PHYSICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 82

Total Marks : 24

Max. Time : 24 min.

Topics : Fluid, Electromagnet Induction, Alternating Current, Morden Physics, Rotation, Magnetic Effect of Current and Magnetic Force on Charge/current

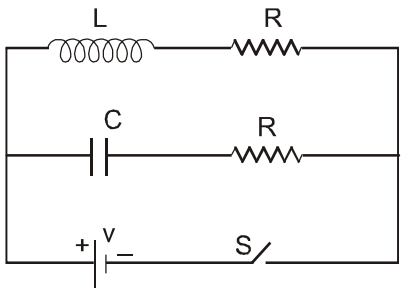
Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.4	**(3 marks, 3 min.)**	**[12, 12]**
Comprehension ('–1' negative marking) Q.5 to Q.7	**(3 marks, 3 min.)**	**[9, 9]**
Assertion and Reason (no negative marking) Q. 8	**(3 marks, 3 min.)**	**[3, 3]**

1. A block of silver of mass 4 kg hanging from a string is immersed in a liquid of relative density 0.72. If relative density of silver is 10, then tension in the string will be:[take g = 10 m/s^2]

(A) 37.12 N (B) 42 N

(C) 73 N (D) 21 N

2. In the circuit switch S is closed at time t = 0, the current through C and L would be equal after a time 't' equal to : (Given : R = $\sqrt{\frac{L}{C}}$) :



(A) RC (B) RL

(C) RC ℓn2 (D) R/L ℓn2

3. Current in an A.C. circuit is given by i = $2\sqrt{2}$ sin (πt + π/4), then the average value of current during time t = 0 to t = 1 sec is:

(A) 0 (B) $\frac{4}{\pi}$ A

(C) $\frac{4\sqrt{2}}{\pi}$ A (D) $2\sqrt{2}$ A

4. A hydrogen atom is in the 4th excited state, then:

(A) the maximum number of emitted photons will be 10.

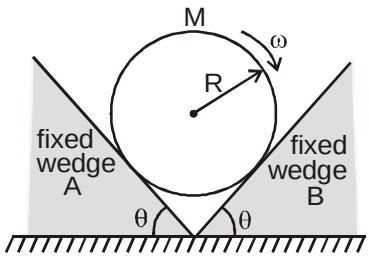
(B) the maximum number of emitted photons will be 6.

(C) it can emit three photons in ultraviolet region.

(D) if an infrared photon is generated, then a visible photon may follow this infrared photon.

COMPREHENSION

A uniform solid cylinder of mass M and radius R is placed on two fixed wedges as shown. The inclined surface of each wedge makes an angle $\theta = 45^o$ with horizontal. The coefficient of friction between cylinder and each wedge is μ ($\mu < 1$). The angular velocity of cylinder at shown instant is non zero and sense of rotation of cylinder about its axis is clockwise.(g is acceleration due to gravity)



5. At the shown instant, magnitude of frictional force on cylinder exerted by left wedge A is :

(A) $\frac{\mu Mg(1+\mu)}{\sqrt{2}(1+\mu^2)}$ (B) $\frac{\mu Mg(1-\mu)}{\sqrt{2}(1+\mu^2)}$ (C) $\frac{\mu Mg(1+\mu)}{2(1+\mu^2)}$ (D)none of these

6. At the shown instant, magnitude of frictional force on cylinder exerted by right wedge B is -

(A) $\frac{\mu Mg(1+\mu)}{\sqrt{2}(1+\mu^2)}$ (B) $\frac{\mu Mg(1-\mu)}{\sqrt{2}(1+\mu^2)}$ (C) $\frac{\mu Mg(1+\mu)}{2(1+\mu^2)}$ (D) none of these

7. At the shown instant, magnitude of angular acceleration of cylinder is :

(A) 0 (B) $\frac{4\mu^2 g}{R(1+\mu^2)}$ (C) $\frac{2\sqrt{2}\mu g}{R(1+\mu^2)}$ (D)none of these

8. **STATEMENT–1 :** No electric current will be present within a region having uniform and constant magnetic field.

STATEMENT–2 : Within a region of uniform and constant magnetic field $\vec{B}$, the path integral of magnetic field $\oint \vec{B}\cdot d\vec{\ell}$ along any closed path is zero. Hence from Ampere circuital law $\oint \vec{B}\cdot d\vec{\ell} = \mu_0 I$ (where the given terms have usual meaning), no current can be present within a region having uniform and constant magnetic field.

(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

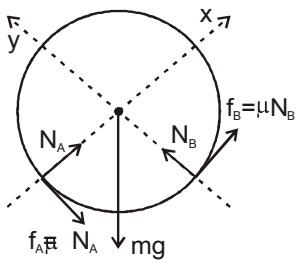
1.	(A)	**2.**	(C)	**3.**	(B)
4.	(D)	**5.**	(B)	**6.**	(A)
7.	(C)	**8.**	(A)		

3. $\langle i \rangle = \dfrac{\int_0^1 i\,dt}{1} = 2\sqrt{2}\int_0^1 \sin\left(\pi t + \dfrac{\pi}{4}\right)dt = \dfrac{4}{\pi}$

4. The hydrogen atom is in n = 5 state.
$\therefore$ Max. no of possible photons = 4
To emit photon in ultra violet region, it must jump to n = 1, because only Lyman series lies in u.v. region. Once it jumps to n = 1 photon, it reaches to its ground state and no more photons can be emitted. So only one photon in u. v. range can be emitted.
If H atom emits a photon and then another photon of Balmer series, option D will be correct.

7. The FBD of cylinder is as shown

Resolving forces along x and y axis



$N_A + f_B = \dfrac{mg}{\sqrt{2}}$ .... (1)

$f_B = \mu N_B$

$N_B - f_A = \dfrac{mg}{\sqrt{2}}$ .... (2)

$f_A = \mu N_A$
solving we get

$f_A = \dfrac{\mu Mg(1-\mu)}{\sqrt{2}(1+\mu^2)}$ and

$f_B = \dfrac{\mu Mg(1+\mu)}{\sqrt{2}(1+\mu^2)}$

Angular acceleration

$= \dfrac{(f_A + f_B)R}{\frac{MR^2}{2}} = \dfrac{2\sqrt{2}\mu g}{R(1+\mu^2)}$

8. $\oint \vec{B} \cdot d\vec{\ell}$ along any closed path within a uniform magnetic field is always zero. Hence the closed path can be chosen of any size, even very small size enclosing a very small area. Hence we can prove that net current through each area of infinitesimally small size within region of uniform magnetic field is zero. Hence we can say no current (rather than no net current) flows through region of uniform magnetic field. Hence statement -2 is correct explanation of statement-1.