

# JEE Main 2022 B.E./B.Tech June 29- Shift 1- Physics

Question ID:101701

Topic Name:Physics-Section A

Question:

Two balls A and B are placed at the top of 180 m tall tower. Ball A is released from the top at  $t=0$  s. Ball B is thrown vertically down with an initial velocity 'u' at  $t=2$  s. After a certain time, both balls meet 100 m above the ground. Find the value of 'u' in  $\text{ms}^{-1}$ . [use  $g=10 \text{ ms}^{-2}$ ]:

- A 10
- B 15
- C 20
- D 30

Answer Given By Candidate: **Not Attempted**

Question ID:101702

Topic Name:Physics-Section A

Question:

A body of mass M at rest explodes into three pieces, in the ratio of masses 1 : 1 : 2. Two smaller pieces fly off perpendicular to each other with velocities of  $30 \text{ ms}^{-1}$  and  $40 \text{ ms}^{-1}$  respectively. The velocity of the third piece will be :

- A  $15 \text{ ms}^{-1}$
- B  $25 \text{ ms}^{-1}$
- C  $35 \text{ ms}^{-1}$
- D  $50 \text{ ms}^{-1}$

Answer Given By Candidate: **B**

Question ID:101703

Topic Name:Physics-Section A

Question:

The activity of a radioactive material is  $2.56 \times 10^{-3}$  Ci. If the half life of the material is 5 days, after how many days the activity will become  $2 \times 10^{-5}$  Ci ?

- A 30 days
- B 35 days
- C 40 days
- D 25 days

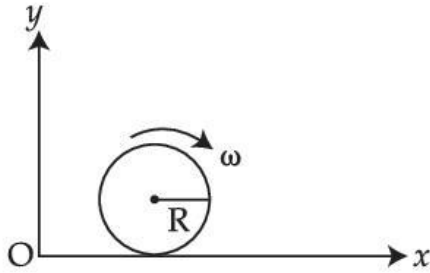
Answer Given By Candidate: **B**

Question ID:101704

Topic Name:Physics-Section A

Question:

A spherical shell of 1 kg mass and radius  $R$  is rolling with angular speed  $\omega$  on horizontal plane (as shown in figure). The magnitude of angular momentum of the shell about the origin  $O$  is  $\frac{a}{3} R^2\omega$ . The value of  $a$  will be :



- A 2
- B 3
- C 5
- D 4

Answer Given By Candidate: B

Question ID:101705

Topic Name:Physics-Section A

Question:

A cylinder of fixed capacity of 44.8 litres contains helium gas at standard temperature and pressure. The amount of heat needed to raise the temperature of gas in the cylinder by  $20.0^\circ\text{C}$  will be :

(Given gas constant  $R = 8.3 \text{ JK}^{-1}\text{-mol}^{-1}$ )

- A 249 J
- B 415 J
- C 498 J
- D 830 J

Answer Given By Candidate: C

Question ID:101706

Topic Name:Physics-Section A

Question:

A wire of length  $L$  is hanging from a fixed support. The length changes to  $L_1$  and  $L_2$  when masses 1 kg and 2 kg are suspended respectively from its free end. Then the value of  $L$  is equal to :

- A  $\sqrt{L_1 L_2}$

- B  $\frac{L_1 + L_2}{2}$
- C  $2L_1 - L_2$
- D  $3L_1 - 2L_2$

Answer Given By Candidate:C

Question ID:101707

Topic Name:Physics-Section A

Question:

Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R**.

**Assertion A :** The photoelectric effect does not takes place, if the energy of the incident radiation is less than the work function of a metal.

**Reason R :** Kinetic energy of the photoelectrons is zero, if the energy of the incident radiation is equal to the work function of a metal.

In the light of the above statements, choose the **most appropriate** answer from the options given below.

