

KENDRIYA VIDYALAYA SANGATHAN SILCHAR REGION
SESSION ENDING EXAMINATION (2017-18)
SUBJECT – CHEMISTRY CLASS – XI

MAXIMUM MARKS : 70

TIME: 3

HRS.

General Instructions:

1. All questions are compulsory.
2. Q. no. 1 to 5 is very short answer type questions carry 1 mark each. Answer them in one word or one sentence.
3. Q. no. 6 to 10 are short answer type question carry 2 marks each. Answer them in about thirty words.
4. Q. no. 11 to 22 are also short answer type questions carry 3 marks each. Answer them in about 40 words.
5. Q. No. 23 is value based question carry 4 marks.
6. Q. no. 24 to 26 is long answer type questions carry 5 mark each. Answer them in about 70 words.
7. Use log table if necessary. Use of calculators is not allowed.

1. What is the total number of orbital's associated with the principal quantum number $n = 3$?
2. In terms of period and group where would you locate the element with atomic number 114?
3. Why NH_3 has higher dipole moment than NF_3 ?
4. What causes permanent hardness of water?
5. Why is KO_2 paramagnetic?
6. (a) Express the following number in to scientific notation and find out number of significant figures in it. 0.00250
 (b) Density of a substance is 1.2 g mL^{-1} express the value in SI unit.
7. Why does real gas deviate from ideal behaviour? Write van der Waals equation of state for n moles of real gas.
8. For the reaction $2 \text{ Cl (g)} \rightarrow \text{Cl}_2 \text{ (g)}$, what are the signs of ΔH and ΔS ? Under what condition will the process become spontaneous?
9. Dihydrogen gas is obtained from natural gas by partial oxidation with steam as per following endothermic reaction:
 $\text{CH}_4 \text{ (g)} + \text{H}_2\text{O (g)} \rightleftharpoons \text{CO (g)} + 3 \text{ H}_2 \text{ (g)}$
 (a) Write an expression for K_p for the above reaction.
 (b) How will the value of K_p be affected by (i) increasing the pressure, (ii) increasing the temperature.
10. Write one method of preparation of diborane. Explain the structure of diborane.

OR

What are silicones? How are they prepared?

11. Explain why?
- O has lower ionisation energy than N.
 - Cations are smaller and anions are larger in radii than their parent atoms.
 - Elements in the same group have similar physical and chemical properties.
12. A compound contains 4.07 % hydrogen, 24.27 % carbon and 71.65 % chlorine. Its molar mass is 98.96 g. What are the empirical and molecular formulas?
13. Density of a gas is found to be 5.46 g/dm^3 at 27°C at 2 bar pressure. What will be its density at STP?
14. If water vapour is assumed to be a perfect gas, molar enthalpy change for vaporisation of 1 mol of water at 1 bar and 100°C is 41 kJmol^{-1} . Calculate the internal energy change, when
- 1 mol of water is vaporised at 1 bar pressure and 100°C .
 - 1 mol of water is converted into ice.
15. Nitric oxide reacts with bromine and gives nitrosyl bromide as per the reaction given below:
- $$2 \text{NO} (\text{g}) + \text{Br}_2 (\text{g}) \rightleftharpoons 2 \text{NOBr} (\text{g})$$
- When 0.087 mol of NO and 0.0437 mol of Br_2 are mixed in a closed container at constant temperature, 0.0518 mol of NOBr is obtained at equilibrium. Calculate equilibrium amount of NO and Br_2
16. (a) What is disproportionation reaction?
- (b) Balance the following ionic redox reaction (in basic medium) either by ion-electron method or by oxidation number method:
- $$\text{MnO}_4^- (\text{aq}) + \text{I}^- (\text{aq}) \rightarrow \text{MnO}_2 (\text{s}) + \text{I}_2 (\text{s}).$$
17. What do you understand by the term 'auto-protolysis' of water? What is its significance? Write chemical reactions to show amphoteric nature of water.

OR

What do you understand by the term non-stoichiometric hydrides? Give one example. Do you expect this type of hydrides to be formed by alkali metals? Justify your answer.

