O.P.JINDAL SCHOOL,SAVITRINAGAR
ANNUAL EXAMINATION-(2022-23)
SAMPLE PAPER

CLASS-XI	MM-70
Subject-Chemistry	Time:3hours

(Fifteen minutes extra will be given for reading the Question paper)
General Instruction:- *(i)All questions are compulsory .There are 35 questions in all.*

(ii)SECTION -A: Question numbers 1 to 18 are MCQs carrying one mark each.
(iii) SECTION -B: Question numbers 19 to 25 are short answer type-I questions and carrying 2 marks each.
(iv) SECTION -C: Question numbers 26 to 30 are short answer type-II questions and carrying 3 marks each.
(v) SECTION -D:Question numbers 31 and 32 are case-based questions carrying 4 marks each.
(v) SECTION -E:Question numbers 33 to 35 are al 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

Q1 .Which of the following attain the linear structure?

(a) $BeCl_2$ (b) NCO^+
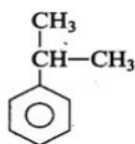(c) NO_2 (d) CO

Q2. What is the oxidation number of P in H_3PO_4?

(a)-3   (b)-5
(c) +5   (d) +2

Q3. Which of the following sets contain only iso electronic ions?

(a) Zn^{2+}, Ca^{2+}, Ga^{3+}, Al^{3+} (b) K^+, Ca^{2+}, Sc^{3+}, Cl^-
(c) P^{3-}, S^{2-} Cl^-,Mg^{2+} (d) Ti^{4+}, Ar, Cl^{3+}, V^{5+}

Q4. The IUPAC name of given compound is:

(a) isopropyl benzene   (b)2-methyl-3- benzene
(c) 4-methyl iso-propylbenzene   (d) 3-methyl-2- benzene

Q5 Which of the following pairs have the same number of atoms?

(a) 16 g of $O_2(g)$ and 4 g of $H_2(g)$ (b) 16 g of O_2 and 44 g of CO_2
(c) 28 g of N_2 and 32 g of O_2 (d) 12 g of C(s) and 23 g of Na(s)

Q6. Number of atoms of oxygen present in 10.6 g Na_2CO_3 will be :

(a)6.02×10^{22} (b)12.04×10^{22}

(c)1.806×10^{23} (d)31.8×10^{28}

Q7. The total number of atomic orbital in third energy level of an atom is

(a) 32   (b) 16

(c) 8   (d) 9
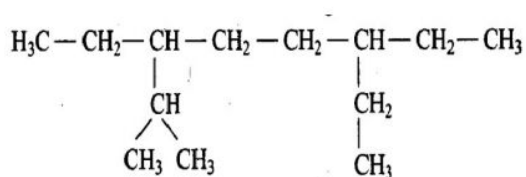
Q8 Ionic radii vary in:
(a) inverse proportion to the effective nuclear charge.
(b) inverse proportion to the square of effective nuclear charge.
(c) direct proportion to the screening effect.
(d) direct proportion to the square of screening effect.

Q9. The correct IUPAC name of the following alkane is:

$$H_3C-CH_2-CH-CH_2-CH_2-CH-CH_2-CH_3$$

with CH branching to CH_3 CH_3 on the first branch, and CH_2-CH_3 on the second branch.

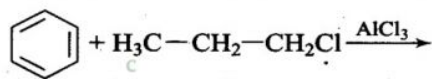(a) 3, 6-Diethyl-2-methyloctane   (b) 5-Isopropyl-3-ethyloctane
(c) 3-Ethyl-5-isopropyloctane   (d) 3-Isopropyl-6-ethyloctane

Q10. What will be the product obtained as a result of the following reaction

benzene $+ H_3C-CH_2-CH_2Cl \xrightarrow{AlCl_3}$

(a) isopropyl benzene   (b) isobutyl benzene
(c) di -chlorobenzene   (d) chloropropyl benzene

Q11 Which are the conjugate acids for the $HCOO^-$
(a) NH_2^- (b) Cl^-
(c) HBr   (d) HCOOH

Q12. Arrange the following in decreasing order of their boiling points.
(i) n-Butane   (ii) 2-Methylbutane
(iii) n-Pentane   (iv) 2,2-Dimethylpropane

(a) i > ii > iii > iv   (b) ii> iii > iv> i
(c)iv >iii>ii>I   (d) iii >ii>iv > i

Q13. The empirical formula and molecular mass of a compound are CH_2O and180 g respectively. What will be the molecular formula of the compound?
(a) $C_9H_{18}O_9$ (b) CH_2O

(c) $C_6H_{12}O_6$ (d) $C_2H_4O_2$

Q14. Which of the following are correct?

(a) $CH_3 - O - CH_2^+$ is more stable than $CH_3 - CH_2^+$

(b) $(CH_3)_2CH^+$ is less stable than $CH_3 - CH_2 - CH_2^+$

(c) $CH_2 = CH - CH_2^+$ is more stable than $CH_3 - CH_2 - CH_2^+$

(d) $CH_2 = CH^+$ is more stable than $CH_3 - CH_2^+$

Questions 15-18 are Assertion and Reason questions:

In these questions (15-18) 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.

