

**ROYAL COLLEGE OF ARTS, SCIENCE & COMMERCE**  
**T.Y.B.Sc. – SEM 6**  
**PAPER I – USCH601**  
**(PHYSICAL CHEMISTRY)**  
**SAMPLE PAPER**

Note : 1) All questions are **compulsory** and carry equal marks.

Choose the correct answer:

- 1 The activity of uni-univalent electrolyte is \_\_\_\_\_  
 a)  $m^2\gamma^2$   
 b)  $4 m^3\gamma^3$   
 c)  $27 m^4\gamma^4$   
 d)  $4 m^2\gamma^2$
  
- 2 What is the value of activity coefficient ( $\gamma$ ) for a non-ideal solution?  
 a)  $> 1$   
 b)  $1$   
 c)  $< 1$   
 d)  $0$
  
- 3 The expression for emf of cell  $\text{Ag} | \text{AgNO}_3 (a_1) || \text{AgNO}_3(a_2) | \text{Ag}$  is \_\_\_\_\_.  
 a)  $E_{cell} = 0.0592 \log_{10} \frac{a_1}{a_2}$   
 b)  $E_{cell} = 0.0592 \log_{10} \frac{a_2}{a_1}$   
 c)  $E_{cell} = 2t_- \times 0.0592 \log_{10} \frac{a_2}{a_1}$   
 d)  $E_{cell} = 0.0592 \log_{10} \frac{m_1\gamma_1}{m_2\gamma_2}$
  
- 4 For discharge of  $\text{H}^+$  ions on cathode, the reaction is  $\text{H}^+ + \text{e}^- \longrightarrow \frac{1}{2} \text{H}_2(\text{g})$ . the reversible discharge potential is given by the relation \_\_\_\_\_.  
 a)  $E_{rev} = -0.0592 \text{ pH}$   
 b)  $E_{rev} = 0.0592 \text{ pH}$   
 c)  $E_{rev} = -0.0592 \log a_{\text{H}^+}$   
 d)  $E_{rev} = 0.0\text{V}$
  
- 5 How much is hydrogen overvoltage as per Tafels equation, if  $\text{H}_2\text{SO}_4$  is electrolysed using lead cathode at current density  $10.0 \text{ mA/cm}^2$ .  
 [ Given :  $a = 0.64$  volt and  $b = 0.12$  at  $298\text{K}$  ]  
 a)  $\eta = 0.76 \text{ V}$   
 b)  $\eta = 0.64 \text{ V}$   
 c)  $\eta = 0.52 \text{ V}$   
 d)  $\eta = 0.12 \text{ V}$
  
- 6 Polydispersity index of a natural polymer is usually \_\_\_\_\_.  
 a) greater than zero  
 b) greater than one  
 c) unity  
 d) greater than unity

- 7 \_\_\_\_\_ are polymers used as adhesives.
- a) Fibres
  - b) Elastomers
  - c) Liquid resins
  - d) Plastics
- 8 What is the number average molecular weight of a sample of polymer containing equal number of two polymers of molecular weight 1000 and 2000?
- a) 3000
  - b) 1500
  - c) 300
  - d) 150
- 9 Specific viscosity is represented by \_\_\_\_\_
- a)  $\eta/\eta_0$
  - b)  $(\eta - \eta_0)/\eta_0$
  - c)  $[\eta] = k (Mv)^\alpha$
  - d)  $\eta_0/\eta$
- 10 What is added to minimize the build-up of charge in plastic materials ?
- a) Curing agents
  - b) Antioxidants
  - c) Antistatic agent
  - d) Colorants
- 11 What is the eigen value ,if the operator  $d^2/dx^2$  operates on the function  $\sin 3x$  ?
- a) 9
  - b) -3
  - c) 3
  - d) -9
- 12 The condition  $A [f(x) + g(x)] = Af(x) + Ag(x)$  is fulfilled by \_\_\_\_\_ .
- a) Momentum operator
  - b) Hamiltonian operator
  - c) Commutative operator
  - d) Linear operator
- 13 According to photoelectric effect, the kinetic energy of the electrons emitted from the surface of metal is \_\_\_\_\_
- a) directly proportional to intensity of light
  - b) inversely proportional to the frequency of light
  - c) inversely proportional to the intensity of light
  - d) directly proportional to the frequency of light
- 14 Solar cells work on which principal?
- a) Compton effect
  - b) Photoelectric effect
  - c) Photovoltaic effect
  - d) Thermoelectric effect

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$$-\frac{h^2}{8\pi^2 m} \nabla^2 + \hat{V}_{(x,y,z)}$$

is an operator for \_\_\_\_\_ .

- a) position
- b) momentum
- c) Kinetic energy
- d) Total energy

16 The number of peaks observed in esr spectrum of hydrogen are \_\_\_\_\_ .

- a) 1
- b) 2
- c) 3
- d) 4

17 Which of the following is not a component of an NMR spectrometer?

- a) Strong magnet
- b) Sweep generator
- c) Radio-frequency oscillator
- d) Quartz sample holder

18 In which region NMR spectrum is recorded?

- a) Infra red
- b) Microwave
- c) Radio frequency
- d) Visible

19 Bohr magneton is defined as

- a)  $\mu = \frac{e^2 h}{4\pi m_e}$
- b)  $\mu = \frac{e h}{4\pi m_e}$
- c)  $\mu = \frac{e h}{2\pi m_e}$
- d)  $\mu = \frac{e h^2}{2\pi m_e}$

20 For a free electron , value of 'g' is \_\_\_\_\_

- a) 20.023
- b) 2.1000
- c) 2.0023
- d) 1.9000

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