



40. The specific heat at constant pressure of a real gas obeying  $PV^2 = RT$  equation is :

- (1)  $C_V + R$                       (2)  $\frac{R}{3} + C_V$   
 (3)  $R$                                 (4)  $C_V + \frac{R}{2V}$

Ans. (4)

41. Match List I with List II

	LIST I		LIST II
A.	Torque	I.	$[M^1L^1T^{-2}A^{-2}]$
B.	Magnetic field	II.	$[L^2A^1]$
C.	Magnetic moment	III.	$[M^1T^{-2}A^{-1}]$
D.	Permeability of free space	IV.	$[M^1L^2T^{-2}]$

Choose the **correct** answer from the options given below :

- (1) A-I, B-III, C-II, D-IV  
 (2) A-IV, B-III, C-II, D-I  
 (3) A-III, B-I, C-II, D-IV  
 (4) A-IV, B-II, C-III, D-I

Ans. (2)

42. Given below are two statements :

**Statement I :** In an LCR series circuit, current is maximum at resonance.

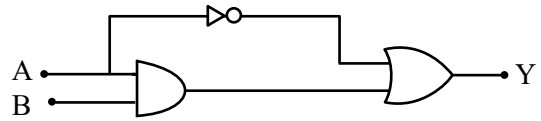
**Statement II :** Current in a purely resistive circuit can never be less than that in a series LCR circuit when connected to same voltage source.

In the light of the above statements, choose the **correct** from the options given below :

- (1) Statement I is true but Statement II is false  
 (2) Statement I is false but Statement II is true  
 (3) Both Statement I and Statement II are true  
 (4) Both Statement I and Statement II are false

Ans. (3)

43. The correct truth table for the following logic circuit is :



Options :

(1) 

A	B	Y
0	0	0
0	1	1
1	0	0
1	1	1

(2) 

A	B	Y
0	0	1
0	1	1
1	0	0
1	1	1

(3) 

A	B	Y
0	0	1
0	1	1
1	0	0
1	1	0

(4) 

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

Ans. (2)

44. A sample contains mixture of helium and oxygen gas. The ratio of root mean square speed of helium and oxygen in the sample, is :

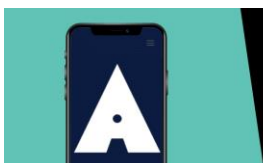
- (1)  $\frac{1}{32}$                                 (2)  $\frac{2\sqrt{2}}{1}$   
 (3)  $\frac{1}{4}$                                     (4)  $\frac{1}{2\sqrt{2}}$

Ans. (2)

45. A light string passing over a smooth light pulley connects two blocks of masses  $m_1$  and  $m_2$  (where  $m_2 > m_1$ ). If the acceleration of the system is  $\frac{g}{\sqrt{2}}$ , then the ratio of the masses  $\frac{m_1}{m_2}$  is :

- (1)  $\frac{\sqrt{2}-1}{\sqrt{2}+1}$                             (2)  $\frac{1+\sqrt{5}}{\sqrt{5}-1}$   
 (3)  $\frac{1+\sqrt{5}}{\sqrt{2}-1}$                             (4)  $\frac{\sqrt{3}+1}{\sqrt{2}-1}$

Ans. (1)



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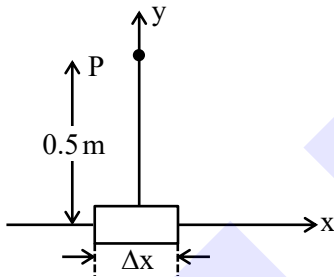
46. Four particles A, B, C, D of mass  $\frac{m}{2}$ ,  $m$ ,  $2m$ ,  $4m$ , have same momentum, respectively. The particle with maximum kinetic energy is :
- (1) D (2) C  
(3) A (4) B

Ans. (3)

47. A train starting from rest first accelerates uniformly up to a speed of 80 km/h for time  $t$ , then it moves with a constant speed for time  $3t$ . The average speed of the train for this duration of journey will be (in km/h) :
- (1) 80 (2) 70  
(3) 30 (4) 40

Ans. (2)

48. An element  $\Delta l = \Delta x \hat{i}$  is placed at the origin and carries a large current  $I = 10A$ . The magnetic field on the  $y$ -axis at a distance of 0.5 m from the elements  $\Delta x$  of 1 cm length is :



- (1)  $4 \times 10^{-8} T$  (2)  $8 \times 10^{-8} T$   
(3)  $12 \times 10^{-8} T$  (4)  $10 \times 10^{-8} T$

Ans. (1)

49. A small ball of mass  $m$  and density  $\rho$  is dropped in a viscous liquid of density  $\rho_0$ . After sometime, the ball falls with constant velocity. The viscous force on the ball is :

