Roll No _____ (To be filled in by the candidate) (Academic Sessions 2015 – 2017 to 2018 – 2020)

CHEMISTRY 219-(INTER PART – I) Time Allowed : 20 Minutes
Q.PAPER – I (Objective Type) GROUP – I Maximum Marks : 17
PAPER CODE = 6481

Note : Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1	The largest number of molecules is present in :
	(A) 5.4 g of N_2O_4 (B) 2.8 g of CO (C) 4.8 g of C_2H_6O (D) 3.6 g of H_2O
2	1.00 mole of SO_2 contains :
	(A) 6.02×10^{23} atoms of oxygen (B) 3.01×10^{23} molecules of SO_2
	(C) 6.02×10^{23} molecules of SO_2 (D) 3.01×10^{23} atoms of sulphur
3	Solvent extraction is a separation technique used for the product, which is :
	(A) Non-volatile; thermally unstable (B) Volatile; thermally stable
	(C) Non-volatile; thermally stable (D) Volatile; thermally unstable
4	The deviation of a gas from ideal behaviour is maximum at :
	(A) $-10\,^{\circ}C$ and 5 atm (B) $-10\,^{\circ}C$ and 2 atm (C) $100\,^{\circ}C$ and 2 atm (D) $0\,^{\circ}C$ and 2 atm
5	The order of effusion of NH_3, SO_2, Cl_2 and CO_2 gases is :
	(A) $NH_3 > SO_2 > Cl_2 > CO_2$ (B) $NH_3 > CO_2 > SO_2 > Cl_2$
	(C) $Cl_2 > SO_2 > CO_2 > NH_3$ (D) $NH_3 > CO_2 > Cl_2 > SO_2$
6	Density of ice is minimum at 4 $^{\circ}C$ due to :
	(A) Empty spaces in structure of ice (B) Tetrahedral shape of crystal of ice
	(C) Large bond lengths (D) Large bond angles
7	The solid which has no definite crystalline shape :
	(A) Sugar (B) Salt (C) Glass (D) Dry ice
8	Quantum numbers, which represents 2p orbitals are :
	(A) $n = 2$, $\ell = 1$ (B) $n = 1$, $\ell = 2$ (C) $n = 1$, $\ell = 0$ (D) $n = 2$, $\ell = 0$
9	The nature of positive rays in discharge tube depends upon nature of :
	(A) Anode (B) Cathode (C) Residual gas (D) Discharge tube
10	Nature of bonds in N_2 molecule is :
	(A) One sigma ; two pi bonds (B) Two sigma; two pi bonds
	(C) Two sigma; one pi bond (D) Three pi bonds
11	For HF molecule μ_{obs} is 1.90 D ; μ_{ionic} is 4.4 D. The percentage ionic character of HF molecule is :
	(A) 100 (B) 80 (C) 57 (D) 43
12	The amount of heat absorbed when one mole of gaseous atoms are formed from the element is called enthalpy of :
	(A) Formation (B) Reaction (C) Combustion (D) Atomization
13	For which of the following reaction, the unit of equilibrium constant (K_c) is reciprocal of molar concentration (M^{-1}) :
	(A) $3H_2(g) + N_2(g) \rightleftharpoons 2H_3N(g)$ (B) $2NO_2(g) \rightleftharpoons N_2O_4(g)$
	(C) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ (D) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$
14	18 g glucose dissolved in 90 g water has relative lowering of vapour pressure equal to :
	(A) $\dfrac{18}{90}$ (B) $\dfrac{1}{6}$ (C) $\dfrac{10}{51}$ (D) $\dfrac{1}{51}$
15	The salt dissolved in water forms a solution of pH greater than 7 :
	(A) $NaCl$ (B) Na_2CO_3 (C) $CuSO_4$ (D) NH_4Cl
16	The oxidation state of oxygen in OF_2 is :
	(A) -2 (B) -1 (C) $+1$ (D) $+2$
17	The unit of rate constant is same as that of rate of the reaction having order :
	(A) Zero (B) One (C) Fractional (D) Two

Roll No _____ (To be filled in by the candidate) (Academic Sessions 2015 – 2017 to 2018 – 2020 ,
CHEMISTRY　　　　　219-(INTER PART – I)　　　Time Allowed : 2.40 hours
PAPER – I (Essay Type)　　　　GROUP – I　　　Maximum Marks : 68

SECTION – I

2. Write short answers to any EIGHT (8) questions :　　　　　　　　16

　(i) Define relative atomic mass. Give two examples.

　(ii) Calculate the percentage of nitrogen in NH_2CONH_2.(Atomic masses of C = 12 ,
　　　N = 14 , O = 16 and H = 1)

　(iii) Define gram formula giving one example.

　(iv) Write two disadvantages of drying crystals in the folds of filter paper.

　(v) Define distribution law about solvent extraction.

