

Time : 3Hrs

M.M : 70

General Instructions:

1. There are total of 37 questions and four sections in the question paper. All questions are compulsory.
 2. Section A contains 20 questions of one mark each.
 3. Section B contains 07 questions, short answer type questions and of two marks each.
 4. Section C contains 07 questions, short answer type questions and of three marks each.
 5. Section D contains 03 questions long answer type questions and of five marks each.
 6. There is no overall choice in the question paper. However, internal choices are provided in two questions of two marks, two questions of three marks and all questions of five marks. An examinee is to attempt any one of the questions out of the two given in the question paper with the same question number.
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(Section- A)

Read the following passage and answer the questions 1 to 5 that follow:

Mahak is very sincere girl. She sits quietly in the class on her seat and does not disturb other students of the class. Contrary to it, Ravi does not adhere to his seat. Ravi keeps on moving in the entire class and talking to his friends. He would like to share the seat of every students of the class. Ravi does not wish to remain sitting on his seat. Sana has balance habits. She move to her friends only when it is required.

- Q1. To which state of matter does Mahak resemble?
- Q2. To which state of matter does Ravi resemble?
- Q3. To which state of matter does Sana resemble?
- Q4. Which is higher- Normal boiling point or standard boiling point of liquid?
- Q5. What is Boyle's law ?

Questions 6 to 10 are one word or one sentence answer.

- Q6. Why does a moving car not show characters of a wave?
- Q7. Give examples of state functions and path functions.
- Q8. What is Baking soda and Baking powder?
- Q9. How will you purify camphor containing non-volatile solids?
- Q10. Is boric acid a protic acid? Explain.

Questions number 11 to 15 are multiple choice questions.

Q11. When the electron in hydrogen atom jumps from $n = 4$ to $n = 1$ state, The number of spectral lines emitted is :

- (a) 15 (b) 9 (c) 6 (d) 3

Q12. The bond order of N-O in NO_3^- ion is :

- (a) 0.33 (b) 1.0 (c) 1.5 (d) 1.33

Q13. Most stable carbonium ion is :

- (a) $(\text{CH}_3)_3\text{C}^+$ (b) CH_3CH_2^+
(c) $(\text{CH}_3)_2\text{CH}^+$ (d) CH_3^+

Q14. Which of these is weakest ?

- (a) Ionic bond (b) Vander-walls forces
(c) Covalent bond (d) Metallic bond

Q15. Two electrons occupying the same orbital are distinguish by :

- (a) Azimuthal quantum no. (b) Magnetic quantum no.
(c) Spin quantum no. (d) Principle quantum no.

Q16 To 20 are Assertion and reason type:

In the following question a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- (a) Assertion and reason both are correct statement and reason is correct explanation for assertion.
(b) Assertion and reason are correct statement but reason is not correct explanation for assertion.
(c) Assertion is correct but reason is wrong statement.
(d) Assertion and reason both are incorrect statement.

Q16. **Assertion :** CuSO_4 solution is not stored in a Zn vessel.

Reason : Zn forms complex with CuSO_4 .

Q17. **Assertion :** C-H bond length in C_2H_6 , C_2H_4 and C_2H_2 is same .

Reason : There is single bond between C and H in all these compounds.

Q18. **Assertion :** PV is constant at constant temperature.

Reason : Real gas deviate from ideal behaviour at high pressure and low temperature.

Q19. **Assertion :** The free gaseous ${}_{24}\text{Cr}$ -atom has six unpaired electrons.

Reason : $(n + l)$ rule is followed for determining the orbital of the lower energy.

Q20. **Assertion :** Graphite is a good conductor of heat and electricity.

Reason : Graphite has all the electrons firmly held in C-C sigma bonds.

(Section-B)

- Q21. For the gaseous equilibrium reaction, $2\text{SO}_2 + \text{O}_2 \rightleftharpoons 2\text{SO}_3$ The value of K_p at 427°C is 1.8×10^{-3} Kpa. Calculate K_c for the reaction at 700K. (Given: $R=0.082$)
- Q22. State and explain : (i) Pauli-Exclusion principle (ii) Hund's rule
- Q23. Write short note on the following:
- (i) Friedal crafts reaction (ii) Wurtz reaction

OR

- The molecular mass of an alkane is 72. How many structural isomers are possible for this alkane? What are the IUPAC name of these isomer?
- Q24. Assign oxidation number to the underlined elements in each of the following compound: (i) NaH_2PO_4 (ii) K_2CrO_4
- Q25. Give two faulty assumptions which lead to Vander-walls equation?

