Admission Tech

Islamic University of Technology (IUT)

Question bank 2019

IUT Admission Test 2018-2019

01. A block of mass 3kg slides down a frictionless inclined plane of length 6m and height 4m. If the block is released from rest at the top of the inclined plane, what is its speed when it reaches the bottom?

(a) $9.78ms^{-1}$ (b) $5.42ms^{-1}$ (c) $8.85ms^{-1}$ (d) $10ms^{-1}$

Solution: (c); $E_p = E_k$; $mgh = \frac{1}{2}mv^2 \Rightarrow v = \sqrt{2gh} = \sqrt{2 \times 9.8 \times 4} = 8.85m/s$

02. A satellite is currently orbiting Earth in a circular orbit of radius R with velocity, v_1. Its kinetic energy is K_1. If the satellite is moved and enters into a new circular orbit of radius 2R and moving with the same speed, what will be its kinetic energy?

(a) $\frac{K_1}{4}$ (b) $\frac{K_1}{2}$ (c) K_1 (d) $2K_1$

Solution: (c); $E_k = \frac{1}{2}mv^2$; Velocity is constant (as per question) So, E_k is same.

03. A student measures the maximum speed of a block undergoing simple harmonic oscillations of amplitude A on the end of an ideal spring. If the block is replaced by one with twice the mass but the amplitude of its oscillations remains the same, then the maximum speed of the block will-

(a) decrease by a factor of 4 (b) decrease by a factor of 2

(c) decrease by a factor of $\sqrt{2}$ (d) remain the same

Solution: (c); $k = m\omega^2 \therefore m_1\omega_1^2 = m_2\omega_2^2$ [Spring is not replaced] ; $\frac{\omega_1}{\omega_2} = \sqrt{\frac{m_2}{m_1}}$

$\therefore \omega_2 = \sqrt{\frac{m_1}{m_2}}\omega_1 = \sqrt{\frac{m_1}{2m_1}}\omega_1 = \frac{\omega_1}{\sqrt{2}}$

Now, $V_{max} = \omega A \therefore V_{max(1)} = \omega_1 A = \sqrt{2}\omega_2 A = \sqrt{2}\,V_{max(2)} \therefore V_{max(2)} = \frac{V_{max(1)}}{\sqrt{2}}$

04. Water has the specific heat 4.186 kJ/kg°C, a boilling point of 100°C, and a heat of vaporization of 2260kJ/kg. A sealed beaker contains 100g of water that is initially at 20°C. How much heat is required to bring the water to its boiling point?

(a) 30kJ (b) 33kJ (c) 226kJ (d) 230kJ

Solution: (b); $\theta = ms\Delta\theta = 0.1 \times 4.186 \times 80 = 33kJ$ (approx)

05. Which of the following best approximates the energy of a photon whose wave length is $2.0 \times 10^{-9}m$? [Planck's constant, h, has a value of $6.6 \times 10^{-34}J.s$]

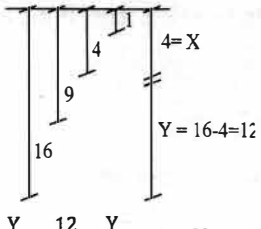
(a) $4 \times 10^{-51}J$ (b) $1 \times 10^{-34}J$ (c) $1 \times 10^{-16}J$ (d) $1 \times 10^{34}J$

Solution: (c); $E = \frac{hc}{\lambda} = \frac{6.6\times10^{-34}\times3\times10^{8}}{2\times10^{-9}} = 9.9 \times 10^{-17} \approx 10^{-16}J$

06. A particle is moving from rest in uniform acceleration. It travels a distance 'X' in the first two seconds and distance 'Y' in the next two seconds, then-

(a) Y = X (b) Y = 2X (c) Y = 3X (d) Y = 4X

Solution: (c); Galileo's 3rd Law $s \propto t^2$



$\frac{Y}{X} = \frac{12}{4}$; $\frac{Y}{X} = 3$; $Y = 3X$

07. Ali has a weight of 100N. What is his weight in a roller coaster moving downwards with acceleration $a = 0.3g$? [Here, $g = 9.8ms^{-2}$]

(a) 100N (b) 130N (c) 30N (d) 70N

Solution: (d); $g' = g - a = g - 0.3g = 0.7g \therefore w' = \frac{w}{g} \times g' = \frac{w}{g} \times 0.7g = w \times 0.7 = 70N$

08. A Carnot engine whose sink is at 300 K has an efficiency of 40%. By how much should the temperature of source be increased, so as to increase its efficiency by 50% of original efficiency?

(a) 275 K (b) 300 K (c) 250 K (d) 380 K

Solution: (c); $1 - \frac{T_1}{T_2} = 0.4 = \eta_1 ; \frac{T_1}{T_2} = 0.6 = T_2 = \frac{300}{0.6} = 500K$

$\eta_2 = \eta_1 \times 1.5 = 0.4 \times 1.5 = 0.6 \therefore 1 - \frac{T_1}{T_3} = 0.6$

$\therefore T_3 = \frac{T_1}{0.4} = \frac{300}{0.4} = 750 \therefore \Delta T = 750 - 500 = 250K$

09. Object 1 moves toward object 2, whose mass is twice that of object 1 and which is initially at rest After their impact, the objects lock together and move with what fraction of object 1's initial kinetic energy?

(a) $\frac{1}{18}$ (b) $\frac{1}{9}$ (c) $\frac{1}{6}$ (d) $\frac{1}{3}$

Solution: (d); $m_1u_1 + m_2u_2 = (m_1 + m_2)v \Rightarrow m_1u_1 + 0 = (m_1 + 2m_1)v \therefore v = \frac{u_1}{3}$

$\therefore E_{k_2} = \frac{1}{2}(m_1 + m_2)v^2 = \frac{1}{2}(m_1 + 2m_1)\left(\frac{u_1}{3}\right)^2 = \frac{1}{2}m_1u_1^2 \times \frac{1}{3} = E_{k_1} \times \frac{1}{3}$

10. The half-life of one isotope of radium is about 1600 years. In a given sample of this isotope, 15/16 of the radium atoms will decay in a time most nearly equal to-

(a) 1000 years (b) 1600 years (c) 3200 years (d) 6400 years

Solution: (d); $T_{1/2} = 1600$ years.

We know, $N = N_0e^{-\lambda t} \Rightarrow 1 - \frac{15}{16} = e^{-\frac{\ln 2}{T_{1/2}}t} \Rightarrow \frac{1}{16} = e^{-\frac{\ln 2}{1600}t} \Rightarrow t = 6400$ years

Alternate: After n^{th} half-life $\frac{1}{2^n}$. So, $\frac{1}{16}$ will be left after $n = 4, 4 \times 1600 = 6400$ years

11. Which of the followings is true of the magnetic field produced by a current in a long-straight wire? [Ans: d]

(a) The field increases in strength as the distance from the wire increases.

