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ANNUAL EXAMINATION (2022-23)
CLASS XI   SUBJECT-CHEMISTRY(043)

TIME- 3Hrs.   **MM:70**

General Instructions

1.All questions are compulsory. There are 35 questions in this question paper with internal choice.

2. This question paper has five sections. Section A, B,C,D,E

3.Section A consists of 18 MCQ, Assertion-reason questions carrying 1 mark each.(1×18=18)

4.Section B consists of 7 very short answer questions carrying 2 marks each (2×7=14)

5.Section C consists of 5 short answer questions carrying 3 marks each.(3×5=15)

6.Section D consists of two Case based questions carrying 4 marks each (4×2=8)

7.Section E consists of 3 long answer questions carrying 5 marks each (5×3=15)

8.Use of log tables and calculators is not allowed.

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SECTION-A

Q.1.An inorganic salt gave the following percentage composition Na = 32.39, oxygen = 45.07 and sulphur = 22.53. The empirical formula of the compound is-

   a)Na_2SO_3 b) Na_2SO_4 c)$Na_2S_2O_3$ d)$Na_2 S_4O_6$

Q.2.Boron has two stable isotopes $_{10}B$(19%) and $_{11}B$ (81%.) The average atomic mass of Boron will be

   a). 10.0   b).10.2   c).10.8   d).11.0

Q.3.The wavelength associated with a moving particle becomes half of its original value if its velocity is

   a). Halved   b). Doubled   c). Is made 3 times   d). Is made 8 times

Q.4.The Lyman series in the spectrum of hydrogen atom lies in

   a). UV region be   b) visible region   c) IR region   d) .microwave region

Q.5.The IUPAC name of an element with atomic number 107 is

   a).Unnilunium   b).Unnilbium   c).Unnilhexium   d).Unnilseptium

Q.6.The screening effect of inner electrons on the nucleus causes

   a). decrease in the ionization energy   b). increase in dimensional energy

   c) .decrease in atomic size   d) .increase in electron negativity

Q.7.The compound having d^2sp^3 hybridization at the central atom is

   a).NH_3 b).PCl_5 c).SF_6 d).CH_4

Q.8.The bond angle is 109.5 degree in –

   a).H_2S b).CH_4 c). NH_3 d.)H_2O

Q.9..The relation between C_P and C_V is given as

   a).$C_P =C_V-R$ b).$Cp - 1 = C_V + R$ c).$C p + C p = R$ d)$C p - C_V = R$

Q.10.At equilibrium, the value of change in entropy is .

   a). Zero   b). much greater than 0   c). must less than zero   d). unpredictable

Q. 11..In the electrolytic cell (Zn-Cu) , the flow of electrons is from

   a) .cathode to anode through external circuit   b) anode to cathode through external circuit

   c). cathode to anode through solution in salt Bridge   d). anode to cathode through solution in Salt Bridge

Q.12.Homolytic fission of a C – Cl Bond in methyl chloride gives

   a).Carbenes   b).Free radicals

   c)methyl carbocation and Cl^- ion   d).methyl carbanion and Cl^+ ion

Q.13.The appropriate method for the preparation of pure Methane is

   a).Kolbe's electrolysis   b). soda lime decarboxylation

   c). reduction of alkenes   d).Wurtz's reaction

Q.14.The function of Lewis acids in the FriedelCraft reaction is to

   a) .stabilize the carbocation   b). provide nucleophile

   c). absorb moisture   d). provide electrophile

In these questions, 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 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.

Q.15. Assertion: Different number of electron pairs are present in resonance structures.

   Reason: Resonance structures differ in the location of electrons around the constituent atoms.

Q.16. Assertion: In a reaction $Zn(s) + CuSO_4(aq)$ -----> $ZnSO_4(aq) + Cu(s)$

   Zn is a reductant but itself get oxidized.

