



Reg. No. :

Name :

VI Semester B.Sc. Degree (CBCSS – Reg./Supple./Improv.)
Examination, April 2021
(2014 – 2018 Admissions)
CORE COURSE IN CHEMISTRY
6B15 CHE : Physical Chemistry – III



Time : 3 Hours

Max. Marks : 40

SECTION – A

Answer **all** questions. **Each** question carries **one** mark.

1. Define Single electrode potential.
2. What is unit of k for a second order reaction ?
3. Name a redox indicator.
4. What is chemiluminescence ?

(1×4=4)

SECTION – B

Answer **any seven** questions. **Each** question carries **2** marks.

5. Why is quantum yield of $H_2 - Cl_2$ reaction very high ?
6. State Growthus Draper Law. What is its significance ?
7. What are pseudounimolecular reactions ? Give examples.
8. Differentiate between threshold energy and activation energy.
9. Explain Lewis concept of acids and bases.
10. Calculate the ionic strength of a 0.01 M Na_2SO_4 solution.
11. Give the electrode reaction in a calomel electrode.
12. Why is KCl used in salt bridge ?

12. Explain briefly the procedure for solving a Fredholm integral equation of second kind with separable integral.
13. Solve the homogeneous Fredholm integral equation $\phi(x) = \lambda \int_0^1 e^x e^{\xi} \phi(\xi) d\xi$.
14. Find the first two iterated kernels of the kernel $K(x, t) = (x - t)^2$, $a = -1$, $b = 1$.
15. Write short note on Abel's equation.
16. Find the eigen values and eigen functions of $y(x) = \lambda \int_0^{2\pi} \sin x \cos t y(t) dt$.
17. Find $L[e^{5t} \cos 3ht]$.

18. Find $L^{-1}\left(\frac{1}{s^2(s^2 + a^2)}\right)$.

19. Find the inverse Laplace Transform of the function $\frac{1}{s^2 - 4s + 5}$.
20. State and prove first shifting theorem.
21. Find $L[t \cos 3t]$.
22. State and prove linearity property of Fourier Transform.
23. Find the Fourier transform of $f(x) = 1$ if $|x| < 1$ and $f(x) = 0$ otherwise.
24. Find the Fourier cosine transformation of the function $f(x) = \begin{cases} k & \text{if } 0 < x < a \\ 0 & \text{otherwise} \end{cases}$.

SECTION - C

Answer any 6 questions. Each question carries 5 marks : (6×5=30)

25. Form the Fredholm integral equation corresponding to the boundary value problem $y'' = f(x)$, $y(0) = 0$, $y(1) = 0$.

26. Find the Green's function of the boundary value problem $\frac{d^4 y}{dx^4} + \lambda y = -f(x)$ with $y(0) = y'(0) = 0$, $y(1) = y'(1) = 0$.

27. If the Kernel $K(x, t)$ is real and symmetric then show that the eigen function corresponding to distinct eigen values of the homogenous Fredholm integral equation

$$y(x) = \lambda \int_a^b k(x, t) y(t) dt$$

are orthogonal.



28. Find eigen value and eigen function of $y(x) = \lambda \int_0^1 (\sqrt{xt} - \sqrt{tx}) y(t) dt$.
29. Solve the initial value problem : $\frac{d^2 y}{dt^2} + 2 \frac{dy}{dt} - 3y = \sin t$ given that $y(0) = y'(0) = 0$.
30. Solve $y'' - 3y' + 2y = 4t$, $y(0) = 1$, $y'(0) = -1$.
31. Find the inverse Laplace transform of $\ln \frac{s+a}{s-a}$.
32. Find the Fourier Transform of $f(x) = e^{-ax}$, if $x > 0$, $f(x) = 0$, if $x < 0$, where $a > 0$.
33. State and prove convolution theorem of fourier transform.

SECTION - D

Answer any one question. It carries 10 marks.

(1×10=10)

34. a) Write down the four properties that have to be satisfied by Green's function of a second order differential equation with homogenous boundary conditions.
b) Define singular integral equations and give examples for each case.
35. a) Evaluate $\int_0^{\infty} \frac{e^{-t} \sin t}{t} dt$.
- b) Find the Fourier integral representation of $f(x) = \begin{cases} \sin x & \text{if } 0 < x < \pi \\ 0 & \text{if } x > \pi \end{cases}$.