

NEW STANDARD ACADEMY

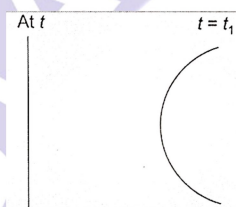
Date : 18-08-25

CLASS : 12TH JEE

Marks: 300
Time: 3 hours.

PHYSICS

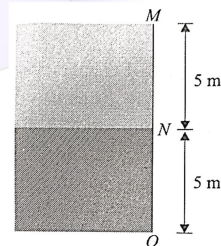
- Ray diverging from a point source from a wavefront that is
(a) Cylindrical (b) Spherical
(c) Plane (d) Cubical
- The figures shows a plane wavefront at a time t and a time t_1 . In the time interval $(t_1 - t)$ the wavefront must have passed through



- (a) a prism
(b) a prism and a convex lens
(c) a convex lens
(d) a plane mirror and a concave lens
- Monochromatic light of wavelength λ_1 travelling in medium of refractive index n_1 enters a denser medium of refractive index n_2 . The wavelength in the second medium is
(a) $\lambda_1(n_1 / n_2)$ (b) $\lambda_1(n_2/n_1)$
(c) λ_1 (d) $\lambda_1 \left(\frac{n_2 - n_1}{n_1} \right)$
- Two coherent sources separated by distance d are radiating in phase having wavelength λ . A detector moves in a big circle around the two sources in the plane of the two sources. The angular position of $n = 4$ interference maxima is given as
(a) $\sin^{-1} \frac{n\lambda}{d}$ (b) $\cos^{-1} \frac{14\lambda}{d}$
(c) $\tan^{-1} \frac{\lambda}{4\lambda}$ (d) $\cos^{-1} \frac{\lambda}{4d}$
- Two coherent sources S_1 and S_2 are separated by a distance four times the wavelength λ of the source. The sources lie along y -axis whereas a detector moves along $+x$ axis. Leaving the origin and far

off points the number of points where maxima are observed is

- (a) 2 (b) 3
(c) 4 (d) 5
- The width of one of the two slits in a Young's double slit experiment is 4 times that of the other slit. The ratio of the maximum to the minimum intensity in the interference pattern is
(a) 1:1 (b) 16:1
(c) 9:1 (d) 4:1
- Light emerges out of a convex lens when a source of light kept at its focus. The shape of wavefront of the light is
(a) both spherical and cylindrical
(b) plane (c) cylindrical
(d) spherical
- Which of the following phenomena is not explained by wave nature of light?
(A) reflection (B) diffraction
(C) photoelectric effect (D) interference
(E) polarization
Choose the most appropriate answer from the options given below:
(a) E only (b) A, C only
(c) B, D only (d) Conly
- Two liquids of densities ρ_1 and ρ_2 ($\rho_2 = 2\rho_1$) are filled up behind a square wall of side 10 m as shown in figure. Each liquid has a height of 5 m. The ratio of the forces due to these liquids exerted on upper part MN to that at the lower part NO is (Assume that the liquids are not mixing)



- (a) $1/4$ (b) $2/3$
(c) $1/3$ (d) $1/2$

10. A long cylindrical vessel is half filled with a liquid. When the vessel is rotated about its own vertical axis, the liquid rises up near the wall. If the radius of vessel is 5 cm and its rotational speed is 2 rotations per second, then the difference in the heights between the centre and the sides, in cm, will be

- (a) 1.2 (b) 0.1
(c) 2.0 (d) 0.4

11. An open glass tube is immersed in mercury in such a way that a length of 8 cm extends above the mercury level. The open end of the tube is then closed and sealed and the tube is raised vertically up by additional 46 cm. What will be length of the air column above mercury in the tube now? (Atmospheric pressure = 76 cm of Hg)

- (a) 38 cm (b) 6 cm
(c) 16 cm (d) 22 cm

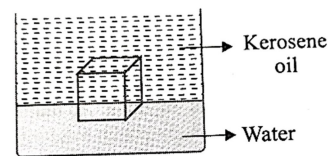
12. The pressure acting on a submarine is 3×10^5 Pa at a certain depth. If the depth is doubled, the percentage increase in the pressure acting on the submarine would be (Assume that atmospheric pressure is 1×10^5 Pa density of water is 10^3 kg m^{-3} $g = 10 \text{ m s}^{-2}$)

- (a) 200/3% (b) 200/5%
(c) 5/200% (d) 3/200%

13. Consider a solid sphere of radius R and mass density $\rho(r) = \rho_0 \left(1 - \frac{r^2}{R^2}\right)$, $0 < r \leq R$. The minimum density of a will float is.

