INDIAN SCHOOL SOHAR
TERM II EXAMINATION 2019-2020
CHEMISTRY

CLASS :   XI   MAX MARKS :70
DATE   :   07.01.2020   TIME   : 3.00 HRS

(a) *All questions are compulsory.*

(b) *Section A: Q.no. 1 to 20 are very short answer questions (objective type) and carry 1 mark each.*

(c) *Section B: Q.no. 21 to 27 are short answer questions and carry 2 marks each.*

(d) *Section C: Q.no. 28 to 34 are long answer questions and carry 3 marks each.*

(e) *Section D: Q.no. 35 to 37 are long answer questions and carry 5 marks each.*

(f) *There is no overall choice. However an internal choice has been provided in two questions in two marks, two questions of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.*

(g) *Use log tables if necessary, use of calculators is not allowed.*

SECTION A

Read the given passage and answer the questions 1 to 5 that follow:

It may be noted that for 1s orbital the probability density is maximum at the nucleus and it decreases sharply as we move away from it. On the other hand, for 2s orbital the probability density first decreases sharply to zero and again starts increasing. After reaching small maxima it decreases again and approaches zero as the value of r increases further. The region where this probability density function reduces to zero is called nodal surfaces or simply nodes.

1.   The number of nodes of ns orbitals is _____.

2.   The number of angular nodes for 3s orbital is _____.

3.   The number of radial nodes for any orbital is _____.

4.   Define nodal surface.

5.   Draw the shape of p_x orbital and shade the nodal plane of it.

Questions 6 to 10 are one word or one sentence answers:

6.   What volume of 17 g of NH_3 at STP (273 K, 1 atm)?

7.   State modern periodic law.

8.   Arrange the given bonds in increasing order of polarity: P-H, H-O, N-H, H-F

9.   How is density of gas related to its molar mass?

10. $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$; ΔH = -890 kJmol^{-1}. What is the calorific value or fuel value of 1 kg of CH_4?

Questions 11 to 15 are multiple choice questions:

11.   For the reaction, $CO(g) + ClO_2(g) \rightleftarrows COCl_2(g)$ the ${K_p}/{K_c}$ is equal to

   (a) $\sqrt{RT}$ (b)   RT   (c) $\frac{1}{RT}$ (d)   1.0

12.   Which of the following is not a redox reaction?

   (a) $CaCO_3 \rightarrow CaO + CO_2$

   (b) $2H_2 + O_2 \rightarrow 2H_2O$

   (c) $2Na + 2H_2O \rightarrow 2NaOH + H_2O$

(d) $MnCl_3 \rightarrow MnCl_2 + \frac{1}{2} Cl_2$

13.   Which of the following will not produce hydrogen?

(a) $Na + C_2H_5OH$ (c)   Copper and HCl

(b) $Fe + H_2O$(steam)   (d)   Iron and oil H_2SO_4

14.   Which of the following hydrides is electron-precise hydride?

(a) B_2H_6 (b) NH_3 (c) H_2O (d) CH_4

15.   Hydrogen peroxide is obtained by the electrolysis of _____.

(a)   water   (c)   hydrochloric acid

(b)   sulphuric acid   (d)   Fused sodium peroxide

Question 16 to 20:

(a) Assertion and reason both are correct statements; reason is correct explanation for assertion.

(b) Assertion and reason both are correct statements; 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.

16.   **Assertion**   :   The density of Heavy water is higher at 11.2^0C.

      Reason   :   The density of water is higher at 4^0C.

17.   **Assertion**   :   10 Volume H_2O_2 gives 10 mL of O_2 at STP.

      Reason   :   10 volume H_2O_2 is 3.03% and 0.89M.

18.   **Assertion**   :   A mixture of o-nitrophenol and p-nitrophenol can be separated by steam distillation.

      Reason   :   p-nitrophenol is steam volatile while o-nitrophenol is not steam volatile.

19.   **Assertion**   :   Energy of resonance hybrid is equal to the average of energies of all canonical forms.

      Reason   :   Resonance hybrid cannot be presented by a single structure.