- (1)  $mg \left( \frac{\rho_0}{\rho} - 1 \right)$  (2)  $mg \left( 1 + \frac{\rho}{\rho_0} \right)$   
(3)  $mg(1 - \rho\rho_0)$  (4)  $mg \left( 1 - \frac{\rho_0}{\rho} \right)$

Ans. (4)

50. In photoelectric experiment energy of 2.48 eV irradiates a photo sensitive material. The stopping potential was measured to be 0.5 V. Work function of the photo sensitive material is :

- (1) 0.5 eV (2) 1.68 eV  
(3) 2.48 eV (4) 1.98 eV

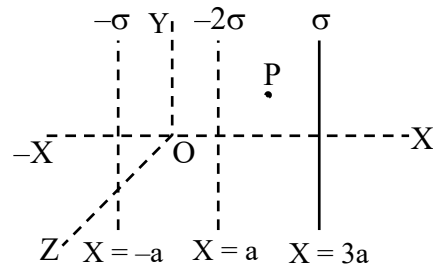
Ans. (4)

### SECTION-B

51. If the radius of earth is reduced to three-fourth of its present value without change in its mass then value of duration of the day of earth will be \_\_\_\_\_ hours 30 minutes.

Ans. (13)

52. Three infinitely long charged thin sheets are placed as shown in figure. The magnitude of electric field at the point P is  $\frac{x\sigma}{\epsilon_0}$ . The value of  $x$  is \_\_\_\_\_ (all quantities are measured in SI units).



Ans. (2)

53. A big drop is formed by coalescing 1000 small droplets of water. The ratio of surface energy of 1000 droplets to that of energy of big drop is  $\frac{10}{x}$ . The value of  $x$  is \_\_\_\_\_.

Ans. (1)

54. When a dc voltage of 100V is applied to an inductor, a dc current of 5A flows through it. When an ac voltage of 200V peak value is connected to inductor, its inductive reactance is found to be  $20\sqrt{3} \Omega$ . The power dissipated in the circuit is \_\_\_\_\_ W.

Ans. (250)

55. The refractive index of prism is  $\mu = \sqrt{3}$  and the ratio of the angle of minimum deviation to the angle of prism is one. The value of angle of prism is \_\_\_\_\_°.

Ans. (60)

56. A wire of resistance R and radius r is stretched till its radius became  $r/2$ . If new resistance of the stretched wire is x R, then value of x is \_\_\_\_\_.

Ans. (16)

57. Radius of a certain orbit of hydrogen atom is  $8.48 \text{ \AA}$ . If energy of electron in this orbit is  $E/x$ , then  $x =$  \_\_\_\_\_.  
 (Given  $a_0 = 0.529 \text{ \AA}$ ,  $E =$  energy of electron in ground state)

Ans. (16)

58. A circular coil having 200 turns,  $2.5 \times 10^{-4} \text{ m}^2$  area and carrying  $100 \mu\text{A}$  current is placed in a uniform magnetic field of 1 T. Initially the magnetic dipole moment ( $\vec{M}$ ) was directed along  $\vec{B}$ . Amount of work, required to rotate the coil through  $90^\circ$  from its initial orientation such that  $\vec{M}$  becomes perpendicular to  $\vec{B}$ , is \_\_\_\_\_  $\mu\text{J}$ .

Ans. (5)

59. A particle is doing simple harmonic motion of amplitude 0.06 m and time period 3.14 s. The maximum velocity of the particle is \_\_\_\_\_ cm/s.

Ans. (12)

60. For three vectors  $\vec{A} = (-x\hat{i} - 6\hat{j} - 2\hat{k})$ ,  $\vec{B} = (-\hat{i} + 4\hat{j} + 3\hat{k})$  and  $\vec{C} = (-8\hat{i} - \hat{j} + 3\hat{k})$ , if  $\vec{A} \cdot (\vec{B} \times \vec{C}) = 0$ , then value of x is \_\_\_\_\_.

Ans. (4)



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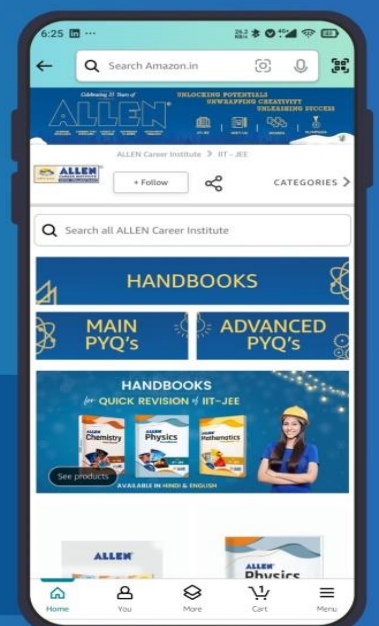
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