(b) The field lines are directed parallel to the wire, but opposite to the direction of the current.

(c) The field lines are directed radially outward from the wire.

(d) The field lines form circles about the wire.

12. An object is placed 60cm from a spherical convex mirror. If the mirror forms a virtual image 20cm from the mirror, what is the magnitude of the mirror's radius of curvature?

(a) 7.5 cm (b) 15 cm (c) 30 cm (d) 60 cm

Solution: (d); Since it is a virtual image, $v = -20cm$.

$u = 60cm$. We know, $\frac{1}{u} + \frac{1}{v} = \frac{2}{r} \Rightarrow \frac{1}{60} - \frac{1}{20} = \frac{2}{r} \Rightarrow r = 60cm$

13. The image created by a converging lens is projected onto a screen that is 60 cm from the lens. If the height of the image is $\frac{1}{4}$ of the height of the object, what is the focal length of the lens?

(a) 36 cm (b) 45 cm (c) 48 cm (d) 72 cm

Solution: (c); $\frac{1}{4} = \frac{v}{u} \Rightarrow v = \frac{u}{4}$; $v = 60cm. u = 240cm.$

$\therefore f = \left(\frac{1}{u} + \frac{1}{v}\right)^{-1} = 48cm.$

14. Ice, which has a temperature of 0°C, is added to 500 gm of water that has a temperature of 100°C. Ice is continually added to the system until it has all melted and no more ice will melt. What is the temperature of the water in the system?

(a) 50°C (b) 4°C (c) 4.184° (d) 0°C

Solution: (d); General logic. As no more ice will melt, temperature will be 0°C.

15. Two objects, mass of one object is 3 kg which is moving with a speed of $2ms^{-1}$ and the mass of other is 5 kg and speed is $2ms^{-1}$, move toward each other and collide head-on. If the collision is perfectly inelastic, find the speed of the objects after the collision.

(a) $0.25ms^{-1}$ (b) $0.5ms^{-1}$ (c) $0.75ms^{-1}$ (d) $1ms^{-1}$

Solution: (b); Since the collision is perfectly inelastic, the objects will move stitching together.

$m_1u_1 + m_1u_2 = m_1v_1 + m_2v_2 \Rightarrow 3 \times 2 - 5 \times 2 = (m_1 + m_2)v \Rightarrow |v| = \left|\frac{3\times2-5\times2}{8}\right| m/s = \frac{1}{2} m/s.$

16. In a common emitter configuration of n-p-n transistor the base current is 5% of the emitter current. Find out the current amplification factor (β) and the current gain (α).

(a) $\alpha = 19, \beta = 0.95$ (b) $\alpha = 0.95, \beta = 19$ (c) $\alpha = 0.90, \beta = 18$ (d) None

Solution: (a); $I_B = 5\%\, I_E$; $I_C = I_E - I_B = 95\%\, I_E$

$\beta = \frac{I_C}{I_B} = \frac{95\%I_E}{5\%I_E} = 19. \alpha = \frac{I_C}{I_E} = \frac{95\%I_E}{I_E} = 0.95$

17. A total charge of 7.5×10^{-6}C is distributed on two different small metal spheres. When the spheres are 6.0cm apart, they feel a repulsive force of 20.0 N. How much charge is in each sphere?

(a) 7.21 μC, 0.29 μC (b) 3.5 μC, 4.0 μC (c) 6.21 μC, 1.29 μC (d) 2.55 μC, 4.95 μC

Solution: (c); Let, the charges are q, $(7.5 \times 10^{-6} - q)$

$\therefore F = \frac{1}{4\pi\epsilon_o} \cdot \frac{q(7.5\times10^{-6}-q)}{r^2} \Rightarrow 20 = \frac{1}{4\pi\epsilon_o} \times \frac{q(7.5\times10^{-6}-q)}{(0.06)^2} \Rightarrow q = 1.29\mu C$

$\therefore$ Charges are: $1.29\mu C, 6.21\mu C$.

18. The velocity of a particle of charge $+4.0 \times 10^{-9}$C and mass 2×10^{-4}kg is perpendicular to a 0.1-tesla magnetic field. If the particle's speed is $3 \times 10^4 ms^{-1}$, what is the acceleration of this particle due to the magnetic force?

(a) $0.0006ms^{-2}$ (b) $0.006ms^{-2}$ (c) $0.06ms^{-2}$ (d) None of the above

Solution: (c); $F = ma \Rightarrow qvB = ma \Rightarrow a = \frac{qvB}{m} = \frac{4\times10^{-9}\times3\times10^4\times0.1}{2\times10^{-4}} = 0.06 m/s^2$

19. Due to the magnetic force, a positively charged particle executes uniform circular motion within a uniform magnetic field, B. If the charge is q and the radius of its path is r, which of the following expressions gives the magnitude of the particle's linear momentum?

(a) qBr (b) $\frac{qB}{r}$ (c) $\frac{q}{Br}$ (d) $\frac{B}{qr}$

Solution: (a); $F = \frac{mv^2}{r} \Rightarrow qvB = \frac{mv^2}{r} \Rightarrow mv = qBr$

20. A train at rest has a length of 100m. At what speed must it approach a tunnel of length 80m so that an observer at rest with respect to the tunnel will see that the entire train is in the tunnel one time?

(a) $1.5 \times 10^8 ms^{-1}$ (b) $2.4 \times 10^8 ms^{-1}$ (c) $1.92 \times 10^8 ms^{-1}$ (d) $1.8 \times 10^8 ms^{-1}$

Solution: (d); $l = l_0\sqrt{1 - \frac{v^2}{c^2}} \Rightarrow \sqrt{1 - \frac{v^2}{c^2}} = 0.8$; $1 - \frac{v^2}{c^2} = 0.64$; $\frac{v^2}{c^2} = 0.36$

$\therefore v = 0.6 \times c = 1.8 \times 10^2 m/s$

21. A washing machine, staring from rest, accelerates within 3.14s to a point where it is revolving at a frequency of 2.00 Hz. Its angular acceleration is mostly near to-

(a) $0.100\ rad/s^2$ (b) $0.637\ rad/s^2$ (c) $2.00\ rad/s^2$ (d) $4.00\ rad/s^2$

Solution: (d); $\omega_f = 2\pi f = 4 \times 3.14$; $\alpha = \frac{\omega_f - \omega_i}{t} = \frac{4\times3.14-0}{3.4} = 4\ rad/s^2$

22. A total of 100 J of energy is supplied to a machine. The machine is then capable of displacing a 30N object to 1.5m. What is the approximate efficiency of the machine?

(a) 45% (b) 20% (c) 30% (d) 15%

Solution: (a); $w_{out} = Fs = 30 \times 1.5 = 45$; $\eta = \frac{w_{out}}{w_{in}} \times 100 = \frac{45}{100} \times 100 = 45\%$

23. A 60 kg student goes on a ride at an amusement park that spins quickly. Then the floor drops out. If the ride has a radius of 2.5m and makes 10 revolutions in 32.3 s, what is the centripetal force acting on the student?

