ANNUAL EXAMINATION

Question Paper 2023

NCERT BASED SYLLABUS

FOR CBSE AND STATE BOARD
FOLLOWING NCERT

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ANNUAL EXAMINATION (2022-23)

Class - XI | **Subject – Chemistry**
Time – 3 Hours | **Maximum Marks- 70**

General Instructions:

Read the following instructions carefully.

a) There are 35 questions in this question paper with internal choice.
b) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
c) SECTION B consists of 7 very short answer questions carrying 2 marks each.
d) SECTION C consists of 5 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

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.

1. A hydrocarbon is found to contain 85.7% by mass of carbon and 14.3% by mass of hydrogen. Molar mass of hydrocarbon is 56 g/mol. The formula for hydrocarbon is
   a) CH_4 b) C_2H_4 c) C_4H_8 d) C_5H_{10}.

2. The pair of ions having same electronic configuration is:
   a) Cr^{3+} , Fe^{3+} b) Fe^{3+} , Mn^{2+} c) Fe^{3+} , Co^{3+} d) Sc^{3+}, Cr^{3+}

3. The elements with positive electron gain enthalpy is
   a) Hydrogen b) Sodium c) Oxygen d) Neon

4. The electronegativities of C,N,Si and P are in order of
   a) Si< P< C< N b) Si<P< N <C c) P< Si< N <C d) P< Si <C<N

5. Which of the following molecule is expected to be diamagnetic?
   a) S_2 b) B_2 c) N_2 d) O_2

6. Which of the following is not correct?
   a) ΔG is zero for a reversible reaction
   b) ΔG is positive for a spontaneous reaction.
   c) ΔG is negative for a spontaneous reaction
   d) ΔG is positive for a non spontaneous reaction.

7. Which group elements are most electropositive and most electronegative respectively?
   a) 1,17 b) 2,16 c) 17,1 d) 16,2

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8. Which type of compound is formed by Group 14 elements in 3rd period and what is the formula of its chloride and its oxide?

a) Ionic,$SiCl_4$,SiO_2 b) Covalent,$SiCl_4$,SiO_2

c) Covalent,$SiCl_2$,SiO_2 d) Ionic,$SiCl_3$,SiO^2

9) The average oxidation number of iodine in I_3^- ion is

a) -1 b) -1/3 c) +1 d) +1/3

10. Which of the following metal displacement reaction will not take place

a) $Cu + Mg^{2+} \longrightarrow$

b) $Mg + Cu^{2+} \longrightarrow$

c) $Pb + Ag+ \longrightarrow$

d) $Zn + Cu^{2+} \longrightarrow$

11. Cu^+ undergoes disproportionation reaction to form

a) Cu b) Cu^{2+} c) Both a and b d) None of these.

12. The order of priority in IUPAC system

a)-$CONH_2$,-CHO ,-SO_3H,-COOH

b) -COOH,-SO_3H,-$CONH_2$,-CHO

c) -SO_3H, -COOH , -$CONH_2$,-CHO

d) -CHO , -COOH ,-SO_3H,-$CONH_2$

13. Which of the following compounds will exhibit geometrical isomerism?

a) 2 – Phenyl – 1 - butene

b) 1, 1 – Diphenyl propane

c) 1 – Phenyl – 2 - butene

d) 3 – Phenyl butane

14. Arrange the following hydrogen halides in order of their decreasing reactivity with propene.

a) HCl>HBr>HI

b) HBr>HI>HCl

c) HI>HBr>HCl

d) HCl> HI>HBr

In the questions 15to18,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 correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

15. **Assertion:** For 3d orbitals,angular nodes are equal to 2
Reason: For 3d orbitals spherical (radial) nodes = n- l -1 = 3-2-1=0

16. **Assertion:**Ionic compounds usually have high melting and boiling points.
Reason: A large amount of energy is needed to overcome the strong interionic electrostatic attractive forces.

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17. **Assertion:** The IUPAC name of $HOCH_2$-$(CH_2)_3$-CH_2COCH_3 is 7-Hydroxy heptan-2-one.
Reason: Keto group is preferred over -OH group.

18. **Assertion:** Neopentane has lower boiling point than n-Pentane and isopentane.
Reason: Boiling point increases with increase in branching.

SECTION B

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

19. What will be the mass of one ^{12}C atom in g?

20. List main differences between orbit and orbital.

21. Why does He_2 not exist?

OR

Draw the shape of PH_3 and SF_6 according to VSEPR theory.

22. Calculate $\Delta_f H^o$ of HCl if bond energy of H-H bond is 437 KJ/mol,Cl-Cl bond is 244Kj/mol and HCl is 433KJ/mol.

23. Assign the oxidation number to the underlined elements in each of the following species:
i) $K_2\underline{Mn}O_4$ ii) $KAl(\underline{S}O_4)_2.12H_2O$

24. a) What is nucleophile?Give one example.
b) Draw the structure of 3-Oxopentanal.

