

No. of Printed Pages : 9

Roll No.....

FAS / Chemistry / XI / Semester-1 / 2016-2017

Time : 3 hrs.]

[M. M. : 70

General Instructions :-

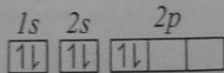
- (1) All questions are compulsory.
- (2) Question nos. 1 to 5 are very short answer questions and carry 1 mark each.
- (3) Question nos. 6 to 10 are short answer questions and carry 2 marks each.
- (4) Question nos. 11 to 22 are also short answer questions and carry 3 marks each.
- (5) Question no. 23 is value based question of 4 marks
- (6) Question nos. 24 to 26 are long answer questions and carry 5 marks each.
- (7) Use log tables if necessary, use of calculators is not allowed.

- 1 Calculate the number of neon atoms in 200u of neon (At. mass Ne=20u)
- 2 Which series of hydrogen spectrum lies in :-
 - (a) visible region
 - (b) UV region
- 3 Give the symbol and the IUPAC name for the element having atomic number 118.
- 4 What do you mean by the term representative block of elements?

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(P.T.O.)

- Why is solid sodium chloride a non conductor of electricity ?
- 6 (a) Give two points of difference between orbit and orbital.
 (b) Which rule is violated in the following orbital diagram.



- 7 An electron has velocity of 50 m/s, accurate upto 99.99%. Calculate the uncertainty in locating its position.
 (Mass of electron 9.1×10^{-31} Kg, $h = 6.63 \times 10^{-34}$ Js)
- 8 Give reasons :-
 (i) Noble gases have larger atomic radius than halogens.
 (ii) PF_5 exists but NF_5 does not.

OR

- Arrange the following species in increasing order of their sizes and justify your order :-
 Mg^{2+} , Al^{3+} , F^- , Na^+ , O^{2-}
- 9 Draw the shape of SF_4 and NH_3 according to VSEPR theory.
- 10 When 430 J of work was done on the system and it lost 120 J of energy as heat. Calculate the value of internal energy change.
- 11 (i) For the given reaction :-
 $2A + 4B \rightarrow 3C + 4D$
 If 5 moles of A react with 6 moles of B find :-
 (a) Limiting reagent.
 (b) Amount of C formed.

- (ii) Molality is considered a better concentration term than molarity justify?
- 12 Conc. HCl is 38% by mass. What is the molarity of this solution if the density of the solution is 1.19 g/ml? Also calculate the volume of this acid required to prepare 1.00 L of 0.10 M HCl?
 (At mass H=1, Cl=35.5)
- 13 (a) An organo metallic compound on analysis was found to contain, C=64.4%, H=5.5% and Fe = 29.9%, determine its empirical formula.
 (at. mass of Fe=56u, H=1u, C=12.01u)
- (b) Find the mole fraction of C in a solution containing A, B and C if the mole fraction of A and B are 2/5 each.
- 14 Give reasons :-
 (a) Na and Mg^+ have same number of electrons but the removal of electron from Mg^+ requires more energy.
 (b) Noble gases have a positive value for electron gain enthalpy.
 (c) First ionization energy of boron is less than Beryllium.
- 15 (a) Study the given table of elements with their first and second ionisation energies in KJ/mole.

| Element | IE ₁ | IE ₂ |
|---------|-----------------|-----------------|
| A | 900 | 1760 |
| B | 520 | 7300 |
| C | 2378 | 5234 |
| D | 1880 | 3380 |

- Which of these elements is likely to be :-
 (i) reactive metal
 (ii) non metal
 (iii) noble gas
 (iv) metal forming a binary halide with formula MX_2
- (b) Give the general electronic configuration for the transition metals.
- 16 Consider the given structure :-

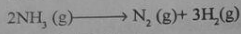
$$\begin{array}{ccccccc} & & O & & & & \\ & & || & & & & \\ \text{①} & \text{②} & \text{④} & \text{⑤} & \text{⑥} & & \\ | & | & | & | & | & & \\ CH_3 & - & CH_2 & - & C & - & CH_2 & - & C & = & CH \\ & & & & ③ & & & & & & \end{array}$$
- (a) Count the total number of sigma and pi bonds.
 (b) Which carbon atoms have same hybridised state as in C_2
 (c) Which carbon atoms have minimum s character?
 (d) What is the bond angle around carbon number 2?
 Give reasons :-
 (a) CO_2 and SO_2 have different dipole moments.
 (b) All P-Cl bonds in PCl_5 are not of same bond length.
 (c) Be_2 molecule is non-existent according to molecular orbital theory.
- 18 (a) Draw the hybridised orbital diagrams for :-
 (i) Ethene
 (ii) BeF_2
 (b) Give an example of :-
 (i) Odd electron molecule

