

M.Sc. Part I Semester II Physical Chemistry I Mock Exam

Q1 The fugacity of a gas in a mixture is equal to the product of its mole fraction and its fugacity in the pure state at the total pressure of the mixture. This

- a. The statement as per Gibb's- Helmholtz
- b. called Lewis-Randall rule
- c. Henry's law
- d. None of these

Q2. Ideal gas law is applicable at

- a) Low T, low P
- b) High T, high P
- c) Low T, high P
- d) High T, low P

Q3. Chemical potential of i th component of a system is given by

- a) $\mu_i = (\delta G / \delta n_i)_{T,P,n_j}$
- b) $\mu_i = (\delta A / \delta n_i)_{T,P,n_j}$
- c) $\mu_i = (\delta S / \delta n_i)_{T,P,n_j}$
- d) $\mu_i = (\delta E / \delta n_i)_{T,P,n_j}$

4. Gibb's- Duhem equation relates composition in liquid phase and the _____ at constant temperature & pressure

- a) Fugacity
- b) Partial pressure
- c) Activity co-efficient
- d) all the above

5 Equilibrium constant of a reaction varies with the

- a) initial concentration of the reactant
- b) pressure
- c) temperature
- d) activity

6. The energy levels for cyclobutadiene are $\alpha + 2\beta$, α and α and $\alpha - 2\beta$. The delocalisation energy in this molecule is

- a) 0
- b) -4β
- c) -8β
- d) 4α

7 The wave function of a certain system is the linear combination

$\varphi = \sqrt{\frac{1}{4}} \varphi_1 + \sqrt{\frac{3}{4}} \varphi_2$, where φ_1, φ_2 are eigen values (non- degenerate) E_1 and E_2 , respectively. What is the probability that the system energy will be observed to be E_1 ?

- a) $\sqrt{\frac{3}{16}}$
- b) $\sqrt{\frac{3}{4}}$
- c) $\frac{1}{4}$
- d) $\sqrt{\frac{1}{4}}$

8. Huckel molecular orbital theory can be applied to the allene radical $\text{H}_2\text{C}=\text{CH}-\text{CH}_2$. The possible values of E are

- a) $\alpha + \sqrt{2}\beta, \alpha, \alpha - \sqrt{2}\beta$
- b) $\alpha + 2\sqrt{2}\beta, \alpha, \alpha - 2\sqrt{2}\beta$
- c) $\alpha + \beta, \alpha, \alpha - \beta$
- d) $\alpha + 2\beta, \alpha, \alpha - 2\beta$

9 sp hybrid orbitals are of the form $C_1 2s, C_2 2p_z$ ($2s$ and $2p_z$) are normalised individually. The coefficient of the normalized form of the above sp hybrid orbitals are

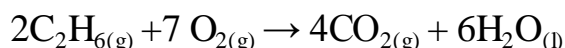
- a) $C_1 = \frac{1}{\sqrt{2}}, C_2 = \pm \frac{1}{\sqrt{2}}$
- b) $C_1 = \frac{1}{2}, C_2 = \pm \frac{1}{2}$
- c) $C_1 = \frac{1}{\sqrt{2}}, C_2 = \pm \frac{1}{2}$

$$d) C_1 = \frac{1}{2}, C_2 = \pm \frac{1}{\sqrt{2}}$$

10. For an electronic configuration of two non-equivalent π electrons [π^1, π^1] which of the following terms is not possible?

- a) $^1\Sigma$ b) $^3\Sigma$ c) $^3\Delta$ d) $^3\Phi$

11. The combustion of ethane (C_2H_6) is represented by the equation



In this reaction

- a) the rate of consumption of ethane is seven times faster than the rate of consumption of oxygen
- b) the rate of formation of CO_2 equals the rate of formation of water
- c) water is formed at a rate equal to two-thirds the rate of formation of CO_2
- d) CO_2 is formed twice as fast as ethane is consumed

12. For the reaction, $2H_2S_{(g)} + O_{2(g)} \rightarrow 2S_{(s)} + 2H_2O_{(l)}$, which one of the statements is absolutely true?

- a) The reaction is first order with respect to H_2S and second order with respect to O_2
- b) the rate law cannot be determined from the information given
- c) The rate law is $\text{rate} = k[H_2S]^2 [O_2]$
- d) The reaction is fourth order overall

13 Which statement is false

- a) if a reaction is thermodynamically spontaneous it may occur rapidly
- b) if a reaction is thermodynamically spontaneous it may occur slowly
- c) if a reaction is thermodynamically spontaneous it must have a low activation energy
- d) if a reaction is thermodynamically nonspontaneous it will not occur spontaneously

14. Which one of the following is not a biological catalyst?

- a) washing powder enzyme
- b) catalyase
- c) yeast
- d) hydrogen peroxide

15. the rate determining step for a consecutive reaction is the one which is

- a) fastest
- b) slowest
- c) last in sequence
- d) first in sequence

16. Edge dislocation imperfection is a sub type of _____

- a) Point imperfections
- b) Line imperfections
- c) Volume imperfections
- d) Surface imperfections

17 Displacement of an ion from regular location to interstitial location is known as _____

- a) Vacancy defect
- b) Line imperfection
- c) Schottky's defect
- d) Frenkel defect

ans d

18. Which one of the following is not a zero-dimensional defect?

- a) Vacancy defect
- b) Substitution imperfection
- c) Schottky's defect
- d) Screw dislocation

19. As the grain size of a metal increases, its strength _____

- a) Decreases
- b) Increases

- c) Remains constant
- d) No effect of grain size on strength

20 The invariant reaction involving, a liquid phase decomposing into two different solids on cooling is known as _____

- a) Eutectoid point
- b) Eutectic point
- c) Peritectic point
- d) Peritectoid point

Answer Key

1	b
2	d
3	a
4	d
5	c
6	a
7	c
8	a
9	a
10	d
11	d
12	b
13	c
14	b
15	b
16	b
17	d
18	d
19	b
20	b