20.   **Assertion**   :   Toluene on Friedel-Crafts methylation gives o- and p-xylene.

      Reason   : CH_3- group bonded to benzene ring increases electron density at o- and p-position.
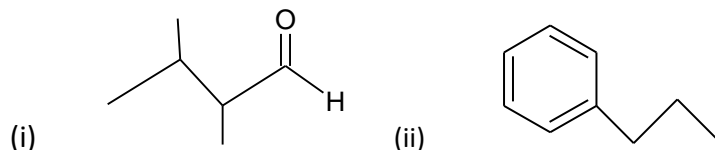
SECTION B

21.   What will be the wavelength of a ball of mass 0.1 kg moving with a velocity of 10 ms^{-1}.(h = 6.626 x 10^{-34} Js)

22.   Give correct reason for the following:

(i) BF_3 has a zero dipole moment although the B-F bonds are polar.

(ii)   All carbon to oxygen bonds in CO_3^{2-} are equivalent.

23.   Among the elements of the third period Na to Ar, pick out the elements:

(i)   with highest first ionisation enthalpy

(ii)   with largest atomic radius

(iii)   which is most reactive non-metal?

(iv)   which is most reactive metal?

24.   Define:

(i)   intensive properties   (ii)   adiabatic process

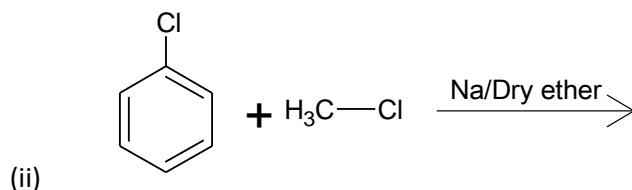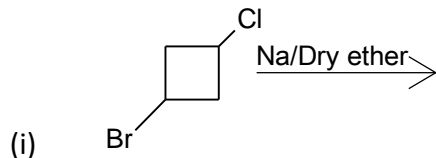25.   Balance the equation: $MnO_4^- + Fe^{2+} \rightarrow Fe^{3+} + Mn^{2+} + H^+$

OR

In neutral or faintly alkaline solution 8 moles of permanganate anions quantitatively oxidise the sulphate anions to produce X moles of sulphur containing product. What is the magnitude of X?

26. Give the IUPAC name of the following compounds:

(i)   (ii)

27. Complete the following reactions:

(i)

(ii)

OR

(i)   Why is Wurtz reaction is carried out in dry ether?

(ii)   Why do alkene have higher boiling point than alkane?

SECTION C

28. In an experiment, when hydrochloric acid was reacted with $CaCO_3$ at STP, 48 cm^3 of CO_2 was formed. Calculate the number of mole of CO_2 and number of molecules. (Atomic mass of Ca = 40; C=12)

29. Calculate:

(i)   Mass in grams of 5.8 mol of N_2O

(ii)   Number of moles in 8.0g O_2

(iii)   Molar mass of 11.2 L of NH_3 at STP weighs 8.5 g

(Atomic Mass of N = 14; O = 16; H = 1)

30. Among the elements B, Al, C and Si

(i)   Which has the highest first ionisation enthalpy?

(ii)   Which has the most negative electron gain enthalpy?

(iii)   Which has the largest atomic radius?

31. Compare the reactive stability of the following species on the basis of molecular orbital theory and indicate their magnetic property. O_2^+, O_2^-, O_2^{2-}

32. (i)   Using the data given below, calculate the value of equilibrium constant for the reaction at 298K. $3CH{\equiv}CH(g) \rightarrow C_6H_6(g)$ assuming ideal gas behaviour.

            $\Delta_fG^0(HC{\equiv}CH) = 2.09 \times 10^5 Jmol^{-1}$; $\Delta_fG^0(C_6H_6) = 1.24 \times 10^5$ $Jmol^{-1}$, R=8.314 $JK^{-1}mol^{-1}$.

(ii)   Based on your calculated value comment whether this process can be recommended as a practical method for making benzene.

OR

(i)   State Hess's Law of constant heat summation. How does it follow from the first law of thermodynamics.