Q15. Assertion: Hept-1-ene and Hept-3-ene are position isomers.
    Reason: Position isomers differ in the position of functional group or a substituent.

Q16. Assertion: Dehydration of alcohol gives alkenes.
    Reason: Alkenes do not undergo addition reactions.

Q17. Assertion: Boron has a smaller first ionization enthalpy than beryllium.
    Reason: The penetration of a 2s electron to the nucleus is more than the 2p electron; hence 2p electron is more shielded by the inner core of electrons than the 2s electrons.
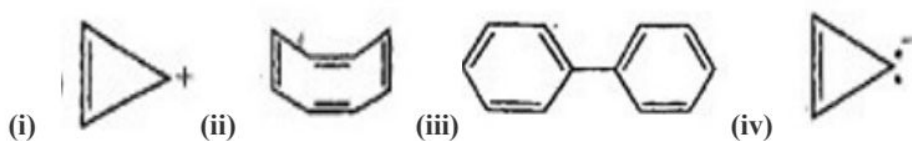
Q18. Assertion: NH_3 is almost pyramidal shaped.
    Reason: N atom is surrounded by 2 lone pairs and 3 bond pairs.

SECTION-B

Q19. What is the number of photons of light with wavelength 4000 pm which provide 1 Joule of energy?

Q20. Four structures are given in options (i) to (iv) Examine them and select the aromatic structures.

(i)   (ii)   (iii)   (iv)

Q21. Alkynes on reduction with sodium in liquid ammonia form trans alkenes. Will the butene thus formed on reduction of 2-butyne show the geometrical isomerism?

OR

Draw the cis- and trans-structures for hex-2-ene. Which isomer will have higher b.p. and why?
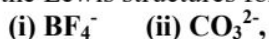
Q22. Nitrogen has positive electron gain enthalpy whereas oxygen has negative. However, oxygen has Lower ionization enthalpy than nitrogen explain.
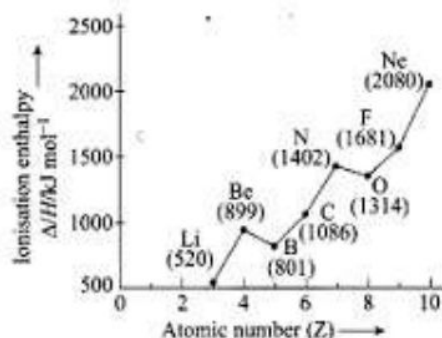
Q23. Arrange benzene, n-hexane and ethyne in decreasing order of acidic behavior. Also give reason for this behavior.
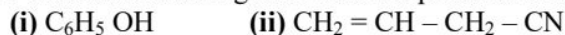
OR

Draw the Lewis structures for the following molecules and ions:
    (i) BF$_4^-$ **(ii) CO$_3^{2-}$,**

Q24. Write bond-line formulas for: Isopropyl alcohol and Heptan-4-one.

OR

What is the total number of sigma bonds and pi bonds in the following compounds?
    (i) C$_6$H$_5$ OH   **(ii) CH$_2$ = CH – CH$_2$ – CN**

Q25. Calculate ΔrG^0 for conversion of oxygen to ozone, $3/2\ O_2\ (g) \rightarrow O_3\ (g)$ at 298 K. if Kp for this conversion is 2.47×10^{-29}.

SECTION-C

Q26. Balance the following redox reactions by ion-electron method.
    (i) MnO_4^-(aq) + I^-(aq) MnO_2(s) + I_2 (s) (in basic medium)
    (ii) What is a disproportionation reaction? Give one example.
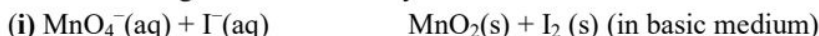
OR

    Consider the elements: Cs, Ne, I, F
    (i) Identify the element that exhibits -ve oxidation state.
    (ii) Identify the element that exhibits +ve oxidation state.
    (iii) Identify the element that exhibits both +ve and -ve oxidation states.

Q27. The following concentration were obtained for the formation of NH_3 from N_2 and H_2 at equilibrium at 500 K. [N_2 (g)] = 1.5 x 10^{-2} M [H_2 (g)] = 3.0 x 10^{-2} M [NH_3] = 1.2 x 10^{-2} M. Calculate equilibrium constant.

Q28.   **(i)** Propanal and pentan-3-one are the ozonolysis products of an alkenes. What is the structural formula of the alkenes?$\longrightarrow$
    (ii) What effect does branching of an alkenes chain has on its boiling point?