- A Both **A** and **R** are correct and **R** is the correct explanation of **A**
- B Both **A** and **R** are correct but **R** is **not** the correct explanation of **A**
- C **A** is correct but **R** is not correct
- D **A** is not correct but **R** is correct

Answer Given By Candidate:B

Question ID:101708

Topic Name:Physics-Section A

Question:

A particle of mass 500 gm is moving in a straight line with velocity  $v = b x^{5/2}$ . The work done by the net force during its displacement from  $x=0$  to  $x=4$  m is : (Take  $b=0.25 \text{ m}^{-3/2} \text{ s}^{-1}$ ).

- A 2 J
- B 4 J
- C 8 J
- D 16 J

Answer Given By Candidate:D

Question ID:101709

Topic Name:Physics-Section A

Question:

A charge particle moves along circular path in a uniform magnetic field in a cyclotron. The kinetic energy of the charge particle increases to 4 times its initial value. What will be the ratio of new radius to the original radius of circular path of the charge particle :

- A 1 : 1  
 B 1 : 2  
 C 2 : 1  
 D 1 : 4

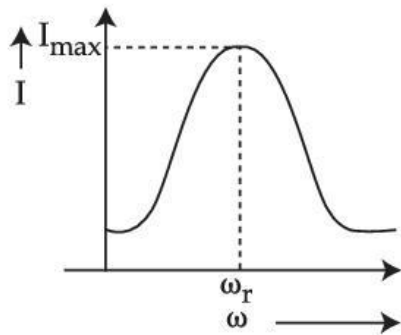
Answer Given By Candidate: C

Question ID: 101710

Topic Name: Physics-Section A

For a series LCR circuit,  $I$  vs  $\omega$  curve is shown :

- (a) To the left of  $\omega_r$ , the circuit is mainly capacitive.  
 (b) To the left of  $\omega_r$ , the circuit is mainly inductive.  
 (c) At  $\omega_r$ , impedance of the circuit is equal to the resistance of the circuit.  
 (d) At  $\omega_r$ , impedance of the circuit is 0.



Question: Choose the **most appropriate** answer from the options given below :

- A (a) and (d) only  
 B (b) and (d) only  
 C (a) and (c) only  
 D (b) and (c) only

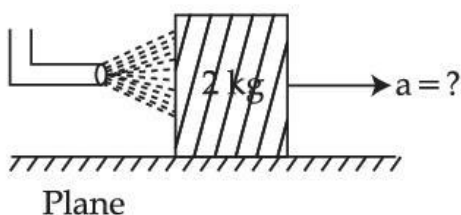
Answer Given By Candidate: C

Question ID: 101711

Topic Name: Physics-Section A

Question:

A block of metal weighing 2 kg is resting on a frictionless plane (as shown in figure). It is struck by a jet releasing water at a rate of  $1 \text{ kg s}^{-1}$  and at a speed of  $10 \text{ ms}^{-1}$ . Then, the initial acceleration of the block, in  $\text{ms}^{-2}$ , will be :



- A 3

B 6

C 5

D 4

Answer Given By Candidate:C

Question ID:101712

Topic Name:Physics-Section A

Question:

In van der Waals equation  $\left[P + \frac{a}{V^2}\right] [V - b] = RT$ ; P is pressure, V is volume, R is universal gas

constant and T is temperature. The ratio of constants  $\frac{a}{b}$  is dimensionally equal to :

A  $\frac{P}{V}$ B  $\frac{V}{P}$ 

C PV

D  $PV^3$ 

Answer Given By Candidate:C

Question ID:101713

Topic Name:Physics-Section A

Question:

Two vectors  $\vec{A}$  and  $\vec{B}$  have equal magnitudes. If magnitude of  $\vec{A} + \vec{B}$  is equal to two times the magnitude of  $\vec{A} - \vec{B}$ , then the angle between  $\vec{A}$  and  $\vec{B}$  will be :

A  $\sin^{-1}\left(\frac{3}{5}\right)$ B  $\sin^{-1}\left(\frac{1}{3}\right)$ C  $\cos^{-1}\left(\frac{3}{5}\right)$ D  $\cos^{-1}\left(\frac{1}{3}\right)$ 