(a) 155 N (b) 194 N (c) 232 N (d) 567 N

Solution: (d); $\omega = 2\pi f = 2\pi \times \frac{10}{32.3}$; $F = mw^2r = 60 \times \left(\frac{2\pi\times10}{32.3}\right)^2 \times 2.5 = 567N$

24. In a mechanical workshop there are 5 grinding machines installed over the circumference of a cricle of radius 5m. When one machine is running, a listener at the center hears sound with 90 dB intensity. When all the machines are running simultaneously, what would be the sound intensity felt by the same listener?

(a) 93 dB (b) 95 dB (c) 97 dB (d) 99 dB

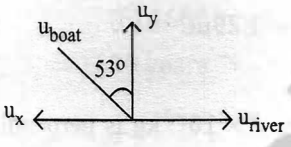
Solution: (c); $I_2 = 5 \times I_1$

$\therefore \beta_2 = 10\log(5 \times I_1) = 10\log(5) + 10\log I_1 = 6.9 + 90 = 97$ dB (approx)

25. A river flows toward the east. You head your boat 53^o west of north and achieve a velocity of $6.0ms^{-1}$ due north relative to the shore. What is your speed relative to the water?

(a) $8\ ms^{-1}$ (b) $6\ ms^{-1}$ (c) $10\ ms^{-1}$ (d) $12\ ms^{-1}$

Solution: (c);



$u_x = u_{river}$; $\tan53° = \frac{u_x}{u_y} = u_x = \tan53° u_y = \tan53° \times 6 = 8ms(approx) = u_{river}$

$u_{relative} = \sqrt{8^2 + 6^2 + 2.8.6\cos90°} = 10$ m/s

26. $\vec{F} = (-2\hat{i} + 3\hat{j} + 4\hat{k})$N force is applied on a particle and the particle moves from $(3, -4, -2)$ to $(-2,3,5)$. What is the amount of work done?

(a) 7 J (b) 59 J (c) 49 J (d) 59 N

Solution: (b); $\vec{r} = (-2-3)\hat{i} + (3+4)\hat{j} + (5+2)\hat{k} = -5\hat{i} + 7\hat{j} + 7\hat{k}$

$\therefore \vec{F}.\vec{r} = (-2\hat{i} + 3\hat{j} + 4\hat{k}) \cdot (-5\hat{i} + 7\hat{j} + 7\hat{k}) = 10 + 21 + 28 = 59$ J

Alternate: $F = \sqrt{2^2 + 3^2 + 4^2} = 5.385$; $r = \sqrt{5^2 + 7^2 + 7^2} = 11.09$ $\therefore W = Fr = 59J$

27. The displacement of a moving particle is given by the equation $x = 3t^3 + 5t^2 + 4t$ m. What is the acceleration of the particle at t = 2 s?

(a) $44\ ms^{-2}$ (b) $45\ ms^{-2}$ (c) $46\ ms^{-2}$ (d) $47\ ms^{-2}$

Solution: (c); $x = 3t^3 + 5t^2 = 4t$; $a = \frac{d^2x}{dt^2} = 18t + 10$ at $t = 2s, a = 18 \times 2 + 10 = 46m/s^2$

28. A change of current from 2.0 A to 2.5 A in 2 seconds induces 10 mV between the terminals of the coil. What is the co-efficient of self-induction of this coil?

(a) 20 mH (b) 30 mH (c) 40 mH (d) 50 mH

Solution: (c); $E = L\frac{dI}{dt}$; $L = \frac{E}{\frac{dI}{dt}} = \frac{10mV}{0.5/2} = 40$ mH

29. A soccer ball, at rest on the ground, is kicked with an initial velocity of $10 ms^{-1}$ at a launch angle of 30^o. Calculate its total flight time, assuming that air resistance is negligible.

(a) 0.5 s (b) 1 s (c) 1.7 s (d) 2 s

Solution: (b); $T = \frac{2V_o \sin\theta_o}{g} = \frac{2\times10\sin30}{9.8} = 1.02 \approx 1s$ (Ans)

30. A 91 kg man's thighbone has a relaxed length of 0.50m, a cross-sectional area of $7.0 \times 10^{-4} m^2$ and a young's modulus of $1.1 \times 10^{11} N/m^2$. By how much does the thighbone compress when the man is standing on both feet?

(a) 4.26 cm (b) 4.26 μm (c) 3.25 cm (d) 3.25 μm

Solution: (No correct answer); $Y = \frac{FL}{A\Delta l} \Rightarrow \Delta l = \frac{FL}{AY} = \frac{\left(\frac{91\times9.8}{2}\right)\times0.5}{7\times10^{-4}\times1.1\times10^{11}} = 2.895 \times 10^{-6} m$

31. Resistors $R_1 = 5\Omega$ and $R_2 = 10\Omega$ are connected in series to a voltage source $E = 60V$. What is the ratio between the power dissipation in R_2 and the power dissipation in R_1?

(a) 1 (b) 2 (c) 3 (d) 4

Solution: (b); Since the resistors are connected in series. Combination, the current, will be same.

We know, $P = I^2R \therefore \frac{P_2}{P_1} = \frac{R_2}{R_1} = \frac{10}{5} = 2$

32. A galvanometer with internal resistance of 100Ω can measure 100 μA at full deflection. What resistance must be connected in parallel to it to make it an ammeter that can measure up to 100 A.

(a) 1 mΩ (b) 2 mΩ (c) 3 mΩ (d) 4 mΩ

Solution: (No correct answer); We know, $S = \frac{G}{n-1} \Rightarrow S = \frac{100\Omega}{\frac{100A}{100\times10^{-6}A}-1} = 0.1m\Omega$

33. A person on the street wants to throw an 8 kg book up to a person leaning out of a window 5 m above street level. At what velocity the person should throw the book so that it reaches the person in the window?

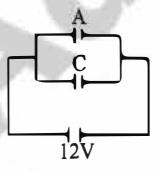
(a) $5 ms^{-1}$ (b) $8 ms^{-1}$ (c) $10 ms^{-1}$ (d) $40 ms^{-1}$

Solution: (c); We know, $v^2 = u^2 - 2gh \Rightarrow 0^2 = u^2 - 2gh \Rightarrow u = \sqrt{2gh} = \sqrt{2\times10\times5} = 10m/s$

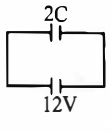
34. Two identical capacitors are arranged in a circuit. What is the ratio of the energy stored when the capacitors are in series and when they are in parallel with 12 V DC source?

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

Solution: (a); In Parallel:

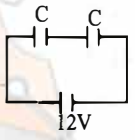


$\Rightarrow$



$U_1 = \frac{1}{2}(2C) \times 12^2$

In Series:



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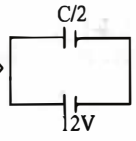


$U_2 = \frac{1}{2} \times \left(\frac{C}{2}\right) \times 12^2$

$\therefore U_2/U_1 = \frac{\frac{1}{2}(C/2)\times12^2}{\frac{1}{2}(2C)\times12^2} = \frac{1}{4}$ (Ans.)

