

SEM	SET	PAPER CODE	TITLE OF THE PAPER
II	2014	14PCH2108	PHYSICAL CHEMISTRY – II

## SECTION - A

Answer all the questions:

 $30 \times 1 = 30$ 

Choose the correct answer:

- The generalized momentum  $P_x$  of a particle of mass  $m$  with velocity  $V_x$  in an electro organic field is given by
  - $P_x = mv_x$
  - $P_x = mv_x - qA_x$
  - $P_x = mv_x - qA_x$
  - $P_x = qv_xA_x$
- The Hamiltonian corresponding to the Lagrangian  $L = ax^2 + by^2 - Kxy$  is
  - $\frac{P_x^2}{2a} + \frac{P_y^2}{2b} + K_{xy}$
  - $\frac{P_x^2}{4a} + \frac{P_y^2}{4b} - K_{xy}$
  - $\frac{P_x^2}{4a} + \frac{P_y^2}{4b} + K_{xy}$
  - $\frac{P_x^2 + P_y^2}{4ab} + K_{xy}$
- The product of generalized co-ordinate and its conjugate momentum has the dimensions of
  - force
  - energy
  - linear momentum
  - angular momentum
- The expression for the relativistic energy of a particle is
  - $mc^2$
  - $\sqrt{p^2c^2 + m_0^2c^4}$
  - $(m - m_0)c^2$
  - $p^2c^2 + m_0^2c^4$



13. de Broglie equation predicts the relationship between
- mass and energy
  - temperature and pressure
  - energy and temperature
  - particle and wave nature
14. Twice is the value of Compton wave length when the  $\theta$  is
- $0^\circ$
  - $90^\circ$
  - $120^\circ$
  - $180^\circ$
15. SCF method provides a powerful method to calculate the ground state energy at wave function for
- single electron atom
  - any atom
  - many – electron atom
  - none of these
16. The zero point energy of a Harmonic oscillator is
- $\frac{8a^2}{m^2}$
  - $\frac{n^2 h^2}{8ma^2}$
  - $\frac{1}{2} h \nu_0$
  - $\frac{8m^2}{h^2}$
17. Uncertainty principle is applicable to
- macro level particle only
  - micro level particle only
  - both micro and macro level particle
  - none of these
18. Which of the following is not an eigen function of  $d^2/dx^2$ ?
- $e^{\cos ax}$
  - $k \cos(ax) + c$
  - $e^{2x}$
  - $k \sin(ax)$
19. Which of the following molecules possess inversion centre
- Trans –  $H_2O_2$
  - $SO_2$
  - HCl
  - $CCl_4$
20. The point group of  $BF_3$  is
- $C_{2v}$
  - $C_{3v}$
  - $D_{2d}$
  - $D_{3h}$
21. The point group of ethyne is
- $C_{6v}$
  - $D_{\infty h}$
  - $D_{\infty v}$
  - $C_{4v}$

22. The water molecular belongs to  
 a) non-abelian group                      b) abelian group  
 c) both abelian and non-abelian      d) none of these
23. The second lowest state of a particle in a cubic box is  
 a) non-degenerate                          b) doubly – degenerate  
 c) triply degenerate                        d) six fold degenerative
24. The molecular point group is determined by  
 a) all the symmetry elements      b) E and  $S_n$  only  
 c)  $C_n, \sigma$                                   d) i only
25. An  $sp^3$  hybrid orbital contains  
 a)  $\frac{1}{2}$  S character                          b)  $\frac{3}{4}$  S character  
 c)  $\frac{1}{4}$  S character                          d)  $\frac{2}{3}$  S character
26. When the molecular  $AB_6$  belonging to  $O_h$  point group changes to  $AB_4C_2$ , the resulting point group is  
 a)  $C_{4v}$     b)  $T_d$   
 c)  $D_{4h}$     d)  $D_{2h}$
27. How many normal modes of vibration are possible for (i) OCS (linear) and (ii)  $SO_2$  (bent)  
 a) 4 and 3                                      b) 3 and 4  
 c) 4 and 2                                      d) 2 and 4
28. A planar  $AB_4$  molecule with a  $D_{4h}$  point group has  $\Gamma_{\sigma} = A_{1g} + B_{1g} + E_n$ . The possible orbital combinations are  
 a)  $dp^3, d^3p$                                   b)  $d^3p, d^3s^1$   
 c)  $dsp^2, d^2p^2$                               d)  $sp^3, s^2p^2$
29. The selection rule for the rotational Raman Spectra of a linear molecule is  
 a)  $\Delta J = 0, \pm 1$                               b)  $\Delta J = 0, \pm 2$   
 c)  $\Delta J = 0, \pm 1, \pm 2$                       d)  $\Delta J = \pm 1$
30. The molecule which is IR inactive but Raman active is  
 a) HCl    b)  $SO_2$     c)  $H_2O$     d)  $N_2$

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