

Question 1Not yet
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The top end of a 6 m long and $3 \times 10^{-6} \text{ m}^2$ cross sectional area wire is attached to a ceiling, and the wire is suspended vertically downward. If a 120 kg mass is attached to the bottom end of the wire, and the wire's Young's modulus is $6 \times 10^{10} \text{ N/m}^2$, what will be the change in length?

- ☐ A. 0.05 m
- ☐ B. 0.04 m
- ☐ C. 0.06 m
- ☐ D. 0.02 m

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Question 2

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The speed of sound in air at $0\text{ }^{\circ}\text{C}$ is 331.0 m/s . What is the approximate speed of sound in air at $27\text{ }^{\circ}\text{C}$?

- ☐ A. 346.4 m/s
- ☐ B. 358.0 m/s
- ☐ C. 434.9 m/s
- ☐ D. 331.0 m/s

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Question 3

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If the coefficients of thermal expansion of a material are designated by α for the linear expansion, β for the surface (area) expansion, and γ for volume expansion, these parameters are related as:

- ☐ A. $\gamma = 2\alpha$
- ☐ B. $2\beta = 3\gamma$
- ☐ C. $3\beta = 2\gamma$
- ☐ D. $\beta = 3\alpha$

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Question 4

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The amount of electric charge on a particle or object is an integral multiple of the charge of an electron. This property indicates

- ☐ A. charge creation.
- ☐ B. charge induction.
- ☐ C. charge quantization.
- ☐ D. charge conservation.

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Question 5Not yet
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A 25 kg box is dragged on a rough horizontal x-y-plane from $\vec{r}_1 = (1.3 \hat{i} + 1.4 \hat{j})$ m to $\vec{r}_2 = (8.3 \hat{i} + 2.9 \hat{j})$ m by a force $\vec{F} = (4 \hat{i} - 6 \hat{j})$. How much work is done by the force?

- ☐ A. 19.0 J
- ☐ B. 37.0 J
- ☐ C. 15.8 J
- ☐ D. 75.6 J

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Question 6

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Two resistors with resistance of $3\ \Omega$ and $6\ \Omega$ are connected in parallel, and their combination is connected in series to $4\ \Omega$ resistor. If the overall combination of the resistors is connected to a $12\ \text{V}$ source, how much is the voltage drop across the $6\ \Omega$ resistor?

- ☐ A. $8\ \text{V}$
- ☐ B. $4\ \text{V}$
- ☐ C. $2\ \text{V}$
- ☐ D. $12\ \text{V}$

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Question 7

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Which of the following is true about anechoic images of tissues in ultrasound imaging? They appear on the screen as:

- ☐ A. black because the tissues do not reflect any sound wave.
- ☐ B. light gray because the tissues do not reflect any sound wave.
- ☐ C. black because the tissues reflect intense sound waves.
- ☐ D. light gray because the tissues reflect intense sound waves.

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Question 8

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A constant force of 250.0 N is applied horizontally on a box that lays on a horizontal frictionless surface. If the box accelerates with 4.0 m/s^2 , what is its mass?

- ☐ A. 125.0 kg
- ☐ B. 41.7 kg
- ☐ C. 10.4 kg
- ☐ D. 62.5 kg

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Question 9

Not yet
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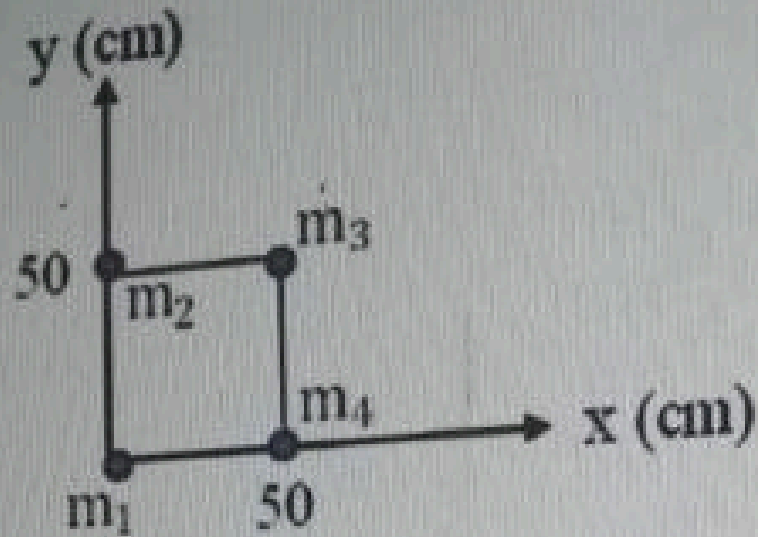
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A stream of water from a wide river enters a narrower and shallow gate of a lake. Which one of the following statements is true?

