OH^- ions are equal. What will be the pH of pure water at 60°C?
(a) Equal to 7.0
(b) Greater than 7.0
(c) Less than 7.0
(d) Equal to zero

6. Acidity of BF_3 can be explained on the basis of which of the following concepts?
(a) Arrhenius concept
(b) Bronsted Lowry concept
(c) Lewis concept
(d) Bronsted Lowry as well as Lewis concept.

7.In Lassaigne's test for nitrogen in an organic compound, the Prussian blue colour is obtained due to the formation of:
(a) $Na_4[Fe(CN)_6]$

(b)$Fe_4[Fe(CN)_6]_3$
(c) $Fe_2[Fe(CN)_6]$

(d)$Fe_3[Fe(CN)_6]_4$.

8.The following reaction is classified as:
CH_3CH_2Cl+ KOH (alc) ———-> $CH_2 = CH_2$ + KCl +H_2O
(a) electrophilic substitution

(b) nucleophilic substitution
(c) elimination

(d) addition

9. In NaH, the oxidation state of hydrogen is _____
a) 2
b) 1

c) -1
d) 0

10. Which of the following is used to reduce phenol vapors to benzene?
a) Hydrogen gas
b) Oleum
c) Zinc dust
d) Anhydrous $AlCl_3$

11. Among halogens, the correct order of amount of energy released in electron gain (electron gain enthalpy) is
(a) F > Cl > Br > I
(b) F < Cl < Br < I
(c) F < Cl > Br > I
(d) F < Cl < Br > I

12. Which of the following is the correct IUPAC name?

(a) 3-Ethyl-4, 4-dimethylheptane

(b) 4,4-Dimethyl-3-ethylheptane

(c) 5-Ethyl-4, 4-dimethylheptane

(d) 4,4-Bis(methyl)-3-ethylheptane

In the following questions, a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct answer out of the following choices:
(a) Both Assertion and Reason are true and the Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true and the Reason is not the correct explanation of Assertion.
(c) Assertion is true and Reason is false.
(d) Assertion is not true but the Reason is true.
(e) **Both Assertion and Reason are false.**

13. Assertion (A) : Nitration of benzene with nitric acid requires the use of concentrated sulphuric acid.

Reason (R) : The mixture of concentrated sulphuric acid and concentrated nitric acid produces the electrophile, NO_2^+ .

14. Assertion (A) : Black body is an ideal body that emits and absorbs radiations of all frequencies.

Reason (R) : The frequency of radiation emitted by a body goes from a lower frequency to higher frequency with an increase in temperature.

15.Assertion (A) : A liquid crystallises into a solid and is accompanied by decrease in entropy. Reason (R) : In crystals, molecules organise in an ordered manner

16. Assertion (A) : Combustion of 16 g of methane gives 18 g of water.

Reason (R) : In the combustion of methane, water is one of the products.

SECTION B

17.In a reaction $A + B_2 \rightarrow AB_2$

Identify the limiting reagent, if any, in the following reaction mixtures.

(i) 300 atoms of A + 200 molecules of B

(ii) 2.5 mol A + 5 mol B

18.(i) Find energy of each of the photons which have wavelength of 0.50 Å.(Planck's constant = 6.626×10^{-34} Js)

(ii) How many electrons in an atom may have the following quantum numbers?

(a) n = 4, $m_s = -½$ (b) n = 3, l = 0

19.(a) Assign the position of the element having outer electronic configuration

(i) $ns^2 np^4$ for n = 3

(b)Use the periodic table to identify an element that would tend to lose two electrons.

20. Explain the terms inductive and electromeric effects. Which electron displacement effect explain the following correct orders of acidity of the carboxylic acids?

$Cl_3CCOOH > Cl_2CHCOOH > ClCH_2 COOH$

21. Draw Newman or Sawhorse projections for the eclipsed and staggered conformations of ethane. Which of these conformations is more stable and why?

OR

Draw the cis and trans structures of hex-2-ene. Which isomer will have higher b.p. and why?

SECTION C

22. Calculate the concentration of nitric acid in moles per litre in a sample which has a density, 1.41 g mL^{-1} and the mass percent of nitric acid in it being 69%. (Atomic mass of N=14, H=1, O=16 u)

23.(a) Which out of NH_3 and NF_3 has higher dipole moment and why?

(b) Describe the change in hybridisation (if any) of the Al atom in the following reaction.

$$AlCl_3 + Cl^- \rightarrow AlCl_4^-$$

24.(a)Which of the following pairs of elements would have a more negative electron gain enthalpy? O or S. Give reason.

(b)Would you expect the second electron gain enthalpy of O as positive, more negative or less negative than the first? Justify your answer.

25. When two moles of $C_2H_6(g)$ are burnt, 3129 kJ of heat is liberated. Calculate the heat of formation of $C_2H_6(g)$. ΔH_f^o for $CO_2(g)$ and $H_2O(l)$ are-393.5 and -286 kJ mol^{-1} respectively.

26.(a)Balance the following redox reaction:-

$$Cr_2O_7^{2-}(aq) + SO_2(g) \longrightarrow Cr^{3+}(aq) + SO_4^{2-}(aq) \text{ (in acidic solution)}$$

(b)What is the role of a salt bridge in an electrochemical cell?

27. (a)Draw the resonance structures for C_6H_5OH. Show the electron shift using curved-arrow notation.

