INTERNATIONAL INDIAN SCHOOL DAMMAM

MODEL – EXAMINATION (2013 – 2014)

CHEMISTRY - XI

**MARKS-70**   **SET-A**   **TIME: 3 hours.**

General Instructions :

(i) All questions are compulsory .

(ii) Question numbers 1 to 5 are very short answer questions , carrying 1 mark each .

(iii) Question numbers 6 to 10 are short answer questions , carrying 2 mark each .

(iv) Question numbers 11 to 22 are also short answer questions , carrying 3 mark each .

(v) Question numbers 23 is value based question , carrying 4 mark .

(vi) Question numbers 24 to 26 are long answer questions , carrying 5 mark each .

(vii) Use of log table is permitted but not Calculator .

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1. What is the effect of temperature on viscosity and why ?

2. Complete the following : $NaNO_3$ $\rightarrow$?

3. How is Gibb's free energy change , $\Delta_r G^0$ is related to equilibrium constant of a reaction .

4. Write the solubility product expression for barium chromate .

5. Name two hormones which maintains the calcium concentration in plasma.

6. (i) What do you mean by "empirical formula ". What will be the empirical formula for Glucose

    ($C_6 H_{12} O_6$)

   (ii) State the law of multiple proportions .

7. (i) $(CH_3)_3 C^+$ is more stable than $CH_3 CH_2^+$ and CH_3^+ is a least stable cation. Why ?

    (ii) What are the hybridisation states of each 'Carbon' in $(CH_3)_2 CO$.

8. 0.15 g of an organic compound gave in a Carius determination 0.12 g of Silver bromide . What is the percentage of bromine in the given organic compound.

9. Ionic product of water at 310 K is 2.7×10^{-14} . What is the p^H of neutral water at this temperature ?

10. Write the important conditions required for the linear combination of atomic orbitals to form molecular orbitals .

11. Calcium carbonate reacts with aqueous HCl to give $CaCl_2$ and CO_2 according to the reaction

$$CaCO_3(s) + 2 HCl (aq) \rightarrow CaCl_2 (aq) + CO_2 (g) + H_2O(l)$$
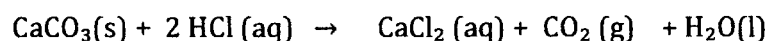
What mass of $CaCl_2$ will be formed when 250 ml of 0.76 M HCl reacts with 1000 gram of $CaCO_3$?

(Atomic masses : Ca = 40 , Cl = 35.5 , H = 1 , C = 12 , O = 16 u)

12. (i) How are orbitals $dx^2 -y^2$, dz^2 and dyz oriented in space?

(ii) State Heisenberg's uncertainty principle.

(iii) Explain why atoms in the half filled and completely filled orbitals have extra stability?

13. (i) Define "bonding "and "anti bonding molecular orbitals ".

(ii) Draw diagrams showing the formation of a double bond and a triple bond between carbon atoms in C_2H_4 and C_2H_2 molecules.

14. Calculate the frequency and the wave length for the radiation emitted when an electron in the hydrogen atom jumps from third orbit to the ground state. In which region of the electro-magnetic spectrum will this line lie. (h = 6.63×10^{-34} J s)

15. (i) What will be the pressure exerted by a mixture of 3.2 gram CH_4 and 4.4 gram CO_2 contained in a 9 dm^3 flask at 27^0C .

(ii) What is compressibility factor ? What is its value for an ideal gas ?

**16.** (i) Derive "Henderson equation for acidic buffer solution " .

(ii) What are the factors affecting acid strength ?

17. (i) Given the standard electrode potentials,

K^+/K = – 2.93V, Ag^+/Ag = 0.80V, Hg^{2+}/Hg = 0.79V, Mg^{2+}/Mg = – 2.37V.
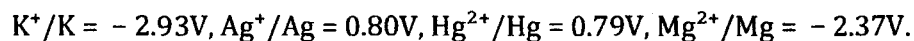
Cr^{3+}/Cr = – 0.74V. Arrange these metals in their increasing order of reducing power.

(ii) What sorts of information can you draw from the following reaction:

$(CN)_2 (g) + 2 OH^- (aq) \text{-----> } CN^-(aq) + CNO^-(aq) + H_2O (l)$
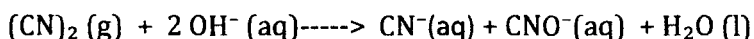
18. Give the reactions involved in the Solvay's process for the preparation of sodium carbonate .