- ☐ A. The speed of the water decreases as it enters the gate of the lake.
- ☐ B. The speed of the water increases as it enters the gate of the lake.
- ☐ C. The density of the water entering the lake is higher than the water leaving the river.
- ☐ D. The volume of the water entering the lake is higher than the water leaving the river.

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Four masses are placed on the corners of a square on x - y plane as shown in figure below, where $m_1 = m_2 = 200$ g and $m_3 = m_4 = 500$ g.



Where is the center of mass (x_{cm} , y_{cm}) of the system?

- ☐ A. (25, 37.14) cm
- ☐ B. (25, 25) cm
- ☐ C. (37.14, 50) cm
- ☐ D. (35.71, 25) cm

Question 11

Not yet
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A light ray passes from a layer of benzene of refractive index ($n = 1.50$) to water of refractive index ($n = 1.33$). If the angle of incidence is 37° , what will be the angle of refraction?

- ☐ A. $\sin^{-1}(0.90)$
- ☐ B. $\sin^{-1}(0.80)$
- ☐ C. $\sin^{-1}(0.53)$
- ☐ D. $\sin^{-1}(0.68)$

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Question 12

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Consider a car performing a motion with constant acceleration (a) starting from position x_0 at time $t = 0$ with initial velocity v_0 . If v and x stand for velocity and position at time t , which one of the following equations correctly govern the motion of the car?

☐ A. $x = -x_0 + \frac{2(v + v_0)}{t}$

☐ B. $x = x_0 + \left(\frac{v + v_0}{2}\right)t$

☐ C. $x = x_0 + \frac{v^2 + v_0^2}{2a}$

☐ D. $x = x_0 + \left(\frac{v - v_0}{2}\right)t$

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Question 13

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Ethiopian Physical Society is established by interested Ethiopian physics professionals to

- ☐ A. prepare physics curriculum under the ministry of education directives.
- ☐ B. contribute its own share to promote physics education and research.
- ☐ C. take part in election and participate in government formation.
- ☐ D. monitor and supervise the curriculum implementation in Ethiopian high schools.

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Question 14

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If an arrow is drawn to a scale to describe a given vector, then its

- ☐ A. length corresponds to the vector magnitude.
- ☐ B. tail stands for the terminal point of the vector.
- ☐ C. length corresponds to the vector direction.
- ☐ D. head represents the initial point of the vector.

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Question 15

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From the given lists of machines, which one contains only simple machines?

- ☐ A. Gas-cylinder, Wedge, Screw, Lever
- ☐ B. Compound pulley, Wheel and axle, Seat belt, Inclined plane
- ☐ C. Washing machine, Car engine, Wedge, Lever
- ☐ D. Inclined plane, Screw, Wheel and axle, Wedge

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Question 16

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The magnetic field created by current carrying wire at a point from the wire will

- ☐ A. increase exponentially with the increase in the magnitude of the current.
- ☐ B. decrease linearly with the increase in the magnitude of the current.
- ☐ C. decrease exponentially with the increase in the magnitude of the current.
- ☐ D. increase linearly with the increase in the magnitude of the current.

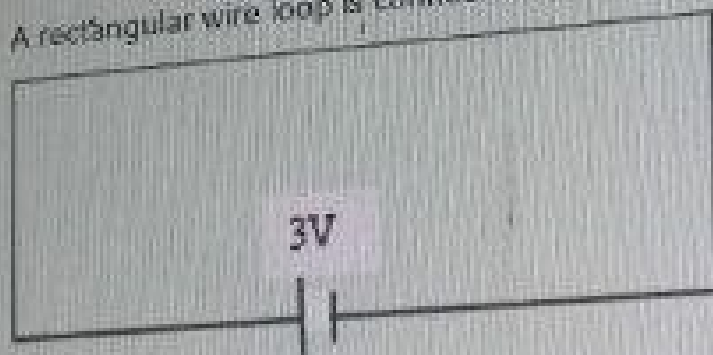
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Question 17

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A rectangular wire loop is connected to a 3 V battery as shown below.



What will happen to the direction of the magnetic field inside the loop if the terminals of the battery are reversed?

