

O.P.JINDAL SCHOOL, SAVITRINAGAR
ANNUAL EXAMINATION-(2025-26)

CLASS-XI
SUBJECT-CHEMISTRY

MAX.MARKS-70
MAX.TIME-3HOURS

General Instruction:-

- (i) All questions are compulsory. There are 33 questions in all.
- (ii) SECTION –A: Question numbers 1 to 16 are MCQs carrying one mark each.
- (iii) SECTION –B: Question numbers 17 to 21 are short answer type-I questions and carrying 2 marks each.
- (iv) SECTION –C: Question numbers 22 to 28 are short answer type-II questions and carrying 3 marks each.
- (v) SECTION –D: Question numbers 29 and 30 are case-based questions carrying 4 marks each.
- (v) SECTION –E: Question numbers 31 to 33 are all long answer type questions and carrying 5 marks each.
- (vi) There is no overall choice. However, an internal choice has been provided in some questions.
- (vii) Use of calculator is not permitted. However, you may use log tables, if necessary.

SECTION-A

- The oxidation number of Mn in MnO_4^- is
 (a)+1 (b)+3
 (c)+5 (d)+7
- The value of K_w in an acidic aqueous solution at 298 K is
 (a) $> 10^{-14}$ (b) $< 10^{-14}$
 (c) 10^{14} (d) 10^{-14}
- The symbol of the element with atomic number 120 is
 (a) Unb (b) Ubt
 (c) Ubs (d) Ubn
- Which one of the following is smallest in size ?
 (a) N^{3-} (b) O^{2-}
 (c) F^- (d) Na^+
- The hybrid state of C in ethane, ethene and ethyne is respectively:
 (a) $\text{sp}^3, \text{sp}^2, \text{sp}$ (b) $\text{sp}, \text{sp}^2, \text{sp}^3$
 (c) $\text{sp}^2, \text{sp}, \text{sp}^3$ (d) $\text{sp}^3, \text{sp}, \text{sp}^2$
- Consider two elements P and Q. If P has 2 and Q has 7 electrons in their outermost shell, then the formula of the compound is :
 (a) PQ (b) PQ_2
 (c) P_2Q (d) P_2Q_3

7. Among the following , the weakest Bronsted base is :
 (a) F^- (b) Cl^-
 (c) Br^- (d) I^-
8. In the reaction , $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$,the elements which have been oxidized and reduced respectively are :
 (a)chlorine and oxygen (b)oxygen and chlorine
 (c)potassium and oxygen (d)oxygen and potassium
9. Which of the following is an intensive property?
 (a)Volume (b)enthalpy
 (c)temperature (d)internal energy
10. The recently discovered element with $Z= 119$ belongs to:
 (a)s-block (b)p-block
 (c)d-block (d)f-block
11. The maximum number of hydrogen bonds in which water molecule can participate is :
 (a)1 (b)2
 (c)3 (d) 4
12. Which amongst the following will be most stable?
 (a) $\dot{\text{C}}\text{H}_3$ (b) $\dot{\text{C}}\text{H}_2\text{CH}_3$
 (c) $\dot{\text{C}}\text{H}(\text{CH}_3)_2$ (d) $\dot{\text{C}}(\text{CH}_3)_3$

Questions 13-16 are Assertion and Reason questions:

In these questions(13-16) 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 statements and reason is the correct explanation for assertion.
 (b) Assertion and reason both are correct statements and reason is not the correct explanation for assertion.
 (c) Assertion is correct statement but reason is wrong statement .
 (d) Assertion is wrong statement but reason is correct statement
- 13 .**Assertion:** The variables like q, V, T are called state functions.
Reason: The values of state function depend only on the state of the system.
14. **Assertion:** CH_4 does not react with Cl_2 in dark.
Reason: Chlorination of CH_4 takes place in sunlight.
15. **Assertion :** K_p can be less than,greater than or equal to K_c .

Reason: Relationship between K_p and K_c depends on the changes in number of moles of gaseous reactants and products.