- (a) $\rho_0/5$ (b) $\rho_0/3$
(c) $2\rho_0/3$ (d) $2\rho_0/5$

14. A cube of ice floats partly in water and partly in kerosene oil. The ratio of volume of ice immersed in water to that in kerosene oil (specific gravity of Kerosene oil = 0.8, specific gravity of ice = 0.9)



- (a) 5:4 (b) 9:10
(c) 1:1 (d) 8:9

15. A sphere of relative density and diameter D has concentric cavity of diameter d . The ratio of D/d water in a tank is: if it just floats on water in a tank is:

- (a) $\left(\frac{\sigma}{\sigma-1}\right)^{\frac{1}{3}}$ (b) $\left(\frac{\sigma+1}{\sigma-1}\right)^{\frac{1}{3}}$
(c) $\left(\frac{\sigma-1}{\sigma}\right)^{\frac{1}{3}}$ (d) $\left(\frac{\sigma-2}{\sigma+2}\right)^{\frac{1}{3}}$

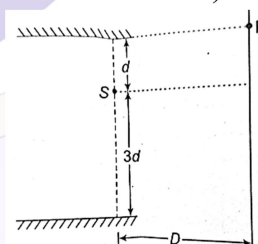
16. A light of ray of frequency ν and wavelength λ enter a liquid of refractive index $3/2$. The ray travels in the liquid with

- (a) frequency ν and wavelength $2/3 \lambda$.
(b) frequency ν and wavelength $(3/2) \lambda$
(c) frequency ν and wavelength λ .
(d) frequency $(3/2) \nu$ wavelength

17. Two coherent sources have intensity in the ratio of 100/1. Ratio of (intensity) max/(intensity) min is

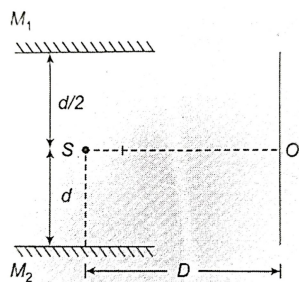
- (a) $1/100$ (b) $1/1$
(c) $10/1$ (d) $3/2$

18. Consider the optical system shown in figure. The point source of light S is having wavelength equals to λ . The light is reaching screen only after reflection. For point P to be 2^{nd} maxima, the value of λ would be ($D \gg d$ and $d \gg \lambda$)



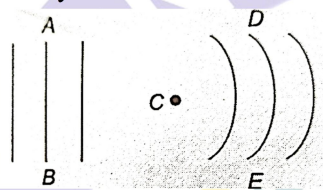
- (a) $12d^2/D$ (b) $6d^2/D$
(c) $3d^4/D$ (d) $24d^4/D$

19. M_1 and M_2 are plane mirrors and kept parallel to each other. At point O there will be a maxima for wavelength. Light from monochromatic source S of wavelength λ is not reaching directly on the screen. The λ is ($D \gg d$, $d \gg \lambda$)



- (a) $3d^2/D$ (b) $3d^2/2D$
(c) d^2/D (d) $2d^2/D$

20. A wavelength λ passing through a system C emerges as DE as shown in the figure. The system C could be



- (a) Converging lens (b) Diverging lens
(c) a concave lens (d) Convex lens

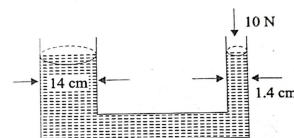
21. A hydraulic press can lift 100 kg when a mass 'm' is placed on the smaller piston. It can lift _____ kg when the diameter of the larger piston is increased by 4 times and that of the smaller piston is decreased by 4 times keeping the same mass 'm' on the smaller piston.

22. A tube of length 50 cm is filled completely with an incompressible liquid of mass 250 g and closed at both ends. The tube is then rotated in horizontal plane about one of its ends with a uniform angular velocity $x\sqrt{F}$ rad s^{-1} . If F be the force exerted by the liquid at the other end then the value of x will be _____

23. Mercury is filled in a tube of radius 2 cm up to a height of 30 cm. The force exerted by mercury on the bottom of the tube is _____ N. (Given, atmospheric pressure = 10^5 N m^{-2} density of mercury $1.36 \times 10^4 \text{ kg m}^{-3}$ $g = 10 \text{ m s}^{-2}$ $\pi = 22/7$)

24. A hydraulic press containing water has two arms with diameters as mentioned in the figure. A force of 10 N is applied on the surface of water in the thinner arm. The force required to be applied on the surface of water in the thicker arm to

maintain equilibrium of water is _____ N.



