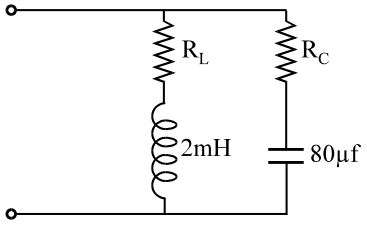
SAMPLE PROBLEMS

(PHYSICS)

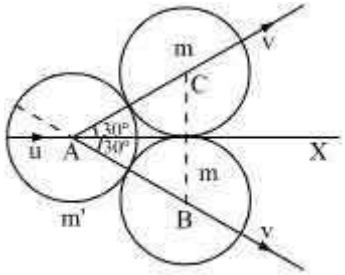
1. What must be the relationship between the value of R_L and R_C if the network shown below is to be resonant at all frequencies?



(a) $R_L = R_C = 5\Omega$ (b) $R_L = 10\Omega, R_C = 5\Omega$

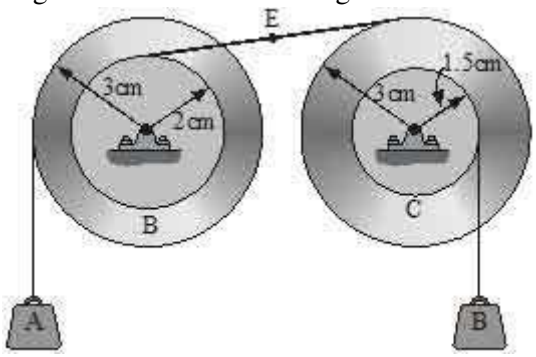
(c) $R_L = 5\Omega, R_C = 10\Omega$ (d) None of these

2. Two equal spheres, each of mass *m* are in contact on a smooth horizontal table, a third identical sphere impinges symmetrically on them if this sphere is reduced to rest by the impact, then



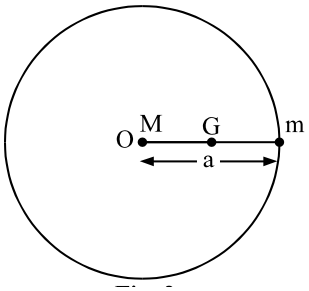
(a) $e = 1/3$ (b) $e = 1/4$ (c) $e = 2/3$ (d) $e = 3/4$

3. For the system of connected bodies the initial angular velocity of the compound pulley B is 6 rad per sec counter clockwise and weight D is decelerating at the constant rate of 4 cm/s^2. What distance will weight A travel before coming to rest?



(a) 6.5 cm (b) 9.5 cm (c) 11.5 cm (d) 13.5 cm

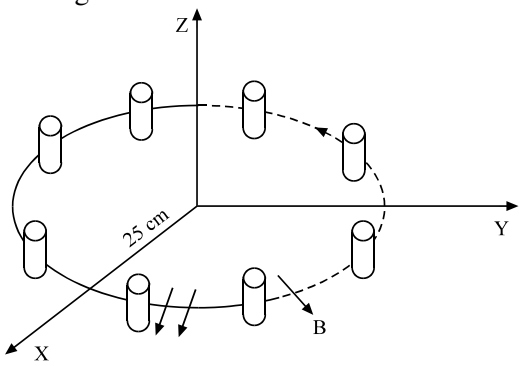
4. A circular board of mass M and radius *a* is placed on a smooth horizontal plane, and a body of mass *m* runs round the edge of it at a uniform rate. See the following statements:



[A] Centre of disc describes a circle around the centre of mass G of the system (body + board) as centre and GO as radius. [B] Centre of mass G of the system (body + board) describes a circle with O as centre and GO as radius.

