



INDIAN SCHOOL SOHAR
FINAL EXAMINATION (2018 – 19)
CHEMISTRY

CLASS : XI
DATE : 24.02.2019

MAX. MARKS : 70
DURATION : 3.00 HRS

General Instructions:

- (a) All questions are compulsory.
- (b) Section A: Question numbers 1 to 5 very short answer questions carrying 1 mark each.
- (c) Section B: Question numbers 6 to 12 are short answer questions carrying 2 marks each.
- (d) Section C: Question numbers 13 to 24 are also short answer questions carrying 3 marks each.
- (e) Section D: Question numbers 25 and 27 are long answer questions carrying 5 marks each.
- (f) There is no overall choice. However an internal choice has been provided in two questions of one mark, two questions of two marks, four 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 calculator is not allowed.

Section A

1. Arrange the following metals in the order in which they displace each other from the solution of their salts. Al, Cu, Fe, Mg and Zn.
2. Write the names of isotopes of hydrogen.

OR

Draw the structure of H_2O_2 (s).

3. Find out the oxidation state of sodium in Na_2O_2 .
4. Why does boron trifluoride behave as a Lewis acid?

OR

PbCl_2 is more ionic than PbCl_4 . Why?

5. List gases which are responsible for greenhouse effect.

Section B

6. A solution is prepared by adding 2 g of a substance A to 18 g of water. Calculate the mass per cent of the solute.
7. An atom of an element contains 29 electrons and 35 neutrons. Deduce (i) the number of protons and (ii) the electronic configuration of the element.

OR

Show that the circumference of the Bohr orbit for the hydrogen atom is an integral multiple of the de Broglie wavelength associated with the electron revolving around the orbit.

8. Explain why cations are smaller and anions are larger in radii than their parent atoms.
9. Use molecular orbital theory to explain why the Be_2 molecule does not exist.

- Calculate the total pressure in a mixture of 8 g of dioxygen and 4 g of dihydrogen confined in a vessel of 1 dm^3 at 27° . ($R = 0.083 \text{ bar dm}^3\text{K}^{-1}\text{mol}^{-1}$)
- Enthalpies of formation of CO(g) , $\text{CO}_2\text{(g)}$, $\text{N}_2\text{O(g)}$ and $\text{N}_2\text{O}_4\text{(g)}$ are -110 , -393.81 and 9.7 kJ/mol respectively. Find the value of $\Delta_r H$ for the reaction: $\text{N}_2\text{O}_4\text{(g)} + 3\text{CO(g)} \rightarrow \text{N}_2\text{O(g)} + 3\text{CO}_2\text{(g)}$

OR

Define the following:

- Isolated System
 - Intensive properties
- What are electrophiles and nucleophiles? Explain with examples.

Section C

- Calculate the concentration of nitric acid in moles per litre in a sample which has a density, 1.41 g mL^{-1} and the mass per cent of nitric acid in it being 60% (molecular mass of $\text{HNO}_3 = 63$).
- The mass of an electron is $9.1 \times 10^{-31} \text{ kg}$. If Kinetic energy is $3.0 \times 10^{-25} \text{ J}$, Calculate its wavelength. ($h = 6.626 \times 10^{-34} \text{ Js}$)
- Predict the formulas of the stable binary compounds that would be formed by the combination of the following pairs of elements.
 - Lithium and oxygen
 - Magnesium and nitrogen
 - Aluminium and iodine
 - Silicon and oxygen
 - Phosphorus and fluorine
 - Element 71 and fluorine
- Describe the hybridisation in case of PCl_5 . Why are the axial bonds are longer as compared to equatorial bonds?
- A sample of pure PCl_5 was introduced into an evacuated vessel at 473 K . After equilibrium was attained, concentration of PCl_5 was found to be $0.5 \times 10^{-1} \text{ mol L}^{-1}$. If value of K_c is 8.3×10^{-3} , what are the concentrations of PCl_3 and Cl_2 at equilibrium? $\text{PCl}_5\text{(g)} \rightleftharpoons \text{PCl}_3\text{(g)} + \text{Cl}_2\text{(g)}$

OR

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 20 L reaction vessel at 500 K . At this temperature, the equilibrium constant, K_c for the reaction $\text{N}_2\text{(g)} + 3\text{H}_2\text{(g)} \rightleftharpoons 2\text{NH}_3\text{(g)}$ is 1.7×10^2 . Is the reaction mixture at equilibrium? If not, What is the direction of the net reaction?

- The ionization constant of acetic acid is 1.74×10^{-5} . Calculate the degree of dissociation of acetic acid in its 0.05 M solution. Calculate the concentration of acetate ion in the solution and its pH.

OR

One mole of H_2O and one mole of CO are taken in 10 L vessel and heated to 725 K . At equilibrium 40% of water (by mass) reacts with CO according to the equation, $\text{H}_2\text{O(g)} + \text{CO(g)} \rightleftharpoons \text{H}_2\text{(g)} + \text{CO}_2\text{(g)}$. Calculate the equilibrium constant for the reaction.

