

JEE Main 2024 Physics Question Paper Jan 30 Shift 1 (B.E./B.Tech)

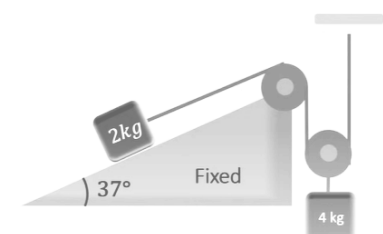
JEE Main Physics Questions

Ques 1. Two rings of equal radius R arranged perpendicular to each other with common center at C , carrying equal current I . Find magnetic field at C .

- A. $\mu_0 I / 2R$
- B. $\mu_0 I / R$
- C. $\sqrt{2} \mu_0 I / R$
- D. $\mu_0 I / \sqrt{2} R$

Ans. D

Ques 2. Find the acceleration of 2 kg block shown in the diagram (neglect friction)



- A. $4g/15$
- B. $2g/15$
- C. $g/15$
- D. $2g/3$

Ans. A

Ques 3. A particle of mass m is projected from ground with speed u at an angle of 30° with the horizontal. Find its angular momentum about the point of projection when it reaches its maximum height.

- A. $mv^3/16g$
- B. $\sqrt{mv^3/16g}$
- C. $mv^3/3g$
- D. $\sqrt{3mv^3/16g}$

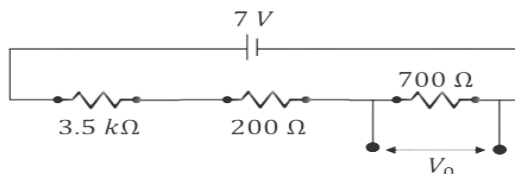
Ans. B

Ques 4. The ratio of KE : PE IN 5th excited state of hydrogen atom is

- A. -2
- B. 2
- C. $-1/2$
- D. $1/2$

Ans. $-1/2$

Ques 5. Find the potential difference across $700\ \Omega$ resistance (i.e. V_0)



- A. 2V
- B. 0.5V
- C. 1.1V
- D. Zero

Ans. C

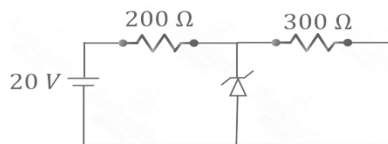
Ques 6. A ball is released from a height of 1 m on a fixed smooth hemispherical surface as shown. Find its velocity when it is at a height of 0.5 m from ground. (take $g = 10\text{ m / s}^2$)



- A. 20 m/s
- B. 10 m/s
- C. $\sqrt{10}$ m/s
- D. 5 m/s

Ans. C

Ques 7. Find the current through Zener diode if its breakdown voltage is 5 V.



- A. 58.33 mA
- B. 25 mA
- C. 28.33 mA
- D. 20.23 mA

Ans. A

Ques 8. A ball released from a height of 10 m strikes the ground and rebounds to height 5 m. Find impulse imparted by the ground while collision, given mass of the ball is 100 g (take $g = 10 \text{ m / (s}^2\text{)}$)

- A. $(\sqrt{2} - 1) \text{ Ns}$
- B. $(\sqrt{2} + 2) \text{ Ns}$
- C. $(2\sqrt{2} - 1) \text{ Ns}$
- D. $(\sqrt{2} + 1) \text{ Ns}$

Ans. D

Ques 9. Electric potential due to short electric dipole on axial position at distance r from dipole is proportional to (assume $r \gg$ length of dipole)

- A. $1/r$**
- B. $1/r^3$**
- C. $1/r^2$**
- D. R**

Ans. C

Ques 10. A block of mass 2kg is placed on a disc which is rotating at constant angular velocity 4 rad/sec. Find the friction force in (N) between block and disc if block is not sliding.

- A. 32**
- B. 34**
- C. 36**
- D. 38**

Ans. A

Ques 11. Distance between virtual image, which is twice the size of object placed in front of mirror and object is 45 cm. The magnitude of focal length of the mirror is ____cm.

