PHYSICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 69

Total Marks : 36

Max. Time : 41 min.

Topics : Heat, Rotation, Magnetic Effect of Current and Magnetic Force on Charge/current, Center of Mass, Geometrical Optics, 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	(4 marks, 4 min.)	[4,4]
Subjective Questions ('–1' negative marking) Q.5 to Q.Q.7	(4 marks, 5 min.)	[12,15]
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. In a compound microscope, the intermediate image is -

(A) virtual, erect and magnified (B) real, erect and magnified

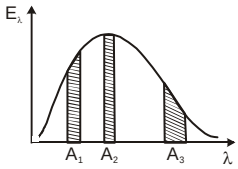
(C) real, inverted and magnified (D) virtual, erect and reduced

2. The resolving power of a telescope is more when its objective lens has

(A) greater focal length (B) smaller focal length

(C) greater diameter (D) smaller diameter

3. Three separate segments of equal area A_1, A_2 and A_3 are shown in the energy distribution curve of a blackbody radiation. If n_1, n_2 and n_3 are number of photons emitted per unit time corresponding to each area segment respectively then :



(A) $n_2 > n_1 > n_3$ (B) $n_3 > n_1 > n_2$ (C) $n_1 = n_2 = n_3$ (D) $n_3 > n_2 > n_1$

4. Which of the following statements is/are true

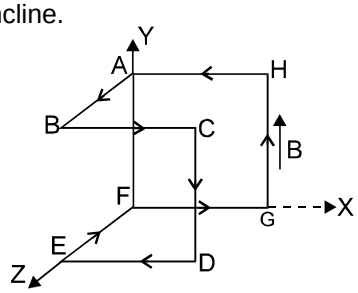
(A) work done by kinetic friction on an object may be positive.

(B) A rigid body rolls up an inclined plane without sliding. The friction force on it will be up the incline. (only contact force and gravitational force is acting)

(C) A rigid body rolls down an inclined plane without sliding. The friction force on it will be up the incline. (only contact force and gravitational force is acting)

(D) A rigid body is left from rest and having no angular velocity from the top of a rough inclined plane. It moves down the plane with slipping. The friction force on it will be up the incline.

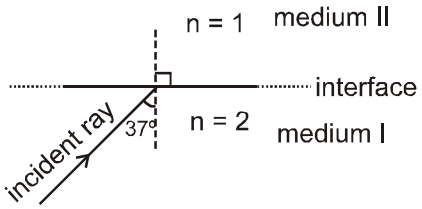
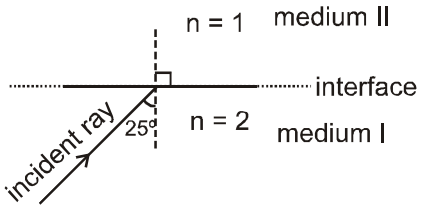
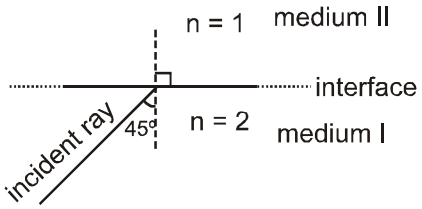
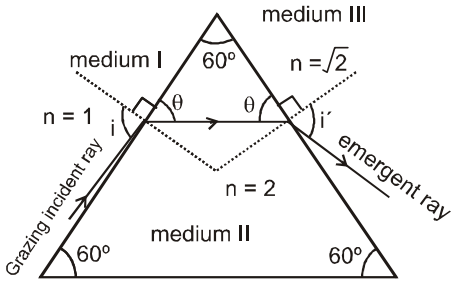
5. The given fig. shows a coil bent with AB=BC=CD=DE=EF=FG=GH=HA = 1 m and carrying current 1 A. There exists in space a vertical uniform magnetic field of 2 T in the y-direction. Then find out the torque (in vector form) on the loop.



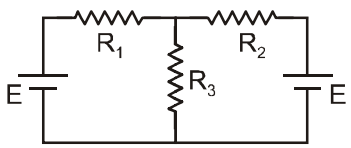
6. A bar magnet or magnetic moment M is aligned parallel to the direction of a uniform magnetic field B. What is the work done to turn the magnet, so as to align its magnetic moment (i) opposite to the field direction and (ii) normal to the field direction ?

7. Two blocks of mass m_1 and m_2 are connected with an ideal spring on a smooth horizontal surface as shown in figure. At t = 0 m_1 is at rest and m_2 is moving with a velocity v towards right. At this time spring is in its natural length. Prove that if $m_1 < m_2$ block of mass m_2 will never come to rest.