35. A transformer has 50 turns in the primary winding and 100 turns in the secondary. An electrical lamp that takes 0.5 A of current is connected to its secondary. What is the current at the primary of the transformer?

(a) 1.5 A (b) 0.75 A (c) 1.0 A (d) 0.25 A

Solution: (c); $N_p = 50$; $N_s = 100$; $I_s = 0.5A$

$\therefore \frac{I_p}{I_s} = \frac{N_s}{N_p} \Rightarrow I_p = 0.5 \times \frac{100}{50} = 1A$

36. For what value of K will the three lines $x-y+5=0, x+y=-0$, and $Kx-y+13=0$ be concurrent?

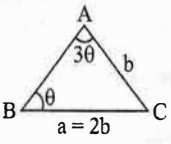
(a) 1 (b) 5 (c) 7 (d) 3

Solution: (b); $x-y+5=0$ ..... (i) $x+y-1=0$ .... (ii)

Solving (i) & (ii) We get, intersecting point $(-2,3)$

$\therefore k\times(-2)-3+13=0 \Rightarrow k=5$

37. In $\Delta ABC, a=2b$ and $\angle A=3\theta$, what is the value of θ?



(a) 60^o (b) 30^o (c) 150^o (d) 90^o

Solution: (b); Applying sine rule we get,

$\frac{a}{\sin A}=\frac{b}{\sin B}\Rightarrow\frac{2b}{\sin 3\theta}=\frac{b}{\sin\theta}\Rightarrow 2\sin\theta=\sin 3\theta\Rightarrow 2=3-4\sin^2\theta\Rightarrow\sin\theta=\frac{1}{2}\Rightarrow\theta=30^\circ$ (Ans.)

38. If $f(x)=\sin x$ then what is the value of $\lim_{x\to 0}\frac{f(x^2)}{x}=?$

(a) -1 (b) 0 (c) 1 (d) Undefined

Solution: (b); $\lim_{x\to 0}\frac{f(x^2)}{x}=\lim_{x\to 0}\frac{\sin(x^2)}{x}\left[\frac{0}{0}\text{form}\right]$

[L'hospital]$\Rightarrow\lim_{x\to 0}\frac{\cos x^2.2x}{1}=2\times 0\times\cos 0^\circ=0$

39. $\int_{1/2}^{1}\frac{dx}{x\sqrt{4x^2-1}}=?$

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\frac{3}{2}$ (d) $\frac{2}{3}$

Solution: (a); $\int_{1/2}^{1}\frac{dx}{x\sqrt{4x^2-1}}$; Let, $x=\frac{1}{z}\Rightarrow dx=-\frac{1}{z}.dz$

x	1/2	1
z	2	1

$=\int_2^1\frac{-\frac{1}{z^2}dz}{\frac{1}{z}\sqrt{\frac{4}{z^2}-1}}=\int_2^1\frac{dz}{\sqrt{4-z^2}}=\int_1^2\frac{dz}{\sqrt{2^2-z^2}}=[\sin^{-1}z/2]_1^2$

$=\sin^{-1}1-\sin^{-1}\frac{1}{2}=\frac{\pi}{2}-\frac{\pi}{6}=\frac{\pi}{3}$ (Ans.)

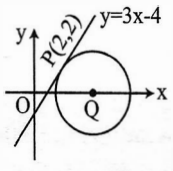
[**Warning:** Cannot be solved by directly using calculator]

40. Sum of the following series up to infinity is- $0.5+0.05+0.005+\cdots$

(a) $\frac{10}{55}$ (b) $\frac{1}{5}$ (c) $\frac{5}{9}$ (d) $\frac{55}{100}$

Solution: (c); $0.5+0.05+\cdots$; $a=0.5$; $r=0.1$ $\therefore S_r=\frac{a}{1-r}=\frac{0.5}{1-0.1}=\frac{0.5}{0.9}=\frac{5}{9}$(Ans.)

41. If $y=3x-4$ is a tangent and touches the circle at P(2,2). Q is the center of the circle then slope of diameter directed towards P is-



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

Solution: (a); Diameter $\perp$ tangent $[y=3x-4]$

$m_{tangent}=3$; $m_{diameter}=-\frac{1}{3}(m_1m_2=-1)$

42. If the order of the matrices A, B and C are $4 \times 5, 5 \times 4$ and 5×2, respectively, what will be the order of matrix of $(B^T + A)C$?

(a) 5×4 (b) 4×2 (c) 5×2 (d) 2×4

Solution: (b); $(BT_{4\times5} + A_{4\times5}) \times C_{5\times2} = X_{4\times2}$

43. For what value of r, the co-efficient of the terms $(r+1)^{th}$ and $(r+2)^{th}$ will be equal in the expansion of $\left(2x^2 + \frac{3}{x}\right)^{19}$?

(a) 11 (b) 13 (c) 14 (d) 10

Solution: (a); $\left(2x^2 + \frac{3}{x}\right)^{19}$ As per question ${}^{19}C_r(2)^{19-r}(3)^r = {}^{19}C_{r+1}2^{18-r}3^{r+1}$

$\Rightarrow \frac{{}^{19}C_r}{{}^{19}C_{r+1}} = \frac{3}{2} \Rightarrow \frac{r+1}{19-r} = \frac{3}{2} \Rightarrow 2p + 2 = 57 - 3r \Rightarrow 5r = 55 \Rightarrow r = 11$ (Ans.)

44. If $A = R - \{3\}, B = R - \{1\}$ and a function $f: A \to B$ is defined by $f(x) = \frac{x-2}{x-3}$. What is the value of $f^{-1}(0)$?

