

JEE-Main-05-04-2024 (Memory Based)
[MORNING SHIFT]

Physics

Question: The given figure shows a system 3 blocks and a pulley. The pulley is light and smooth the strings are inextensible and light. If the right end of string connected 6 kg block is given fixed velocity of 3m/s in downward direction then find T_1 (in N)

(Take $g = 10\text{m/s}^2$)

Options:

- (a) 60
- (b) 200
- (c) 100
- (d) 300

Answer: (b)

Question: In a YDSE setup the values of D , d and λ are 2m, 3 mm and 5000 \AA respectively. Find the position of 3rd bright fringe in mm

Options:

- (a) 1 mm
- (b) 5 mm
- (c) 20 mm
- (d) 15 mm

Answer: (a)

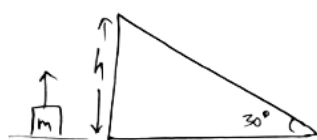
Question: Potential difference between the plates of capacitor of capacitance $12 \mu\text{F}$ changes by 40V at Frequency of 40 KHZ. Find displacement current

Options:

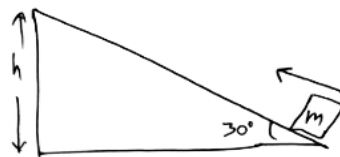
- (a) 10 A
- (b) 9.2 A
- (c) 19.2 A
- (d) 22.2 A

Answer: (c)

Question: A block of mass 'm' is raised by height, $h = 20\text{m}$ in two ways as shown in diagram. In case A, block is raised vertically while in case B, block is raised along the incline. Then the ratio of work done by gravity in both cases is



Case A



Case B

Options:

- (a) 1 : 2
- (b) 2 : 1
- (c) 1 : 1
- (d) 1 : $\sqrt{2}$

Answer: (c)

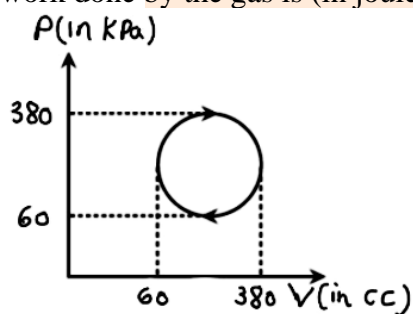
Question: A simple pendulum has time period T_1 at a height R from earth's surface. If height of pendulum becomes $2R$, time period is found to be T_2 . Identify the correct relation

Options:

- (a) $2T_1 = 3T_2$
- (b) $4T_1 = 9T_2$
- (c) $9T_1 = 4T_2$
- (d) $3T_1 = 2T_2$

Answer: (d)

Question: The cyclic process forms a circle on a PV diagram as shown in the figure. The work done by the gas is (in joules):



Options:

- (a) -80.4
- (b) +80.4
- (c) 40.2
- (d) -40.2

Answer: (b)

Question: If the energy density is represented by u and gravitational constant by G , then which of the following quantity will have same unit as that of \sqrt{uG}

Options:

- (a) $\frac{\text{Force}}{\text{mass}}$
- (b) $\left(\frac{\text{Force}}{\text{mass}}\right)^2$
- (c) velocity
- (d) $(\text{velocity})^2$

Answer: (a)

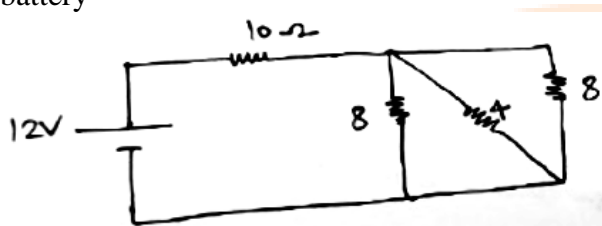
Question: Inner and outer wires of a coaxial wire carry equal and opposite current magnetic field is zero

Options:

- (a) Outside both the wires
- (b) Inside both the wires
- (c) Between the wires
- (d) No where

Answer: (a)

Question: Find the equivalent resistance of the following circuit and the current through the battery



Options:

- (a) 12Ω , 1 Amp
- (b) 30Ω , 4 Amp
- (c) 6Ω , 2 Amp
- (d) 10Ω , 1.2 Amp

Answer: (a)

Question: Statement-1: If a capillary tube is dipped in a liquid, there is no fall (or) rise of liquid then angle of contact is 0°

Statement-2: Angle of contact depends on nature of capillary tube and liquid.