Q29. A welding fuel gas contains carbon and hydrogen only. Burning a small sample of it in oxygen gives 3.38 g carbon dioxide, 0.690 g of water and no other products. A volume of 10.0 L (at S.T.P.) of this welding gas is found to weigh 11.6 g. Calculate
    (i) empirical formula, **(ii)** molar mass of the gas **(iii)** molecular formula.

OR

Calculate the molarity of a solution of ethanol in water in which the mole fraction

of ethanol is 0.040.

Q30. Five litre of ideal gas at 10 atm pressure expands until its volume is 20 litre. How much heat is absorbed and how much work is done

SECTION-D

Q31. We can measure the transfer of heat from one system to another which causes a change in temperature. The magnitude of change in temperature depends upon the heat capacity of the substance. The enthalpy change of reaction remains the same irrespective of the number of steps is Hess's law. It helps to calculate the enthalpy of formation, combustion, and other enthalpy changes. Enthalpy change can also be calculated by using bond enthalpies. The first law gives the law of conservation of energy but does not give the direction of the reaction. The second law states, the entropy of the universe is continuously increasing due to spontaneous processes taking place in it. ΔH and ΔS (entropy change) cannot decide the spontaneity of the process. We need ΔG (free energy change) which is –ve for spontaneous, +ve for non-spontaneous. $\Delta G = 0$ for the process in equilibrium. ΔG is related to the equilibrium constant. If $\Delta G = $ –ve, 'K' is +ve and vice versa. The third law of thermodynamics states the entropy of a perfectly crystalline substance is zero at zero kelvin.

    (i) Who discovered the application of the law of thermodynamics to the enthalpy change?

    (ii) What are the signs of ΔH and ΔS for the process to be always spontaneous?

    (iii) For the reaction; $2Cl\ (g) \longrightarrow Cl_2\ (g)$; what will be the signs of ΔH and ΔS?

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

Give the mathematical expression for the first law of thermodynamics.

Q32 Heisenberg's uncertainty principle states that for particles exhibiting both particle and wave nature, it will not be possible to accurately determine both the position and velocity at the same time. The principle is named after German physicist, Werner Heisenberg who proposed the uncertainty principle in the year 1927. According to Heisenberg's uncertainty principle, it is impossible to precisely measure or calculate an object's position and momentum. This principle is based on matter's wave-particle duality. Although Heisenberg's uncertainty principle can be ignored in the macroscopic world (uncertainties in the position and velocity of objects with relatively large masses are negligible), it is extremely important in the quantum world. Since atoms and subatomic particles have such small masses, any increase in the precision of their positions is accompanied by an increase in the uncertainty of their velocities.

    (i) What does the Heisenberg uncertainty principle imply?

    (ii) The uncertainty in an electron's momentum is $1.0 \times 10^{-5}\ kg\ m\ s^{-1}$.
    What will be its uncertainty of position?

    (iii) What are the limitations of Heisenberg's Uncertainty Principle?

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

Write correct expression for Heisenberg uncertainty principle.

SECTION E

Q33.   **(i)** Alkanes are generally inert towards acids, bases, oxidizing and reducing agents. However, they undergo the substitution and oxidation reactions under certain conditions. Explain and give the mechanism of Halogenations reaction in alkanes.

    (ii) Explain addition of HBr to asymmetrical alkenes according to Markovnikovs rule.

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

    (i) What happens when benzene is treated with Br_2 in presence of anhydrous $AlCl_3$.

    (ii) Out of benzene, m-dinitrobenzene and toluene which will undergo nitration most easily and why?

(iii) How will you bring out the following conversions?
(a) Acetylene to ethane **(b)** Benzene to Toluene **(c)** Ethanol to ethane.

Q34. **(i)** Using molecular orbital energy level diagram to show F_2 have a single bond, Ne_2 no bond and N_2 a triple bond.

(ii) Although both CO_2 and H_2O are tri atomic molecules, the shape of H_2O molecule is bent while that of CO_2 is linear. Explain this on the basis of dipole moment.

OR

(i) Explain and draw the molecular structures of the following.
(a) $BeCl_2$ (b) PF_5

(ii) Which out of NH_3 and NF_3 has higher dipole moment and why?

(iii) Explain why H_2O is a liquid whereas H_2S, H_2Se and H_2Te are all gases at ordinary temperature.

Q 35. **(i)** A sample of pure PCl_5 was introduced into an evacuated vessel at 473 K. After equilibrium was reached, the concentration of PCl_5 was found to be 0.5×10^{-1} mol L^{-1}. If K_c is 8.3×10^{-3} what are the concentrations of PCl_3 and Cl_2 at equilibrium?

(ii) How many grams of NaOH must be dissolved in water to give 1L of solution to have pH=12.

OR

(i) The values of Ksp of two sparingly soluble salts $Ni(OH)_2$ and AgCN are 2.0×10^{-15} and 6×10^{-17} respectively. Which salt is more soluble? Explain.

(ii) Calculate the pH of the solutions when 1 mL of 13.6 M HCl is diluted with water to give 1 litre of the solution.

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