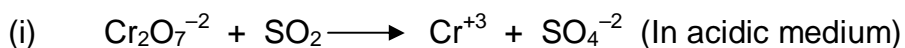
OR

- 100ml of a gas has a pressure of 600mm. What will be the volume of the gas if :
- (i) pressure is doubled (ii) pressure is halved? Temperature is constant.
- Q26. How are nitrogen and sulphur identified in an organic compounds? Give equation for the chemical reactions.
- Q27. What is meant by Gibb's free energy change? The sign of Gibb's energy is very important. Justify the statement.

(Section-C)

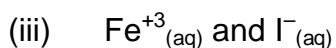
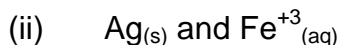
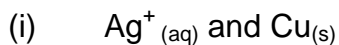
- Q28. A sample of 0.5gm of an organic compound was treated according to Kjeldahl's method. The ammonia evolved was absorbed in 50ml of 0.5M H_2SO_4 . The residual acid required 60ml of 0.5M solution of NaOH for neutralization. Find the percentage composition of nitrogen in the compound.
- Q29. Using s, p, d, f notation, Describe the orbital with the following quantum numbers:
- (i) $n = 3, l = 1$ (ii) $n = 4, l = 2$ (iii) $n = 5, l = 3$
- Q30. How will you explain the following observations:
- (i) K_2CO_3 can not be prepared by Solvay process.
- (ii) BeO is almost insoluble but BeSO_4 is soluble in water.
- (iii) Why are alkali metals not found in nature?

Q31. Balance the following reactions by Ion-electron method :



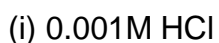
OR

Predict if the reaction between the following is feasible:



(Given: $E^0_{\text{Ag}^+/\text{Ag}} = 0.80\text{V}$, $E^0_{\text{Cu}^{+2}/\text{Cu}} = 0.34\text{V}$, $E^0_{\text{Fe}^{+3}/\text{Fe}^{+2}} = 0.77\text{V}$, $E^0_{\text{I}_2/\text{I}^{-}} = 0.54\text{V}$)

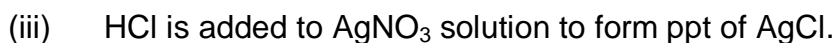
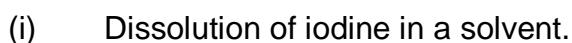
Q32. Assuming complete dissociation, Calculate the PH of the following solutions:



Q33. Explain the following:

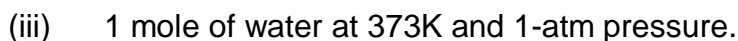
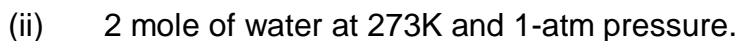
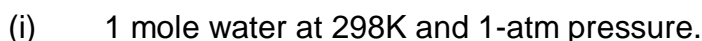


Q34. Which of the following process are accompanied by increasing or decreasing entropy?



OR

Arrange the following in the increasing order of entropy and explain the reason.



(Section- D)

- Q35. (A) Write the important features of linear combination of atomic orbitals.
- (B) Account for the following :
- (i) H₂O has bent structure whereas CO₂ molecule is linear.
- (ii) At room temperature, H₂O is liquid whereas H₂S is gas.
- (iii) Boiling point of HF is higher than HCl.

OR

- (A) What is molecular orbital theory? Sketch the molecular orbital diagram of N₂ and O₂.
- (B) Describe the hybridisation in case of PCl₅. Why the axial bonds longer as compared to equatorial bonds ?
- Q36. (A) Discuss the mechanism of electrophilic substitution in benzene ring with examples.
- (B) what are the necessary conditions for any system to be aromatic.?

OR

- (A) How will you convert benzene into:
- (i) P-nitrobenzene (ii) Acetophenone (iii) Bromobenzene
- (B) Write chemical equations for combustion reaction of the following hydrocarbon:
- (i) Butane (ii) Pentene
- Q37. (A) Derive the relationship between K_p and K_c for a reversible reaction.
- (B) In the reversible reaction, $A + B \rightleftharpoons C + D$, The initial concentration of each of A and B is 0.8. At equilibrium, molar concentration of C is 0.6. Calculate K_c for the reaction.

OR

- (A) Derive the following relation, $PH + POH = 14$.
- (B) Solubility of AgCl in water is 1.06×10^{-5} mol/litre at 298K. Calculate its K_{sp}.
- (C) Write the conjugate acids for HCOO⁻.