- ☐ A. It will change from into the plane to out of the plane.
- ☐ B. It will change from out of the plane to into the plane.
- ☐ C. It will change from counterclockwise to clockwise.
- ☐ D. It will change from clockwise to counterclockwise.

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Question 18

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A traveling wave has a speed v , wavelength λ , period T and frequency f . Which equation correctly states the wave equation?

- ☐ A. $v = \lambda T$
- ☐ B. $f = 1/(\lambda v)$
- ☐ C. $v = \lambda f$
- ☐ D. $T = 1/(\lambda f)$

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Question 19

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The iodine isotope ^{131}I which has an eight-day half-life, is used in nuclear medicine. What is the decay constant of the isotope? ($\ln 2 = 0.693$)

- ☐ A. 5.64 / day
- ☐ B. 8.66×10^{-2} / day
- ☐ C. 1.17×10^{-2} / day
- ☐ D. 12.5 / day

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Question 20

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The velocity of car B with respect to a passenger in car A is 80 km/hr towards West. If the velocity of car A with respect to the ground is 30 km/hr towards East, what would be the velocity of car B with respect to the ground?

- ☐ A. 50 km/hr towards West
- ☐ B. 50 km/hr towards East
- ☐ C. 110 km/hr towards East
- ☐ D. 110 km/hr towards West

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Question 21

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Which one of the following statements correctly describes the rotation of an object around a fixed axis?

- ☐ A. Angular acceleration is perpendicular to the plane of rotation and in the same direction to angular velocity if the rotation rate is increasing.
- ☐ B. Particles in the object that are closer to the axis will have different angular displacement from particles that are far from it.
- ☐ C. Particles in the object closer to the axis will have larger angular velocity than particles that are farther from the axis.
- ☐ D. Particles that are closer to the axis will have similar translational displacement from particles that are far from it.

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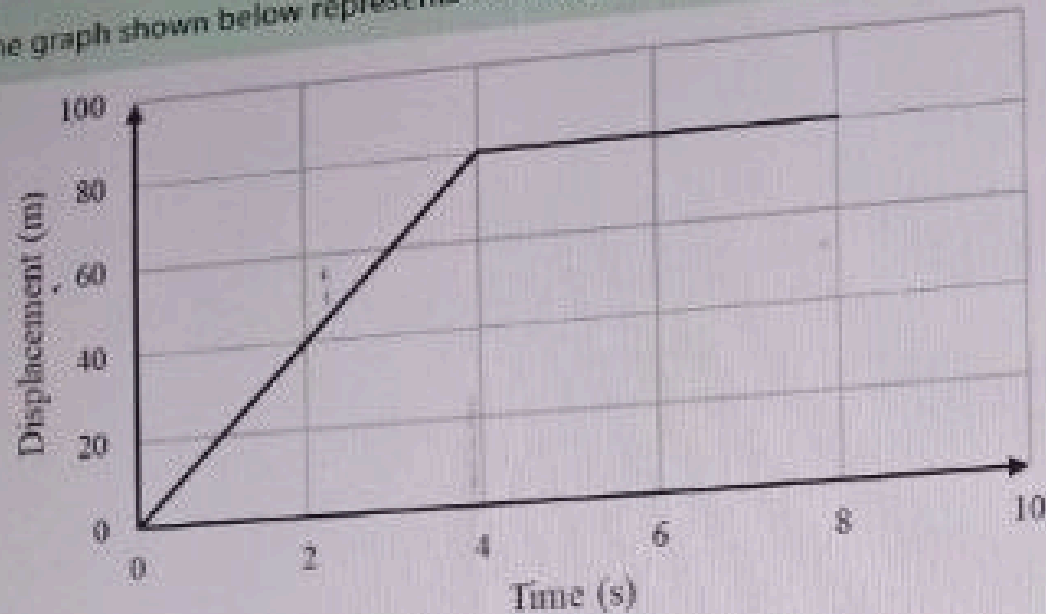


Question 22

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The graph shown below represents the motion of a car along a straight line.



What are the magnitudes of the velocities of the car for the first 4 seconds and the last 4 seconds, respectively?

- ☐ A. 0 m/s and 20 m/s
- ☐ B. 20 m/s and 0 m/s
- ☐ C. 20 m/s and 20 m/s
- ☐ D. 10 m/s and 0 m/s

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Question 23

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Which one of the following sets contains only primary colors?

- ☐ A. {red, blue, orange}
- ☐ B. {blue, green, red}
- ☐ C. {green, blue, black}
- ☐ D. {red, green, yellow}

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Question 24

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The logic circuit shown below consists of OR and NAND gates.