(a) -1 (b) 2 (c) -2 (d) 1

Solution: (b); Let, $f^{-1}(0) = z, f(z) = 0$

Again, $f(z) = \frac{z-2}{z+3} = 0$ $\boxed{Z = 2}$

45. If $ab = |a| \times |b|$, which of the following must be true? [Ans: b]

(i) $a = b$

(ii) $a > b$ and $b > 0$

(iii) $ab > 0$

(a) ii (b) iii (c) i, iii (d) ii, iii

46. If three roots of $f(x) = 0$ are $1, -1, 2$ the roots of $f(2x) = 0$ are-

(a) $-\frac{1}{2}, \frac{1}{2}, 1$ (b) $\frac{1}{2}, -\frac{1}{2}, -1$ (c) $2, -2, 4$ (d) $0, 1, -2$

Solution: (a); $f(x) = (x-1)(x+1)(x-2) \therefore f(2x) = (2x-1)(2x+1)(2x-2)$

$f(2x) = 0$; $(2x-1)(2x+1)(2x-2) = 0 \therefore x = \frac{1}{2}, -\frac{1}{2}, 1$

47. $5y = x + 50$ is the tangent of $y^2 = 4ax$, then focus of the parabola is-

(a) (1,0) (b) (10,0) (c) (2,0) (d) (5,0)

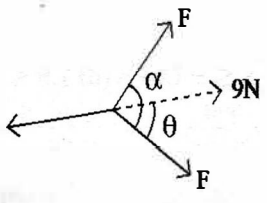
Solution: (c); $5y = x + 50 \Rightarrow y = \frac{x}{5} + 10$ $y = 4ax$

$\therefore m = \frac{1}{5}$ $e = 10$; $c = \frac{a}{m} \Rightarrow a = cm = \frac{10}{5} = 2$; focus $\equiv (a, 0) \equiv (2, 0)$

48. Two equal forces acting at a point at 60^0 are balanced by a force 9N acting on the same point. Value of each of the equal forces-

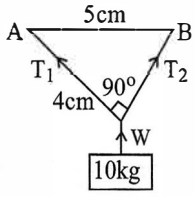
(a) 3 N (b) $\sqrt{3}$ N (c) 7 N (d) $3\sqrt{3}$ N

Solution: (d);



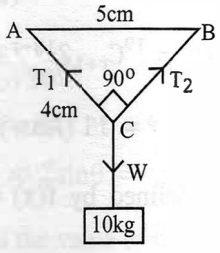
$\alpha = 60°$; $\theta = \frac{60}{2} = 30°$; $2F\cos\theta = g$; $2 \times F \times \frac{\sqrt{3}}{2} \Rightarrow F = \frac{9}{\sqrt{3}} = 3\sqrt{3}N$

49. A balance is formed at the point C due to actions of T_1, T_2 and W = 10kg-weight. Tension T_1 =?



(a) 6 kg (b) 4 kg (c) 8 kg (d) 10 kg

Solution: (a); Applying Pythagorean theorem, we get, $BC = \sqrt{5^2 - 4^2}\text{cm} = 3\text{cm}$



Since the system is in elvuilibrium lami's theorem implies

$\Rightarrow \frac{W}{\sin 90°} = \frac{T_1}{\sin(90°+B)} \Rightarrow T_1 = W\cos B = W \times \frac{3}{5} = \left(10 \times \frac{3}{5}\right)\text{kg} - \omega t = 6\text{kg} - \omega t.$

50. If a 3 digit number formed by 1, 0, 2 is selected at random then what is the probability of the number being divisible by 10 (without replacement)?

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{2}{3}$ (d) $\frac{1}{6}$

Solution: (a); The one's digit has to be 0. Probability $= \frac{2!}{2\times 2} = \frac{1}{2}$

Alternate: $\frac{2!}{3!-2!} = \frac{1}{2}$ (Ans.)

51. Which one is correct for the partial fractions of $\frac{5}{(x-1)(3x+2)}$?

(a) $\frac{1}{x-1} - \frac{3}{3x+2}$ (b) $\frac{1}{x-1} + \frac{3}{3x+2}$ (c) $\frac{3}{x-1} - \frac{5}{3x+2}$ (d) $\frac{2}{x-1} - \frac{6}{3x+2}$

Solution: (a); $\frac{5}{(x-1)(3x+2)}$

Applying thumbs'-rule: $\frac{5}{(x-1)(3x+2)} = \frac{5}{(x-1)(3\times 1+2} + \frac{5}{(-\frac{2}{3}-1)(3x+2)} = \frac{1}{x-1} - \frac{3}{3x+2}$

52. Points $\vec{A}$ and $\vec{B}$ lie on a straight line $\vec{\ell}$ relative to a fixed origin O. Point $\vec{A}$ has position vector $\hat{i} - 3\hat{j} + 2\hat{k}$, point $\vec{B}$ has position vector $-2\hat{i} + 2\hat{j} - \hat{k}$ and point $\vec{C}$ has position vector $2\hat{i} + p\hat{j} - 4\hat{k}$ with respect to O, where p is a constant. Given that $\overrightarrow{AC}$ is perpendicular to $\vec{\ell}$. Find the value of p.

(a) 16 (b) 3 (c) 12 (d) −6

Solution: (d); $\overrightarrow{AC}$ vector: $\hat{i} + (p+3)\hat{j} - 6\hat{k}$; $\vec{\ell}$ vetor: $(-3\hat{i} + 5\hat{j} - 3\hat{k})$

$\therefore \overrightarrow{AC}.\vec{l} = 0 \Rightarrow \left(-3\hat{i} + 5\hat{j} - 3\hat{k}\right).\left(\hat{i} + (p+3)\hat{j} - 6\hat{k}\right) = 0$

$\Rightarrow -3 + 5p + 15 + 18 = 0 \Rightarrow p = -\frac{30}{5} = -6$

53. Which one is correct for the inequality $3 \le -6 - 5x < 12$.

(a) $12 \le x \le -6$ (b) $1.6 \le x \le -8.8$ (c) $-3.6 \le x \le -1.8$ (d) $1.8 \le x \le -3.6$

Solution: (c); $3 \le -6 - 5x \le 12$

$3 \le -6 - 5x \Rightarrow 5x \le -9 \Rightarrow x \le -\frac{9}{5} \Rightarrow \le -1.8$

and $-6 - 5x \le 12 \Rightarrow 5x \ge -18 \Rightarrow x \ge -3.6$

Combining these, we get: $-3.6 \le x \le -1.8$ (Ans.)

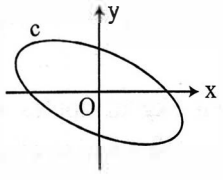
54. Find $\ln(r)$, where $r = \sqrt[3]{\frac{3V}{4\pi}}$.

(a) $\ln(V) - \ln(4) - \ln(\pi)$ (b) $\frac{1}{2}[\ln(3) - \ln(V) - \ln(4) - \ln(\pi)]$

(c) $\frac{1}{3}[\ln(3) + \ln(V) + \ln(4) + \ln(\pi)]$ (d) $\frac{1}{3}[\ln(3) + \ln(V) - \ln(4) - \ln(\pi)]$

Solution: (d); By Definition of logarithm.

55. In the following figure, the curve C has the parametric equations-
$x = 4\cos\left(t + \frac{\pi}{6}\right), y = 2\sin t, 0 \le t \le 2\pi$; Find $x + y$.



(a) $1\sqrt{3}\sin t$ (b) $2\sqrt{3}\cos t$ (c) $2\sqrt{3}\sin t$ (d) $1\sqrt{3}\cos t$

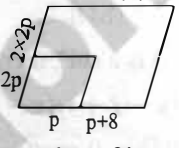
Solution: (b); $x = 4\cos\left(t + \frac{\pi}{6}\right) = 4\cos t\cos\frac{\pi}{6} - 4\sin t\sin\frac{\pi}{6} = 2\sqrt{3}\cos t - 2\sin t.$

$= 2\sqrt{3}\cos t - y \Rightarrow x + y = 2\sqrt{3}\cos t.$ (Ans.)