   Reason: In a redox reaction, oxidant is reduced by accepting electrons and reductant is oxidized by losing electrons

Q. 17. Assertion: Electron gain enthalpy can be exothermic or endothermic.

   Reason: Electron gain enthalpy provides a measure of the ease with which an atom adds an electron to form anion.

Q.18. Assertion: Sodium acetate on Kolbe's electrolysis gives methane.

   Reason : Methyl free radical is formed at anode.

SECTION - B

Q.19. Calculate the molarity of NaOH in the solution prepared by dissolving its 4 g in enough water to form 250 ml of the solution.

Q. 20. A 100 watt bulb emits monochromatic light of wavelength 400 nm. Calculate the number of photons emitted per second by the bulb.

OR

Calculate energy of one mole of photons of radiation whose frequency is $5 \times 10^{14} Hz$.

Q.21. Explain the structure of H_2O on the basis of VSEPR theory.

Q.22. Enthalpies of formation of $CO(g)$, CO_2 (g), $N_2O(g)$ and N_2O_4 (g) are $-110, -393, 81$ and 9.7 kJ mol^{-1} respectively. Find the value of ΔrH for the reaction: N_2O_4 (g) + 3CO(g) $\rightarrow$ $N_2O(g)$ + 3CO$_2$ (g)

Q.23. Balance the equation showing the oxidation of Fe^{2+} ions to Fe^{3+} ions by dichromate ions $(Cr_2O_7)^{2-}$ in acidic medium, wherein, $Cr_2O_7^{2-}$ ions are reduced to Cr^{3+} ions.

Q.24 Write the state of hybridisation of carbon in the following compounds and shapes of each of the molecules
   (a) $H_2C=O$, (b) $CH_3 F$,

Q. 25. a) Write the IUPAC name of $CH_2=CHCH_2CH(OH)CH_3$

   b) Explain chain isomerism with the help of example.

SECTION-C

Q.26. Chlorine is prepared in the laboratory by treating manganese dioxide (MnO_2) with aqueous hydrochloric acid according to the reaction $4 HCl (aq) + MnO_2(s) \rightarrow 2H_2O (l) + MnCl_2(aq) + Cl_2$ (g)
   How many grams of HCl react with 5.0 g of manganese dioxide ?

Q.27. a) What are the reasons for the different chemical behaviour of the first member of a group of elements in the s- and p-blocks compared to that of the subsequent members in the same group?

   b) Why first ionization enthalpy of oxygen is smaller as compared to nitrogen.

   c) 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?

Q.28. What is meant by the term bond order? Calculate the bond order of : N_2 .Also write the magnetic property of N_2 molecule

OR

Define hydrogen bond. What are its type? Is it weaker or stronger than the van der Waals forces?

Q.29. At 473 K, equilibrium constant Kc for decomposition of phosphorus pentachloride, PCl_5 is 8.3×10^{-3}. If decomposition is depicted as, PCl_5 (g) $\square PCl_3$ (g) $+ Cl_2$ (g) $\Delta rH^0 = 124.0$ kJ mol^{-1} what would be the effect on Kc if

(i) more PCl_5 is added   (ii) pressure is increased   (iii) the temperature is increased ?

Q.30.a) Explain Friedel Craft's acylation reaction.

b) Explain Wurtz reaction.

c) Define Huckel rule.

SECTION-D

Q.31.Read the following and answer the questions from (i) to (iv) given below:

Alkenes generally undergo electrophilic addition reactions because of the presence of double bond (a strong σ and a weaker π bond) π electrons, which being loosely held are easily polarised. These reactions involve cleavage of a π bond and formation of two new σ 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 high temperature). Apart from addition reactions alkenes also participate in the oxidation, ozonolysis and polymerisation reaction.

i) Give the reaction of 1-butene with HBr in the presence of a peroxide.

ii) Name the organic products of the reaction of but-2-ene with HBr dissolved in tetra-chloromethane.

iii) Addition of unsymmetrical reagent to unsymmetrical alkene takes place according to which rule?

iv) Write the reaction of polymerisation of ethylene.