(b) Why is nitric acid added to sodium extract before adding silver nitrate for testing halogens ?

28. (a) Compare the relative stability and magnetic character of the following species on the basis of Molecular Orbital Theory: O_2^- (Superoxide), O_2^{2-} (peroxide)

(b)Arrange the following, according to increasing covalent nature.

$$NaCl, MgCl_2, AlCl_3$$

OR

(a)Describe the hybridisation in case of PCl_5. Why are the axial bonds longer as compared to equatorial bonds? (Atomic number of P=15)

(b) Write the conditions which favour the formation of ionic bond.(Any two)

SECTION D

29.Read the given passage and answer the questions that follow:

Organic compounds are formed by covalent bonding. The nature of covalent bonding can described with the help of hybridisation, sp, sp2 and sp3. The structure and reactivity depends

upon type of bonds present in organic compounds. Organic compound can be represented by various structural formulae, Wedge and Dash formula is 3-D representation. Organic compounds can be classified on the basis of functional groups. Organic reactions mechanism are based on structure of substrate and the attacking reagent.

The intermediate formed can be free radical, carbocation, carbanion or carbene. The attacking reagent can be electrophile or nucleophile. The inductive, electromeric, resonance and hyperconjugative effect may help in polarisation of covalent bond. Organic reactions may be regarded as substitution, addition, elimination and rearrangement, oxidation and reduction reaction.

1.Write the hybridized state of C atoms in the following $CH_2 = CH - CN$

2.Explain why $(CH_3)_3C^+$ is more stable than $CH_3CH_2^+$

3.Which of the two:

$O_2NCH_2CH_2O^-$ or $CH_3CH_2O^-$ is expected to be more stable, and why?

4.Draw the possible resonance structures for CH_3-O-CH_2^+, and predict which of the structures is more stable.

30.Read the following passage and answer the questions that follow:

Bohr's model explained electrons can revolve only in certain permitted orbits whose angular momentum is integral multiple of h/2p, associated with fixed amount of energy. Bohr theory could successfully explain stability of atoms and spectrum of unielectron species. Hydrogen spectrum consist of Lyman, Balmer, Paschen, Brackett

and Pfund series. Bohr's theory could not explain spectrum of multi-electron species, Stark effect, Zeeman effect, dual nature of matter, de Broglie equation and Heisenberg uncertainty principle which lead to orbital concept. Electrons were filled in orbitals according to Aufbau's principle, Hund's Rule and Pauli's exclusion principle. Each electron is identified by four quantum numbers n, l, ml and ms out which n, l, ml were derived from Schrodinger's wave equation. Half filled and completely filled orbitals are more stable due to exchange energy and symmetrical distribution of electrons.

1.Calculate the wavelength of an electron moving with a velocity of 2.05×10^7 m s^{-1}. (Planck's constant = 6.626×10^{-34} Js)

2.Show that the circumference of the Bohr orbit for the hydrogen atom is an integral multiple of the de Broglie wavelength associated with the electron revolving around the orbit.

3. Write the electronic configuration of Cu^{2+} (Atomic no. of Cu=29)

SECTION E

31.(a) The bond enthalpy of $H_2(g)$ is 436 kJ $mol^{-1}$and that of N_2 (g) is 941.3 kJ mol^{-1}. Calculate the average bond enthalpy of an N-H bond in ammonia. Given: $\Delta H_f{}^o$ (NH_3) = -46 kJ mol^{-1}

(b)Given the condition, $\Delta H = 0$ for the mixing of the two gases. Explain if the diffusion of these gases into each other in the closed container is a spontaneous process or not.

(c)Predict the change in the internal energy for the isolated system at the constant volume.

32.(a)pH of a solution of a strong acid is 5.0. What will be the pH of the solution obtained after diluting the given solution a 100 times? (log2=0.3010)

(b)The solubility of AgCl in water at 298 K is 1.06 x 10^{-5} mole per litre. Calculate its solubility product at this temperature.

(c) Write the conjugate acids for the following Bronsted bases:

NH_3 and $HCOO^-$

OR

(a)State Le Chatelier's principle.
(b)Following reactions occur in a Blast furnace.
$Fe_2O_3(s) + 3CO(g) \longrightarrow 2Fe(s) + 3CO_2(g)$

predict the direction of reaction when equilibrium mixture is disturbed by
(i) adding Fe_2O_3 (ii) removing CO_2 .
(c)A mixture of 1.57 mol of N_2, 1.92 mol of H_2 and 8.13 mol of NH_3 is introduced into a 20 L reaction vessel at 500 K. At this temperature, the equilibrium constant Kc for the reaction
$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ is 1.7×10^{-2}.
Is this reaction at equilibrium?

33.(a)How will you convert benzene into
(i) p-chloronitrobenzene (ii) Acetophenone

(b)Addition of HBr to propene yields 2-bromopropane as the major product. Write the reaction giving suitable mechanism.

(c)An alkene 'A' on ozonolysis gives a mixture of ethanal and pentan-3-one. Write the structure and IUPAC name of 'A'.

OR

(a)Write the equations for the following reactions:

(i) Dehydrohalogenation of 1-bromopropane

(ii) Decarboxylation of sodium benzoate

(b) Write the mechanism of halogenation of benzene.

(c) What happens when ethyne gas is passed through red hot iron tube? (eqn. only)