

## JEE Main 2024 April 9 Shift 1 Question Paper and Answer Key

1. A point at which intensity is 1 of maximum intensity, find  $y$ ?

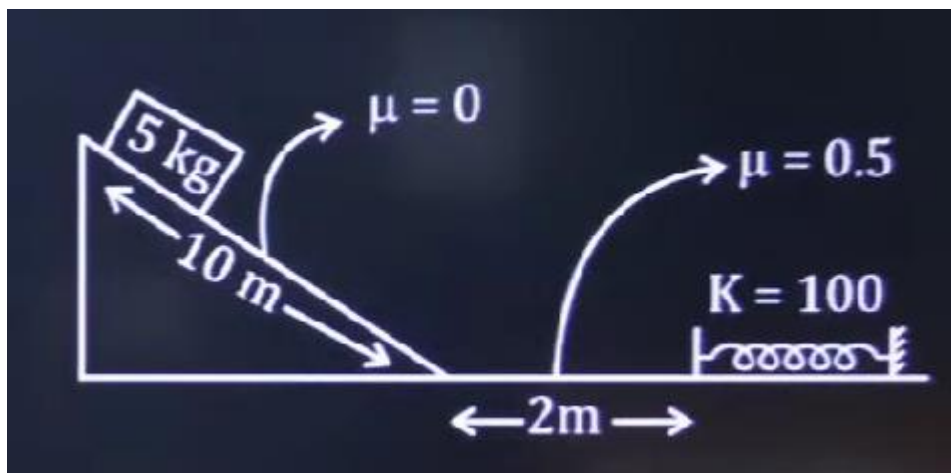
**Ans:  $2\pi e/3$**

2. If the wavelength of the electron and proton are the same, then find the ratios of their kinetic energies.

**Ans:  $p^2/2m$**

3.

In the given diagram calculate the maximum compression in the spring.  
(The angle of wedge is  $30^\circ$ )



Ans:  $x = 1.5$  and  $-2$

4.

A disc of mass  $M$  and radius  $R$  is rotating with angular speed  $\omega$  then another disc of mass  $M/2$  is kept on it then find angular velocity of system

- (a)  $3\omega/4$   
(b)  $\omega/4$   
(c)  $\omega/2$

Ans:  $2\omega/3$

5.

Dimension formula of  $\epsilon_0 E^2$ .  
(where E is electric field and  $\epsilon_0$  is permittivity of free space)

**A**  $[M L^2 T^{-2}]$

**B**  $[M L^{-2} T^{-2}]$

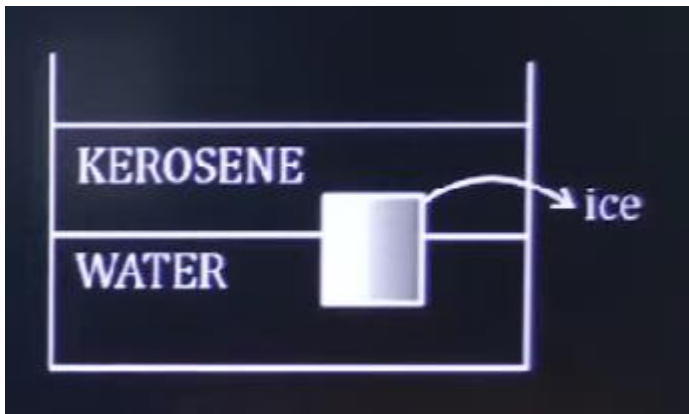
**C**  $[M L^{-1} T^{-2}]$

**D**  $[M L T^{-2}]$

Ans: C

6.

Find the ratio of volume of ice in kerosene and water. (Specific gravity of kerosene = 0.8 and specific gravity of ice = 0.9)



Ans: 1:1

7.

The work done by a diatomic gas during an isobaric process is 100 J. Calculate the heat supplied.

Ans: 350 J

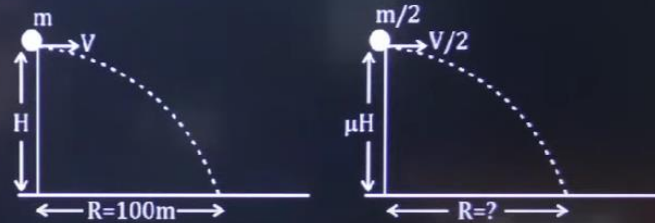
8.

