Std. 11   Time : 3 hrs.

19-9-2016   Half Yearly Examination in **CHEMISTRY**   M. Marks : 70

General Instructions:
i)   Question 1 – 5 carry 1 mark each.
ii)   Question 6 – 10 carry 2 marks each.
iii)   Question 11 – 22 carry 3 marks each.
iv)   Question 23 carry 4 marks.
v)   Question 24 – 26 carry 5 marks each.
vi)   Use log tables if necessary.

1.   Write orbital electronic configuration and predict magnetic nature of $_{28}Ni^{2+}$.   1

2.   Name the series of H-spectrum to which a line with $n_1 = 2$ and $n_2 = 4$ belongs to.   1

3.   Arrange the following atoms / ions in the increasing order of size.
        $_{18}Ar$, $_{17}Cl^-$, $_{16}S^{2-}$, $_{20}Ca^{2+}$, $_{19}K^+$ 1

4.   Indicate the total number of sigma and pi bonds in the following molecule.

$$CH_2 = CH - \overset{\overset{\textstyle O}{\|}}{C} - CH_2 - \overset{\overset{\textstyle O}{\|}}{C} - OH$$ 1

5.   What is meant by state function? Give example.   1

6.   a)   Arrange the following orbitals in the increasing order of energy.
                4f, 5d, 6p, 7s, 7p
        b)   What is the maximum number of electrons that can be accommodated
                in n=1, l=0 sub shell?
        c)   Draw the shape of dxy orbital.   2

7.   Two particles A and B are in motion. If the wavelength associated with particle A is
        5×10^{-8}m, calculate the wavelength associated with particle B if its momentum is half of A. 2

8.   a)   In the reaction $A + B_2 \rightarrow AB_2$, identify limiting reagent in a mixture containing
                300 atoms of A and 200 molecules of B.
        b)   State and explain the law of multiple proportions
                                            (OR)
        3g of H_2 react with 29g of O_2 to yield H_2O
        i)   Which is the limiting reagent?
        ii)   Calculate the maximum amount of H_2O that can be formed.
        iii)   Calculate the amount of one of the reactants which remains unreacted.   2
                (Atomic mass, H=1, O=16)

9. a) Define molality. Why molality is preferred over molarity?
    b) In a solution of components A and B, if the mole fraction of A is 0.04,
        what is the mole fraction of B?   2

10. What mass of calcium oxide will be obtained by heating 3mol of calcium carbonate?
    (Atomic mass, Ca = 40g, C = 12g)   2

11. a) Commercially available HBr solution contains 48% HBr by mass. What is the
        molarity of this solution? The density of the solution is $1.5 g/cm^3$.
        (Molar mass of HBr = 80.9 g/mol.)
    b) 3 litre of water added to 2 litre of 5M HCl. What is the molarity of resultant
        HCl solution?   3

12. An organic compound on analysis gave C=57.82%, H=3.6%, and the rest is oxygen, if its
    molar mass is 166 g/mol, find the empirical and molecular formula of the compound.
    (Atomic mass C=12, H=1, O=16)   3

13. a) State pauli's exclusion principle.
    b) Differentiate between an orbit and orbital.
    c) What are the informations given by principal quantum number?   3

14. a) Which of the following orbitals are not possible?
            Ip, 3s, 4f, 2d
    b) Calculate the uncertainity in the position of an electron if uncertainty in its velocity
        is 0.001%. Mass of electron = 9.1×10^{-31} Kg. Velocity of electron is $300 ms^{-1}$.   3
        $h = 6.6 \times 10^{-34}$ Kg m^2 s^{-1}.

15. Choose the correct option from column II for each item in column I.   3

a.	A halogen	Sodium
b.	An alkali metal	Helium
c.	Highest electronegative element	Flourine
d.	Element with highest electrons gain enthalpy	Copper
e.	A noble gas	Chlorine
f.	A d-block metal	Bromine

16. a) Give general outer electronic configuration of d-block elements.
    b) Predict the position of an element with atomic number 20 in the periodic table.
    c) Why does electron gain enthalpy decreases down a group?   3