56. Two forces 2p and p are acting on a body. If the first force is doubled and second force is increased by 8 unit, then the direction of the resultant remains unchanged. What is the value of p?

(a) 16 (b) 8 (c) 4 (d) 2

Solution: (b); $\frac{2p}{p} = \frac{2\times(2p)}{p+8} \Rightarrow 2 = \frac{2\times4p}{p+8} \Rightarrow p + 8 = 2p \Rightarrow p = 8$

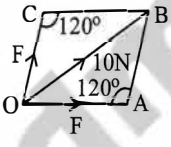


57. The role of volume increase of a spherical ball is how many times to that of its radius?

(a) 4 (b) $4\pi r^2$ (c) πr^2 (d) $2\pi r$

Solution: (b); $\frac{dv}{dt} = \frac{d}{dt}\left(\frac{4}{3}\pi r^3\right) = \frac{4}{3}\pi \times 3r^2\frac{dr}{dt} = 4\pi r^2\frac{dr}{dt}$

58. In figure OABC is a rhombus



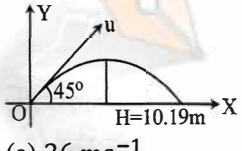
What is the value of F

(a) $\frac{10\sqrt{10}}{\sqrt{3}}$N (b) $\frac{10\sqrt{30}}{\sqrt{10}}$N (c) $\frac{10\sqrt{10}}{\sqrt{30}}$N (d) $\frac{10\sqrt{3}}{\sqrt{10}}$N

Solution: (c); $\angle AOC = 60°$; $\theta = \frac{1}{2}\angle AOC = 30°$; $2F\cos\theta = 10 \therefore \sqrt{3}\times F = 10$

$\therefore F = \frac{10}{\sqrt{3}} = 10\times\sqrt{\frac{10}{30}} = \frac{10\sqrt{10}}{\sqrt{30}}$N

59. What is the initial velocity of the projectile body?



(a) 36 ms^{-1} (b) 20 ms^{-1} (c) 18 ms^{-1} (d) 10 ms^{-1}

Solution: (b); $H = \frac{u^2\sin^2\theta}{2g}$; $u^2 = \frac{2gH}{\sin^2\theta} \Rightarrow u = \frac{\sqrt{2gH}}{\sin\theta} = \frac{\sqrt{2\times9.8\times10.19}}{\frac{1}{\sqrt{2}}} = 20\text{m/s}$

60. The current, I amps, in an electric circuit at time t seconds is given by $I = 16 - 16(0.5)^t, t \ge 0$. What is the value of dI/dt when $t = 3$?

(a) $\ln 4$ (b) $\ln 2$ (c) $\ln 16$ (d) $\ln 8$

Solution: (a); $\frac{dI}{dt} = \frac{d}{dt}[16 - 16(0.5)^t] = -16(0.5)^t \times \ln(0.5)$

at $t = 3, \frac{dI}{dt} = -16(0.5)^3 \times \ln(0.5) = -2\ln(0.5) = 2\ln 2 = \ln 4$

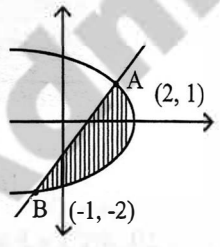
61. An encyclopedia has eight volumes. In how many ways can the eight volumes be replaced on the shelf?
(a) 40320 (b) 5040 (c) 362880 (d) 720
Solution: (a); $8! = 40{,}320$

62. A password consists of two letters of the alphabet followed by three digits chosen from 0 to 9. Repeats are allowed. How many different possible passwords are there?
(a) 26000 (b) 676000 (c) 36000 (d) 488800
Solution: (b); $26^2 \times 10^3 = 676000$

63. Alal and Dulal shopped at the same store. Alal bought 5kg of apples and 2kg of bananas and paid altogether BDT22. Dulal bought 4kg of apples and 6kg of bananas and paid together BDT 33. Find the cost of 1kg of bananas.
(a) BDT 3.5 (b) BDT 3 (c) BDT 2.5 (d) BDT 4.5
Solution: (a); cost of 1 apple → x ; cost of 1 banana = y
As per Ovestion $5x + 2y = 22$; $4x + 6y = 33$
Solving, $x = 3$; $y = 3.5$ (Ans.)

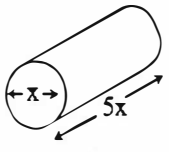
64. $(2 - i)$ is a solution of $x^2 - 4x + k = 0$. Find the value of k.
(a) $5 + 8i$ (b) 8 (c) $8 + 5i$ (d) 5
Solution: (d); if (2 - i) is a sol^n, then (2 + i) is also the other sol^n.
$\therefore$ The eq^n will be : $(x - 2 + i)(x - 2 - i) = 0$
$\Rightarrow x^2 - 4x + [2^2 + 1^2] = 0 \Rightarrow x^2 - 4x + 5 = 0 \ \therefore k = 5$

65. Find the area of the region enclosed by the graphs $y = x - 1$ and $x = 3 - y^2$.
(a) $\frac{11}{3}$ (b) $\frac{7}{2}$ (c) $\frac{9}{2}$ (d) $\frac{13}{3}$
Solution: (c); $y = x - 1$; $x = 3 - y^2$



$\therefore$ Area, $A = \int_{-2}^{1}[(3 - y^2) - (y + 1)]dy = \frac{9}{2}$ sq. unit. (Ans.)

66. The following figure shows a right circular cylinder metal rod which is expanding as it is heated. After t seconds the radius of the rod is x cm and the length of the rod is 5x cm. The cross-sectional area of the rod is increasing at the constant rate of $0.032\ cm^2s^{-1}$. Find dx/dt when the radius of the rod is 2 cm.



(a) 0.002546 (b) 0.003546 (c) 0.022546 (d) 0.302546
Solution: (a); Cross sectional Area, $A = \pi x^2 \Rightarrow \frac{dA}{dt} = \pi . 2x . \frac{dx}{dt}$
$\Rightarrow 0.0032\ cm^2s^{-1} = 2\pi \times 2cm \times \frac{dx}{dt} \Rightarrow \frac{dx}{dt} = 2.54647 \times 10^{-3} cm/s$

67. Find the integration of the following- $\int e^x\left(\frac{1+\sin x}{1+\cos x}\right)dx$

(a) $e^{2x}.\cos x + c$ (b) $2e^x.\sin x + c$ (c) $e^x.\tan\frac{x}{2} + c$ (d) $e^{2x}.\cot\frac{x}{2} + c$

Solution: (c); $\int e^x\left(\frac{1+\sin x}{1+\cos x}\right)dx = \int e^x\left(\frac{1+\sin x}{2\cos^2\frac{x}{2}}\right)dx = \int e^x\left(\frac{1}{2}\sec^2\frac{x}{2} + \tan\frac{x}{2}\right)dx.$

$= \int\left[e^x.\tan\frac{x}{2} + e^x.\frac{d}{dx}\left(\tan\frac{x}{2}\right)\right]dx = e^x\tan\frac{x}{2} + c \left[\because \int e^x\big(f(x) + f'(x)\big)dx = e^x f(x) + c\right]$

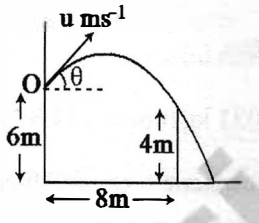
68. Along a straight horizontal road, a truck of mass 1800 kg travels. The truck's engine is working at a constant rate of 30 kW. When the truck's speed is 20 ms^{-1}, its acceleration is 0.4 ms^{-2}. The magnitude of the resistance to the motion of the truck is R newtons. Find the value of R.