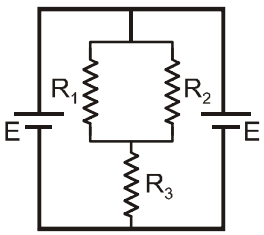
8. Match the Column if deviation in the Column–II is the magnitude of total deviation (between incident ray and finally refracted or reflected ray) to lie between 0° and 180°. Here n represents refractive index of medium.

Column–I		Column–II	
(A)		(p)	deviation in the light ray is greater than 90°
(B)		(q)	deviation in the light ray is less than 90°
(C)		(r)	deviation in the light ray is equal to 90°
(D)		(s)	Speed of finally reflected or refracted light is same as speed of incident light.

9. **STATEMENT-1 :** For calculation of current in resistors of resistance R_1, R_2 and R_3 in the circuit shown in figure 1, the circuit can be redrawn as shown in figure 2 (this means that circuit shown in figure 2 is equivalent to circuit shown in figure 1). All the cells shown are ideal and identical.



(fig.1)



(fig.2)

STATEMENT-2 : Whenever potential difference across two resistors is same, both resistors can be assumed as a combination of two resistors in parallel.

(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. (C) **2.** (C) **3.** (D)

4. (A)(B)(C)(D) **5.** $2\hat{K}$ **6.** 2 M B, M B

8. (A) p, s; (B) q; (C) r, s; (D) q **9.** (C)

Hints & Solutions

3. Equal area means equal power output. A_3 area pertains to highest wavelength range, thus photons with minimum range of frequency. Thus maximum number of photons are required from this segment to keep the power same.

4. Work done by kinetic friction may be positive when it acts along motion of the body.
Friction on rigid body rolling on inclined plane is along upward because tendency of slipping is downwards.

5. The torque of system = Torque on loop [AFGH + BCPE + ABEF]

$= ISB\ (-\hat{i}) + ISB(\hat{\ }) + ISB\hat{\ }$ (I = current, S = area of loop, B = magnetic field.

$= I\ S\ B\ \hat{\ }$

$= 1 \times 1 \times 2\ \hat{\ } = 2\hat{\ }$ units

[Ans: $2\hat{K}$ **]**

6. The work done to rotate a bar magnet from its initial position $\theta = \theta_1$ to the final position $\theta = \theta_2$ is given by
$W = M\ B\ (\cos\theta_1 - \cos\theta_2)$,
(i) Here $\theta_1 = 0°$ and $\theta_2 = 180°$
$\therefore$ $W = M\ B\ (\cos\theta_1 - \cos 180°) = M\ B = [1-(-1)] = 2$ **M B**
(ii) Here $\theta_1 = 0°$ and $\theta_2 = 90°$
$\therefore$ $W = M\ B\ (\cos 0° - \cos 90°) = M\ B = [1- 0)]$
$=$ **M B**

7. If velocity of m_2 is zero then by momentum conservation
$m_1 v' = m_2 v$

$$v' = \frac{m_2 v}{m_1}$$

Now kinetic energy of m_1

$$\frac{1}{2} m_1 v'^2 = \frac{1}{2} m \left(\frac{m_2}{}\right)^2 v^2$$

$$= \frac{1}{2}\left(\frac{m_2}{m_1}\right) m_2 v^2 = \left(\frac{m_2}{m_1}\right) \frac{1}{2} m_2 v^2 = \frac{m_2}{m_1} \times \text{initial}$$

Kinetic energy

Kinetic energy of m_1 > initial mechanical energy of system m_1

Hence proved

8. $C = \sin^{-1}\left(\frac{1}{2/1}\right) = 30°$

for i = 37 TIR

so, $\delta = \pi - 2(37°) = 104°$

i = 25, Refraction $\delta < \frac{\pi}{2} - C$

i = 45°, TIR

so, $\delta = \pi - 2\left(\frac{\pi}{4}\right) = 90°$

By applying snells law for prism :

i = 90

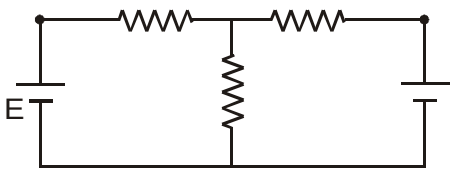
$r_1 = 30$

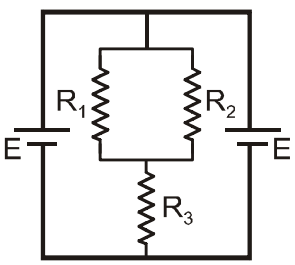
$r_2 = 30$

e = 45

$\delta = 90 + 45 - 60 = 75°$

9. The points A and B are at same potential, then under given conditions points A and B on the circuit can be connected by a conducting wire. Hence the circuit can be redrawn as shown in figure 2.





(fig.2)

Therefore statement 1 is true. Statement 2 is obviously false.