An infinitely long current carrying wire of radius 'a' carries uniform current (i) find out the ratio of magnetic field at distance  $a/2$  and  $2a$ .

Ans: 1 m

9.

Two particles are projected from two different towers of heights  $H$  and  $4H$  with velocity  $V$  and  $V/2$  respectively. If horizontal range for first particle is  $100\text{ m}$  then find horizontal range for other.



Ans: 100 m

10.

A given object takes  $n$  times as much time to slide down at  $45^\circ$  rough incline as it takes to slide down a perfectly smooth  $45^\circ$  incline. The coefficient of kinetic friction between the object and the incline is given by:

Ans:  $1/1-n^2$

11.

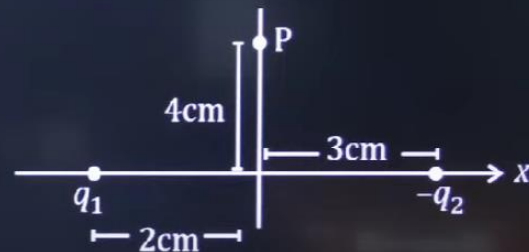
Figure shows two charges  $q_1$  and  $q_2$  placed on  $x$ -axis as shown. If electric field at  $P$  is along  $x$ -direction, find  $\frac{q_1}{q_2}$ .

**A**  $\frac{4\sqrt{5}}{25}$

**B**  $\frac{8\sqrt{5}}{25}$

**C**  $\frac{12}{25}$

**D**  $16\sqrt{5}$



Ans: B

12.

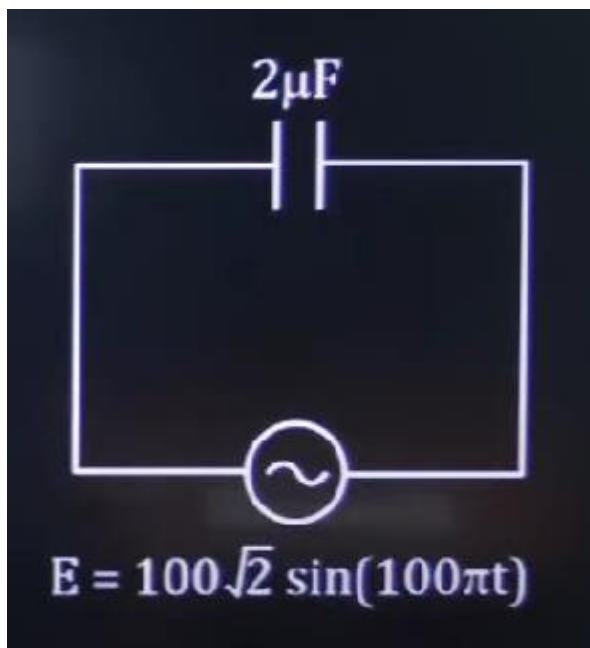
Two satellites are revolving around a planet at radius  $a$  and  $4a$  respectively. If the speed of first satellite is  $6u$ , then find the speed of second satellite.

- A**  $4u$
- B**  $5u$
- C**  $3u$
- D**  $2u$

Ans: C

13.

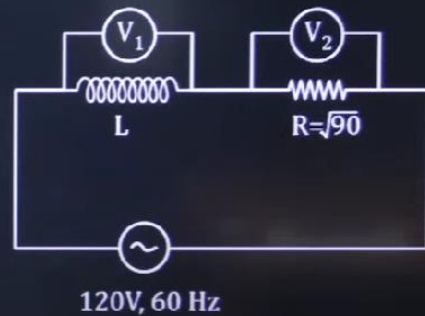
An AC source is connected across a capacitor having capacitance  $2\mu\text{F}$ . Find the rms current in the given circuit.



Ans:  $2\pi \times 10$  raised to the power -2

14.

In given AC circuit consisting resistor R and inductor C and source emf. Two voltmeter  $V_1$  and  $V_2$  are connected as shown in figure. If  $V_2 = 36V$  then inductance of inductor is:



Ans:  $R/36(120 \text{ pie})$

15.

An isotope  $^{12}\text{B}_5$  of mass  $m$  having proton ( $m_p$ ) and neutron ( $m_n$ ) then what will be the binding energy in terms of  $m_p$ ,  $m_n$  and  $m$ .

Ans:

$$(5m_p + 7m_n - m) c^2 = BE.$$

16.