　(vi) Derive Graham's law of diffusion from kinetic equation.

　(vii) Give two reasons for deviation of real gases from ideal behaviour.

　(viii) Write down two characteristics of plasma.

　(ix) Derive the SI units of van der Waal's constant 'a'.

　(x) Sea water has $5.65 \times 10^{-3} g$ of dissolved oxygen in one kg of water. Calculate the
　　　concentration of oxygen in sea water in parts per million (ppm).

　(xi) Define molal boiling point constant. Give one example.

　(xii) Define solubility curve. Name its two types.

3. Write short answers to any EIGHT (8) questions :　　　　　　　　16

　(i) Why ice occupies 9% more volume than liquid water?

　(ii) Why evaporation causes cooling?

　(iii) Write two applications of liquid crystals.

　(iv) Why heat of sublimation of I_2 is very high than other halogens?

　(v) Write defects of Rutherford atomic model.

　(vi) State Moseley law and also give its importance.

　(vii) Why e/m value of cathode rays is equal to that of electron?

　(viii) State Hund's rule.

　(ix) How does buffer act?

　(x) Give optimum conditions to get maximum yield of NH_3.

　(xi) Justify that radioactive decay is always a first order reaction.

　(xii) Describe auto catalysis with example.

4. Write short answers to any SIX (6) questions :　　　　　　　　12

　(i) Why the radius of an atom can not be determined precisely?

　(ii) Define ionization energy. Give its trend in periods and group of periodic table.

　(iii) How electronegativity changes in a group?

　(iv) Define coordinate covalent bond. Give one example.

　(v) Explain that burning of candle is a spontaneous process. Justify.

(Turn Over)

4. (vi) Define state and state function.

  (vii) Write reactions taking place at anode and cathode in silver oxide battery.

  (viii) How is aluminum anodized in an electrolytic cell?

  (ix) Calculate oxidation number of Cr in K_2CrO_4.

SECTION – II

Note : **Attempt any THREE questions.**

5. (a) Describe combustion analysis method for the determination of percentage composition of an organic compound.   4

  (b) Define ionic solids.   Give their three properties.   4

6. (a) One mole of methane gas is maintained at 300 K, its volume is $250\,cm^3$. Calculate the pressure exerted by the gas, when the gas is ideal.   4

  (b) Write four defects of Bohr's atomic model.   4

7. (a) Draw the molecular orbital picture of O_2 molecule.   4

  (b) State Hess's law of constant heat summation. Explain it giving two examples.   4

8. (a) $Ca(OH)_2$ is a sparingly soluble compound. Its solubility product is 6.5×10^{-6}. Calculate the solubility of $Ca(OH)_2$.   4

  (b) How does the Arrhenius equation help us to calculate energy of activation of a reaction?   4

9. (a) Give the three statements of Raoult's law.   4

  (b) Describe the electrolysis of concentrated solution of $NaNO_3$ in aqueous solution.   4

42-219-I-(Essay Type) – 53500

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Note : Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1	Liquids which are practically immiscible :		
	(A) $H_2O + C_6H_6$	(B) $H_2O + C_2H_5 - OH$	
	(C) $H_2O + HC\ell$	(D) $H_2O + CH_3 - O - CH_3$	
2	The velocity of photon is :		
	(A) Independent of its wavelength	(B) Depend on its wavelength	
	(C) Depend on its source	(D) Depend upon its amplitude	
3	The molar volume of CO_2 is maximum at :		
	(A) S.T.P (B) 127 °C and 1 atm.	(C) O °C and 2 atm.	(D) 273 °C and 2 atm.
4	The type of hybridization in $BeC\ell_2$ is :		
	(A) sp^3 (B) sp^2	(C) sp	(D) dsp^2
5	Splitting of spectral lines when atoms are subjected to strong electrical field is called :		
	(A) Zeeman effect (B) Stark effect		
	(C) Photoelectric effect (D) Compton effect		
6	The volume occupied by 16 g of CH_4 at STP is :		
	(A) 2.24 dm³ (B) 22.414 dm³	(C) 1.3 dm³	(D) 1.8 dm³
7	In zero order reaction, the rate is independent of :		
	(A) Temperature of reaction (B) Concentration of reactants		
	(C) Concentration of products (D) Nature of reactants		
8	Hydrogen bonding is maximum in :		
	(A) HI (B) HBr	(C) HCℓ	(D) H_2O
9	The pH of 10^{-3} mole dm⁻³ of an aqueous solution of H_2SO_4 is :		
	(A) 3.0 (B) 2.7	(C) 2.0	(D) 1.5
10	The largest number of molecules are present in :		
	(A) 3.6 g of H_2O (B) 4.8 g of C_2H_5OH	(C) 2.8 g of CO	(D) 5.4 g of N_2O_5
11	The dipole moment of CO_2 is :		
	(A) 0.95 D (B) 1.85 D	(C) 1.61 D	(D) 0 D
12	Which one of the following compound is purified by sublimation :		
	(A) Benzoic acid (B) SiO_2	(C) CS_2	(D) NaI
13	The molal boiling point constant is the ratio of the elevation in boiling point to :		
	(A) Molarity (B) Molality (C) Mole fraction of solute	(D) Mole fraction of solvent	
14	The term that is not state function :		
	(A) Enthalpy (B) Internal energy	(C) Work	(D) Volume
15	The oxidation state of Mn in $KMnO_4$ is :		
	(A) + 7 (B) + 6	(C) + 2	(D) + 5
16	The molecules of CO_2 in dry ice form the :		
	(A) Ionic crystals (B) Covalent crystals		
	(C) Molecular crystals (D) Metallic crystals		
17	The unit millibar is commonly used by :		
	(A) Meteorologists (B) Astronauts	(C) Engineers	(D) Dalton