Which of the following tables represent the correct truth table for the circuit?

☐ A.

A	B	C
0	0	1
0	1	0
1	0	0
1	1	1

☐ B.

A	B	C
0	0	0
0	1	1
1	0	0
1	1	1

☐ C.

A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

☐ D.

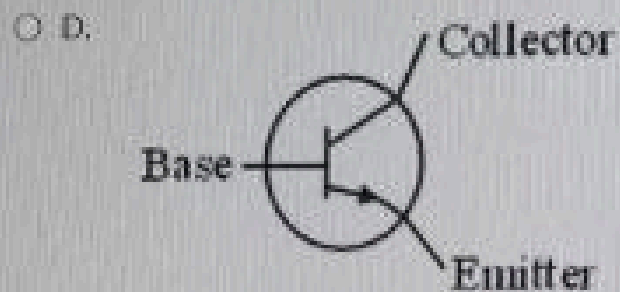
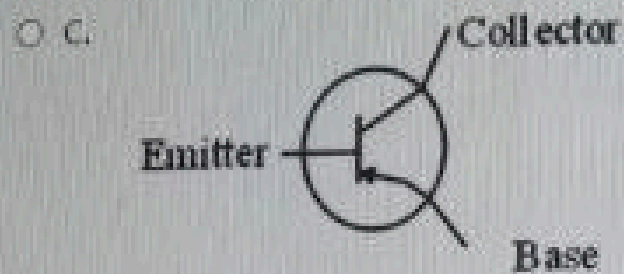
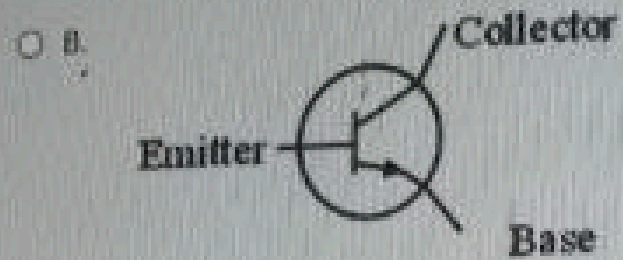
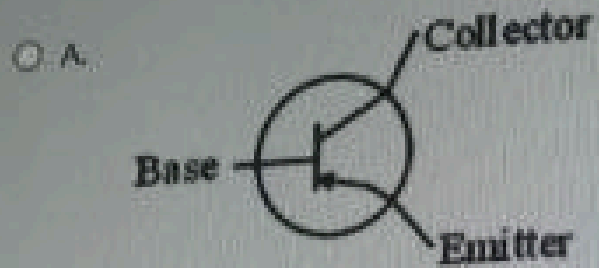
A	B	C
0	0	1
0	1	0
1	0	1
1	1	0

Question 25

Not yet
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Which of the following is a correct schematic symbol for an NPN transistor with its labelled terminals?



Question 26

Not yet
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A water hose of diameter 4 cm is connected to a tap of diameter 6 cm. The water flow rate from the tap is $1.57 \times 10^{-4} \text{ m}^3/\text{s}$. What will be the speed of the water in the hose?

- ☐ A. 0.125 m/s
- ☐ B. 0.393 m/s
- ☐ C. 0.174 m/s
- ☐ D. 0.560 m/s

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Question 27

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Suppose you want to check, without any touch, if there is a current flowing through a wire or not. Which one of the following devices is used?

- ☐ A. Test light
- ☐ B. Voltmeter
- ☐ C. Compass
- ☐ D. Ohmmeter

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Question 28

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Which one of the following statements describes the characteristics of third order lever?

- ☐ A. The load is between the effort and fulcrum.
- ☐ B. The fulcrum is between the load and the effort.
- ☐ C. The effort distance is greater than load distance.
- ☐ D. The effort is between the load and the fulcrum.

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Question 29

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Which one of the following statements correctly describes the characteristics of equipotential lines?

- ☐ A. For point charge, the equipotential lines are straight lines and parallel to each other.
- ☐ B. For uniform electric field, the equipotential lines are parallel to that of the field lines.
- ☐ C. Electric potential difference is non-zero between two points on different equipotential lines.
- ☐ D. Electric potential difference is non-zero between two points on the same equipotential line.

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Question 30

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A strong nuclear force is

- ☐ A. an attractive force between the nucleus and the electrons around the nucleus.
- ☐ B. a short-range attractive force that acts between nucleons in the nucleus.
- ☐ C. a short-range repulsive force that acts between protons in the nucleus.
- ☐ D. a short-range force which acts inside the individual nucleons, and can split a neutron into proton and electron.