25. The metallic bob of simple pendulum has the relative density 5. The time period of this pendulum is 10 s. If the metallic bob is immersed in water, then the new time period becomes $5\sqrt{x}$ s. The value of x will be _____

CHEMISTRY

26. Preparation of alkyl halides in laboratory is least preferred by

- (a) halide exchange
(b) direct halogenation of alkanes
(c) treatment of alcohols
(d) addition of hydrogen halides to alkenes.

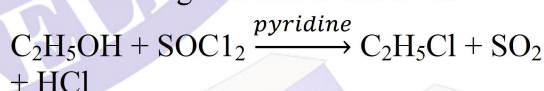
27. The correct order of C - X bond polarity is

- (a) $\text{CH}_3\text{Br} > \text{CH}_3\text{Cl} > \text{CH}_3\text{I}$
(b) $\text{CH}_3\text{I} > \text{CH}_3\text{Br} > \text{CH}_3\text{Cl}$
(c) $\text{CH}_3\text{Cl} > \text{CH}_3\text{Br} > \text{CH}_3\text{I}$
(d) $\text{CH}_3\text{Cl} > \text{CH}_3\text{I} > \text{CH}_3\text{Br}$

28. Which of the following can bring about free radical chlorination of propane?

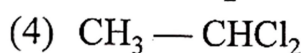
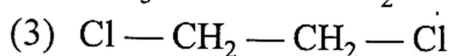
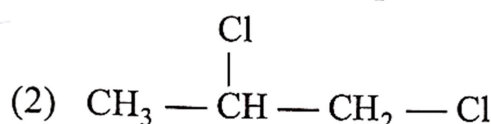
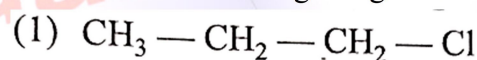
- (a) SOCl_2 (b) SO_2Cl_2
(c) PCl_5 (d) PCl_3

29. The following reaction is known as



- (a) Kharasch effect (b) Darzens procedure
(c) Williamson's synthesis
(d) Hunsdiecker synthesis reaction

30. Which of the following is a gem dihalide?



31. Halogenation of alkanes is

- (a) A reductive process

- (b) An oxidative process
(c) An isothermal process
(d) An endothermal process
32. In the following reaction