16. Assertion: All the carbon atoms in $\text{H}_2\text{C}=\text{C}=\text{CH}_2$ are sp^2 hybridised.

Reason: In this molecule all the carbon atoms are attached to each other by double bonds.

SECTION-B

17. What do you mean by disproportionation reaction? Give one example.

18. Classify the following species into Lewis acids and Lewis bases :

(i) OH^- (ii) H^+ (iii) BF_3 (iv) F^-

OR

Write the conjugate acid and base of the following species :

(i) NH_3 (ii) HS^-

19. For a gaseous reaction, $2\text{A}_2(\text{g}) + 5\text{B}_2(\text{g}) \rightarrow 2\text{A}_2\text{B}_5(\text{g})$ at 27°C the heat change at constant pressure is found to be -50160J . Calculate the value of internal energy change. (Given that $R = 8.314\text{ JK}^{-1}\text{mol}^{-1}$)

OR

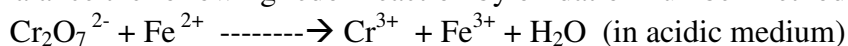
A gas expands isothermally against constant external pressure of 1 atm from a volume of 10 dm^3 to a volume of 20 dm^3 . In the process, it absorbs 800J of thermal energy from surroundings. Calculate the value of internal energy change.

20. Calculate the formal charges on different atoms in carbonate ion.

21. How would you explain the fact that the first ionization enthalpy of sodium is lower than that of magnesium but its second ionization enthalpy is higher than that of magnesium.

SECTION-C

22. Balance the following redox reaction by oxidation number method:



OR

Balance the following redox reaction by ion-electron method:



23. The density of 3M solution of NaCl is 1.25 g mL^{-1} . Calculate the molality of the solution?

24. Explain the structure of ethene molecule on the basis of hybridization concept.

25. Calculate the uncertainty in the velocity of a cricket ball of mass 150 g, if the uncertainty in its position is of the order of $1 \text{ \AA}$. ($h = 6.6 \times 10^{-34} \text{ kg m}^2 \text{ s}^{-1}$)

OR

A 200 watt bulb emits electromagnetic light of wave length 800 nm. Calculate the number of photons emitted per second by the bulb.

26. 3.6 g of glucose (molar mass=180) is dissolved in 72 g of water. Calculate

(i) The concentration of the solution in terms of molality .

(ii) mole fraction of glucose and water.

OR

An organic compound on analysis gave the following data: C=57.82% , H=3.6% and the rest is oxygen. Its vapour density is 83. Find its empirical formula and molecular formula .

27. Write all the resonating structures of the following:

(i) Phenol

(ii) Nitrobenzene

(iii) Aniline

28. How will you convert the following?

(i) Benzene to p-nitrobromobenzene

(ii) Hexane to benzene

(iii) Benzene to m-nitrobromobenzene

SECTION-D

29. Read the following and answer the questions given below.

A total of four quantum numbers are used to describe completely the movement and trajectories of each electron within an atom. Each electron has a unique set of quantum numbers; according to the Pauli Exclusion principle, no two electrons can share the same combination of four quantum numbers. Quantum numbers are important because they can be used to determine the electron configuration of an atom and the probable location of the atom's electron. In atoms there are total of four quantum numbers; the Principal quantum number (n), the orbital angular momentum quantum number (l), the magnetic quantum number (m_l), and the spin quantum number (m_s). The Principal quantum number (n), describes the energy of an electron and the most probable distance of the electron from the nucleus. In other words, it refers to size of the orbital and energy level of an electron is placed in. The number of sub shells, or l, describes the shape of the orbital. It can also be used to determine the number of angular nodes. The magnetic quantum number (m_l) describes the energy levels in a sub shell and (m_s) refer to the spin on the electron, which can either be up or down. The value of the principal quantum number n is the level of the

principal electronic shell (Principal energy level) . All orbitals that have the same n value are in the same Principal energy level. The size of the atom and its atomic radius increases ,as the electrons are farther from the nucleus . Thus , it is easier for the atom to expel an electron because the nucleus does not have as strong a pull on it, and the ionization energy decreases . We can designate a Principal quantum number , n, and a certain sub shell by combining the value of n and the name of the sub shell (which can be found using l). The s orbital , because the value of m_l can only be 0 , can only exist in one plane . The p- orbital , however , has three possible orientation of the orbitals shown by p_x , p_y and p_z . The pattern continues , with the d orbital containing 5 possible orbital orientation , and f has 7 .