17. a) From each of the following pair select the molecule with higher value of the
        property mentioned:
        i) NH_3, PH_3 :   bond angle
        ii) NH_3, NF_3 :   dipole moment
        iii) HCl, HF   :   boiling point
        iv) C_2H_2, C_2H_4 :   C-C bond length

b) Why do ionic compounds have high melting and boiling points? 3

18. Write molecular orbital configuration, calculate bond order and compare stability of O_2 and O_2^{2+} (Atomic number O=8)

(OR)

a) Define co-ordinate bond. Show coordinate bonding in NH_4^+.
b) What is meant by bond order? How is it related to the stability of the molecule?
c) Write molecular orbital configuration of N_2 (atomic No = 7) 3

19. a) Define entropy.
b) Predict the sign of entropy change for $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$.
c) What are extensive properties? Give an example.
d) What is meant by 'enthalpy of reaction'? 3

20. a) Calculate the internal energy change when a system absorbs 15 KJ of heat and does 5 KJ of work.
b) The internal energy change for the reaction $CH_4(g) + 2O_2(g) \rightarrow CO_2(g)\ 2H_2O(l)$ is -885KJ/mol at 298K. What is the enthalpy change at 298k?
$(R = 8.314\ J\ k^{-1}\ mol^{-1})$ 3

21. Name the reagent used for the confirmation of following ions:
a) Cl^- b) SO_4^{2-} c) NH_4^+ 3

22. a) Explain the chemistry of flame test.
b) Why magnesium does not show any flame colouration?
c) Name the group reagent for group III. 3

23. Rohan accidentally broke con. H_2SO_4 bottle while working in the chemistry lab.
Amit, his friend immediately pour cold water on his hand and took lab assistant's help to apply $NaHCO_3$ on the burnt area.
a) Mention any two precautions to be taken while working in the chemistry lab.
b) Give the reaction between dil. H_2SO_4 and $NaHCO_3$.
c) What are the values shown by Amit? 4

24. Account for the following:
a) Ionisation enthalpy of $_7N$ is greater than that of $_8O$.
b) Metallic character increases down a group.
c) Halogens have high negative electron gain enthalpy
d) Cl^- is larger than Cl
e) There are only two elements in first period.

(OR)

a) Define covalent radius.
b) Second electron gain enthalpy of oxygen is positive. Explain.
c) Explain the variation of reducing power along a group in the periodic table.
d) $I-E_3 > I-E_2 > I.E_1$. Explain.

e) Would you expect the first ionization enthalpies of two isotopes of the same element to be the same or different? Justify your answer. 5

25. a) How does valence bond theory explains the non-formation of He_2?
    b) Predict the geometry and bond angle of following molecules in terms of VSEPR theory.
        i) NH_3 ii) BCl_3
    c) Define hybridisation. Explain the formation of SF_6 on the basis of hybridisation.

    (OR)

    a) Explain SP hybridisation with the help of an example.
    b) "All the five P-Cl bonds in PCl_5 are not equivalent." Explain.
    c) Draw potential energy diagram to explain the formation of H_2. 5

26. a) Calculate the enthalpy of formation of sucrose ($C_{12}H_{22}O_{11}$) from the following data:
        i) $C_{12}H_{22}O_{11} + 12O_2 \rightarrow 12CO_2 + 11H_2O$ $\Delta H = -5200.7$ KJ / mol
        ii) $C + O_2 \rightarrow CO_2$ $\Delta H = -394.5$ KJ / mol
        iii) $H_2 + \frac{1}{2} O_2 \rightarrow H_2O$ $\Delta H = -285.8$ KJ / mol
    b) At what temperature the reaction
        $$PbO + C \rightarrow Pb + CO$$
        becomes spontaneous. ΔH and Δs for the reaction are 108.4 KJ / mol^{-1} and 190 JK^{-1} mol^{-1} respectively.

    (OR)

    a) Why does low temperature favour exothermic reactions?
    b) Calculate enthalpy change for the reaction
        $$H_2 + Br_2 \rightarrow 2HBr$$
        Bond enthalpies of H-H, Br-Br and H-Br are 435, 192, and 364 KJ / mol respectively.
    c) Calculate the enthalpy of formation of CO from the following data:
        i) $C + O_2 \rightarrow CO_2$ $\Delta H = -393.5$ KJ/mol
        ii) $CO + \frac{1}{2} O_2 \rightarrow CO_2$ $\Delta H = -283$ KJ/mol   5

-x-x-x-x-x-x-x-x-x