- (ii) Expanded octet molecule
- 19 Give the electronic configuration, calculate the bond order and comment on the magnetic character for O_2 molecule.
 OR
 (1) Draw the resonating structures of NO_3^- ion
 (2) Arrange the following in increasing order of ionic character :-
 NaF , MgF_2 , AlF_3 , SiF_4
 (3) Why is ortho nitro phenol steam volatile?
- 20 (a) Calculate the temperature of 5 moles of a gas occupying 12 L at 4.4 bar pressure. ($R = 0.083$ L bar K^{-1} mol⁻¹)
 (b) Name the intermolecular force acting between the following pairs :-
 (i) Xe and F_2
 (ii) HF and H_2O
- 21 CH_4 , NH_3 , H_2O , BH_3
 Which out of the above mentioned hydrides is :-
 (a) Electron deficient
 (b) Lewis base
 (c) Highest boiling
 (d) sp^3 hybridised
 (e) Hydride with bond angle 109.5
 (f) Electron precise hydride
- 22 (a) Give one example each of extensive and intensive property.
 (b) Under what conditions will internal energy change and enthalpy change

(6)

be equal in a chemical reaction, explain ?

- (c) What will be the enthalpy of formation of $\text{NH}_3(\text{g})$ from the given thermo chemical equation :-



$$\Delta_f H = +92.4 \text{ K J/mol}$$

Rohit cooks vegetables in shimla in an open pan while Rahul cooks them in a pressure cooker in the same kitchen. Rahul's gas cylinder lasts 15 days more than Rohit's gas cylinder.

- (a) Whose vegetables will cook faster ?
 (b) What is the reason for delay in cooking by Rohit ?
 (c) State a value possessed by Rahul.
 (d) How is the boiling point of a liquid related to its inter molecular force of attraction.

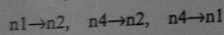
- (a) Why is the +2 state of Mn (Z=25) more stable than +2 state of Fe (Z=26) ?

- (b) Using the s, p, d, f notation describe the following orbitals :-

(i) $n=4, l=3$

(ii) $n=5, l=0$

- (c) Which of the following transitions will have minimum wave length and why ?



- (d) Why is the energy of an electron negative ?

- (e) Which quantum number determines :-

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- (i) energy of electron

- (ii) orientation of the orbital ?

OR

- (1) An element has electronic configuration $[\text{Ar}] 3d^4$ in its +3 oxidation state. What will be electronic configuration of its atom.
 (2) If an unpaired electron contributes a value of 1.1 towards its magnetic moment, then calculate the magnetic moment of Chromium (Z=24).

- (3) How many electrons in an atom have the following quantum numbers :-
 $n=3$ and $l=0$

- (4) Calculate the radius of bohr's fifth orbit for hydrogen atom.

- (5) Define photo electric effect.

- 25 (a) State the conditions of temperature and pressure for an ideal gas to transforms into real gas.

- (b) Define critical temperature of a gas.

- (c) Which out of standard boiling point and normal boiling point is higher and why ?

- (d) State the physical significance of 'a' and 'b' in real gas equation.

- (e) What is the name given to pressure exerted by water vapour in a gas collected by downward displacement of water ?

OR

- (a) Why do water droplets take a spherical shape ?

- (b) Graphical representation of which gas law is called an isobar.

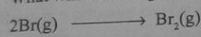
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- (c) Give the mathematical expression relating the density of a gas to its molar mass.

- (d) The size of a weather balloon becomes larger as it ascends up into higher altitudes . State the gas law applicable to the above observation.

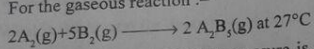
- (e) Define compressibility factor and what is its value for ideal gases.

- 26 (a) What will be the sign of ΔH and ΔS for the given reaction :



- (b) State the second law of thermodynamics.

- (c) For the gaseous reaction :-



The heat change at constant pressure is -50.16 KJ . Calculate the value of internal energy change.

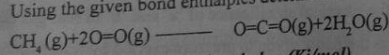
$$(R = 8.314 \text{ Jk}^{-1}\text{mol}^{-1})$$

- (d) What is the value of ΔG when ice and water are in equilibrium ?

OR

- (1) What should be the values of ΔH and ΔS for a reaction to be spontaneous at all temperatures ?

- (2) Using the given bond enthalpies determine the enthalpy of reaction



Bond type Bond enthalpy (Kj/mol)

C=O 741

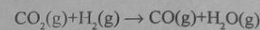
C-H 414

H-O 464

O=O 498

(9)

- (3) Calculate the heat of reaction for :-



from the $\Delta H^{\circ}f$ values.

| Compounds | $\Delta H^{\circ}f$ (K J/Mol) |
|--------------------------------|-------------------------------|
| $\text{CO}_2(\text{g})$ | -393.8 |
| $\text{CO}(\text{g})$ | -110.5 |
| $\text{H}_2\text{O}(\text{g})$ | -241.8 |