(a) 640 (b) 820 (c) 780 (d) 960

Solution: (c); We know, $P = Fv \Rightarrow P = (R + ma)v$

$\Rightarrow 30 \times 10^3 = (R + 1800 \times 0.4) \times 20 \Rightarrow R = 780N$

69. A ball is thrown from a point O, which is 6m above horizontal ground. The ball is projectd with speed u ms^{-1} at an angle θ above the horizontal. There is a thin vertical post which is 4m high and 8m horizontally away from the vertical through O, as shown in following figure. The ball passes just above the top of the post 2s after projection. Find the value of tan θ.



(a) 0.8 (b) 12.2 (c) 4.6 (d) 2.2

Solution: (d); $y = x\tan\theta - \frac{1}{2}g\frac{x^2}{v_0^2\cos^2\theta} \Rightarrow y = x\tan\theta - \frac{1}{2}gt^2$

$\Rightarrow 4 - 6 = 8\tan\theta - \frac{1}{2} \times 9.8 \times 2^2 \Rightarrow -2 = 8\tan\theta - 4.9 \times 2^2 \Rightarrow \tan\theta = 2.2$

70. Abdul Hakim is the Chairman of a committee. In how many ways can a committee of 5 be chosen from 10 people given that Abdul Hakim must be one of them?

(a) 252 (b) 210 (c) 84 (d) 126

Solution: (d); $^9C_4 = 126$ (Ans.)

71. Which one of the followings precipitated hydroxides is not green?

(a) $Cr(OH)_2$ (b) $Fe(OH)_2$ (c) $Ni(OH)_2$ (d) $Co(OH)_2$

Solution: (d); $Co^{2+} \rightarrow$ pink

72. The activation energy of molecules of a reaction is 50 kJ/mol. If the temperature of the reaction increases from 27°C to 37°C, what is the change of the rate of reaction (RR)?

(a) RR becomes double (b) RR becomes half (c) RR becomes 3 times (d) RR becomes on third

Solution: (a); $\ln\frac{k_2}{k_1} = \frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right) = \frac{50{,}000}{8.316}\left(\frac{1}{300} - \frac{1}{310}\right) = \frac{k_2}{k_1} = e^{0.647} = 2$ (approx)

73. In the synthesis of ammonia using Haber-Bosch process, an increase in pressure should-

(a) Increase the production of ammonia (b) Decrease the production of ammonia

(c) Have no effect on the production of ammonia (d) None of the above

Solution: (a); $N_2 + 3H_2 = 2NH_3; \Delta n = 2 - 4 = -2$; So increase in pressure will increase the production of ammonia.

74. DNA absorption has a peak at- [Ans: c]

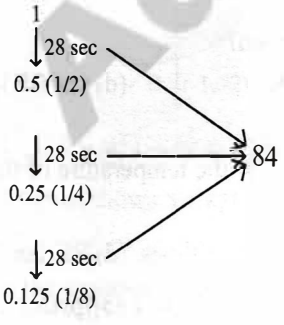
(a) 60 nm (b) 160 nm (c) 260 nm (d) 360 nm

75. Which one of the following is not true for p block elements?
(a) In a period from left to right, reducing property of the element decreases gradually.
(b) In a period from left to right, oxidizing property of the element decreases gradually.
(c) In a period from left to right, atomic sizes of the elements decrease gradually.
(d) In a same group from upwards to downwards, the reducing property of the element increases.
Solution: (b); Non-metallic property $\propto$ oxidizing capacity.

76. Which one is false?
(a) Metallic property decreases from left to right and increases downwards.
(b) Oxidizing property increases from left to right and decreases downwards.
(c) Electron affinity increases from left to right and increases downwards.
(d) Acidic property of oxides decreases from left to right and increases downwards.
Solution: (c or d); c $\rightarrow$ E. A. DECREASES DONNWARDS
d $\rightarrow$ Acidic Prop. INCREASES LEFT TO RIGHT.

77. To identify a gas in an unlabeled gas cylinder, a sample was collected and found to have density of 5.38 gm/L at 15°C and 736 mm(Hg) pressure. Atomic mass of Sn = 118.7 amu, Te = 127.6 amu, Xe = 131.3 amu and Ba = 137.3 amu. What is the gas in that unlabeled gas cylinder?
(a) Xe (b) Ba (c) Te (d) Sn
Solution: (a); $PV = nRT$; $PV = \frac{w}{M}RT$
$\therefore M = \frac{\rho RT}{P} = \frac{5.38\times8.316\times288}{\frac{736}{760}\times101325} = 0.131031$ kg mol = 131.31 gm mol $\approx$ Xe

78. At a temperature of 30°C and 1.5 atmospheric pressure, di-nitrogen tetraoxide (N_2O_4) was dissociated to 20% nitrogen dioxide. The value of K_p for the process is-
(a) 0.20 atm (b) 0.25 atm (c) 0.30 atm (d) 0.32 atm
Solution: (b); $\underset{1-\alpha}{N_2O_4} \rightarrow \underset{2\alpha}{2NO_2}$ $\therefore K_p = \frac{4x^2}{1-\alpha^2}\times p$
$P = 1.5$; $\alpha = 0.2 \Rightarrow K_p = 0.25$ atm

79. The half-life of a first order reaction is 28 seconds. In how many seconds, will the concentration of the reactant be reduced to one-eighth of the initial value?
(a) 28 (b) 56 (c) 84 (d) 112
Solution: (c);


80. What is the main product of the following reaction? $CH_2 = CH_2 + KMnO_4 \xrightarrow{H_2O}$ [Ans: b]
(a) ethanoic acid (b) ethylene glycol (c) ethyl alcohol (d) ethylene oxide

81. C_2H_5OH is oxidized to produce Z, Z reacts with C_2H_5OH to produce an ester. What is Z? [Ans: b]
(a) HCOOH (b) CH_3COOH (c) CH_3CH_2COOH (d) $CH_3COOC_2H_5$