OR

a) Why is resonance hybrid is more stable than resonating structures?
b) Carbon atom number 2 in CH_3CH_2Cl has more positive charge than that in CH_3-CH_2-Br.

25. Propanal and pentan-3-one are the ozonolysis products of an alkene?What is the structural formula and IUPAC name of the alkene.

SECTION C

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

26. a) Define unified mass.
b) At STP,what will be the volume of 6.022×10^{23} molecules of H_2?
c) Define limiting reagent.

27. The ejection of the photoelectron from the silver metal in the photoelectric effect experiment can be stopped by applying the voltage of 0.35V when the radiation 256.7 nm is used. Calculate the work function for silver metal.

28. Give reason for the following :
i) Electron gain enthalpy of fluorine is less negative than that of chlorine.
ii) Anionic radius is always more than that of neutral atom.
iii) Ionization enthalpy of nitrogen is more than that of oxygen.

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29. 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 20L reaction vessel at 500K.At this temperature,the equilibrium constant,Kc for the reaction:
$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ is $1.7x10^2$

Is the reaction mixture at equilibrium? If not,what is the direction of the net reaction?

OR

Equal volumes of 0.002M solutions of sodium iodate($NaIO_3$) and copper chlorate $Cu(ClO_3)_2$ are mixed together.Will it lead to precipitation of copper iodate $Cu(IO_3)_2$? (For cupric iodate,Ksp=7.4×10^{-8})

30. Balance the following redox reaction either by oxidation number method or ion electron method:

i) $MnO_4^-(aq) + I^-(aq) \longrightarrow MnO_2(s) + I_2(s)$ (In basic medium)

ii) $MnO_4^-(aq) + SO_2(g) \longrightarrow Mn^{2+}(s) + HSO_4^-(aq)$ (In acidic solution)

SECTION D

The following questions are case based questions. Each questions has an internal choice and carries 4(1+1+2) marks each.Read the passage carefully and answer the questions that follow.

31. The attractive force which holds the two atoms together is called chemical bond.Covalent bond is formed by equal sharing of electrons.Coordinate bond is formed by unequal sharing of electrons. Ionic bond is formed by transfer of electron from one atom to another.According to valence bond theory,covalent bond is formed by overlapping of half filled atomic orbitals resulting in lowering of energy and more stability. Bond order is the number of bonds between atoms in a molecule. Higher the bond order ,more will be stability and bond dissociation enthalpy but smaller bond length. Polarity of covalent bond depends upon difference in electronegativity. VSEPR theory helps to predict the shapes of molecules.

a) Draw the structure of N_2O.
b) Define Valence bond theory.
c) Draw the shape of NH_3 and ClF_3.

OR

Define electronegativity with one example.

32. Organic compounds are formed by covalent bonding.The nature of covalent bonding can described with the help of hybridisation and structural reactivity depends upon type of bond present in organic compound.Organic compound can be classified on the basis of functional group. Organic reaction mechanism are based on structure of substrate and the attacking reagent.

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

a) What are free radicals?
b) Write the order of stability of alkyl carbocation.
c) Give difference between Inductive and electromeric effect

OR

Draw all possible resonating structures of aniline.

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SECTION E

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

33. i) The value of Kc for the reaction

$3O_2(g) \leftrightarrows 2O_3(g)$ is 2.0×10^{-5} at 25^0C. If the equilibrium concentration of O_2 in air at 25^0C is 1.6×10^{-2}, What is the concentration of O_3.

ii) The species HCO_3^- and NH_3 can act as Bronsted acid and bases.For each case give the corresponding conjugate acid and base.

iii) If Qc<Kc, in which direction reaction will proceed?

34. a) Calculate the heat of combustion of glucose from the following data:

$C(\text{graphite}) + O_2(g) \longrightarrow CO_2(g)$; $\Delta H = -395.0$ kJ/mol

$H_2(g) + 1/2O_2(g) \longrightarrow H_2O(l)$; $\Delta H = -269.4$kJ/mol

$6C(\text{graphite}) + 6H_2(g) + O_2(g) \longrightarrow C_6H_{12}O_6(s)$; $\Delta H = -1169.8$kJ/mol
Glucose

b) Define the following terms:
i) Enthalpy of neutralization
ii) Hess's law of constant heat summation.

OR

a) Calculate the temperature above which the reduction of lead oxide in the following reaction becomes spontaneous
PbO (s) + C (s) → Pb (s) + CO (g)
[Given Δ H = 108.4 KJ/mol, Δ S = 190 $JK^{-1}\ mol^{-1}$]

b) Define Entropy and State Function.

35. a) Explain the mechanism of nitration in benzene ring.

b) Arrange Benzene, n – Hexane and Ethyne in decreasing order of acidic behaviour. Also give reason for this behaviour

OR

a) Explain the mechanism of Friedel Craft Alkylation reaction.

b) Why is Wurtz reaction not preferred for the alkanes containing odd number of carbon atoms?

c) How will you convert benzene into acetophenone.

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