- (i) Write the electronic configuration of Fe^{3+}
- (ii) Calculate the maximum number of electrons in a subshell with $l=2$ and $n=3$.
- (iii) How many orbitals are possible in $n=4$ energy level?

OR

(iii) Explain giving reasons, which of the following sets of quantum numbers are not possible.

- (i) $n=3$, $l=3$, $m_l = +3$, $m_s = +\frac{1}{2}$
- (ii) $n=4$, $l=3$, $m_l = -2$, $m_s = -\frac{1}{2}$
- (iii) $n=5$, $l=4$, $m_l = +3$, $m_s = +1$
- (iv) $n=3$, $l=0$, $m_l = +1$, $m_s = -\frac{1}{2}$

30. Read the following and answer the questions given below.

Alkenes generally undergo electrophilic addition reactions because of the presence of a double bond (a strong sigma bond and weaker pi bond), pi – electrons which being loosely held are easily polarized. These reactions involve cleavage of a pi-bond and formation of two new sigma bonds. In polar solvents, addition proceeds by ionic mechanism (at low temperature), whereas in the presence of light or non polar solvents, the addition occurs by free radical mechanism (at higher temperature). Apart from addition reactions alkenes also participate in the oxidation, ozonolysis and polymerization reaction.

- (i) Give the reaction of 1-butene with HBr in the presence of a peroxide.
- (ii) Write the IUPAC name of the following:
- (iii) An alkene A on ozonolysis gives a mixture of ethanal and pentan-3-one. Write the structure and IUPAC name of A.

OR

- (iii) (a) Write the reaction of polymerization of ethene.

- (b) Write the IUPAC name of the organic products of the reaction of but-2-ene with bromine dissolved in tetrachloromethane.

SECTION-E

31. (i) Explain the mechanism of chlorination of benzene.

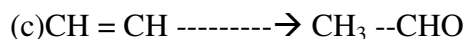
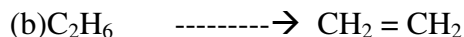
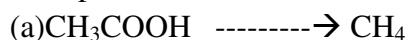
(ii) How are the following conversions carried out ?

(a) Benzene to toluene

(b) Phenol to benzene

OR

(i) Complete and balance the following reaction equations:



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

32. (i) Compare the relative stability of the following species and indicate their magnetic properties; N_2 , N_2^+ , N_2^- , N_2^{2-}

(ii) XeF_2 molecule is a linear molecule but it is a sp^3d hybridized. Why?

OR

(i) Using VSEPR theory draw the molecular structures of the following.

(a) H_2O

(b) BrF_5

(c) XeF_4

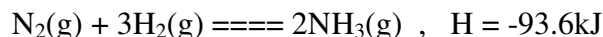
(ii) Why o-nitrophenol is steam volatile whereas p-nitrophenol is not steam volatile.

33. (i) The solubility of PbCl_2 at 298K is $2 \times 10^{-2} \text{ mol L}^{-1}$. Find out K_{sp} at this temperature.

(ii) The pK_a of acetic acid and pK_b of ammonium hydroxide are 4.76 and 4.75 respectively.

Calculate the pH of ammonium acetate solution.

(iii) How will the following reaction be affected by decreasing temperature:



OR

(i) For a reaction, $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$, the value of K_p is 3.6×10^{-2} at

500 K. Calculate the value of K_c for the reaction at this same temperature.

(ii) Ionic product of water at 310 K is 2.17×10^{-14} . What is the pH of neutral water at this temperature. ($\log 1.643 = 0.2156$)

(iii) How will the following reaction be affected by increasing pressure:

