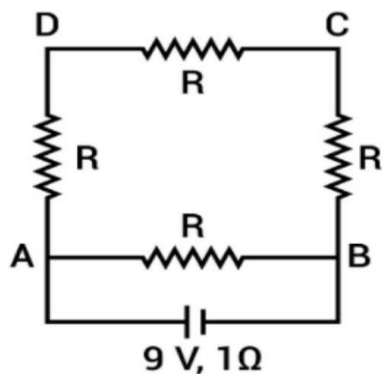


PART-I PHYSICS

- A balloon is rising up with constant velocity of 10 m/s. At a height of 75 m, a small stone is dropped from it. At what height from the ground would the balloon be, when the mass reaches the ground?
- For the force equation $F = A\cos(Bx) + C\sin(Dt)$. Find dimensions of $\frac{AD}{B}$?
 (a) M^1T^{-1} (b) $M^1L^2T^{-3}$
 (c) M^1T^3 (d) M^1T^{-3}
- A particle starts from rest with acceleration $a = \alpha t + \beta t^2$ where α and β are constant. Find its displacement between $t = 1$ and $t = 2$ seconds.
 (a) $\frac{7\alpha}{3} + \frac{5\beta}{4}$ (b) $\frac{7\alpha}{6} + \frac{5\beta}{4}$
 (c) $7\alpha + 5\beta$ (d) None
- If velocity of photon is C and that of electron is v , then find the ratio of KE of electron to photon if their de-Broglie wavelength is same.
 (a) $\frac{C}{v}$ (b) $\frac{2C}{v}$
 (c) $\frac{v}{2C}$ (d) $\frac{v}{C}$
- Two soap bubbles of radius R_1 and R_2 combine isothermally to form a new soap bubble. Find the radius of the new soap bubble formed
 (a) $\frac{R_1+R_2}{2}$ (b) $\sqrt{R_1R_2}$
 (c) $\frac{R_1R_2}{R_1+R_2}$ (d) $\sqrt{R_1^2 + R_2^2}$
- Two dipoles p_1 and p_2 are perpendicular to each other, are placed in a uniform magnetic field such that p_1 makes an angle of 37° with field. Both dipoles experiences same torque. Find ratio of their dipole moment.
 (a) $\frac{4}{3}$ (b) $\frac{3}{4}$
 (c) $\frac{3}{5}$ (d) $\frac{4}{5}$
- If $\vec{X}$ and $\vec{Y}$ are two vectors, such that $|\vec{X}| = |\vec{Y}|$ & $|\vec{X} - \vec{Y}| = 10|\vec{X} + \vec{Y}|$, then. Find the angle between $\vec{X}$ and $\vec{Y}$
 (a) $\cos^{-1}\left(\frac{-7}{99}\right)$ (b) $\cos^{-1}\left(\frac{-99}{101}\right)$
 (c) $\sin^{-1}\left(\frac{-99}{101}\right)$ (d) $\sin^{-1}\left(\frac{-7}{99}\right)$
- A disc of radius 2 metres and mass M , is rotating with 200rpm. Find the torque required to stop the disc in 10 seconds.
 (a) $\frac{4\pi M}{3}$ SI units (b) $\frac{2\pi M}{3}$ SI units

- (c) $\frac{\pi M}{3}$ SI units (d) $\frac{8\pi M}{3}$ SI units

9. A wire of 16ohms is bent to form a square. Now a cell of 9 volt and internal resistance 1Ω is connected across one of the sides. Find the potential difference across the diagram of the square.



- (a) 8 V (b) 5.5 V
(c) 6.75 V (d) 3.5 V

10. If $\delta_{\min}$ is the minimum deviation through a prism and μ is refractive index and A is angle of prism, then

- (a) $\mu = \frac{\sin(\delta_{\min})}{\sin(\frac{A}{2})}$ (b) $\mu = \frac{\sin(\frac{A+\delta_{\min}}{2})}{\sin(\frac{A}{2})}$
(c) $\mu = \frac{\sin(\frac{A}{2})}{\sin(\frac{A+\delta_{\min}}{2})}$ (d) None of these

11. A radioactive nucleus decays so that after 30 years, only $\frac{1}{8}$ of the initial sample is active. What is the half-life of sample?

- (a) 20 years (b) 10 years
(c) 40 years (d) 5 years

12. For an amplitude modulated wave, message signal peak voltage = 20 V, carrier signal peak voltage = 20 V. What is the modulation index?

- (a) 50% (b) 200%
(c) 0% (d) 100%

13. Two charges of equal magnitude are thrown with speeds ratio (3: 2) perpendicular to the magnetic field. If their masses are in the ratio of 1: 2. Find ratio of the radii?