$$\text{RCOOAg} + \text{Br}_2 \xrightarrow{\text{CCl}_4} \text{RBr} + \text{CO}_2 + \text{AgBr}$$
 The intermediate formed is -
 (a) R-COOBr (b) RCOO
 (c) R• (d) All of these
33. In which one of the following conversions phosphorus pentachloride is used as a reagent?
 (a) $\text{H}_2\text{C} = \text{CH}_2 \rightarrow \text{CH}_3\text{CH}_2\text{Cl}$
 (b) $\text{C}_3\text{H}_8 \rightarrow \text{C}_3\text{H}_7\text{Cl} + \text{HCl}$
 (c) $\text{CH}_3\text{CH}_2\text{OH} \rightarrow \text{CH}_3\text{CH}_2\text{Cl}$
 (d) $\text{HC} \equiv \text{CH} \rightarrow \text{CH}_2 = \text{CHCl}$
34. When ethyl bromide reacts with sodium acetylide the main product is
 (a) 1-butane (b) 1-butene
 (c) 1-butyne (d) 2-butene
35. The order of reactivities of the following alkyl halides for a $\text{S}_\text{N}2$ reaction is:
 (a) $\text{RF} > \text{RCl} > \text{RBr} > \text{RI}$
 (b) $\text{RF} > \text{RBr} > \text{RCl} > \text{RI}$
 (c) $\text{RCl} > \text{RBr} > \text{RF} > \text{RI}$
 (d) $\text{RI} > \text{RBr} > \text{RCl} > \text{RF}$
36. Among the following, the molecule with the highest dipole moment is
 (a) CH_3Cl (b) CH_2Cl_2
 (c) CHCl_3 (d) CCl_4
37. Which of the following undergoes nucleophilic substitution exclusively by $\text{S}_\text{N}1$ mechanism?
 (a) Ethyl chloride (b) Isopropyl chloride
 (c) Chlorobenzene (d) Benzyl chloride.
38. Which of the following isomeric pairs shows ionization isomerism?
 (a) $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$ and $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$
 (b) $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$ and $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$
 (c) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ and $[\text{Pt}(\text{NH}_3)_4][\text{PtCl}_4]$
 (d) $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$ and $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$
39. Which of the following cannot show linkage isomerism?
 (a) NO_2^- (b) SCN^-
 (c) C N^- (d) NH_3
40. Which kind of isomerism is exhibited by octahedral $[\text{Co}(\text{NH}_3)_4\text{Br}_2]\text{Cl}$?
 (a) Geometrical and Ionization
 (b) Geometrical and Optical
 (c) Optical and Ionization
 (d) Geometrical only
41. In the following d^n configuration, the number of unpaired electrons in O_h complexes remains same irrespective of nature of ligand
 (a) d^4 (b) d^9
 (c) d^6 (d) d^3
42. Which of the following complex is inner orbital as well as low spin complex?
 (a) $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ (2) $[\text{Fe}(\text{CN})_6]^{3-}$
 (c) $[\text{Cu}(\text{CN})_4]^{3-}$ (4) $[\text{Mn}(\text{NH}_3)_6]^{2+}$
43. Consider the following two complex ions: $[\text{CoF}_6]^{3-}$ and $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$. Which of the following statement(s) is/are false?
 (A) Both are octahedral
 (B) $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$ is diamagnetic while $[\text{CoF}_6]^{3-}$ is paramagnetic
 (C) Both are outer orbital complexes
 (D) In both the complexes the central metal is in the same oxidation state
 (a) (B) and (C) (b) (B), (C) and (D)
 (c) (C) only (d) (C) and (D)
44. According to CFT ligands are treated as
 (a) Point charges (b) Lewis acids
 (c) Proton donor (d) All of the above
45. The pair in which both species have same magnetic moment (spin value only) is:
 (a) $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$, $[\text{CoCl}_4]^{2-}$
 (b) $[\text{CoCl}_4]^{2-}$, $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$
 (c) $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$, $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$
 (d) $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$, $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$
46. The magnetic moment (μ) for compound $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_2$ is _____.
47. The crystal field stabilization energy for $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ ion in high spin states, if mean pairing energy P is 23500cm^{-1} and $|\Delta_0|$ is 13900cm^{-1} is _____.
48. The crystal field energy (in cm^{-1}) of a d^6 complex having $\Delta_0 = 25000\text{cm}^{-1}$ and $P = 15000\text{cm}^{-1}$ is _____.
49. The total number of geometrical isomers exist for the complex $\text{M}(\text{AA})\text{B}_2\text{C}_2$ is

50. The total number of unpaired electrons in the two complexes $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{Cr}(\text{CN})_6]^{4-}$ having octahedral geometry are _____

MATHS

51. $\int_0^{\frac{\pi}{2}} \frac{x + \sin x}{1 + \cos x} dx =$
 (a) $-\log 2$ (b) $\log 2$
 (c) $\frac{\pi}{2}$ (d) 0
52. The value of $\int_0^1 \log x dx$ is
 (a) 1 (b) 2
 (c) -2 (d) -1
53. $\int_0^{\pi/4} \sec x \log(\sec x + \tan x) dx =$
 (a) $\frac{1}{2} [\log(1 + \sqrt{2})]^2$ (b) $[\log(1 + \sqrt{2})]^2$
 (c) $\frac{1}{2} [\log(\sqrt{2} - 1)]^2$ (d) $[\log(\sqrt{2} - 1)]^2$
54. $\int_{-1}^1 x^{17} \cos^4 x dx =$
 (a) -2 (b) -1
 (c) 0 (d) 2
55. If $f(x) = \begin{cases} 4x + 3, & \text{if } 1 \leq x \leq 2 \\ 3x + 5, & \text{if } 2 < x \leq 4 \end{cases}$ then $\int_1^4 f(x) dx =$
 (a) 80 (b) 20
 (c) -20 (d) 37
56. $\int_{-2}^2 |x| dx =$
 (a) 0 (b) 1
 (c) 2 (d) 4
57. $\int_0^{\pi/4} \frac{\sqrt{\tan x}}{\sin x \cos x} dx$ equals
 (a) 1 (b) 2
 (c) 0 (d) 4
58. The value of $\int_0^{\pi} \frac{\cos x}{|\cos x|} dx$ is
 (a) 0 (b) π
 (c) $-\pi$ (d) None of these
59. The value of $\int_0^{\pi/2} \frac{2^{\sin x}}{2^{\sin x} + 2^{\cos x}} dx$ is
 (a) $\frac{\pi}{4}$ (b) $\frac{\pi}{2}$
 (c) π (d) 2π
60. The value of $\int_0^{4042} \frac{\sqrt{x} dx}{\sqrt{x} + \sqrt{4042 - x}}$ is equal to
 (a) 4042 (b) 2021
 (c) 8084 (d) 1010

