





17. Expression for time in terms of  $G$  (universal gravitational constant),  $h$  (Planck constant) and  $c$  (speed of light) is proportional to :

- (1)  $\sqrt{\frac{Gh}{c^3}}$                       (2)  $\sqrt{\frac{hc^5}{G}}$   
 (3)  $\sqrt{\frac{c^3}{Gh}}$                       (4)  $\sqrt{\frac{Gh}{c^5}}$

Ans. (4)

18. The magnetic field associated with a light wave is given, at the origin, by

$$B = B_0 [\sin(3.14 \times 10^7)ct + \sin(6.28 \times 10^7)ct].$$

If this light falls on a silver plate having a work function of 4.7 eV, what will be the maximum kinetic energy of the photo electrons ?

$$(c = 3 \times 10^8 \text{ms}^{-1}, h = 6.6 \times 10^{-34} \text{J-s})$$

- (1) 7.72 eV                      (2) 8.52 eV  
 (3) 12.5 eV                      (4) 6.82 eV

Ans. (1)

19. Charge is distributed within a sphere of radius  $R$

with a volume charge density  $\rho(r) = \frac{A}{r^2} e^{-2r/a}$ ,

where  $A$  and  $a$  are constants. If  $Q$  is the total charge of this charge distribution, the radius  $R$  is :

- (1)  $\frac{a}{2} \log\left(1 - \frac{Q}{2\pi aA}\right)$                       (2)  $a \log\left(1 - \frac{Q}{2\pi aA}\right)$   
 (3)  $a \log\left(\frac{1}{1 - \frac{Q}{2\pi aA}}\right)$                       (4)  $\frac{a}{2} \log\left(\frac{1}{1 - \frac{Q}{2\pi aA}}\right)$

Ans. (4)

20. Two Carnot engines A and B are operated in series. The first one, A, receives heat at  $T_1 (= 600 \text{ K})$  and rejects to a reservoir at temperature  $T_2$ . The second engine B receives heat rejected by the first engine and, in turn, rejects to a heat reservoir at  $T_3 (= 400 \text{ K})$ . Calculate the temperature  $T_2$  if the work outputs of the two engines are equal :

- (1) 400 K    (2) 600 K    (3) 500 K    (4) 300 K

Ans. (3)

21. A carbon resistance has a following colour code. What is the value of the resistance ?



- (1)  $1.64 \text{ M}\Omega \pm 5\%$   
 (2)  $530 \text{ k}\Omega \pm 5\%$   
 (3)  $64 \text{ k}\Omega \pm 10\%$   
 (4)  $5.3 \text{ M}\Omega \pm 5\%$

Ans. (2)

22. A force acts on a 2 kg object so that its position is given as a function of time as  $x = 3t^2 + 5$ . What is the work done by this force in first 5 seconds ?

- (1) 850 J                      (2) 900 J  
 (3) 950 J                      (4) 875 J

Ans. (2)

23. The position co-ordinates of a particle moving in a 3-D coordinate system is given by

$$x = a \cos \omega t$$

$$y = a \sin \omega t$$

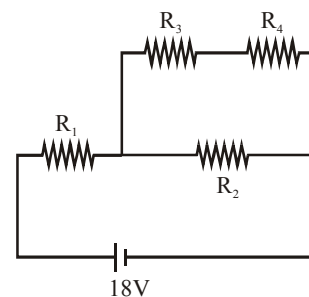
$$\text{and } z = a \omega t$$

The speed of the particle is :

- (1)  $a\omega$                       (2)  $\sqrt{3} a\omega$   
 (3)  $\sqrt{2} a\omega$                       (4)  $2a\omega$

Ans. (3)

24. In the given circuit the internal resistance of the 18 V cell is negligible. If  $R_1 = 400 \Omega$ ,  $R_3 = 100 \Omega$  and  $R_4 = 500 \Omega$  and the reading of an ideal voltmeter across  $R_4$  is 5V, then the value  $R_2$  will be :



- (1) 300  $\Omega$                       (2) 230  $\Omega$   
 (3) 450  $\Omega$                       (4) 550  $\Omega$

Ans. (1)

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25. A mass of 10 kg is suspended vertically by a rope from the roof. When a horizontal force is applied on the rope at some point, the rope deviated at an angle of  $45^\circ$  at the roof point. If the suspended mass is at equilibrium, the magnitude of the force applied is ( $g = 10 \text{ ms}^{-2}$ )
- (1) 200 N  
(2) 100 N  
(3) 140 N  
(4) 70 N

Ans. (2)

26. In a car race on straight road, car A takes a time  $t$  less than car B at the finish and passes finishing point with a speed ' $v$ ' more than that of car B. Both the cars start from rest and travel with constant acceleration  $a_1$  and  $a_2$  respectively. Then ' $v$ ' is equal to :

- (1)  $\frac{a_1 + a_2}{2}t$   
(2)  $\sqrt{2a_1a_2}t$   
(3)  $\frac{2a_1a_2}{a_1 + a_2}t$   
(4)  $\sqrt{a_1a_2}t$

Ans. (1)

27. A power transmission line feeds input power at 2300 V to a step down transformer with its primary windings having 4000 turns. The output power is delivered at 230 V by the transformer. If the current in the primary of the transformer is 5A and its efficiency is 90%, the output current would be :
- (1) 25 A                      (2) 50 A  
(3) 35 A                      (4) 45 A

Ans. (4)

28. The top of a water tank is open to air and its water level is maintained. It is giving out  $0.74 \text{ m}^3$  water per minute through a circular opening of 2 cm radius in its wall. The depth of the centre of the opening from the level of water in the tank is close to :
- (1) 9.6 m                      (2) 4.8 m  
(3) 2.9 m                      (4) 6.0 m

Ans. (1)

29. The pitch and the number of divisions, on the circular scale, for a given screw gauge are 0.5 mm and 100 respectively. When the screw gauge is fully tightened without any object, the zero of its circular scale lies 3 divisions below the mean line.

The readings of the main scale and the circular scale, for a thin sheet, are 5.5 mm and 48 respectively, the thickness of this sheet is :

- (1) 5.755 mm  
(2) 5.725 mm  
(3) 5.740 mm  
(4) 5.950 mm

Ans. (1)

30. A particle having the same charge as of electron moves in a circular path of radius 0.5 cm under the influence of a magnetic field of 0.5 T. If an electric field of 100 V/m makes it to move in a straight path, then the mass of the particle is (Given charge of electron =  $1.6 \times 10^{-19} \text{C}$ )
- (1)  $2.0 \times 10^{-24} \text{ kg}$   
(2)  $1.6 \times 10^{-19} \text{ kg}$   
(3)  $1.6 \times 10^{-27} \text{ kg}$   
(4)  $9.1 \times 10^{-31} \text{ kg}$

Ans. (1)

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