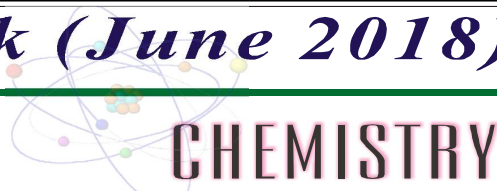


# Holiday Homework (June 2018)



*Class : XI*

## One mark Questions

1. Define law of multiple proportions with example.
2. Calculate the molecular mass of  $C_{12}H_{22}O_{11}$ .
3. Calculate the no. of atoms present in 11.5 litres of  $H_2$  at N.T.P.
4. Calculate the no. of moles of 5.68 gm. of iron.
5. What is the effect of temp. on molality and molarity?
6. An atom of an element is 10.1 times heavier than the mass of a carbon atom. What is its mass in a.m.u.?
7. Explain with example, limiting reagent.
8. Why molality is preferred over molarity in expressing the concentration of a solution?
9. How much copper can be obtained from 110gm of  $CuSO_4$ ?
10. Define Normality.
11. From the following nuclei select the isotopes and isobars.  
 ${}_{92}^{238}U$ ,  ${}_{90}^{238}Th$ ,  ${}_{92}^{234}U$ ,  ${}_{91}^{234}Pa$ ,  ${}_{93}^{238}Np$
12. What is Zeeman effect and Stark effect?
13. Write electronic configurations, of Cr, Cu, Zn?
14. Define Aufbau's Principle. Which of the following orbitals are possible.  
1 s, 1 p, 2 s, 3 d, 3 f
15. Explain Hund's rule of maximum multiplicity by taking an example of phosphorous.
16. Why are Bohr's orbits called Stationary States?
17. What is the difference between atomic mass and mass number?
18. Calculate the uncertainty in the position of a particle when the uncertainty in momentum is  $1 \times 10^{-3} \text{ g cm sec}^{-1}$ .
19. Why anode rays are called canal rays?
20. What is alpha particle and beta particle?
21. What are magic numbers?
22. Give Modern periodic law.
23. What are Dobereiner's triads?
24. Give general electronic configuration of 'd'-block and 'f'-block elements.
25. What are the defects of long form of the periodic table?
26. What is the cause of periodicity?
27. What are successive ionization enthalpies?
28. What are iso electronic species?
29. What is effective nuclear charge?
30. Which of the following has the larger size (a)  $Na^+$  and  $Mg^{2+}$  (b) F and  $F^-$ .

