INDIAN SCHOOL SOHAR
FINAL EXAMINATION 2017-2018
CHEMISTRY

Class : XI	**Time : 3.00 Hrs.**
Date : 25.02.2018	**Max. Marks : 70**

General Instructions:

(i)   All questions are compulsory.

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

(iii) Question numbers 5 to 10 are short answer questions carrying 2 marks each.

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

(v)   Question numbers 23 is a value based question carrying 4 marks.

(vi)   Question numbers 24 and 26 are long answer questions carrying 5 marks each.

(vii) Use log tables, if necessary. Use of calculator is not allowed.

Constants : $R = 8.314 \, JK^{-1}mol^{-1}$; $N_A = 6.02 \times 10^{23}$; $m_e = 9.1 \times 10^{-31} kg$; $C = 3 \times 10^8 ms^{-1}$

1.   Write the IUPAC name and symbol for the element with atomic number 119.

2.   Which of the following species has tetrahedral geometry?
     BH_4^-, NH_2^-, CO_3^{2-}, H_3O^+

3.   The largest oxidation number exhibited by an element depends on its outer electronic configuration. With which of the following outer electronic configurations the element will exhibit largest oxidation number? $3d^14s^2$; $3d^34s^2$; $3d^54s^1$; $3d^54s^2$

4.   Write water gas shift reaction.

5.   Arrange the following in order of their increasing covalent character: MCl, MBr, MF, MI (where M is alkali metal)

6.   1M solution of $NaNO_3$ has density $1.25 gcm^{-3}$. Calculate its molality. (Molecular weight of $NaNO_3 = 85 \, gmol^{-1}$

7.   Define an orbital. What does angular quantum number tell about an orbital?

OR

     Define (i) frequency (ii) wavelength.

8.   Write the conditions of temperature and pressure when gases deviate most from the ideal behaviour? Write real gas equation for n moles of a gas.

9.   Define the following terms:

     (i)   Enthalpy of neutralisation

     (ii)   Hess's law of constant heat summation

10. Identify the compound A, X and Z in the following reactions:

     (i) $A + 2HCl + 5H_2O \rightarrow 2NaCl + X$

     (ii) $X \xrightarrow{\Delta/370 \, K} HBO_2 \xrightarrow{\Delta/>370 \, K} Z$

11. A compound contains 4.07% hydrogen, 24.27% carbon and 71.65% chlorine. Its molar mass is 98.96 g. What are its empirical and molecular formulae? (At. Mass of H = 1 $gmol^{-1}$; C = 12 $gmol^{-1}$; Cl = 35.5 $gmol^{-1}$)

12. When electromagnetic radiation of wavelength 300 nm falls on the surface of sodium, electrons are emitted with a kinetic energy of $1.68 \times 10^5 \, Jmol^{-1}$. What is the minimum energy needed to

remove an electron from sodium? What is the maximum wavelength that will cause a photoelectron to be emitted? ($h = 6.626 \times 10^{-34}$ Js)

OR

A photon of wavelength 4×10^{-7} m strikes on metal surface, the work function of the metal being 2.13 eV. Calculate

(i)   Energy of the photon (eV)

(ii)   The kinetic energy of the emission

(iii)   The velocity of the photoelectron (1 eV = 1.602×10^{-19} J)

13. Among the elements of second period Li to Ne, pick out element:

(a) With the highest first ionisation energy

(b) With the highest electronegativity

(c) With largest atomic radius

(d) that is most reactive non-metal

(e) that is most reactive metal

(f) with valency equal to 4

14. Discuss the shape of the following molecules using the VSEPR model:

$BeCl_2$, BCl_3, $SiCl_4$, AsF_5, H_2S, PH_3

15. (i) State Boyle's Law.

(ii) What will be the minimum pressure required to compress 500 dm^3 of air at 1 bar to 200 dm^3 at 30^0C.

16. Calculate the lattice enthalpy of $MgBr_2$ given that

Enthalpy of formation of $MgBr_2$	=	-524 kJmol^{-1}
Sublimation energy of Mg	=	148 kJmol^{-1}
Ionization energy of Mg	=	2187 kJmol^{-1}
Vaporisation energy of Br_2(l)	=	31 kJmol^{-1}
Dissociation energy of $Br_{2(g)}$	=	193 kJmol^{-1}
Electron gain enthalpy of $Br_{(g)}$	=	331 kJmol^{-1}

17. Calculate the molar solubility of $Ni(OH)_2$ in 0.10 M NaOH. The ionic product of $Ni(OH)_2$ is 2.0×10^{-15}.

18. (i) Find the oxidation number of (a)   Mn in MnO_4^-; (b)   O in H_2O_2

(ii) Balance the following equation by oxidation number method in basic medium:

$$MnO_4^- + I^- \rightarrow MnO_2 + IO_3^-$$

19. Write down the one method for manufacture of H_2O_2 and one example in which it act as oxidising and reducing agent.

20. (i)   Draw the structure of $BeCl_2$ in vapour state.

