PHYSICS DPP DAILY PRACTICE PROBLEMS	DPP No. 68	Total Marks : 33 Max. Time : 36 min.

Topics : Heat, Emf, Rotation, Center of Mass, Visosity, Geometrical Optics, Current Electricity

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.6	(3 marks, 3 min.)	[18, 18]
Subjective Questions ('–1' negative marking) Q.7	(4 marks, 5 min.)	[4, 5]
Match the Following (no negative marking) (2 × 4) Q.8	(8 marks, 10 min.)	[8,10]
Assertion and Reason (no negative marking) Q. 9	(3 marks, 3 min.)	[3, 3]

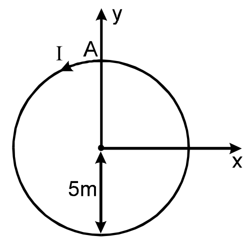
1. A simple microscope has a focal length of 5 cm. The magnification at the least distance of distinct vision is-

(A) 1 (B) 5 (C) 4 (D) 6

2. Two identical solid spheres have the same temperature. One of the sphere is cut into two identical pieces. The intact sphere radiates an energy Q during a given small time interval. During the same interval, the two hemispheres radiate a total energy Q'. The ratio Q'/Q is equal to :

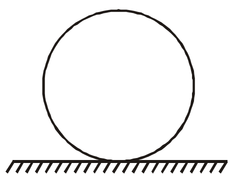
(A) 2.0 (B) 4.0 (C) $\frac{2}{3}$ (D) 1.5

3. A ring of radius 5 m is lying in the x-y plane and is carrying current of 1 A in anti-clockwise sense. If a uniform magnetic field $\vec{B} = 3\hat{i} + 4\hat{j}$ is switched on, then the co-ordinates of point about which the loop will lift up is:



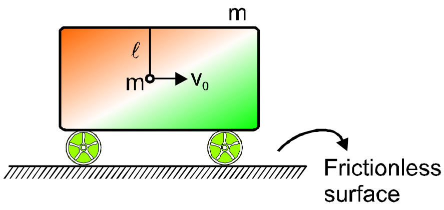
(A) (3, 4) (B) (4, 3)
(C) (3, 0) (D) (0, 3)

4. A ring of radius R rolls without slipping on a rough horizontal surface with a constant velocity. The radius of curvature of the path followed by any particle of the ring at the highest point of its path will be :



(A) (B) 2 R
(C) 4 R (D) none of these

5. A small bob of mass 'm' is suspended by a massless string from a cart of the same mass 'm' as shown in the figure.The friction between the cart and horizontal ground is negligible. The bob is given a velocity V_0 in horizontal direction as shown. The maximum height attained by the bob is,



(A) $\frac{2V_0^2}{g}$ (B) $\frac{V_0^2}{g}$ (C) $\frac{V_0^2}{4g}$ (D) $\frac{V_0^2}{2g}$

6. Two identical spherical drops of water are falling (vvertically downwards) through air with a steady velocity of 5 cm/sec. If both the drops coalesce (combine) to form a new spherical drop, the terminal velocity of the new drop will be- (neglect bouyant force on the drops.)

(A) 5 × 2 cm/sec (B) $5 \times \sqrt{2}$ cm/sec (C) $5 \times (4)^{1/3}$ cm/sec (D) $\frac{5}{\sqrt{2}}$ cm/sec.

7. A steel wire of length l has a magnetic moment M. It is then bent into a semicircular arc. What is the new magnetic moment ?

8. In each situation of column-I a statement regarding a point object and its image is given. In column-II four optical instruments are given which form the image of that object. Match the statement in column-I with the optical instruments in column-II.

Column-I	**Column-II**
(A) Real image of a real point object may be formed by	(p) concave mirror
(B) Virtual image of a real point object may be formed by	(q) convex mirror
(C) Real image of a virtual point object may be formed by	(r) convex lens (surrounded by air)
(D) Virtual image of a virtual point object may be formed by	(s) concave lens (surrounded by air)

9. **STATEMENT-1 :** Two cells of unequal emf E_1 and E_2 having internal resistances r_1 and r_2 are connected as shown in figure. Then the potential difference across any cell cannot be zero.