18. What happens when? (Write chemical equation for the reaction)
- Quick lime is heated with silica.
 - Sodium metal is heated in free supply of air.
 - Gypsum is heated to 393 K.
19. Account for the following:
- CCl_4 cannot be hydrolysed but SiCl_4 can be hydrolysed.

- (b) Boric acid is considered as weak acid.
- (c) Conc. HNO_3 can be transported in aluminium container.

20. Answer the following:

- (a) Give condensed and structural formula of 2,2,4-trimethyl pentan-1-ol.
- (b) Explain why alkyl groups act as electron donors when attached to a π system?
- (c) Draw the resonance structures for $\text{C}_6\text{H}_5\text{OH}$. Show the electron shift using curved-arrow notation.

21. Answer the following:

- (a) An alkene 'A' on ozonolysis gives a mixture of ethanal and propanone. Write structure and IUPAC name of 'A'.
- (b) How would you account for the formation of ethane during chlorination of methane?
- (c) Draw cis and trans structures of but-2-ene.

22. What do you mean by ozone hole? What are its consequences? Write the reactions involved for ozone layer depletion in the stratosphere.

23. Three students Rajesh, Ramesh and Mahesh were determining the extra elements present in an organic compound given by their teacher. They prepared Lassaigne's extract independently by the fusion of the compound with sodium metal. Then they added solid FeSO_4 and dil H_2SO_4 to a part of Lassaigne's extract. Rajesh and Ramesh obtained prussian blue colour but Mahesh got red colour. Mahesh repeated the test but again got red colour only. They were surprised and went to their teacher and told him about their observation. Teacher asked them to think over the reason for this and finally they got the answer. Answer the following questions:

- (a) What may be extra elements present in the organic compound?
- (b) Write the reaction involved in the process for the formation of Prussian blue colour.
- (c) What may be the reason of getting red colour instead of blue colour by Mahesh?
- (d) What values are displayed by the students?

24. (a) Show that the circumference of the Bohr orbit for the hydrogen atom is an integral multiple of the de-Broglie wave length associated with the electron revolving around the orbit.

(b) (i) Write electronic configuration of Cr^{3+} (atomic number of Cr is 24)

(ii) What is the lowest value of n that allows g orbitals to exist?

(iii) What is the maximum numbers of emission lines when the excited electron of a hydrogen atom in $n = 8$ drops to the ground state.

or

(a) What transition in the hydrogen spectrum would have the same wave length as the Balmer transition $n = 4$ to $n = 2$ of He^+ spectrum?

(b) (i) Indicate the number of unpaired electrons in Fe.

(ii) The unpaired electrons in Al and Si are present in 3p orbital. Which electrons will experience more effective nuclear charge from the nucleus and why?

(iii) What is the significance of Heisenberg's uncertainty principle?

25. (a) Draw the structure of the following molecules using VSEPR theory:

(i) ClF_3 (ii) PH_3

(b) Arrange the following as directed:

(i) O_2 , O_2^- , O_2^+ , O_2^{2-} (increasing order of bond order)

(ii) NH_3 , H_2O , CH_4 , H_2S (decreasing order of bond angle)

(iii) LiF , K_2O , SO_2 , ClF_3 (Arrange the bonds in order of increasing ionic character).

Or

(a) What is meant by hybridization of atomic orbitals? Draw the shapes of sp , sp^2 and sp^3 hybrid orbital.

(b) Give reason why?

(i) BeH_2 molecule has zero dipole moment although $\text{Be} - \text{H}$ bonds are polar.

(ii) O_2 is paramagnetic but O_2^{2-} is diamagnetic.

(iii) H_2O is liquid but H_2S is gas at room temperature.

26. (a) Carry out the following conversions:

(i) Benzene into 4-nitrochlorobenzene.

(ii) 1-bromopropane into 2-bromopropane.

(b) Explain the following reactions with suitable example:

(i) Wurtz reaction.

(ii) Kolbe's electrolysis.

(iii) Friedel Crafts alkylation of benzene.

or

(a) Addition of HBr to propene yields 2-bromopropane, while the presence of benzoyl peroxide, the same reaction yields 1-bromopropane. Explain and give mechanism.

(b) Carryout the following conversions:

(i) Phenol into toluene.

(ii) Ethene into ethyne.

(iii) Benzene into m-nitrochlorobenzene.