(ii)   Write two uses of Plaster of Paris.

(iii)   What happens when chlorine reacts with slaked lime?

21. (i) Write the formula or Prussian blue colour formed in Lassigne's test for nitrogen detection.

(ii) Write the formula for estimation of Nitrogen by Kjeldhal's method.

(iii) Name the method used to separate:

(a)   Glycerol from spent lye in soap industry

(b)   Aniline from aniline water mixture

22. Give three points of differences between inductive effect and resonance effect.

23. "Super Dry Cleaning" owner Mr. Grover was using tetrachloroethene earlier as a solvent for dry cleaning. The compound contaminates the ground water and is also suspected

carcinogenic. Mr. Jindal owner of "White Tiger Dry Cleaning" is using CO_2 these days. Hydrogen peroxide is being used for bleaching purpose.

    (i)   What is the advantage of using liquid CO_2 with suitable detergent for dry-cleaning?

    (ii)   What is the advantage of using H_2O_2 as bleaching agent?

    (iii)   What is your responsibility as human being to protect environment?

    (iv)   What values are possessed by Mr. Jindal?

24. (a)   A sparingly soluble salt having general formula A^{P+}, B^{q+} and molar solubility S is in equilibrium with its saturated solution. Derive a relationship between the solubility and solubility product for such salt.

    (b)   Write a relation between ΔG and Q and define the meaning of each term and answer the following:

        (i)   Why a reaction proceeds forward when $Q < K$ and no net reaction occurs when $Q = K$

        (ii)   Explain the effect of increase in pressure in terms of reaction quotient Q for the reaction: $CO_{(g)} + 3H_{2(g)} \leftrightharpoons CH_{4(g)} + H_2O_{(g)}$

    (c)   A reaction between ammonia and boron trifluoride is given below:

        $:NH_3 + BF_3 \rightarrow H_3N:BF_3$

        Identify the acid and base in this reaction. Which theory explains it? What is the hybridisation of B and N in the reactants?

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

(a) How can you predict the following stages of a reaction by comparing the value of K_c and Q?

    (i)   Net reaction proceeds in the forward direction.

    (ii)   Net reaction proceeds in the backward direction.

    (iii)   No net reaction occurs.

(b) On the basis of Le Chatelier principle explain how temperature and pressure can be adjusted to increase the yield of ammonia in the following reaction:

$N_{2(g)} + 3H_{2(g)} \leftrightharpoons 2NH_{3(g)}$ $\Delta H = -92.38$ kJmol^{-1}.

What will be the effect of addition of argon to the above reaction mixture at constant volume?

(c) The ionisation of hydrochloric acid in water is given below:

        $HCl_{(aq)} + H_2O_{(l)} \leftrightharpoons H_3O^+_{(aq)} + Cl^-_{(aq)}$

    Label two conjugate acid-base pairs in this ionisation.

(d) Conjugate acid of a weak base is always stronger. What will be the decreasing order of basic strength of the following conjugate bases? OH^-, RO^-, CH_3COO^-, Cl^-

25. (i)   Complete the following chemical equations:

        (a) $Fe_2O_3 + 3CO \xrightarrow{\Delta}$

        (b) $CaCO_3 + 2HCl \rightarrow$

   (ii)   Write a brief account on the following:

        (a)   Diamond is covalent, yet it has high melting point.

        (b)   Atomic radius of gallium (135pm) is less than that of aluminium (143 pm)

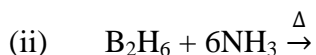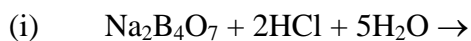   (c)   Graphite is a good conductor of electricity but diamond is insulator.

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

(a) Account for the following:

(i)   Boron trihalides (BX_3) act as Lewis acids.

(ii) $PbCl_4$ is a powerful oxidising agent.

(iii)   Graphite acts as a good lubricant.

(b) Complete the following reactions:

(i) $Na_2B_4O_7 + 2HCl + 5H_2O \rightarrow$

(ii) $B_2H_6 + 6NH_3 \xrightarrow{\Delta}$

26. (i)   Explain the following reactions with suitable examples:

        (a)   Wurtz reaction

        (b)   Friedel-Crafts alkylation

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

(iii)   Give one chemical test to distinguish between ethene and ethyne.

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

(i)   An alkyl halide(X) of formula $C_6H_{13}Cl$ on treatment with alcoholic KOH or potassium-butoxide give two isomeric alkenes Y and $Z(C_6H_{12})$. Both alkenes on hydrogenation give 2,3-dimthylbutane. Predict structure of X,Y and Z.

(ii)   Give the main products of the reactions:

(a) $\bigcirc$ $\xrightarrow{Anhyd.AlCl_3/CH_3Cl}$

(b) $CH_3C(CH_3)=CH_2 + H_2O \xrightarrow{H^+}$