

M.Sc-I, Sem. II

Seat No.: **MARCH - 2022 (Summer session) Examination****Subject Code: 84510**

(विद्यार्थ्यांनी हा विषय कोड OMR वर लिहावा / Student should fill this code on OMR sheet)

Subject Name: Master Of Science (New CBCS)_84510_84510 - Physical Chemistry - II_23.08.2022_04.00 PM**Date: 23-08-2022****Time: 16:00:00 to 17:00:00****QP Code: 10518QP****Total Marks : 50 Each Question 2 Marks, Total 25 Ques, Duration 1 Hr****1. Question**The Eigen value of a given wave function $\sin 3x$ with $\frac{d^2}{dx^2}$ operator is...

- A) $\cos 6x$
- B) -9
- C) $-9\cos 6x$
- D) -18

- a. A
- b. B
- c. C
- d. D

2. QuestionIf ψ_1 and ψ_2 be the eigenfunctions of a Hermitian operator \hat{A} , with eigenvalues a_1 and a_2 respectively, then the eigenfunctions are

- A) Orthogonal
- B) real
- C) normalized
- D) commuting

- a. A
- b. B
- c. C
- d. D

3. Question

Correct expression of Hamiltonian operator is.....

A) $-\frac{h}{8\pi^2 m} \frac{\partial^2}{\partial x^2} + V(x)$

B) $-\frac{h}{8\pi^2 m} \frac{\partial^3}{\partial x^2} + V(x)$

C) $-\frac{1}{8\pi^2 m} \frac{\partial^2}{\partial x^2} + V(x)$

D) $-\frac{h}{8m} \frac{\partial^2}{\partial x^2} + V(x)$

a. A

b. B

c. C

d. D

4. Question

Quantization is the confinement of a dynamical observable to.....

A) Discrete values

B) Continuous values

C) Single valued

D) None of the above

a. A

b. B

c. C

d. D

5. Question

The walls of a particle in a box are supposed to be _____

A) Small but infinitely hard

B) Infinitely large but soft

C) Soft and Small

D) Infinitely hard and infinitely large

a. A

b. B

c. C

d. D

6. Question

The Non-normalized wave function must have _____ norm

A) Infinite

B) Zero

C) Finite

D) Complex

a. A

b. B

c. C

d. D

7. Question

Which of the following model is called diffused charged model?

- A) Helmholtz model
- B) Stern Model
- C) Gouy-Chamann model
- D) All

a. A

b. B

c. C

d. D

Question

Which of the following statement is correct

- A) Electrophoretic mobility is lower than the electro osmotic mobility
- B) Zeta potential is electro kinetic phenomenon
- C) Stern model is combined approach by Helmholtz and Gouy-Chapman
- D) All

a. A

b. B

c. C

d. D

9. Question

Which of the following method is used to determine the activity coefficient of electrolytes?

- A) Potentiometry
- B) NMR
- C) IR
- D) Raman

c. C

b. B

d. D

10. Question

Which the following ions activity is counted in the Ag/AgCl reference electrode?

- A) Ag^+ ions
- B) Cl^- ions
- C) K^+ ions
- D) NO_3^- ions

a. A

b. B

c. C

d. D

11. Question

In alkaline battery, the electrolyte contains ---

- A) MnO_2
- B) KOH
- C) NaCl
- D) NaNO_3

a. A
c. C

b. B
d. D

12. Question

Which of the following is not electro-kinetic phenomenon?

- A) Electro-osmosis
- B) Electrophoresis
- C) Zeta potential
- D) Density measurement

a. A
c. C

b. B
d. D

13. Question

Which of the following is an allowed transition?

- S_0 to S_1
- S_1 to T_1
- S_0 to T_1
- All of these

a. A
c. C

b. B
d. D

14. Question

The species which decreases the fluorescence intensity of fluorophore is called...

- A) Enhancer
- B) Inducer
- C) Quencher
- D) Promoter

a. A
c. C

b. B
d. D

15. Question

Give the equation which relates radiative lifetime and actual life time.

- A) $\tau^0 = \Phi f$
- B) $\tau^0 = \tau f$
- C) $\tau^0 = \tau \Phi f$
- D) $\tau^0 = 36 \text{ sec}$

a. A
c. C

b. B
d. D

16. Question

Why N_2 gas bubbled through solution before fluorescence measurement?

- A) To remove oxygen
- B) To remove CO_2
- C) To control temperature
- D) To control pressure

a. A
c. C

b. B
d. D

17. Question

Write the Stern-Volmer equation.

- A) $\frac{\Phi_f}{\Phi_{f,0}} = 1$
- B) $\frac{\Phi_f}{\Phi_{f,0}} = 1 + k_Q \tau_0 [Q]$
- C) $\frac{\Phi_f}{\Phi_{f,0}} = -1 + k_Q \tau_0 [Q]$
- D) $\frac{\Phi_f}{\Phi_{f,0}} = 1 + [Q]$

a. A
c. C

b. B
d. D

18. Question

$T^1 - S^0$ by non radiation process is called ---

- A) Fluorescence
- B) Phosphorescence
- C) Delayed emission
- D) Both c and d

a. A
c. C

b. B
d. D

19. Question

Write the equation of rate constant for first order reaction.

A) $k = \log\left(\frac{[R]_0}{[R]}\right)$

B) $k = \frac{2.303}{t} \log\left(\frac{[R]_0}{[R]}\right)$

C) $k = \frac{4.606}{t} \log\left(\frac{[R]_0}{[R]}\right)$

D) $k = \frac{1}{t} \log\left(\frac{[R]_0}{[R]}\right)$

a. A

b. B

c. C

d. D

20. Question

Which of the following expression describes the steady state?

A) $\frac{d[\text{Intermediate}]}{dt} > 0$

B) $\frac{d[\text{Intermediate}]}{dt} < 0$

C) $\frac{d[\text{Intermediate}]}{dt} = 0$

D) All

a. A

b. B

c. C

d. D

21. Question

In Haber process for the synthesis of ammonia along with iron, molybdenum is also used what is the role of molybdenum?

A) Reactant

B) Side product

C) Promoter

D) none

a. A

b. B

c. C

d. D

22. Question

In case of polarographic estimation of rate of reaction, the calibration plot is.... used.

- A) Potential vs. concentration
- B) Diffusion current vs. concentration of species of different time interval
- C) Concentration vs. time
- D) All

- a. A
- b. B
- c. C
- d. D

23. Question

The decomposition of ozone follows ----- reaction kinetics.

- A) Zero order
- B) First order
- C) Second order
- D) None of the above

- a. A
- b. B
- c. C
- d. D

24. Question

The slope of $\log k$ vs. square root of ionic strength plot is negative for

- A) Reaction between oppositely charged ion
- B) Same charge ions
- C) Between non ionic species
- D) None

- a. A
- b. B
- c. C
- d. D

25. Question

A plot of $\log k$ vs. $1/T$ is linear with slope of ...

- A) E_a/R
- B) $-E_a/R$
- C) $E_a/2.030R$
- D) $-E_a/2.303R$

- a. A
- b. B
- c. C
- d. D