PHYSICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 63

Total Marks : 25

Max. Time : 26 min.

Topics : Heat, Current Electricity, Magnetic Effect of Current and Magnetic Force on Charge/current, Rotation, Kinematics, Center of Mass

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.4	(3 marks, 3 min.)	[12, 12]
Subjective Questions ('–1' negative marking) Q.5	(4 marks, 5 min.)	[4, 5]
Comprehension ('–1' negative marking) Q.6 to Q.8	(3 marks, 3 min.)	[9, 9]

1. Two identical long, solid cylinders are used to conduct heat from temp T_1 to temp T_2. Originally the cylinder are connected in series and the rate of heat transfer is H. If the cylinders are connected in parallel then the rate of heat transfer would be :

(A) H/4 (B) 2H (C) 4H (D) 8H

2. In a metre bridge experiment null point is obtained at 20 cm from one end of the wire when resistance X is balanced against another resistance Y. If X < Y, then where will be the new position of the null point from the same end, if one decides to balance a resistance of 4X against Y ?

(A) 50 cm (B) 80 cm (C) 40 cm (D) 70 cm

3. An electron (charge – e, mass ' m ') is revolving around a fixed proton in circular path of radius ' r '. The magnetic field at the centre due to electron is:

(A) 0 (B) $\frac{\mu_0 e^2}{8\pi r^2\sqrt{\pi m \in_0 r}}$ (C) $\frac{\mu_0 e}{8\pi r\sqrt{\pi m \in_0 r}}$ (D) $\frac{\mu_0 e}{4\pi r^2\sqrt{\pi m \in_0 r}}$

4. A weightless rod is acted on by upward parallel forces of 2 N and 4 N ends A and B respectively. The total length of the rod AB = 3 m. To keep the rod in equilibrium a force of 6 N should act in the following manner: (A) Downwards at any point between A and B

(B) Downwards at mid point of AB

(C) Downwards at a point C such that AC = 1 m

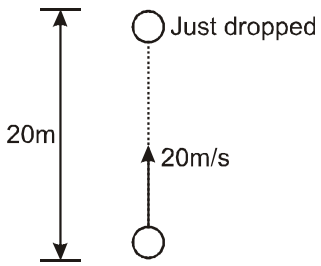
(D) Downwards at a point D such that BD = 1

5. Two cars A and B are travelling towards each other on a single-lane road at 24 m/s and 21 m/s respectively. They notice each other when 180 m apart and apply brakes simultaneously. They just succeed in avoiding collision, both stopping simultaneously at the same position. Assuming constant retardation for each car, the distance travelled by car A while slowing down is

COMPREHENSION

Two identical masses are as shown in figure. One is thrown upwards with velocity 20 m/s and another is just dropped simultaneously. [g = 10 m/s²]

6. The masses collide in air and stick together. After how much time the combined mass will fall to the ground (Calculate the time from the starting when the motion was started).



(A) $(1+\sqrt{2})$ second (B) $2\sqrt{2}$ second

(C) $(2+\sqrt{2})$ second (D) none of these

7. In the above problem, to what maximum height (from ground) will the combined mass rise .

(A) 25 m (B) 18 m (C) 15 m (D) 20 m

8. If collision between them is elastic, find the time interval between their striking with ground.

(A) zero (B) 2 sec (C) 1 sec (D) 3 sec

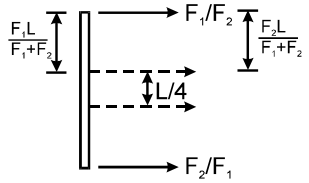
Answers Key

1.	(C)	**2.**	(A)	**3.**	(B)	**4.**	(D)
5.	96 m	**6.**	(D)	**7.**	(C)	**8.**	(B)

Hints & Solutions

1. (B) Initially effective resistance = 2R. In parallel effective resistance = $\frac{R}{2}$. It has reduced by a factor of 1/4 so rate of heat transfer would be increased by a factor of 4, keeping other parameters same.

4.



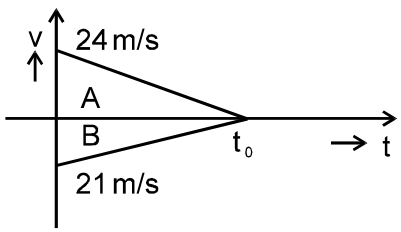
$$\frac{F_1L}{F_1+F_2} - \frac{F_2L}{F_1+F_2} = \frac{L}{4}$$

$$\Rightarrow \frac{F_1}{F_4} = \frac{5}{3} K$$

[Ans.: 3: 5]

5. (A)

Distance travelled = $24t_0 + 21\ t_0$



$= 45\ t_0$

$\Rightarrow 45t_0 = 180$ m

$\Rightarrow t_0 = 4$ seconds

$\therefore$ Distance translted by A is

$24t_0 = 24 \times 4 = 96$ m

Sol(57,58,59)

(57). Initial velocity of com

$$u = \frac{20\ m + 0}{m + m} = 10\ m/s \uparrow$$

acceleration of com
$= g = 10\ m/s^2 \downarrow$
initial height = 10 m

$$S = ut + \frac{1}{2}\ at^2$$

$$10 = -10t + \frac{1}{2}(10)\ t^2$$

$5t^2 - 10\ t - 10 = 0$
$t^2 - 2t - 2 = 0$

$$t = \frac{2 + \sqrt{4 + 8}}{2}$$

$$t = 1 + \sqrt{3}$$

(58). $H_{max.} = 10 + \frac{u^2}{2g} = 10 + 5 = 15\ m$

(59). $\Delta t = \frac{2 \times 20}{a} - \sqrt{\frac{2 \times 20}{g}} = 4 - 2 = 2sec.$