1. A mass m rotates in a vertical circle of radius R and has a circular speed v_c at the top. If the radius of the circle is increased by a factor of 4, circular speed at the top will be

   A) decreased by a factor of 2   B) decreased by a factor of 4   C) increased by a factor of 2   D) increased by a factor of 4

2. A vessel contains 1 mol of O_2 and 2 mol of He. What is the value of 'C_P/C_V' of the mixture?

   A) 17/11   B) 71/65   C) 38/15   D) 46/15

3. The effective capacitance between terminals A and B (as shown in the figure) is

   A) 16 μF   B) 8 μF   C) 6 μF   D) 8/3 μF
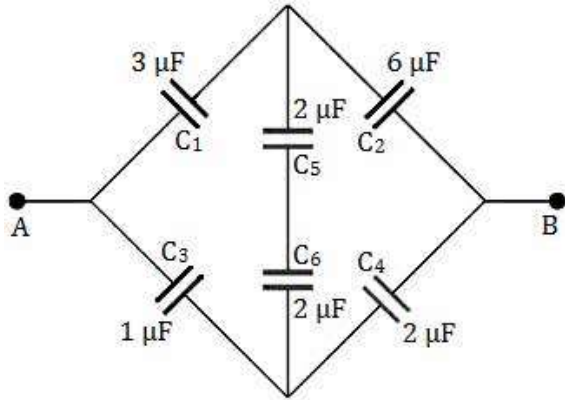
4. The current I in the circuit shown below is
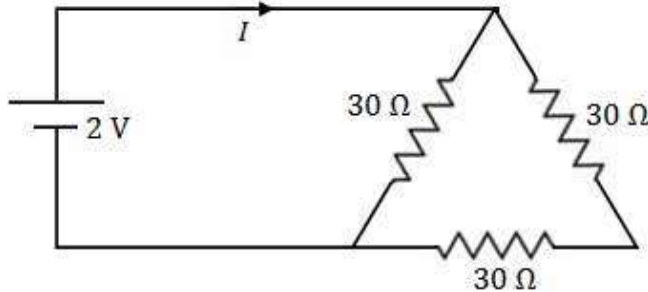
   A) $\frac{1}{45}$ A   B) $\frac{1}{15}$ A   C) $\frac{1}{10}$ A   D) $\frac{1}{5}$ A

5. An electric wire in the wall of a building carries a DC current of 25 A vertically upward. What is the magnetic field due to this current at a point which is 10 cm to the right of the wire?

   A) 3.1×10^{-4} T   B) 5.0×10^{-5} T   C) 4.23×10^{-4} T   D) 5.11×10^{-3} T

6. In an electric circuit, R, C, L and AC voltage are all connected in series. When L is removed from the LCR circuit, the phase difference between the voltage and the current in the circuit is $\pi/3$. If instead, C is removed from the LCR circuit, the phase difference is again $\pi/3$. Determine the power factor of the circuit.

   A) $\frac{1}{2}$ B) $\frac{1}{\sqrt{2}}$ C) 1   D) $\frac{\sqrt{3}}{2}$

7. A short object of length l is placed along the principal axis of a concave mirror away from focus. The object distance is x. If the mirror has a focal length f what will be the length of the image? ($l << |v - f|$, where v is the image distance)

   A) $\frac{(x-f)^2}{f^2 l}$ B) $\frac{f^2 l}{(x-f)^2}$ C) $\frac{fl}{(x-f)}$ D) $\frac{(x-f)}{fl}$

8. The wavelength of the characteristic X-ray K_α line emitted by a hydrogen like element is 0.32 Å. The wavelength of K_β line emitted by the same element will be

   A) 0.21 Å   B) 0.27 Å   C) 0.34 Å   D) 0.40 Å

9. The number of alpha-particles scattered at 60° is 100 per minute in an alpha-scattering experiment on gold foil. The number of alpha-particles scattered per minute at 90° will be

   A) 25   B) 50   C) 16   D) 32

10. A p-n junction diode connected in series with a resistor of 200 Ω is forward biased so that a current of 200 mA flows. If the voltage across this combination is instantaneously reversed at $t = 0$, the current through diode is approximately,

    A) 400 mA   B) 200 mA   C) 100 mA   D) 0 mA