OR

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

Q.32. .Read the following and answer the questions from (i) to (iv) given below:

According to the Le-Chatelier's principle,' if any of the factors that determine the equilibrium condition, of a system(like temperature , pressure, concentration etc,) is changed , the system will move in such a direction so that effect of the change is reduced or nullified.'

According to Le-Chatelier's principle, the concentration stress due to the addition of reactant/ product in relieved by shifting of the net reaction in that direction where the added substance is consumed.

The concentration stress due to the removal of reactant/ product in relieved by shifting of the net reaction in that direction where the removed substance is replenished or in other words, "change in the concentration of either reactant(s) or product(s) shift the reaction in such a direction in which the effect of the change is minimised or nullified".

Pressure change , that is achieved by changing the volume of the system, generally affect the gaseous reactions having different number of moles of gaseous reactants and products. It has no effect on solids/liquids as the volume (and concentration) of liquids is nearly independent of pressure.

In general, increase in pressure shifts the equilibrium in that direction where the number of moles of the gas or pressure decreases and vice-versa

.

i) What will happens to the equilibrium constant if an inert gas is added into the reaction at constant volume?

ii) What happens to the following reaction on increasing pressure? Ice <=> Water

OR

What is the effect of heating on the equilibria, Solid <=> liquid ?

iii) For the reaction. SO_2 (g) + 1/2 O_2 (g) <=> SO_2(g) + Heat

What happens when temperature of reaction mixture is increased ?

iv)What is the effect of reducing volume on the following system ? 2C (s) + O_2(g) <=> 2CO(g)

Q. **33**.a) Define Threshold frequency.

    b) Write the electronic configuration of Copper.

    c) Electrons are emitted with zero velocity from a metal surface when it is exposed to radiation of wavelength 6800 Å. Calculate threshold frequency (v_0) and work function (W_0) of the metal.

<div align="center">OR</div>

    a) Define quantum number.

    b) Write the electronic configuration of Chromium.

    c).What is the wavelength of light emitted when the electron in a hydrogen atom undergoes transition from an energy level with $n = 4$ to an energy level with $n = 2$?

Q.**34**. a) Define an adiabatic process and isothermal process

    b)Assuming the water vapour to be a perfect gas, calculate the internal energy change when 1 mol of water at 100°C and 1 bar pressure is converted to ice at 0°C. (Given the enthalpy of fusion of ice is 6.00 kJ mol^{-1} heat capacity of water is 4.2 J/g°C)

<div align="center">OR</div>

    a) Define Molar enthalpy of vaporisation

    b) What is a thermo chemical equation?

    c) Calculate the standard enthalpy of formation of $CH_3OH(l)$ from the following data:
$CH_3OH (l) + 3/2\ O_2 (g) \rightarrow CO_2 (g) + 2H_2O(l)$; $\Delta rH^0 = -726$ kJ mol^{-1}
$C(graphite) + O_2 (g) \rightarrow CO_2 (g)$; $\Delta cH^0 = -393$ kJ mol^{-1}
$H_2 (g) + 1/2\ O_2 (g) \rightarrow H_2O(l)$; $\Delta f\ H^0 = -286$ kJ mol^{-1} .

Q.**35** a).Draw the resonance structures showing the electron shift using curved-arrow notation

        i) C_6H_5OH ii) $C_6H_5NO_2$ iii) C_6H_5CHO

    b) Giving justification, categorise the following molecules/ ions as nucleophile or electrophile:
        HS^- , BF_3 , $C_2H_5O^-$, Cl^+

<div align="center">OR</div>

    a) Indicate the σ and π bonds in the following molecules : C_6H_6 , C_6H_{12}, CH_2Cl_2 ,

    b) How hyperconjugation helps in stabilisation of carbocation?