- Balance the following redox reactions by ion-electron method:
 - $\text{MnO}_4^-\text{(aq)} + \text{I}^-\text{(aq)} \rightarrow \text{MnO}_2\text{(s)} + \text{I}_2\text{(s)}$ (in basic medium)
 - $\text{Cr}_2\text{O}_7^{2-}\text{(aq)} + \text{SO}_2\text{(g)} \rightarrow \text{Cr}^{3+}\text{(aq)} + \text{SO}_4^{2-}\text{(aq)}$ (in acidic medium)
- Complete the following reactions:
 - $\text{PbS(s)} + \text{H}_2\text{O}_2\text{(aq)} \rightarrow$
 - $\text{MnO}_4^-\text{(aq)} + \text{H}_2\text{O}_2\text{(aq)} \rightarrow$
 - $\text{AlCl}_3\text{(g)} + \text{H}_2\text{O(l)} \rightarrow$

21. What happens when
- Sodium metal is dropped in water?
 - Sodium metal is heated in free supply of air?
 - Sodium peroxide dissolved in water?

OR

Describe two important uses of each of the following: (i) Caustic soda (ii) sodium carbonate (iii) quicklime

22. Complete the following reactions:
- $\text{BF}_3 + \text{LiH} \rightarrow$
 - $\text{P}_4 + \text{SOCl}_2 \rightarrow$
 - $\text{Zn} + \text{dil. HNO}_3 \rightarrow$

OR

What do you understand by (a) inert pair effect (b) allotropy and (c) catenation.

23. 0.3780 g of an organic chloro compound gas 0.5740 g of silver chloride to Carius estimation. Calculate the percentage of chlorine present in the compound.
24. What are the reactions involved for ozone layer depletion in the stratosphere?

Section D

25. What will be the pressure exerted by a mixture of 3.2 g of methane and 4.4g of carbon dioxide contained in a 9 dm^3 flask at 27°C ? ($R = 0.083 \text{ bar dm}^3\text{K}^{-1}\text{mol}^{-1}$)

Explain the following properties giving suitable examples.

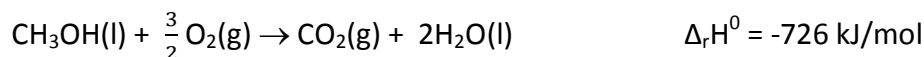
- Ferromagnetism
- paramagnetism
- Ferrimagnetism

OR

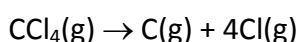
Density of a gas is found to be 5.46 g/dm^3 at 27°C at 2 bar pressure. What will be its density at STP?

An element with density 2.8 gcm^{-3} forms a fcc unit cell with edge length $4 \times 10^{-8} \text{ cm}$. Calculate the molar mass of the element. (Given $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$)

26. (i) Calculate the standard enthalpy of formation of $\text{CH}_3\text{OH}(\text{l})$ from the following data:



- (ii) Calculate the enthalpy change for the process



And calculate bond enthalpy of C-Cl in $\text{CCl}_4(\text{g})$.

$$\Delta_{\text{vap}} H^\circ(\text{CCl}_4) = 30.5 \text{ kJ/mol}$$

$$\Delta_a H^\circ(\text{C}) = 715 \text{ kJ/mol, Where } \Delta_a H^\circ \text{ is enthalpy of atomisation}$$

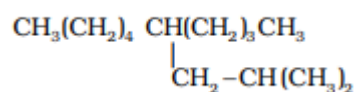
$$\Delta_f H^\circ(\text{CCl}_4) = -135.5 \text{ kJ/mol} \quad \Delta_a H^\circ(\text{Cl}_2) = 242 \text{ kJ/mol}$$

OR

- For an isolated system. $\Delta U = 0$, what will be ΔS ?
- For the reaction at 298K , $2\text{A} + \text{B} \rightarrow \text{C}$ $\Delta H = 400 \text{ kJ/mol}$ and $\Delta S = 0.2 \text{ kJ/mol}$. At what temperature will the reaction become spontaneous considering ΔH and ΔS to be constant over the temperature range. ($R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$)

- (iii) For the reaction $2\text{Cl}(\text{g}) \rightarrow \text{Cl}_2(\text{g})$, what are the signs of ΔH and ΔS ?
- (iv) For the reaction $2\text{A}(\text{g}) + \text{B}(\text{g}) \rightarrow 2\text{D}(\text{g})$ $\Delta U^0 = -10.5 \text{ kJ}$ and $\Delta S^0 = -44.1 \text{ JK}^{-1}$. Calculate ΔG^0 for the reaction, and predict whether the reaction may occur spontaneously.

27. (i) Write the IUPAC name of the following compound:



- (ii) Write the structures of all the alkenes which on hydrogenation give 2-methylbutane.
- (iii) How would you convert the following compounds into benzene?
- (a) Ethyne (b) Ethene (c) Hexane

OR

- (i) What are the necessary conditions for any system to be aromatic?
- (ii) How will you convert benzene into
- (a) P-nitrobromobenzene (c) m-nitrochlorobenzene
- (b) P-nitrotoluene (d) acetophenone?