PHYSICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 60

Total Marks : 26

Max. Time : 26 min.

Topics : Heat, Work, Power and Energy, Rotation, Elasticity, Current Electricity

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.3	(3 marks, 3 min.)	[9, 9]
Multiple choice objective ('–1' negative marking) Q.4 to Q.5	(4 marks, 4 min.)	[8, 8]
Comprehension ('–1' negative marking) Q.6 to Q.8	(3 marks, 3 min.)	[9, 9]

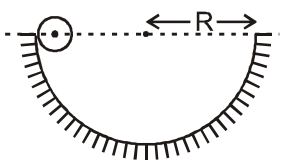
1. The energy radiated per unit area per sec. by a spherical black body will be doubled if its

(A) radius is increased by nearly 41.5%
(B) radius is doubled
(C) temp. (T) is increased by nearly 41.5%
(D) T is increased by nearly 19%.

2. A body of mass 6 kg is acted upon by a force which causes a displacement in it given by $x = \frac{t^2}{4}$ metre where t is the time in second. The work done by the force is 2 seconds is:

(A) 12 J
(B) 9 J
(C) 6 J
(D) 3 J

3. In the figure shown, a small ball of mass 'm' can move without sliding in a fixed semicircular track of radius R in vertical plane. It is released from the top. The resultant force on the ball at the lowest point of the track is



(A) $\frac{10mg}{7}$
(B) $\frac{17mg}{7}$
(C) $\frac{3mg}{7}$
(D) zero

4. An elastic rod will change its length, if

(A) the rod is suspended at one end
(B) The rod is allowed to fall freely under gravity
(C) the rod is rotated about one end on a frictionless horizontal table
(D) the rod is given a horizontal acceleration by a force applied at one end

5. A charged particle X moves directly towards another charged particle Y. For the 'X + Y' system, the total momentum is p and the total energy is E.

(A) p & E are conserved if both X & Y are free to move
(B) (A) is true only if X and Y have similar charges
(C) If Y is fixed, E is conserved but not p
(D) If Y is fixed, neither E nor p is conserved.

COMPREHENSION

Resistance value of an unknown resistor is calculated using the formula $R = \frac{V}{I}$ where V and I be the readings of the voltmeter and the ammeter respectively. Consider the circuits below. The internal resistances of the voltmeter and the ammeter (R_v and R_G respectively) are finite and non zero.

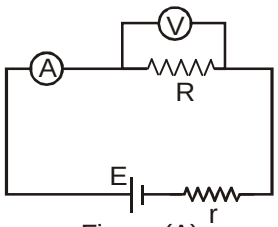


Figure (A)

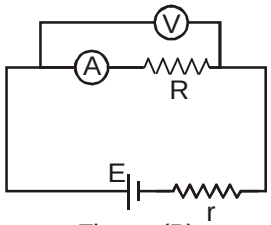


Figure (B)

Let R_A and R_B be the calculated values in the two cases A and B respectively.

6. The relation between R_A and the actual value R is

(A) $R > R_A$ (B) $R < R_A$

(C) $R = R_A$ (D) dependent upon E and r.

7. The relation between R_B and the actual value R is :

(A) $R < R_B$ (B) $R > R_B$

(C) $R = R_B$ (D) dependent upon E and r.

8. If the resistance of voltmeter is R_v = 1 k Ω and that of ammeter is R_G = 1 Ω, the magnitude of the percentage error in the measurement of R (the value of R is nearly 10 Ω) is :

(A) zero in both cases (B) non zero but equal in both cases

(C) more in circuit A (D) more in circuit B

Answers Key

1.	(D)	**2.**	(D)	**3.**	(A)	**4.**	(A) (C) (D)
5.	(A) (C)	**6.**	(A)	**7.**	(A)	**8.**	(D)

2. The velocity of the body a time t is given by

$$\upsilon = \frac{dx}{dt} = \frac{d}{dt}\left(\frac{t^2}{4}\right) = \frac{t}{2}$$

$\therefore$ At $t = 0$, υ = u = 0 and $t = 2$ s, υ = 1ms^{-1}, Now, work done = increase in KE

$$= \frac{1}{2}m\upsilon^2 - \frac{1}{2}mu^2 = \frac{1}{2}m\upsilon^2 - 0$$

$$= \frac{1}{2}m\upsilon^2 = \frac{1}{2}\times 6 \times (1)^2 = 3\text{J},$$

Hence the correct choice is (d).

3. From conservation of energy, the kinetic energy of ball at lowest portion is (v_c = speed of centre of ball)

$$\frac{1}{2}mv_c^2 + \frac{1}{2}\times\frac{2}{5}mv_c^2 = mgR$$

or $$\frac{7}{10}mv_c^2 = mgR$$

Since net tangential force on sphere at lowest point is zero, net force on sphere at lowest position is

$$= \frac{mv_c^2}{R} = \frac{10}{7}mg$$ **upwards.**

6. $R_A = \dfrac{R.R_V}{R+R_V} < R$

7. $R_B = R + R_G > R$

8. % error in case A.

$$\frac{R_A - R}{R} \times 100 = \left(\frac{R_V}{R+R_V} - 1\right) \times 100$$

$$= \frac{-R}{R+R_V} \times 100 \approx -1\%$$

% error in case B

$$\frac{R_B - R}{R} \times 100 = \frac{R_G}{R} \times 100 \approx 10\%$$

Hence percentage error in circuit B is more than