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Question 31Not yet
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A 200 g piece of ice at 0°C is placed in a certain amount of water at 20°C . This system is in a container of negligible heat capacity and is insulated from its surroundings. How much should be the minimum mass of water to melt all the ice at 0°C temperature? (The latent heat of fusion of ice is $L_f = 3.33 \times 10^5 \text{ J/kg}$)

- ☐ A. 666 g
- ☐ B. 200 g
- ☐ C. 400 g
- ☐ D. 793 g

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Question 32

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Consider two objects A and B, that A has twice the mass of B. If object B is raised to a height, h , above the ground and object A is raised to a height $h/2$, which of the following is correct about their gravitational potential energies? The gravitational potential energy of

- ☐ A. A is equal to that of B.
- ☐ B. A is twice that of B.
- ☐ C. B is twice that of A.
- ☐ D. A is 4 times that of B.

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Question 33

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A quantity that describes deformation of materials that is given by fractional change in length or volume is

- ☐ A. stress.
- ☐ B. strain.
- ☐ C. elasticity.
- ☐ D. density.

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Question 34

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Conservative force differs from the nonconservative one in that, the work done by

- ☐ A. conservative force along a closed path is non-zero unlike that by non-conservative force.
- ☐ B. conservative force is path independent unlike that by non-conservative one.
- ☐ C. non-conservative force is path independent unlike that by the conservative one.
- ☐ D. non-conservative force along a closed path is zero unlike that by non-conservative force.

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Question 35

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Starting from rest, a car accelerates uniformly for 400 m, then continues for 600 m with constant velocity. It then decelerates uniformly with 1 m/s^2 until it stops after traveling for 200 m. What is the average velocity for the total trip?

- ☐ A. 20.0 m/s
- ☐ B. 6.5 m/s
- ☐ C. 13.3 m/s
- ☐ D. 10.0 m/s

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Question 36

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If a student walks 100 m due 37° North of East and then 120 m towards South, what is the displacement moved by the student?

- ☐ A. 220 m, 53° North of East
- ☐ B. 100 m, 53° North of East
- ☐ C. 220 m, 37° South of East
- ☐ D. 100 m, 37° South of East

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Question 37

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To determine the specific heat capacity of a solid we can use a method called

- ☐ A. mixture method with heat energy supplied to the solid for a known time by an electrical heater of known power.
- ☐ B. electrical method with the heat energy supplied for a known time by an electrical heater of known power.
- ☐ C. electrical method with heat energy supplied to the solid by mixing a hot water and solid in a calorimeter.
- ☐ D. mixture method with the heat energy supplied to the solid for unknown time by an electrical heater of known power.

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Items

1	2	3	
10	11	12	13
19	20	21	22
28	29	30	31
37	38	39	40
46	47	48	49
55	56	57	58

Finish attempt ...

Question 38

Not yet answered

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A compound pulley system consisting of two moveable and two fixed pulleys is used to lift a 400 N object as shown in the figure below.



Weight = 400 N

If the frictional force between the pulleys and the rope is negligible, what is the mechanical advantage of the pulley system?

- ☐ A. 4
- ☐ B. 2
- ☐ C. 5
- ☐ D. 1

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Question 39

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The upward force that an object immersed in a fluid experience is known as

- ☐ A. weight of the object.
- ☐ B. turbulent force.
- ☐ C. buoyant force.
- ☐ D. force of the fluid.

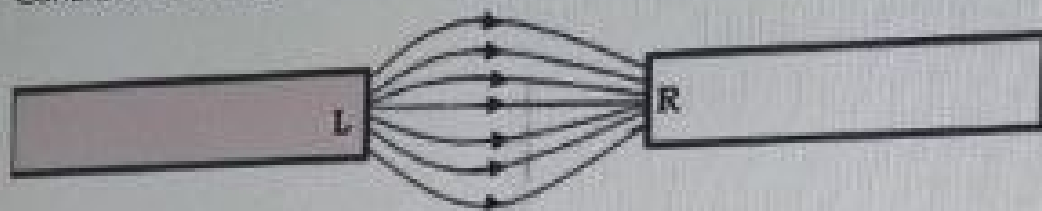
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Question 40

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Consider the magnetic field lines between two bar magnets are partially drawn as shown in figure below.



The two poles of the magnets indicated by R and L 'respectively' are

- ☐ A. North and South poles.
- ☐ B. North and North poles.
- ☐ C. South and North poles.
- ☐ D. South and South poles.