Answer Given By Candidate:D

Question ID:101714

Topic Name:Physics-Section A

**Question:**

The escape velocity of a body on a planet 'A' is  $12 \text{ kms}^{-1}$ . The escape velocity of the body on another planet 'B', whose density is four times and radius is half of the planet 'A', is :

- A  $12 \text{ kms}^{-1}$
- B  $24 \text{ kms}^{-1}$
- C  $36 \text{ kms}^{-1}$
- D  $6 \text{ kms}^{-1}$

Answer Given By Candidate: **A****Question ID:101715****Topic Name:**Physics-Section A**Question:**

At a certain place the angle of dip is  $30^\circ$  and the horizontal component of earth's magnetic field is 0.5 G. The earth's total magnetic field (in G), at that certain place, is :

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

Answer Given By Candidate: **A****Question ID:101716****Topic Name:**Physics-Section A**Question:**

A longitudinal wave is represented by  $x = 10 \sin 2\pi \left( nt - \frac{x}{\lambda} \right)$  cm. The maximum particle velocity will be four times the wave velocity if the determined value of wavelength is equal to :

- A  $2\pi$
- B  $5\pi$
- C  $\pi$
- D  $\frac{5\pi}{2}$

Answer Given By Candidate: **Not Attempted****Question ID:101717****Topic Name:**Physics-Section A

**Question:**

A parallel plate capacitor filled with a medium of dielectric constant 10, is connected across a battery and is charged. The dielectric slab is replaced by another slab of dielectric constant 15. Then the energy of capacitor will :

- A increase by 50%
- B decrease by 15%
- C increase by 25%
- D increase by 33%

Answer Given By Candidate:A

**Question ID:101718**

Topic Name:Physics-Section A

**Question:**

A positive charge particle of 100 mg is thrown in opposite direction to a uniform electric field of strength  $1 \times 10^5 \text{ NC}^{-1}$ . If the charge on the particle is  $40 \mu\text{C}$  and the initial velocity is  $200 \text{ ms}^{-1}$ , how much distance it will travel before coming to the rest momentarily :

- A 1 m
- B 5 m
- C 10 m
- D 0.5 m

Answer Given By Candidate:D

**Question ID:101719**

Topic Name:Physics-Section A

Using Young's double slit experiment, a monochromatic light of wavelength  $5000 \text{ \AA}$  produces fringes of fringe width 0.5 mm. If another monochromatic light of wavelength  $6000 \text{ \AA}$  is used and the separation between the slits is doubled, then the new fringe width will be :

**Question:**

- A 0.5 mm
- B 1.0 mm
- C 0.6 mm
- D 0.3 mm

Answer Given By Candidate:D

**Question ID:101720**

Topic Name:Physics-Section A

**Question:**

Only 2% of the optical source frequency is the available channel bandwidth for an optical communicating system operating at 1000 nm. If an audio signal requires a bandwidth of 8 kHz, how many channels can be accommodated for transmission :

- A  $375 \times 10^7$

B  $75 \times 10^7$

C  $375 \times 10^8$

D  $75 \times 10^9$

Answer Given By Candidate: **Not Attempted****Question ID:101721**

Topic Name:Physics-Section B

Question:

Two coils require 20 minutes and 60 minutes respectively to produce same amount of heat energy when connected separately to the same source. If they are connected in parallel arrangement to the same source; the time required to produce same amount of heat by the combination of coils, will be \_\_\_\_\_ min.

Answer Given By Candidate:30

**Question ID:101722**

Topic Name:Physics-Section B

Question:

The intensity of the light from a bulb incident on a surface is  $0.22 \text{ W/m}^2$ . The amplitude of the magnetic field in this light-wave is \_\_\_\_\_  $\times 10^{-9} \text{ T}$ .

