B.Tech 1st Year 1st Semester
First Unit Test, September 2018
CHEMISTRY 1 [BSCH-101]

Set-1

(Students are requested to write down the SET No. in the Answer sheet)

Time allotted: 1 hr **Full marks: 25**

Group A

Answer any **five** of the following **six** questions 5 X 1 = 5

1 (a) Ψ should not be

(i) Finite (ii) Normalized (iii) Multi-valued (iv) Continuous

(b) Which of the following is known as the Schrödinger Equation?

(i) $E = h\gamma$ (ii) $H\psi = E\psi$ (iii) $E = mc^2$ (iv) $\lambda = h/p$

(c) Unit of Frequency is

(i) cm (ii) sec. (iii) hertz (iv) gm

(d) Source of light covers the UV- region is

(i) Sodium Lamp (ii) Deuterium Lamp (iii) Magnesium Lamp (iv) Radium Lamp

(e) Which among these hydrogen halides produce anti-Markownikoff addition product?

(i) HF (ii) HCl (iii) HBr (iv) HI

(f) SNi occurs with

(i) inversion of configuration (ii) racemization (iii) retention of configuration (iv) none

Group B

Answer any **four** of the following **six** questions

2. (a) A particle in a one dimensional box behaves like a classical oscillator when the walls are infinitely far apart - Justify

(b) Calculate the de Broglie wavelength associated with a stone having velocity 1 m s^{-1} and mass 100g; on the other side an electron having velocity 6 X 10^5 m s^{-1} and mass 9.1 x 10^{-31} kg. Which one of these is meaningful and why? 3+2 = 5

3. (a) Prove that, $\left(V - \frac{h^2}{8\pi^2 m}\nabla^2\right)\Psi = E\Psi$

(b) The Kinetic energy of a subatomic particle is 5.65 X 10^{25} J. Calculate the frequency of the particle wave

(c) Why $n \neq 0$ is taken in Zero Point Energy calculations? 2+2+1 =5

4. (a) Write the complete electromagnetic spectrum of rays in a Table form.

(b) Give appropriate reasons --Why above EMS is important and useful for Spectroscopy Studies? 3+2= 5

5. (a) Write the Selection Rules of Electronic Transitions.

(b) What are Fluorescence and its application in Medicine? 2+3 = 5

6. (a) Suggest two pathways to convert benzene to n-propylbenzene. Which among these is a better method? Justify your answer with mechanism.

(b) Why S_N1 reaction is associated with racemization? 4 + 1 = 5

7. (a) Polar protic solvent is suitable for S_N1 reaction while polar aprotic solvent is suitable for S_N2 reaction. Justify.

(b) Halogens are ortho-para orienting and deactivating. State reason.

(c) Write the reagent for following conversion:

$CH_3CH_2CH=CH_2 \rightarrow CH_3CH_2CH(OH)CH_3$ 2 + 2 + 1 = 5

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Set-2

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Time allotted: 1 hr **Full marks: 25**

Group A

Answer any **five** of the following **six** questions 5 X 1 = 5

1. (a) Solutions to Schrodinger's equation are labeled with

(i) phi (ii) psi (iii) mu (iv) pi

(b) Schrodinger's equation described the

(i) procedure for splitting an atom (ii) complement of the wave function

(iii) behavior of "matter" waves (iv) motion of light

(c) Radiations of higher frequency have

(i) higher wavelength (ii) greater energy (iii) lower energy (iv) none

(d) Which of these exhibit Fluorescence?

(i) NaCl (ii) BaF_2 (iii) CaF_2 (iv) $CaCl_2$

(e) Identify the most stable carbocation:

(i) vinyl carbocation (ii) allyl carbobcation (iii) ethyl carbocation (iv) benzyl carbocation

(f) Which among the following reactions of benzene is a reversible reaction?

(i) nitration (ii) halogenations (iii) Friedel craft alkylation (iv) sulphonation

Group B

Answer any **four** of the following **six** questions

2. (a) What are the Eigen values and Eigen functions?

(b) Prove that De Broglie wavelength λ of an electron of kinetic energy E is given by $\lambda=\frac{h}{\sqrt{2meV}}$.

(c) Calculate the wavelength of an electron moving with a velocity of 10^4 m. s^{-1} 2+2+1 = 5

3. (a) What are the applications of Particle in 1 dimensional box?

(b) Assuming an electron to be confined in a one dimensional box 2.0 nm in length. Find the lowest three energy levels for the electron 2+3 = 5

4. (a)Write in brief the Principles of Spectroscopy.
   (b)Write the applications of Fluorescence. 3+2 = 5

5. (a)Write the Absorption Law and its Limitations.
   (b)Explain the function of UV – Spectrophotometer with a Schematic Diagram. 2+3 = 5

6. (a) Explain how saytzeff product and Hofmann product can be selectively produced as major products by elimination reaction taking suitable examples.
   (b) Why S_N2 reaction is associated with inversion of configuration? 4 + 1 = 5

7. (a) Compare S_N1 and S_N2 reactions in terms of substrate preference and strength of nucleophile.
   (b) Explain the role of Lewis acid in halogenation of benzene.
   (c) Write the reagent for following conversion:
   $CH_3CH_2CH=CH_2 \rightarrow CH_3CH_2CH_2CH_2OH$ 2 + 2 + 1 = 5