## Two marks Questions

31. Differentiate between molarity and molality.
32. 1.82 g. of glucose (molar mass-180) is dissolved in 25g of water. Calculate (a) the molality (b) mole fraction of glucose and water.
33. The molecular mass of an organic compound is 90 and its %age composition is C-26.6%; O=71.1% and H=2.2%. Determine the molecular formula of the compound.
34. How chemical equations are made more informative?
35. How Avogadro's hypothesis used to deduce atomicity of elementary gases?
36. Verify law of Reciprocal proportions or law of equivalent proportions, with example.
37. Define formula mass and how does it differs from molecular mass?
38. 4.90 g of  $\text{KClO}_3$  when heated produced 1.92 g of oxygen and the residue (KCl) left behind weights 2.96 g. Show that these results illustrate the law of conservation of mass.
39. 3.0 g of  $\text{H}_2$  react with 29.0 g of  $\text{O}_2$  to form  $\text{H}_2\text{O}$ .
  - i. Which is the limiting reactant?
  - ii. Calculate the maximum amount of  $\text{H}_2\text{O}$  that can be formed.
40. Differentiate between normality and molarity?
41. Explain why the uncertainty principle is significant only for the microscopic particles and not for the macroscopic particles?
42. Why half-filled and fully filled orbitals are extra stable?
43. Why config of 'Cr' is  $3d^5 4s^1$  and not  $3d^4 4s^2$  and 'Cu' is  $3d^{10} 4s^1$  and not  $3d^9 4s^2$ ?
44. Give differences between orbit and orbital.
45. What is photoelectric effect? What is the effect of frequency and intensity on photoelectric effect?
46. Why large no. of lines appear in the spectrum of hydrogen although it contains only one electron?
47. Derive de Broglie relationship and give its significance.
48. (i) Using s, p, d, f notations, describe the orbital with the following quantum numbers:
  - (a)  $n = 2, l = 1$
  - (b)  $n = 4, l = 0$(ii) An electron is in a 4f orbital. What possible values for the quantum number n, l, m and s can it have?
49. Calculate the uncertainty in the position of an electron if the uncertainty in its velocity is  $5.7 \times 10^5 \text{ m/sec}$  ( $h = 6.6 \times 10^{-34} \text{ kg m}^2 \text{ s}^{-1}$ , Mass of the electron =  $9.1 \times 10^{-31} \text{ kg}$ )
50. Write down the quantum numbers n, l and m for the following orbitals:
  - i.  $3d_{x^2-y^2}$
  - ii.  $4d_{z^2}$
  - iii.  $3d_{xy}$
  - iv.  $4d_{xz}$
  - v.  $2p_z$
  - vi.  $3p_x$
51. Why Ionization enthalpy of 'Be' is more than 'B' and of 'N' is more than 'O' explain?
52. Why electron gain enthalpies of Noble gases are positive while those of 'Mg' and 'P' are almost zero?
53. Why electron gain enthalpy of flourine is less negative than that of chlorine?
54. What are iso electronic species? How are their sizes vary in iso electronic series?
55. Which of the following will have the largest and smallest size and why?  $\text{Cl}, \text{Cl}^-, \text{Al}, \text{Al}^{3+}$
56. Why d- and f-block elements are less electropositive than group 1 and 2 elements?
57. What is diagonal relationship? Explain it with the help of 'Be' and 'Al'.
58. Define Electronegativity? Arrange these in increasing order of electronegativity.  
Na, Mg, F, O, C

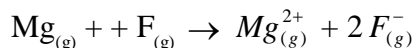
59. Consider the following species.  $\text{N}^{3-}$ ,  $\text{O}^{2-}$ ,  $\text{F}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$  and  $\text{Al}^{3+}$ .  
 (i) What is common in them? (ii) Arrange them in order of increasing ionic radii?
60. An element 'X' with atomic number 112 has recently been discovered. Predict its electronic configuration and suggest the group in which this element would be placed.

### Three marks Questions

61. Calculate equivalent mass of following:-  
 (a)  $\text{H}_3\text{PO}_4$   
 (b)  $\text{Al}_2(\text{SO}_4)_3$   
 (c)  $\text{C}_2\text{H}_2\text{O}_4$
62. Calculate the mass of iron which will be converted into its oxide ( $\text{Fe}_3\text{O}_4$ ) by the action of 18 g of steam on it.
63. A sample of drinking water was found to be severely contaminated with chloroform,  $\text{CHCl}_3$ , supposed to be carcinogen. The level of contamination was 15 ppm (by mass).  
 i. Express this in percent by mass  
 ii. Determine the molarity of chloroform in the water sample.
64. The density of 3 M solution of NaCl is  $1.25 \text{ g mL}^{-1}$ . Calculate the molality and normality of the solution.
65. (a) Calculate the molarity of NaOH in the solution prepared by dissolving its 4 g in enough water to form 250 mL of the solution.  
 (b) 2.38 g of uranium was heated strongly in a current of air. The resulting oxide weighed 2.806 g. Determine the empirical formula of the the oxide. (At mass U = 238 ; O = 16)
66. (a) How many moles of methane are required to produce 22 g  $\text{CO}_2(\text{g})$  after combustion?  
 (b) Acetylene burns in oxygen producing carbon dioxide and water. Write the balanced equation for this reaction.
67. What are postulates of Bohr's atomic model.
68. (i) Calculate the number of protons, neutrons and electrons in  $^{80}_{35}\text{Br}$ .  
 (ii) Calculate (a) wave number and (b) frequency of yellow radiations having wavelength of  $5800\text{\AA}$ .
69. Calculate the wavelength of the radiation which would cause the photodissociation of chlorine molecule if the Cl—Cl bond energy is  $243 \text{ kJ mol}^{-1}$ .
70. Alveoli are tiny sacs in the lungs whose average diameter is  $5 \times 10^{-5} \text{ m}$ . Consider an oxygen molecule ( $5.3 \times 10^{-26} \text{ kg}$ ) trapped within a sac. Calculate uncertainty in the velocity of oxygen molecule.
71. The ionisation energy of hydrogen atom is 13.6 eV. What be the ionisation energy of  $\text{He}^+$  and  $\text{Li}^{2+}$  ions?
72. Light of wavelength  $12818 \text{\AA}$  is emitted when the electron of a hydrogen atom drops from 5th to 3rd orbit. Find the wavelength of the photon emitted when the electron falls from 3rd to 2nd orbit.
73. The wavelength of a certain line in Balmer series is observed to be  $4341 \text{\AA}$ . To what value of 'n' does this correspond? ( $R_{\text{H}} = 109678 \text{ cm}^{-1}$ )
74. The electron affinity of chlorine is 3.7 eV. How much energy in kcal is released when 2 g of chlorine is completely converted to  $\text{Cl}^-$  ion in a gaseous state? ( $1 \text{ eV} = 23.06 \text{ kcal mol}^{-1}$ ).
75. How many Cs atoms can be converted to  $\text{Cs}^+$  ions by 1 joule energy if  $1E_1$  for Cs is  $376 \text{ kJ}$