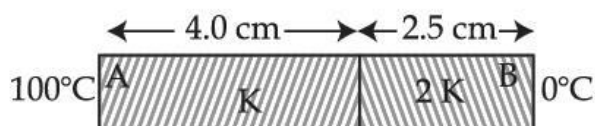
(Given : Permittivity of vacuum  $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$ , speed of light in vacuum  $c = 3 \times 10^8 \text{ ms}^{-1}$ )

Answer Given By Candidate: **Not Attempted****Question ID:101723**

Topic Name:Physics-Section B

Question:

As per the given figure, two plates A and B of thermal conductivity  $K$  and  $2K$  are joined together to form a compound plate. The thickness of plates are  $4.0 \text{ cm}$  and  $2.5 \text{ cm}$  respectively and the area of cross-section is  $120 \text{ cm}^2$  for each plate. The equivalent thermal conductivity of the compound plate is  $\left(1 + \frac{5}{\alpha}\right) K$ , then the value of  $\alpha$  will be \_\_\_\_\_.

Answer Given By Candidate: **Not Attempted****Question ID:101724**

Topic Name:Physics-Section B

Question:

A body is performing simple harmonic with an amplitude of  $10 \text{ cm}$ . The velocity of the body was tripled by air Jet when it is at  $5 \text{ cm}$  from its mean position. The new amplitude of vibration is  $\sqrt{x} \text{ cm}$ . The value of  $x$  is \_\_\_\_\_.

Answer Given By Candidate:9

**Question ID:101725**

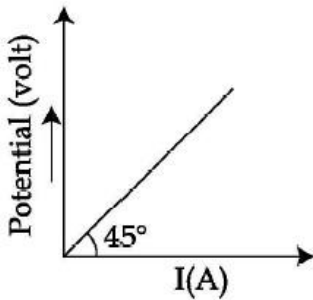
Topic Name:Physics-Section B



**Question:**

The variation of applied potential and current flowing through a given wire is shown in figure. The length of wire is 31.4 cm. The diameter of wire is measured as 2.4 cm. The resistivity of the given wire is measured as  $x \times 10^{-3} \Omega \text{ cm}$ . The value of  $x$  is \_\_\_\_\_.

[Take  $\pi = 3.14$ ]



Answer Given By Candidate:576

**Question ID:101726**

Topic Name:Physics-Section B

**Question:**

300 cal. of heat is given to a heat engine and it rejects 225 cal. of heat. If source temperature is  $227^\circ\text{C}$ , then the temperature of sink will be \_\_\_\_\_  $^\circ\text{C}$ .

Answer Given By Candidate:218

**Question ID:101727**

Topic Name:Physics-Section B

$\sqrt{d_1}$  and  $\sqrt{d_2}$  are the impact parameters corresponding to scattering angles  $60^\circ$  and  $90^\circ$  respectively, when an  $\alpha$  particle is approaching a gold nucleus. For  $d_1 = x d_2$ , the value of  $x$  will be \_\_\_\_\_.

**Question:**

Answer Given By Candidate:Not Attempted

**Question ID:101728**

Topic Name:Physics-Section B

**Question:**

A transistor is used in an amplifier circuit in common emitter mode. If the base current changes by  $100 \mu\text{A}$ , it brings a change of 10 mA in collector current. If the load resistance is  $2 \text{ k}\Omega$  and input resistance is  $1 \text{ k}\Omega$ , the value of power gain is  $x \times 10^4$ . The value of  $x$  is \_\_\_\_\_.

Answer Given By Candidate:Not Attempted

**Question ID:101729**

Topic Name:Physics-Section B

**Question:**

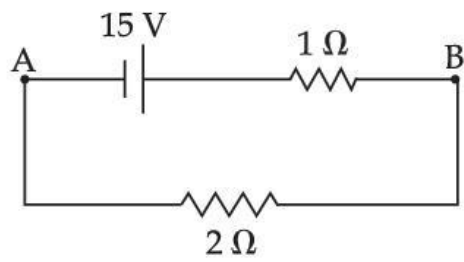
A parallel beam of light is allowed to fall on a transparent spherical globe of diameter 30 cm and refractive index 1.5. The distance from the centre of the globe at which the beam of light can converge is \_\_\_\_\_ mm.

Answer Given By Candidate:Not Attempted

**Question ID:101730**

Topic Name:Physics-Section B

For the network shown below, the value of  $V_B - V_A$  is \_\_\_\_\_ V.



**Question:**

Answer Given By Candidate: **10**