M.Sc. Part I Semester II Physical Chemsitry 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 ith component of a system is given by

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

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 $\varphi 1, \varphi 2$ 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 $H_2C{=}CH{-}CH_2$ 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) $^1\sum$ b) $^3\sum$ c) $^3\Delta$ d) $^3\Phi$

11. The combustion of ethane (C2H6) is represented by the equation

$2C_2H_{6(g)} + 7\ O_{2(g)} \rightarrow 4CO_{2(g)} + 6H_2O_{(l)}$

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 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 insequence

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

20The 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