STATEMENT-2 : If two cells having nonzero internal resistance and unequal emf are connected across each other as shown, then the current in the circuit cannot be zero.

(A) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1
(B) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True.

Answers Key

1. (D) **2.** (D) **3.** (A) **4.** (C)

5. (C) **6.** (C) **7.** $M' = m \times 2r = \frac{M}{l} \times \frac{2l}{\pi} = \frac{2M}{\pi}$

8. (A) p,r (B) p,q,r,s (C) p,q,r,s (D) q,s

9. (B)

Hints & Solutions

1. MP = $\left(1+\frac{D}{f}\right) = \left(1+\frac{25}{5}\right) = 6$

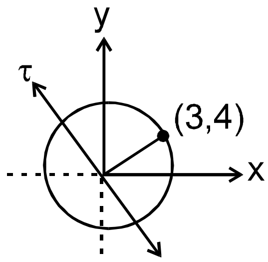
2. Heat radiated (at temp same temp) $\propto$ A

$\Rightarrow$ $Q \propto 4\pi R^2$ and $Q' \propto (4\pi R^2 + 2 \times \pi R^2)$

$\Rightarrow$ $\frac{Q'}{Q} = \frac{6\pi R^2}{4\pi R^2} = 1.5$

Here πR^2 is extra surface area of plane surface of one of the hemisphere.

3.



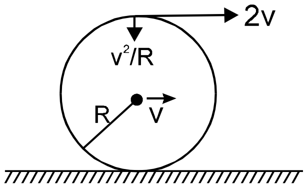
Megnetic moment $\vec{M} = \pi r^2 i\ \hat{i}$ & $\vec{B} = 3\hat{i} + 4\hat{j}$

$\therefore\ \vec{\tau} = \vec{M} \times \vec{B} = \pi r^2 (3\ \hat{i} - 4\ \hat{i})$

$\vec{\tau}$ will be along the direction shown .

Hence , the point about which the loop will be lift up will be : (3, 4)

4.



Radius of Curvature = $\frac{(\text{velocity})^2}{\text{Normal Acceleration}}$

$= \frac{(2v)^2}{v^2/R} = 4R$

5. By linear momentum conservation in horizontal direction = for (bob + string + cart)

$mV_0 = (m + m)v$

$$v = \frac{V_0}{2}$$

By mechanical energy conservation for (bob + string + cart + earth)

$$\frac{1}{2}mV_0^2 + 0 + 0 = \frac{1}{2}(2m)v^2 + mgh + 0$$

$$\frac{1}{2}mV_0^2 - \frac{1}{2}(2m)\frac{V_0^2}{4} = mgh$$

Solving it,

$$h = \frac{V_0^2}{4g}.$$

6. When two drops of radius r each combine to form a big drop, the radius of big drop will be given by

$$\frac{4}{3}\pi R^3 = \frac{4\pi}{3}r^2 + \frac{4\pi}{3}r^3$$

or $R^3 = 2r^3$ or $R = 2^{1/3}r$ Now

$$\frac{V_R}{V_r} = \left(\frac{R}{r}\right)^2 = 2^{\frac{2}{3}} = 4^{\frac{1}{3}}$$

$\therefore$ $V_R = 5 \times 4^{1/3}$ cm/s

7. If m is pole strength , then

$$m = m = \frac{M}{l}$$

When the wire is bent into a semicircular arc, the separation between the two poles changes from l to 2l, where new magnetic moment of the steel wire,

$$M' = m \times 2r = \frac{M}{l} \times \frac{2l}{\pi} = \frac{2M}{\pi}$$

8. (A) Real image of a real object is formed by concave mirror and convex lens.
(B) Virtual image of a real object is formed by all four.
(C) Real image of a virtual object may be formed by all four.
(D) Virtual image of a virtual object may be formed by convex mirror and concave lens.
(A) p,r (B) p,q,r,s (C) p,q,r,s (D) q,s

9. Let $E_1 < E_2$ and a current i flows through the circuit. Then the potential difference across cell of emf E_1 is $E_1 + ir_1$ which is positive, hence potential difference across this cell cannot be zero. Hence statement 1 is correct.
For current in the circuit to be zero, emf of both the cells should be equal. But $E_1 \neq E_2$. Hence statement 2 is correct but it is not a correct explanation of statement 1.