mol<sup>-1</sup>?

76. Using the data given below, predict the nature of heat changes for the reaction.



IE<sub>1</sub> and IE<sub>2</sub> of Mg<sub>(g)</sub> are 737.7 and 1451 kJ mol<sup>-1</sup>. EA<sub>1</sub> for F<sub>(g)</sub> is -328 kJ mol<sup>-1</sup>.

77. Calculate electronegativity of carbon at Pauling scale. Given that :

$$E_{H-H} = 104.2 \text{ kcal mol}^{-1} ;$$

$$E_{C-C} = 83.1 \text{ kcal mol}^{-1} ;$$

$$E_{C-H} = 98.8 \text{ kcal mol}^{-1} ;$$

Electronegativity of hydrogen = 2.1.

78. Define ionisation energy. What is the trend of I.E. from down the group and along the period. Explain.
79. (i) What are emission and absorption spectra? Why dark lines appear in the absorption spectra?  
(ii) Explain Heisenberg's uncertainty Principle.
80. (i) Discuss Planck's Quantum theory of Radiation.  
(ii) Using the s, p, d, f, notations describe the following quantum no.  
(a) n=1, l=0 (b) n=4; l=3 (c) n=4; l=2

### Five marks Questions

81. (i) Calculate the electronegativity of fluorine from the following data :

$$E_{H-H} = 104.2 \text{ kcal mol}^{-1} ;$$

$$E_{F-F} = 36.6 \text{ kcal mol}^{-1} ;$$

$$E_{H-F} = 134.6 \text{ kcal mol}^{-1} ;$$

Electronegativity of hydrogen = 2.1

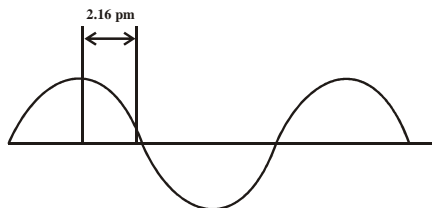
- (ii) Why molality is preferred over molarity in expressing the concentration of a solution?
82. (i) Explain with the help of an example law of conservation of mass and energy and also the law of constant proportions.  
(ii) Discuss Avogadro's hypothesis.
83. (i) Give important postulates of Bohr's model of an atom.  
(ii) How are anode rays produced?
84. (i) Explain the properties of cathode rays.  
(ii) During photosynthesis, chlorophyll-a absorbs light of wavelength 440 nm and emits light of wavelength 670 nm. What is the energy available for photosynthesis from the absorption-emission of a mole of photons?
85. (i) What is electron gain enthalpy? On what factors it depends. How it varies in a group and in a period?  
(ii) How many atoms and molecules of sulphur are present in 64.0 g of sulphur (S<sub>8</sub>)?
86. (i) How will you justify presence of 18 elements in 5th period and presence of 32 elements in 6th period?  
(ii) Define isosters and isodiaphers?
87. (i) Calculate the number of molecules present in 350 cm<sup>3</sup> of NH<sub>3</sub> gas at 273 K and atmosphere pressure.  
(ii) Calculate the number of atoms of the constituent elements in 53 g of Na<sub>2</sub>CO<sub>3</sub>.
88. (i) Discuss Modern Atomic theory. Why it is better than Dalton's Atomic theory?  
(ii) How Avogadro's hypothesis used to deduce atomicity of elementary gases?
89. Commercially available sulphuric acid contains 91% acid by mass and has a density

of 1.83g mL<sup>-1</sup> (i) Calculate the molarity of the solution (ii) volume of concentrated acid required to prepare 3.5L of 0.50 M H<sub>2</sub>SO<sub>4</sub>.