Options:

- (a) Only statement-1 is correct
- (b) Only statement-2 is correct
- (c) Both are correct
- (d) Both are incorrect

Answer: (b)

Question: Find the potential difference across capacitor in series LCR circuit where $L = 1H$, $C = 20 \mu F$ and $R = 300\Omega$ and the applied emf has the form $V = 50\sqrt{2} \cdot \sin(100t)$ volts

Options:

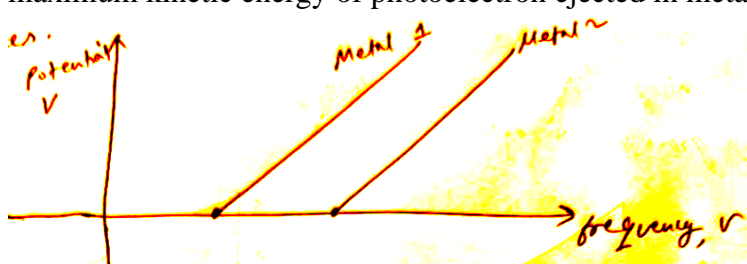
- (a) 70
- (b) 30
- (c) 20
- (d) 50

Answer: (d)

Question: A graph is plotted between voltage and frequency of photons. Metal 1 and metal 2 are the photosensitive plates.

Statement-I: The slope of the graph is h/e where h is planck's constant and e is electronic charge

Statement-II: Maximum kinetic energy of photoelectron ejected will be more in metal 2 than maximum kinetic energy of photoelectron ejected in metal 1.



Options:

- (a) Statement-I is true statement-II is false
- (b) Both Statements are correct and statement-II is the correct explanation of S1
- (c) Statement-I is false ; statement-II is true
- (d) Both statements are false

Answer: (a)

Question: Three capacitors with capacitance $C_1 = 25\mu\text{F}$, $C_2 = 30\mu\text{F}$ and $C_3 = 45\mu\text{F}$ are used as a combination. If C_1 , C_2 and C_3 are arranged in parallel combination, total energy stored is E . If C_1 , C_2 , C_3 are arranged in series combination, total energy stored is E' . Then E/E' is

Options:

- (a) 7.5
- (b) 8.5
- (c) 9.5
- (d) 10.5

Answer: (c)

Question: The ratio of electrostatic force to Gravitational force between a proton and an electron is in order

Options:

- (a) 10^{28}
- (b) 10^{19}
- (c) 10^{22}
- (d) 10^8

Answer: (a)

Question: A block of mass 5kg is kept on the ground. A solid cylinder of 25 kg is kept on the block, after some ground yields and system falls with an acceleration of 0.1m/s^2 . The reaction force by ground is

($g = 9.8 \text{ m/s}^2$)

Options:

- (a) 291 N
- (b) 294 N
- (c) 297 N
- (d) 576 N

Answer: (a)

Question: Ratio of radius of gyration of solid cylinder and hollow sphere is

$$\frac{K_{\text{cylinder}}}{K_{\text{sphere}}} = \sqrt{\frac{3}{x}}$$

Options:

- (a) 4
- (b) 5
- (c) 6
- (d) 7

Answer: (a)

Question: Match the column

1) Escape velocity	A) \sqrt{gR}
2) Orbital velocity	B) $\sqrt{2gR}$
3) Gravitational Potential Energy	C) $-\frac{GM_1M_2}{R}$

Options:

- (a) 1 - A, 2 - B, 3 - C
- (b) 1 - B, 2 - A, 3 - C
- (c) 1 - C, 2 - B, 3 - A
- (d) 1 - C, 2 - A, 3 - B

Answer: (b)

Question: Find mutual inductance if radius of inner loop is a and outer loop is b

Options:

- (a) $\mu_0\pi a^2/2b$
- (b) $\mu_0\pi a^2/2b^2$
- (c) $\mu_0\pi a/2b$
- (d) $\mu_0\pi/2b$

Answer: (a)

Question: A wire of resistance 1Ω , area of cross section $a = 2 \times 10^{-6} \text{ m}^2$, resistivity $\rho = 4 \times 10^{-7} \Omega \cdot \text{m}$. The wire is horizontal and floats in equilibrium in the presence of a magnetic field B. Wire carries current of 2 Amperes and is of mass 0.5 kg. If B is $x \times 10^{-1} \text{ T}$, then find x

Answer: (5)