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CHEMISTRY   219-(INTER PART – I)   Time Allowed : 2.40 hours

PAPER – I (Essay Type)   GROUP – II   Maximum Marks : 68

SECTION – I

2. Write short answers to any EIGHT (8) questions :   16

(i) Define isotopes. Why they have same chemical properties?

(ii) What is mass spectrum?

(iii) Molecular formula is nth multiple of empirical formula. Explain with an example.

(iv) How can rate of filtration be increased by fluted filter paper?

(v) Define ether extraction.

(vi) Calculate the value of general gas constant (R) in SI units.

(vii) Why do we get straight line, when pressure is plotted against inverse of volume?

(viii) Why lighter gases diffuse more rapidly than heavier gases?

(ix) State Joule-Thomson effect.

(x) How will you prepare 10% w/v glucose solution in water?

(xi) One molal solution of urea is dilute as compared to one molar solution. Justify.

(xii) Define molarity. How is molarity related to mass of solute?

3. Write short answers to any EIGHT (8) questions :   16

(i) Boiling point of water is greater than boiling point of HF, although hydrogen bonding is stronger in HF than in H_2O. Why?

(ii) Evaporation is a cooling process. Justify.

(iii) Define isomorphism and polymorphism giving one example in each.

(iv) Write two applications of liquid crystals.

(v) Write nuclear reaction for the production of neutron.

(vi) Write any two points of Planck's quantum theory.

(vii) State Hund's rule, giving an example.

(viii) Write any two defects of Bohr's atomic model.

(ix) Differentiate between reversible and irreversible reactions.

(x) How are acidic buffer and basic buffer prepared? Give one example in each case.

(xi) Define catalysis. Give its different types with one example in each case.

(xii) Justify that rate of chemical reaction is an ever changing parameter under the given conditions.

4. Write short answers to any SIX (6) questions :   12

(i) Explain geometry of H_2S molecule on the basis of VSEPR theory.

(ii) Define ionization potentials of elements. How the ionization potential vary across the periods?

(iii) Cationic radius is smaller than that of its parent atomic radius. Why?

(iv) Differentiate between bonding and antibonding molecular orbitals with reference to relative energies and symmetry of electronic clouds (no figure required).

(v) Define state function. Write name of two such functions.

(Turn Over)

4. (vi) Burning of natural gas is spontaneous reaction. Justify.

   (vii) What are secondary cells? Write name of any two such cells.

   (viii) Describe function of salt bridge in a voltaic cell.

   (ix) Define electrode potential.

SECTION – II

Note : Attempt any THREE questions.

5. (a) Write detailed note on : (i) Avogadro's number (ii) Molar volume.   4

   (b) Define vapour pressure. Write down manometric method for its determination with diagram.   4

6. (a) A sample of nitrogen gas is enclosed in a vessel of volume $380\,cm^3$ at $120\,^{\circ}C$ and pressure of $101325\,Nm^{-2}$. This gas is transferred to $10\,dm^3$ flask and cooled to $27\,^{\circ}C$, calculate the pressure in Nm^{-2} exerted by the gas at $27\,^{\circ}C$.   4

   (b) Write any four properties of cathode rays.   4

7. (a) Explain the structure of ethyne (C_2H_2) according to hybridization concept.   4

   (b) Explain the following terms : (i) Standard heat of neutralization.
                                      (ii) Standard enthalpy of solution.   4

8. (a) $Ca(OH)_2$ is a sparingly soluble compound. Its solubility product is 6.5×10^{-6}. Calculate the solubility of $Ca(OH)_2$.   4

   (b) Explain the effect of temperature on the rate of reaction.   4

9. (a) Differentiate between ideal and non-ideal solutions.   4

   (b) Define electrochemical series. Discuss calculation of the voltage of cell, giving one example.   4

132-219-II-(Essay Type) – 30500