Ans. 30

Ques 12. A particle is having uniform acceleration. If its displacement from t to $(t + 1)$ second is 120 m and change in velocity is 50 m/s. Find its displacement (in m) in $(t + 2)^{\text{th}}$ second

Ans. 170

Ques 13. A uniform disc of mass 5 kg and radius 2 m is rotating with 10 rad/s. Now another identical disc is gently placed on first disc. Because of

friction both disc acquire common angular velocity. Loss of kinetic energy in process is _____J.

- A. 125
- B. 250
- C. 62.5
- D. 500

Ans. B

Ques 14. Maximum wavelength of the light source such that photo electrons can be ejected from material of work-function 3 eV is

- A. 2133.3 Å
- B. 3133.3 Å
- C. 4133.3 Å
- D. 313.3 Å

Ans. C

Ques 15. A long wire carrying current $\sqrt{2}$ A is placed in uniform magnetic field of 3×10^{-5} T. If magnetic field is perpendicular to wire, find magnetic force on un length of wire.

- A. 3×10^{-4} N
- B. $3\sqrt{2} \times 10^{-5}$ N
- C. 3×10^{-3} N
- D. Zero

Ans. B

Ques 16. The electric field in an electromagnetic wave is moving in a free space given as $\vec{E} = E_0 \sin(\omega t - kz) \hat{i}$ The corresponding magnetic field will be:

- A. $E_0 c \sin(\omega t - kz) \hat{j}$
- B. $E_0/c \sin(\omega t - kz) \hat{j}$

- C. $E_0/c \cos(\omega t - kz) \hat{i}$
 D. $E_0/c \sin(\omega t - kz) \hat{i}$

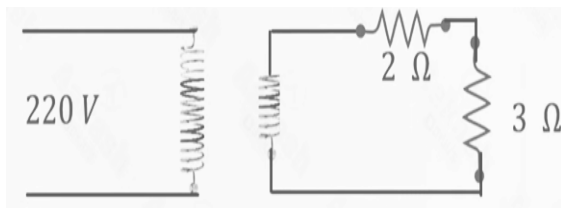
Ans. B

Ques 17. If the area of cross-section is halved and length of a wire having Young's modulus Y is doubled, then its new Young's modulus will be

- A. Y
 B. $4Y$
 C. $Y/2$
 D. $Y/4$

Ans. A

Ques 18. In an electric transformer, 220 V is applied on primary coil having number of turns 100. Find output current through 3Ω resistance if number of turns in secondary coil is 10.



- A. 4 A
 B. 4.4 A
 C. 2 A
 D. 2.2 A

Ans. B

Ques 19. Find the temperature of H_2 gas at which its rms speed is equal to that of O_2 at $47^\circ C$.

- A. $20^\circ C$
 B. $-20^\circ C$
 C. $-253^\circ C$

D. 17°C

Ans. C

Ques 20. In AC circuit with source voltage $E = 20 \sin 1000 t$ is connected to series L-R circuit whose power factor is $1/\sqrt{2}$. If $E = 25 \sin 2000 t$, the new power factor is :

- A. $2/\sqrt{5}$
- B. $1/\sqrt{5}$
- C. $1/\sqrt{3}$
- D. $\sqrt{3/5}$

Ans. B

Ques 21. At P, a point away from planet of radius 6400 km, the gravitational potential and field are -6.4×10^7 SI units and 6.4 SI units, respectively. Find height of that point above surface of planet?

- A. 3000 km
- B. 6400 km
- C. 3600 km
- D. 9400 km

Ans. C

Ques 22. A wire has resistance of 60Ω at temperature 27°C . When it is connected to a 220 V dc supply, a current 2.75 A flows through it at a certain temperature. Find the value of the temperature, if coefficient of thermal resistance (α) is $2 \times 10^{-4}/^{\circ}\text{C}$.

- A. 1694°C
- B. 1500°C
- C. 1000°C
- D. 1200°C

Ans. A