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

14. For a certain incident wavelength on a metal surface, the max KE of the photoelectron is 4. 8eV. If the incident wavelength is doubled, then the max KE changes to 1. 6eV. Then find the threshold wavelength for the metal surface.

- (a) 7750 nm (b) 775 nm
(c) 77.5 nm (d) can't be determined

15. The efficiency of heat engine is $\frac{1}{6}$. When the temperature of sink is reduced by 62°C , then efficiency doubles. What is the temperature of the source?

16. Two particles having identical masses and charges $2Q$ and Q are moving with velocities V and $2V$ respectively, In uniform magnetic field B . Find ratio of the radius of circle describe by them

- (a) $\frac{1}{2}$ (b) 2: 1
(c) $\frac{1}{4}$ (d) 4: 1

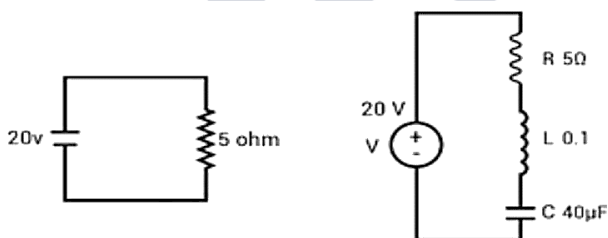
17. A force $(5y + 4)\hat{j}$ displaces a particle from $y = 0$ to $y = 2$. Find work done by force.

- (a) 16 J (b) 18 J
(c) 20 J (d) 22 J

18. In an AC circuit having resistance of 10Ω , find the time taken by current to reach RMS value from maximum value. Frequency and RMS voltage of the source is 50 Hz and 220 V respectively.

- (a) 2.5msec (b) 5msec
(c) 10msec (d) 1msec

19. For both the given circuits, average power dissipated is same. Find ω of the second circuit.



- (a) 1000rad/sec (b) 500rad/sec
(c) 100rad/sec (d) 5000rad/sec

PART-II CHEMISTRY

20. What is the correct structure of cytosine

21. Which of the following form interstitial hydride easily?

- (a) Cr (b) Fe
(c) Mn (d) Co

22. Increasing order of Bond order of : O_2 , O_2^+ , O_2^- , O_2^{2-} Options:

- (a) $\text{O}_2^+ > \text{O}_2 > \text{O}_2^- > \text{O}_2^{2-}$ (b) $\text{O}_2 > \text{O}_2^+ > \text{O}_2^- > \text{O}_2^{2-}$



23. If work done by system is 200 J and heat absorbed is 150 then what is change in internal energy?

- (a) +50 J (b) -50 J
(c) 350 J (d) -350 J

24. Number of electrons in 4f orbitals of Ho^{3+} ($Z = 67$)

- (a) 10 (b) 12
(c) 11 (d) 9

25. Match the column

Column I	Column II
(i) Clouds	(P) Gel
(ii) Pumice stone	(Q) Aerosols
(iii) Cheese	(R) Solid foam
(iv) Shaving cream	(S) Emulsion

- (a) (i) → Q, (ii) → R, (iii) → P, (iv) → S
(b) (i) → S, (ii) → R, (iii) → Q, (iv) → P
(c) (i) → P, (ii) → Q, (iii) → S, (iv) → R
(d) (i) → R, (ii) → S, (iii) → P, (iv) → Q

26. S1: Chlorofluorocarbon react in the visible range and Cl radical is formed S2: O_3 react with nitric acid to form nitrogen and oxygen

- (a) S1 is true and S2 is false
(b) S1 is false, S2 is true
(c) Both Statements are true
(d) Both statements are false

27. Biodegradable polyamide is formed by which of these two- reactant?

- (a) Glycine, amino caproic acid
(b) Vinyl chloride, glycine
(c) Glucose, adipic acid
(d) Adipic acid, Hexamethylenediamine

28. Match the column

Column I	Column II
(i) Froth floatation method	P. Sulphide ore
(ii) Reverberatory furnace	Q. Pig iron
(iii) Blast furnace	R. Ag
(iv) Leaching	S. Blister Copper

(a) (i) → Q, (ii) → R, (iii) → P, (iv) → S

(b) (i) → S, (ii) → R, (iii) → Q, (iv) → P

(c) (i) → P, (ii) → S, (iii) → Q, (iv) → R

(d) (i) → R, (ii) → S, (iii) → , , (iv) → Q

29. maleic anhydride can be prepared by

(a) Heating trans but-2-en-1,4-dioic acid

(b) treating trans but-2-en-1, 4-dioic acid with alcohol and acid

(c) treating cis but-2-en-1 4-dioic acid with alcohol and acid

(d) Heating cis but-2-en-1, 4-dioic acid

30. $A \rightarrow B$. In this reaction concentration of change B changes by 0.2 in 30 minutes. Find the average rate of the reaction in moles per litre hour

31. $[Ba(OH)_2] = 5 \times 10^{-3}$, It dissociates completely, Find the conc of H_3O^+ Options:

(a) $10^{-12}M$

(b) $10^{-10}M$

(c) $10^{-11}M$

(d) $2 \times 10^{-10}M$

32. Which reaction oxidation state gets changed by +5

(a) $C_2O_4^{2-}$ to CO_2 (b) MnO_4^- to Mn^{2+}

(c) $Cr_2O_7^{2-}$ to Cr^{3+} (d) CrO_4^{2-} to Cr^{3+}

33. Find magnetic moments for Sc^{3+} , V^{2+} , Ti^{2+}

(a) 0,2.8,1 (b) 1.5,0,2.8

(c) 0,3.9,2.8 (d) 1,2.7,3.9

34. Maximum canonical form with 1 pi bond Options:

- (a) CO_3^{2-} (b) SO_3
(c) SO_3 (d) O_2

35. In Kjeldahl method, 0.8 g of organic compound is used. % of nitrogen come out to be 46%. the ml of $1\text{M}\text{H}_2\text{SO}_4$ used to neutralize NH_3

- (a) 15.20 mL (b) 13.14 mL
(c) 12.00 mL (d) 7.80 mL

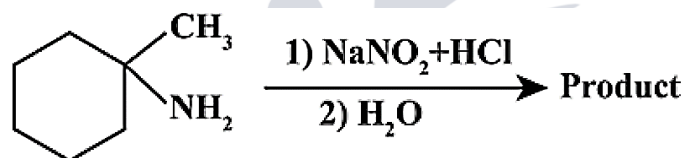
36. Arrange the following in increasing density order:

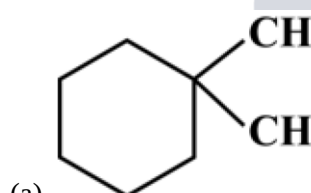
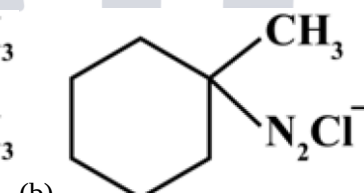
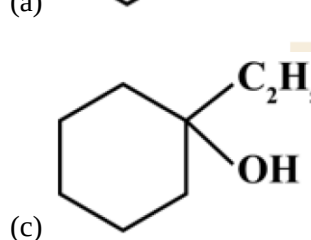
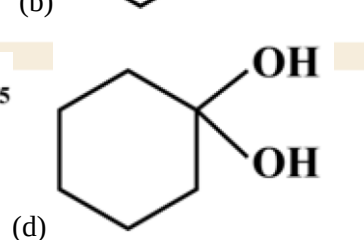
- (a) Benzene
(b) Chlorobenzene
(c) 1,3 chlorobenzene
(d) 1-bromo-3-chlorobenzene

37. Which compound is most stable?

- (a) $[\text{Co}(\text{en})_2(\text{NH}_3)_2]\text{Cl}_2$ (b) $[\text{Co}(\text{en})(\text{NH}_3)_4]\text{Cl}_2$
(c) $[\text{Co}(\text{en})_3]\text{Cl}_2$ (d) $[\text{Co}(\text{NH}_3)_6]\text{Cl}_2$

38.

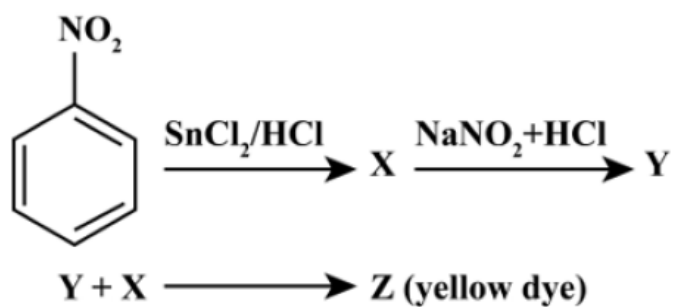


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 (a) (b)


 (c) (d)

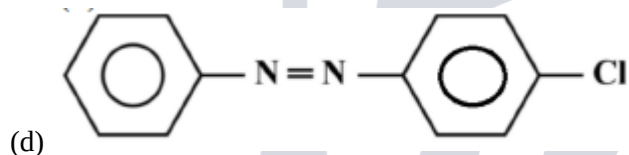
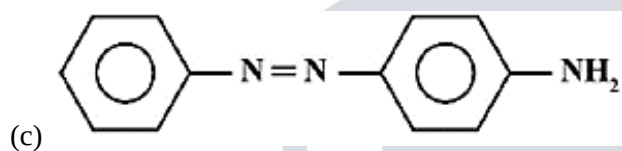
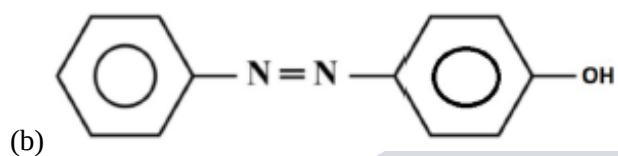
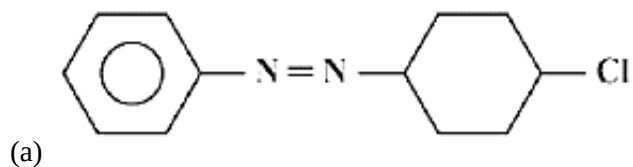
39. Most acidic amongst these is:

- (a) toluene (b) butane
(c) cyclopropane (d) cyclopentadiene

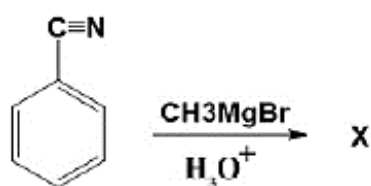
40. Y + aniline reacts to give yellow dye. Find structure of yellow dye



Identify Z



41.



X shows

- (a) Ninhydrin test (b) Iodoform
 (c) Tollen's test (d) Fehling's test

42. Match the column

Column I	Column II
(i) Li	P. Bicarbonate used in Fire extinguisher

(ii) Cs	Q. element in fluid of cell
(iii) Na	R. Carbonate that disintegrate
(iv) K	S. Forma unstable compound with I^-

(a) (i) $\rightarrow$ Q, (ii) $\rightarrow$ R, (iii) $\rightarrow$ P, (iv) $\rightarrow$ S

(b) (i) $\rightarrow$ R, (ii) $\rightarrow$ S, (iii) $\rightarrow$ P, (iv) $\rightarrow$ Q

(c) (i) $\rightarrow$ P, (ii) $\rightarrow$ S, (iii) $\rightarrow$ Q, (iv) $\rightarrow$ R

(d) (i) $\rightarrow$ R, (ii) $\rightarrow$ S, (iii) $\rightarrow$ P, (iv) $\rightarrow$ Q

PART-III MATHEMATICS

43. Real solution of $x^2 - |x| - 12 = 0$

(a) 1 (b) 2

(c) 3 (d) 4

44. If ${}^nP_r = {}^nP_{r+1}$, ${}^nC_r = {}^nC_{r-1}$. Find r

(a) (b) 2

(c) (d) $r - 1$

45. $y = p(x)$ & $y = q(x)$ are lines can be written as $(y - p_x)(y - q_x) = 0$, then find angle bisector of $x^2 - 4xy - 5y^2 = 0$

46. If $f(x) = \begin{cases} 5x + 1, & x < 2 \\ \int_0^x (5 + |1 - t|) dt, & x \geq 2 \end{cases}$

(a) $f(x)$ is differentiable $\forall x \in R$

(b) $f(x)$ is continuous at $x = 2$ but not differentiable at $x = 2$

(c) $f(x)$ is continuous at $x = 2$ but not differentiable at $x = 1$

(d) none of these

47. $\int_{-1}^1 \log(x + \sqrt{x^2 + 1}) dx$

48. If $P = \begin{bmatrix} 1 & 0 \\ \frac{1}{2} & 1 \end{bmatrix}$ then $P^{50} = ?$

49. If $|\vec{a}| = 2$, $|\vec{b}| = 5$, $|\vec{a} \times \vec{b}| = 8$, then $|\vec{a} \cdot \vec{b}| = ?$

50. If $\frac{\pi}{4} \leq x \leq \frac{\pi}{4}$ $\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$, number of solutions =?

51. $\cot\left(\frac{\pi}{24}\right) = ?$

52. Equation of circle $\text{Re}(z^2) + 2(\text{img}(z))^2 + 2\text{Re}(z) = 0$ where $z = x + iy$. A line passes through the vertex of parabola $x^2 - 6x + y + 13 = 0$ and center of circle, then the y intercept of the line is

53. If $f(x) = \frac{P(x)}{\sin(x-2)}$, at $x = 2, p(x) = 7$. $P(x)$ is a polynomial where $P(3) = 9$. Find $P(5)$.

54. $\left(2 + \frac{3}{x}\right)^n$ if coefficient of x^7 & x^8 is same

55. Find the value of $\sum_{n=8}^{100} \left[\frac{(-1)^n n}{2} \right]$ where $[x]$ greatest integer function n.

56. If $a\hat{i} + a\hat{j} + c\hat{k}, \hat{i} + \hat{k}$ and $c\hat{i} + c\hat{j} + b\hat{k}$ are coplanar then $c = ?$

57. Find the number of irrational terms in $\left(2^{\frac{1}{3}} + 3^{\frac{1}{4}}\right)^{12}$.