61. $\int_0^{\pi/2} \frac{\cos x \sin x}{1 + \sin x} dx$ is equal to
 (a) $\log 2 - 1$ (b) $-\log 2$
 (c) $\log 2$ (d) $1 - \log 2$
62. If n arithmetic means are inserted between a and 100 such that the ratio of the first mean to the last mean is $1:7$ and $a + n = 33$, then the value of n is
 (a) 21 (b) 22
 (c) 23 (d) 24
63. Let a_1, a_2, a_3 be a G. P. of increasing positive numbers. If $a_3 a_5 = 729$ and $a_2 + a_4 = 111/4$ then $24(a_1 + a_2 + a_3)$ is equal to
 (a) 131 (b) 130
 (c) 129 (d) 128
64. Let S_n be the sum of the first n terms of an arithmetic progression. If $S_{3n} = 3S_{2n}$ then the value of S_{4n}/S_{2n} is
 (a) 2 (b) 6
 (c) 8 (d) 4
65. If the 2nd, 5th and 9th terms of a non-constant A.P. are in G.P., then the common ratio of this G.P. is
 (a) $4/3$ (b) 1
 (c) $7/4$ (d) $8/5$
66. The sum of the first three terms of a G.P. is S and their product is 27. Then all such S lie in
 (a) $[-3, \infty)$ (b) $(-\infty, 9]$
 (c) $(-\infty, -9] \cup [3, \infty)$ (d) $(-\infty, -3] \cup [9, \infty)$
67. The sum of first 20 terms of the sequence $0.7, 0.77, 0.777, \dots$ is
 (a) $7/81 (179 - 10^{-20})$
 (b) $7/9 (99 - 10^{-20})$
 (c) $7/81 (179 + 10^{-20})$
 (d) $7/9 (99 + 10^{-20})$
68. If $A = \sum_{n=1}^{\infty} \frac{1}{(3 + (-1)^n)^n} B = \sum_{n=1}^{\infty} \frac{(-1)^x}{(3 + (-1)^n)^n}$ then $\frac{A}{B}$ is equal to
 (a) $\frac{11}{9}$ (b) 1
 (c) $-\frac{11}{9}$ (d) $-\frac{11}{3}$
69. The sum of 10 terms of the series $\frac{3}{1^2 \times 2^3} + \frac{5}{2^2 \times 3^2} + \frac{7}{3^2 \times 4^2} + \dots$ is
 (a) $143/144$ (b) $99/100$
 (c) 1 (d) $120/121$

70. Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be such that for all $x \in \mathbb{R}$
 $(2^{1+x} + 2^{1-x}) f(x)$ and $(3^x + 3^{-x})$ are in
 A.P., then the minimum value of $f(x)$ is
 (a) 3 (b) 0
 (c) 4 (d) 2

71. The sum

$$\sum_{n=1}^7 \frac{n(n+1)(2n+1)}{4}$$

is equal to _____

72. If

$$\frac{1^3+2^3+3^3+\dots \text{up to } n \text{ term}}{1.3+2.5+3.7+\dots \text{up to } n \text{ term}} = \frac{9}{5}, \text{ the value of } n \text{ is } \underline{\hspace{2cm}}$$

73. For the two positive numbers a, b , if a, b
 and $1/18$ are in a geometric progression,
 while $1/a, 10$ and $1/b$ are in an arithmetic
 progression, then $16a + 12b$ is equal to
 _____.

74. The interior angles of a polygon with n
 sides, are in an A.P. with common
 difference 6° . If the largest interior angle of
 the polygon is 219° , then n is equal
 to _____

75. The number of elements in the set $\{n \in \mathbb{N} : 10 \leq n \leq 100 \text{ and } 3^n - 3 \text{ is a multiple of } 7\}$ is _____