(ii)   Determine Δ_rH^0, at 298 K for reaction: $C(graphite)+2H_2(g) \rightarrow CH_4(g)$ Δ_rH^0 = ?

            You are given:

(a)   C(graphite) + O_2(g) $\rightarrow$ CO_2(g) Δ_rH^0 = -393.51 kJmol^{-1}

(b) H_2(g) + ½ O_2(g) $\rightarrow$ H_2O(l) Δ_rH^0 = -285.8 kJmol^{-1}

(c) CO_2(g) + $2H_2O$(l) $\rightarrow$ CH_4(g) + $2O_2$(g) Δ_rH^0 = +890.3 kJmol^{-1}

33. (a)   What is the oxidation number of Fe in Fe_3O_4?

(b)   Balance the equation: $Cr_2O_7^{2-}$ + $C_2O_4^{2-}$ + H^+ $\rightarrow$ Cr^{3+} + CO_2 + H_2O

OR

(i)   Write the functions of salt bridged in electrochemical cell.

(ii)   Give one decomposition reaction which is redox reaction and one which is not a redox reaction.

34. 0.3780g of an organic chloro compound gave 0.5740g of silver chloride in Carius estimation. Calculate the percentage of chlorine present in the compound. (Given that atomic mass of Ag = 108; Cl = 35.5)

SECTION D

35. (a)   A discharge tube containing oxygen gas at 35^{0}C is evacuated till the pressure is 5 x 10^{-2} mmHg. If the volume of discharge tube is 4.5 L, calculate the number of oxygen molecules will present in the tube. (R= 0.0821 Latmmol^{-1}K^{-1})

(b)   Name the two processes that can be used to liquefy gases.

(c)   What type of intermolecular forces are present in the following gases?

(i)   noble gases   (ii)   water

OR

(i)   A vessel of 1.00 dm^3 capacity contains 16.00g of oxygen and 8.00g of hydrogen at 17^{0}C. Calculate the partial pressure of each gas and also the total pressure is the container. (R= 0.083 bar dm^{3}K^{-1}mol^{-1}; atomic mass of oxygen = 16; Hydrogen = 1)

(ii)   According to kinetic molecular theory, explain why gases exert pressure?

(iii)   How is isotherm at critical temperature of a gas different from those at lower temperature?

36. (i)   For the reaction: N_2(g) + $3H_2$(g) $\rightarrow$ $2NH_3$(g) the value of K_p is 3.6 x 10^{-2} at 500K. Calculate the value of K_c for the reaction at the same temperature. R= 0.083 LbarK^{-1}mol^{-1}.

(ii)   What is the effect of increasing pressure in the reactions? Give reason.

(a) PCl_5(g) $\rightarrow$ PCl_3(g) + Cl_2(g)

(b) N_2(g) + O_2(g) $\rightarrow$ 2NO(g)

OR

(i)   Write the conjugate acid for Bronsted base of HCOO$^-$.

(ii)   Calculate the pH of a 1.0x 10^{-8}M solution of HCl.

(iii)   Calculate the solubility of A_2X_2 in pure water, assuming that neither kind of ion reacts with water. (The solubility product of A_2X_2, K_{sp} = 1.1 x 10^{-23})

37. (i)   How can you convert the following?

(a)   Acetylene to nitrobenzene

(b)   2-Bromopropane to 1-bromopropane

(ii)   Give a chemical test to distinguish between ethane and ethane.

(iii)   Give a brief account of the following statements:

(a) n-Pentane has greater boiling point that ispentane

(b) CH_4 cannot be synthesised by Wurtz reaction.

OR

An alkyl halide $C_5H_{11}Br$ 'A' reacts with ethanolic KOH to give an alkene 'B', which reacts with Br_2 give compound 'C', which further on dehydrobromination gives an alkyne 'D'. On treatment with sodium metal in liquid ammonia, one mole of 'D' gives one mole of the sodium salt of 'D' and half a mole of hydrogen gas. Complete hydrogenation of 'D' yields a straight chain alkane. Identify A, B, C and D. Give the reaction involved.