



Date :-21/01/2022

Time :-50 Minutes

Exam Name :-IIT-JEE-
1to1Guru-3

Mark :- 84

1. If the radius of the circular track decreases, then the angle of banking

- (a) increases. (b) decreases.
(c) first increases then decreases.
(d) does not change.

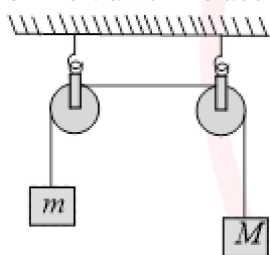
2. The bob of a simple pendulum executes simple harmonic motion in water with a period t , while the period of oscillation of the bob is t_0 in air.

Neglecting frictional force of water and given that the density of the bob is $(\frac{4}{3} \times 1000 \text{ kg} - \text{m}^3)$.

What relationship between t and t_0 is true?

- (a) $t = t_0$ (b) $t = t_0/2$ (c) $t = 2t_0$ (d) $t = 4t_0$

3. Each pulley in Figure has radius r and moment of inertia I . The acceleration of the block is



- (a) $\frac{(M - m)g}{(M + m + \frac{2I}{r^2})}$ (b) $\frac{(M - m)g}{(M + m - \frac{2I}{r^2})}$
(c) $\frac{(M - m)g}{(M + m + \frac{I}{r^2})}$ (d) $\frac{(M - m)g}{(M + m - \frac{I}{r^2})}$

4. An impulse $J = mv$ at one end of a stationary uniform frictionless rod of mass m and length l which is free to rotate in a gravity-free space. The impact is elastic. Instantaneous axis of rotation of the rod will pass through

- (a) Its centre of mass
(b) The centre of mass of the rod plus ball
(c) The point of impact of the ball on the rod
(d) The point which is at a distance $2/3$ from the striking end

5. A brass rod and a lead rod each 80 cm long at 0°C are clamped together at one end with their free ends coinciding. The separation of free ends of the rods if the system is placed in a steam bath is ($\alpha_{\text{brass}} = 18 \times 10^{-6}/^\circ\text{C}$ and $\alpha_{\text{lead}} = 28 \times 10^{-6}/^\circ\text{C}$)

- (a) 0.2 mm (b) 0.8 mm (c) 1.4 mm (d) 1.6 mm

6. A 100 eV electron collides with a stationary helium ion (He^+) in its ground state and excites to a higher level. After the collision, He^+ ions emits two photons in succession with wavelength 1085 and 304 . Also the energy of the electron after the collision is $6 \times \dots \text{eV}$ (approximately). Given $h = 6.63 \times 10^{-34} \text{ Js}$.

7.

14. The mean lives of a radioactive substance are 1620 and 405 years for α -emission and β -emission respectively. Find out the time (in years) after which three fourth of a sample will decay if it is decaying both by α -emission and β -emission simultaneously. (Take $\ln 2 = 0.693$)

8. Which of the atomic number pairs represents elements of s -block?

- (a) 7, 15 (b) 5, 12 (c) 9, 17 (d) 3, 12

9. $C_p - C_v = R$. This R is

- (a) Change in KE (b) Change in rotational energy
(c) Work done which system can do on expanding the gas per mol per degree increase in temperature
(d) All correct

10. Which of the following metals is not a pollutant?

- (a) Mercury (b) Arsenic (c) Lead (d) Aluminium

11. Benzyl amine reacts with nitrous acid to give

- (a) Azobenzene (b) Benzene (c) Benzyl alcohol
(d) Phenol

12. Which gas cannot be kept in a glass bottle because it chemically reacts with glass?

- (a) F_2 (b) Cl_2 (c) Br_2 (d) SO_2

13. For a cubical system the following information are available. Edge length = 5 ; density = 2 gm/cm^3 , Atomic wt. = 75 Determine the radius of the atom in pm ?

14. In the following first order competing reactions; $A + \text{Reagent} \xrightarrow{k_1} \text{product B} + \text{Reagent} \xrightarrow{k_2} \text{Product}$ The ratio of k_1 / k_2 if only 50% of B will have been reacted when 94% of A has been reacted is-

15. If $g^2 + f^2 = c$, then the equation $x^2 + y^2 + 2gx + 2fy + c = 0$ will represent

- (a) A circle of radius g (b) A circle of radius f
(c) A circle of diameter \sqrt{c}

(d) A circle of radius zero

16. The range of the function

$f(x) = 1 + \sin x + \sin^3 x + \sin^5 x + \dots$ when $x \in (-\pi/2, \pi/2)$, is

(a) $(0, 1)$ (b) R (c) $(-2, 2)$ (d) None of these

17. If n is a positive integer and $C_k = {}^n C_k$, then

$\sum_{k=1}^n k^3 \left(\frac{C_k}{C_{k-1}}\right)^2$ equals

(a) $\frac{n(n+1)(n+2)}{12}$ (b) $\frac{n(n+1)^2(n+2)}{12}$

(c) $\frac{n(n+1)(n+2)^2}{12}$ (d) None of these

18. The condition that one root of the equation $ax^2 + bx + c = 0$ may be double of the other, is

(a) $b^2 = 9ac$ (b) $2b^2 = 9ac$ (c) $2b^2 = ac$

(d) $b^2 = ac$

19. The number of rational point (s) (a point (a, b) is rational, if a and b both are rational numbers) on the circumference of a circle having centre (π, e) is

(a) At most one (b) At least two (c) Exactly two
(d) Infinite

20. If $x = y \cos \frac{2\pi}{3} = z \cos \frac{4\pi}{3}$, then $xy + yz + zx$ is equal to.....

21. If $n \in N$, then $3^{2n} + 7$ is divisible by