Why K_2CO_3 is not prepared by this method .

19. (i) Kjeldahl method is not applicable to compounds containing nitrogen in Nitro & Azo groups. Why ?

(ii) Write the purification techniques employed for the preparation of Glycerol from 'spent – lye' in soap industry.

(iii) What are the formulae of (a) Sodium nitroprusside and (b) Ferric ferrocyanide ?

20. (i) What would have happened if the green house gases were totally missing in the earth's atmosphere?

(ii) CO_2 is inert and harmless gas , yet it is thought to be a serious pollutant . Why ?

(iii)   What is the importance of measuring BOD of a water body ?

21. (i) What do you mean by "30 vol " H_2O_2 .

(ii) What is water gas shift reaction .

(iii) Complete the following : $CaC_2 + D_2O \rightarrow ?$

22. Write short notes on :

(i) Friedel – Crafts acylation   (ii) Markovnikov rule   (iii) Isomerisation

23. Chemical reactivity of elements is highest at the two extremes of a period and is lowest at the centre . Highly reactive elements do not occur in nature in free state , they usually occur in combined state . Two students whose roll numbers are 87 and 119 are highly aggressive and keep on fighting with each other like highly reactive elements . Some students are sober and help each other and do not fight .

(i) What is the IUPAC name and symbol of element having atomic number 119 ?

(ii) Element having atomic number 87 belongs to which block elements ?

(iii) What values are possessed by sober people ?

(iv) Which kind of people pick up fight , while driving on the road in case of accidents ? What are its consequences ? What should we do ?

24. (i) Starting with the thermodynamic relationship G = H – TS. Derive the following relation $\Delta G_{system} = -T\Delta S_{total}$.

(ii) The combustion of one mole of benzene takes place at 298 K and 1atm. After combustion, $CO_2(g)$ and H_2O (l) are produced and – 2867 K J mol^{-1} of heat is liberated. Calculate the standard enthalpy of formation of benzene . Standard enthalpies of formation of $CO_2(g)$ and H_2O (l) are – 393.5 K J mol^{-1} and – 286 K J mol^{-1} respectively .

(ii)   Derive the relationship between C_p and C_v for an ideal gas .

(ii)   For a reaction: $2A(g) + B(g) \rightarrow 2D(g)$

$\Delta U^0 = -10.5$ KJ and $\Delta S^0 = -44.1$ JK^{-1}. Calculate ΔG^0 for the reaction , and predict whether the reaction may occur spontaneously .

25. (i) A certain salt **X**, gives the following results.

(a) Its aqueous solution is alkaline to litmus. (b) It swells up to a glassy material **Y** on strong heating. (c) When conc. H_2SO_4 is added to a hot solution of **X**, white crystal of an acid **Z** separates out. Write equations for all the above reactions and identify **X, Y** and **Z**.

(ii) Give reasons :

(a) Concentrated HNO_3 can be transported in aluminium container.

(b) CCl_4 does not hydrolyse where as $SiCl_4$ can be hydrolysed easily .

(i) Draw the structure of " B_2H_6 "molecule . How it is prepared on an industrial scale ?

(ii) Suggest reason why B-F bond lengths in BF_3 (130 pm) and BH_4^- (143 pm) differ ?

(iii) Write reactions to justify amphoteric nature of aluminium.

(iv) What is the function of ZSM – 5 ?

26. (i) How will you convert Phenol into toluene ?

(ii) Draw the geometrical isomers of But – 2 – ene . Which isomer has higher boiling point ?

(iii) Arrange the following compounds in the decreasing order of their reactivity with an electrophile, E^+ :   Toluene , p - $H_3C - C_6H_4 - NO_2$, p - $O_2N - C_6H_4 - NO_2$.

(iv)   An unknown alkene "A " on reductive ozonolysis gives two isomeric carbonyl compounds "B "and "C " having molecular formula C_3H_6O . Write the structures of A , B and C .

(i)   What happens when sodium benzoate is heated with soda lime .
(ii)   How will you convert n – heptanes into toluene .
(iii)   But – 1 –yne is more acidic than but – 1 – ene . Why ?
(iv)   Identify A , B , C and D in the following reactions :

$$(A) \xrightarrow{Br_2/CCl_4} (B) \xrightarrow{KOH(alc.)} \begin{array}{c} (C) \\ \downarrow Na \\ CH_3 - C \equiv CNa \end{array} \xrightarrow{Hg^{2+}/ H_2SO_4} (D)$$

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