82. Which one of the following groups will not create a negative mesomeric effect if attached to a benzene ring? [Ans: c]
(a) $-C\equiv N$ (b) $-NO_2$ (c) $-CH_3$ (d) $-SO_3H$

83. Atomic mass of Na and Ca are 23 and 40, respectively. Equal amount of electricity is passed through NaCl and $CaCl_2$ solution. What amount of Ca will be deposited if 2.3 gm of Na is deposited on cathode [Ans: c]
(a) 4 gm (b) 3 gm (c) 2 gm (d) 1 gm

84. A tube-well water was sampled for the presence of arsenic. It was found that 0.015 mg of arsenic was present in 500 mL of the tube-well water. The concentration of arsenic in the tube-well water was-
(a) 30 ppb (b) 300 ppb (c) 30 ppm (d) 300 ppm

Solution: (a); Concentration $= \frac{0.015}{0.5} mgL^{-1} = 0.03ppm = 30ppb$

85. A sample of sea water has an OH^- concentration of 1.58×10^{-4}M. The pH of the sea water is-
(a) 8.20 (b) 11.70 (c) 10.2 (d) 6.8

Solution: (c); $pOH = -\log[OH] = 3.8 \therefore pH = 10.2$

Choose the appropriate word/words for the blank/blanks to complete the sentence.

86. Though science is often imagined as a _____ exploration of external reality, scientists are no different from anyone else; they are ____ human beings enmeshed in a web of personal and social circumstances.
(a) disinterested...passionate (b) fervent...vulnerable
(c) neutral...rational (d) painstaking...careless

87. Even though Human being _____ in Certain aspects, fundamentally they are similar. [Ans: b]
(a) coexist (b) differ (c) quarrel (d) astound

88. Rather than enhancing a country's security, the successful development of nuclear weapons could serve at first to increase that country's____. [Ans: c]
(a) boldness (b) vulnerability (c) influence (d) responsibility

89. Although their initial anger had _____ somewhat, they continued to _____ the careless worker who had broken the machine. [Ans: b]
(a) blazed...assail (b) abated...berate (c) diminished...appease (d) subsided...condone

90. The renowned author's ____ disposition reflects his passion for life. [Ans: b]
(a) austere (b) animated (c) lugubrious (d) enervating

These questions (91-95) are based on a passage given below. Read the passage and choose the best answer that can be deduced from the passage directly or indirectly.

Sleep-learning experiments are notoriously difficult to conduct. For one thing, one must be sure that the subjects are actually asleep and stay that way during the "lessons". The most rigorous trials of verbal sleep learning have failed to show any new knowledge taking root. While more and more research has demonstrated the importance of sleep for learning and memory consolidation, none had managed to show actual learning of new information taking place in an adult brain during sleep.

Recently, however, researchers chose to experiment with a type of conditioning that involves **exposing** to a tone followed by an odor, so that the subjects soon exhibit a similar response to the tone as they would to the odor. The pairing of tones and odors presented several advantages. Neither wakes the sleeper (in fact, certain odors can promote sound sleep), yet the brain processes them and even reacts during slumber. Moreover, the sense of smell holds a unique non-verbal measure that can be observed-namely sniffing. The researchers found that, in the case of smelling, the sleeping brain acts much as it does when awake: We inhale deeply when we smell a pleasant aroma but stop our inhalation short when assaulted by a bad smell. This variation in sniffing could be recorded whether the subjects were asleep or awake. Finally, this type of conditioning, while it may appear to be quite simple, is associated with some higher brain areas – including the hippocampus, which is involved in memory formation.

In the experiments, the subjects slept in a special lab while their sleep state was continuously monitored. As they slept, a tone was played, followed by an odor – either pleasant or unpleasant. Then another tone was played, followed by an odor at the opposite end of the pleasantness scale. Over the course of the night, the associations were partially reinforced, so that the subject was exposed to just the tones as well. The sleeping volunteers reacted to the tones alone as if the associated odor were still present by either sniffing

deeply or taking shallow breaths. The next day, the now awake subjects again heard the tones alone with no accompanying odor. Although they had no conscious recollection of listening to them during the night, their breathing patterns told a different story. When exposed to tones that had been paired with pleasant odors, they sniffed deeply, while the second tones tones-those associated with bad smells-provoked short, shallow sniffs.

The team then asked whether this type of learning is tied to a particular phase of sleep. In a second experiment, they divided the sleep cycles into rapid eye movement (REM) and no-REM sleep, and then induced the conditioning during only one phase or the other. Surprisingly, they found that the learned response was more **pronounced** during the REM phase, but the transfer of the association from sleep to waking was evident only when learning took place during the non-REM phase. The researchers suggest that during REM sleep we may be more open to influence from the stimuli in our surrounding, but so-called "dream amnesia"-which makes us forget most of our dreams-may operate on any conditioning occurring in that stage of sleep. In contrast, non-REM sleep is the phase that is important for memory consolidation, so it might also play a role in this form of sleep-learning.

91. The primary purpose of the above passage is to [Ans: d]
(a) describe the difference between REM sleep and non-REM sleep in regards to learnign.
(b) explore the implications of an experiment on the consolidation of memory during non-REM sleep.
(c) illustrate the effects of sleep on learning.
(d) discuss how specific results were obtained using a new means of dealing with a hitherto difficult problem.

92. The first paragraph serves primarily to [Ans: c]
(a) capture the complexity of an ongoing controversy.
(b) describe the current state in a particular field of study.
(c) anticipate difficulties related to certain forms of research.
(d) elaborate on a novel approach to a lingering question.

93. According to the passage, sniffing, as it relates to the experiment described in the passage, primarily
(a) offers researchers a quantifiable physiological response that exhibits. [Ans: a]
(b) poses both advantages and disadvantages to researchers.
(c) enables scientists to study the effect of sleep on memory consolidation.
(d) functions as a non-verbal measure of changes that occur in lower areas of the brain.

94. The bold word "**exposing**" in second paragraph means- [Ans: c]
(a) Exhibit (b) Manifest (c) Introduce (d) Make Vulnerable

95. The bold word "**Pronounced**" in the last paragraph means- [Ans: b]
(a) Enunciated (b) Distinct (c) Articulated (d) Affirmed

Choose the word that means the opposite of the italicized word.

96. Subversive websites [Ans: a]
(a) Loyal (b) Insurgent (c) Harmful (d) Evil

97. Beatific smile [Ans: b]
(a) Euphoric (b) Devilish (c) Divine (d) Chortle

Identify the correct synonym by looking for word roots, prefixes or suffixes. Choose the word that means the same or about the same as the italicized word.

98. Inimical to any form of life [Ans: b]
(a) Friendly (b) Destructive (c) Undeniable (d) Gifted

99. Rustic charm [Ans: d]
(a) Abnormal (b) Polished (c) Bucolic (d) Urban

100. Numerous idiosyncrasies [Ans: c]
(a) Sophisticate (b) Culture (c) Distinctive (d) Deceit