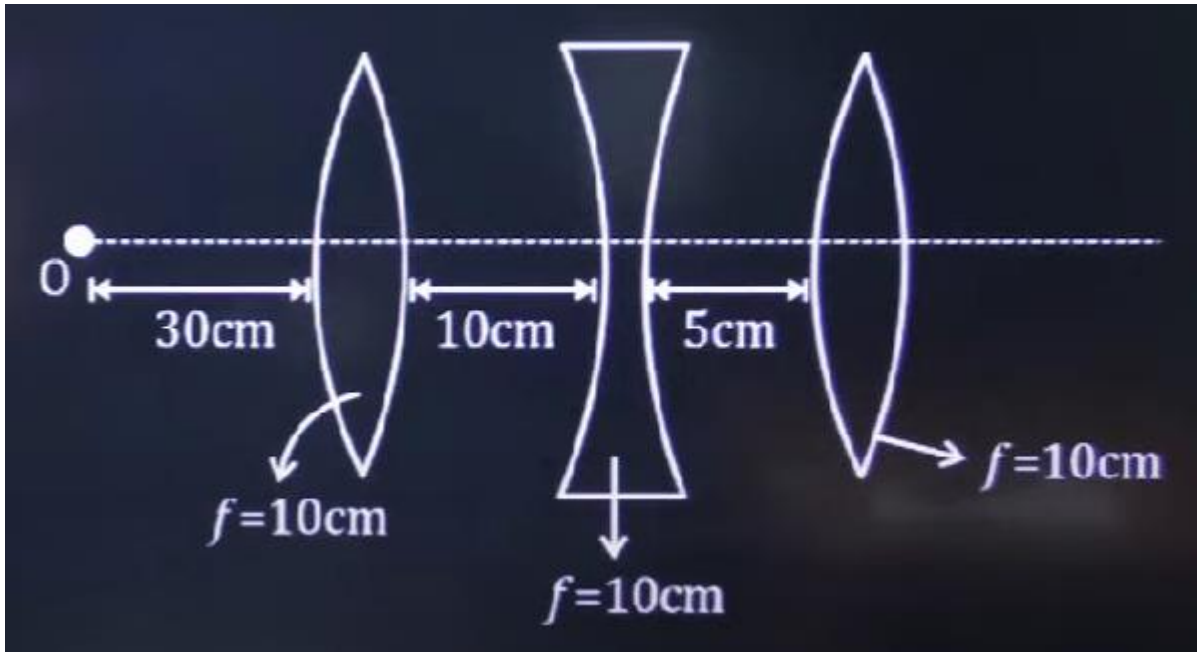
Some amount of water is heated using a constant supply source for 20 minutes. Now if we change the length of heating element then same amount of water gets heated using same source in 15 minutes calculate the change in length.

Ans:  $3/4$

17.

Find distance between final image and object.





Ans:  $45 + \frac{10}{3}\text{ cm}$

18.

A disc having radius  $3\text{ m}$  has a smooth groove as shown in figure. The disc is rotating with some constant angular velocity if a particle of mass  $m$  is placed at a distance  $1\text{ m}$  from the center. Then the velocity of the particle with respect to the disc when it leaves the disc is  $(2\omega\sqrt{x})$ . Find  $x$ .

Ans:  $2\sqrt{2}$

19.

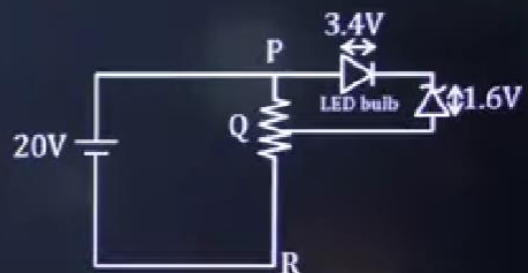
A particle is performing SHM. At a particular position  $x = 0.4\text{ m}$ , the potential energy is  $0.4\text{ J}$  and the kinetic energy is  $0.5\text{ J}$ . Then find the amplitude of SHM.

Ans:  $0.6$

20.

In the given circuit, the length of  $PR$  is  $20\text{ cm}$ . Find the length  $PQ$  so that the bulb will glow.

- A**  $15\text{ cm}$
- B**  $5\text{ cm}$
- C**  $10\text{ cm}$
- D**  $2\text{ cm}$



Ans: B