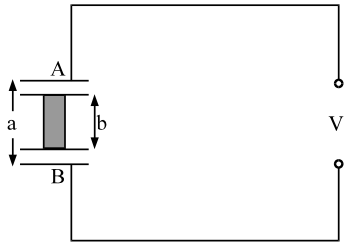
(a) A is correct, B is wrong
(b) A is wrong, B is correct
(c) Both A and B are wrong
(d) Both A and B are correct

5. A conductor 1 cm in length is parallel to z axis and rotates at a radius of 25 cm at 1200 rev/min. The induced voltage across the conductor if the radial field is given by B = 0.5 T is



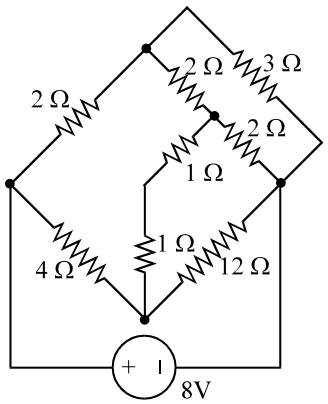
(a) 0.157 with top end of the rod positive
(b) 0.157 with top end of the rod negative
(c) 0.257 with top end of the rod negative
(d) 0.57 with top end of the rod negative

6. Two parallel plate capacitors are connected in series. The rigid centre section of length '*b*' is movable vertically. All the plates have the same area. Then effective capacitance of the combination.



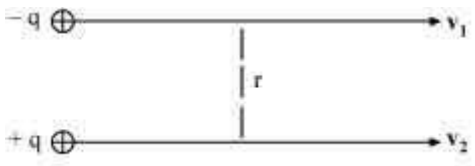
(a) Is independent of the position of the centre section.
(b) Depends on the position of the centre section.
(c) Decreases when length '*b*' approaches to value '*a*'.
(d) Depends on the voltage difference between the points A and B.

7. Find the current delivered by the source in the circuit



(a) 1 A (b) 2 A (c) 3 A (d) 4 A

8. Two charges $+q$ and $-q$ are moving parallel to each other with a non-relativistic velocities v_1 and v_2 respectively. Find the magnetic force experienced by $-q$ due to $+q$ in the position shown.



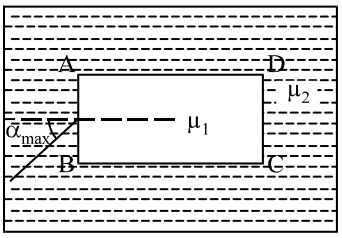
(a) $\frac{\mu_0}{4\pi}\frac{q^2 v_1 v_2}{r^2}$ N in the direction of v_1

(b) $\frac{\mu_0}{4\pi}\frac{q^2 v_1 v_2}{r^2}$ N in a direction opposite to v_1

(c) $\frac{\mu_0}{4\pi}\frac{q^2 v_1 v_2}{r^2}$ N perpendicular to v_1 in the plane of paper upwards

(d) $\frac{\mu_0}{4\pi}\frac{q^2 v_1 v_2}{r^2}$ N perpendicular to v_1 in the plane of paper downwards

9. A rectangular glass slab ABCD, of refractive index, μ_1, is immersed in water of refractive index μ_2 ($\mu_1 > \mu_2$). A ray of light is incident at the surface AB of the slab as shown. The maximum value of the angle of incidence a_{max} such that the ray comes out only from the outer surface CD, is given by



(a) $\sin^{-1}\left[\frac{\mu_1}{\mu_2}\cos\left(\sin^{-1}\frac{\mu_2}{\mu_1}\right)\right]$

(b) $\sin^{-1}\left[\mu_1\cos\left(\sin^{-1}\frac{1}{\mu_2}\right)\right]$

(c) $\sin^{-1}\left(\frac{\mu_1}{\mu_2}\right)$

(d) $\sin^{-1}\left(\frac{\mu_2}{\mu_1}\right)$

10. A block can be supported on a rough inclined plane by the least force of 10 N or the maximum force of 14 N. What amount of force is needed to support the same block on the same plane provided that the plane is smooth?

(a) 10 N (b) 14 N (c) 13 N (d) None of these

ANSWERS
(PHYSICS)

1. (a)	2. (c)	3. (d)	4. (a)	5. (b)
6. (a)	7. (c)	8. (c)	9. (a)	10. (d)