90. (i) What are emission and absorption spectra? Why dark lines appear in the absorption spectra?  
(ii) Calculate the ratio of the velocity of light and the velocity of electron in the first orbit of a hydrogen atom. (Given,  $h = 6.624 \times 10^{-27}$  erg-sec;  $m = 9.108 \times 10^{-28}$  g,  $r = 0.529 \times 10^{-8}$  cm.)

91. Calculate the effective nuclear charge at the periphery of nitrogen atom when an extra electron is added in the formation of anion. Also calculate the effective nuclear charge of N atom.

92. (a) A hypothetical electromagnetic wave is shown in fog. Find out the wavelength of the radiation.



- (b) Wavelengths of different radiations are given below:

$$\lambda(A) = 300 \text{ nm}, \lambda(B) = 300 \mu\text{m}, \lambda(C) = 3 \text{ nm}, \lambda(D) = 30 \text{ \AA}$$

Arrange these radiations in the increasing order of their energies.

- (c) Out of electron and proton, which one will have, a higher velocity to produce matter waves of the same wavelength? Explain it.
93. (i) The velocity associated with proton moving in a potential difference of 1000 V is  $4.37 \times 10^5 \text{ m s}^{-1}$ . If the hockey ball of mass 0.1 kg is moving with this velocity, calculate the wavelength associated with this velocity.  
(ii) Similar to electron diffraction, neutron diffraction microscope is also used for the determination of the structure of molecules. If the wavelength used here is 800 pm, calculate characteristic velocity associated with neutron.
94. (i) (a) How would sub-shells be associated with  $n = 4$ ?  
(b) How many electrons will be present in the subshells having  $m_s$  value of  $-\frac{1}{2}$  for  $n = 4$ ?

- (ii) An element with mass number 81 contains 31.7% more neutrons as compared to protons. Assign the atomic symbol.

95. (i) What would be the IUPAC name and symbol for the element with atomic number 120?  
(ii) Explain why cations are smaller and anions larger in radii than their parent atoms.  
(iii) Which element do you think would have been named by:  
(a) Lawrence Berkeley laboratory  
(b) Seaborg's group

96. (i) Would you expect the ionisation enthalpies of two isotopes of the same element to be same or different? Justify your answer.  
(ii) Assign the position of the element having outer electron configuration (i)  $ns^2 np^4$  for  $n = 3$  (ii)  $(n - 1)d^2 ns^2$  for  $n = 4$  and (iii)  $(n - 2)f^7(n - 1)d^1 ns^2$  for  $n = 6$ , in the periodic table.

97. (i) How does the metallic and non-metallic character vary on moving from left to right in a period?  
(ii) The radius of  $\text{Na}^+$  cation is less than that of Na atom. Give reason.

- (iii) Among alkali metals which element do you expect to be least electronegative and why?
98. (i) If 4 g NaOH dissolves in 36 g of H<sub>2</sub>O calculate the mole fraction of each component in the solution. Also, determine the molarity of solution (specific gravity of solution is 1 g mL<sup>-1</sup>).
- (ii) What will be the mass of one atom of C-12 in grams?
99. (i) In three moles of ethane (C<sub>2</sub>H<sub>6</sub>), calculate the following:
- (a) No. of moles of carbon atoms
- (b) No. of moles of hydrogen atoms
- (c) No. of moles of ethane
- (ii) If the density of methanol is 0.793 kg L<sup>-1</sup>. What is its volume needed for making 2.5 L of its 0.25 M solution?
100. (i) What do you understand by strength of a solution?
- (ii) Prove that, Molecular mass = 2 × vapour density.
- (iii) What do you understand by Phytochemistry?