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Question 41

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Which one of the following statements describes heat?

- ☐ A. It is the form of energy that transfers when two objects of different temperatures are brought in thermal contact.
- ☐ B. It is the form of energy which is stored in an object and increases when the object's temperature increases.
- ☐ C. It is a property of a physical system which is related to the average kinetic energy of the particles of the system.
- ☐ D. It is a form of energy that transfers between two systems by doing work in the process to achieve mechanical equilibrium.

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Question 42

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A current of 6 A flows in hot plate when the potential difference between the terminals of a hot plate is 102 V. How much current will flow if the potential difference is reduced to 68 V for a plate that obeys Ohm's law?

- ☐ A. 2 A
- ☐ B. 4 A
- ☐ C. 6 A
- ☐ D. 3.4 A

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Question 43

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Which one of the following statements correctly describes a uniform circular motion of a particle in a horizontal plane? Its

- ☐ A. centripetal acceleration is a non-zero constant.
- ☐ B. tangential velocity is a non-zero constant.
- ☐ C. angular velocity is a non-zero constant.
- ☐ D. tangential acceleration is a non-zero constant.

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Question 44

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Electric field at a point is defined as the electric

- ☐ A. force per unit mass that a test charge experiences when placed at that point.
- ☐ B. force that a positive test charge exerts on another point charge placed at that point.
- ☐ C. potential energy per unit charge of a test charge placed at that point.
- ☐ D. force per unit charge that a positive test charge experiences when placed at that point.

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Question 45

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When an n-type and p-type semiconductors form a junction, it will form a diode

- ☐ A. that conducts significant current in both forward and reverse biasing.
- ☐ B. that will have an ohmic type current-voltage characteristics.
- ☐ C. where a p-side is anode and the n-side is cathode at the junction.
- ☐ D. that conducts current in the reverse biasing but not in the forward biasing.

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Question 46

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A car is moving with a constant acceleration. This means that

- ☐ A. its velocity changes equally with equal interval of time.
- ☐ B. it moves with constant speed.
- ☐ C. it moves with constant velocity.
- ☐ D. its position changes equally with equal interval of time.

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Question 47

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A packed books of mass 3 kg is lying on the surface of a 0.90 m high table. If you pick it up and place it on a bookshelf 2.0 m above the floor, the work done by you and by the gravity, respectively, are

- ☐ A. -60 J and 60 J
- ☐ B. 33 J and -33 J
- ☐ C. -33 J and 33 J
- ☐ D. 60 J and -60 J

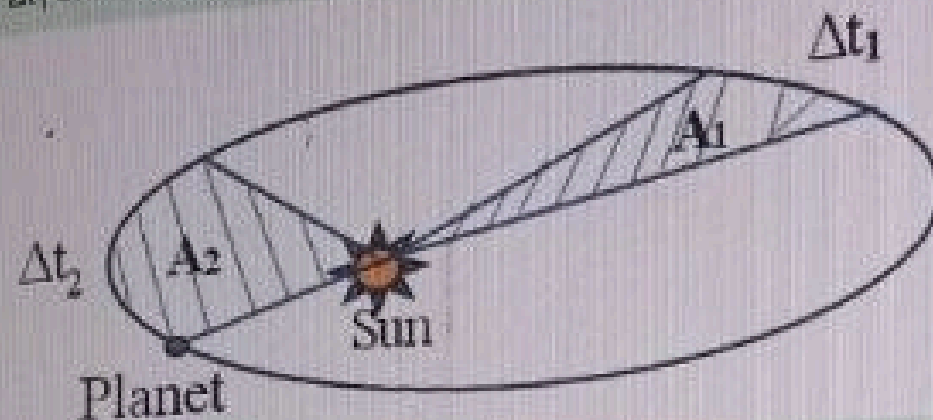
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Question 48

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A certain planet revolving around the sun sweeps areas A_1 and A_2 at different positions during the time interval of Δt_1 and Δt_2 respectively as shown in the figure below.



Which one of the following correctly states Kepler's second law of planetary motion?

- ☐ A. If $\Delta t_1 > \Delta t_2$, then $A_1 = A_2$
- ☐ B. If $\Delta t_1 = \Delta t_2$, then $A_1 = A_2$
- ☐ C. If $\Delta t_1 > \Delta t_2$, then $A_1 < A_2$
- ☐ D. If $\Delta t_1 = 2\Delta t_2$, then $A_1 = (A_2)^2$

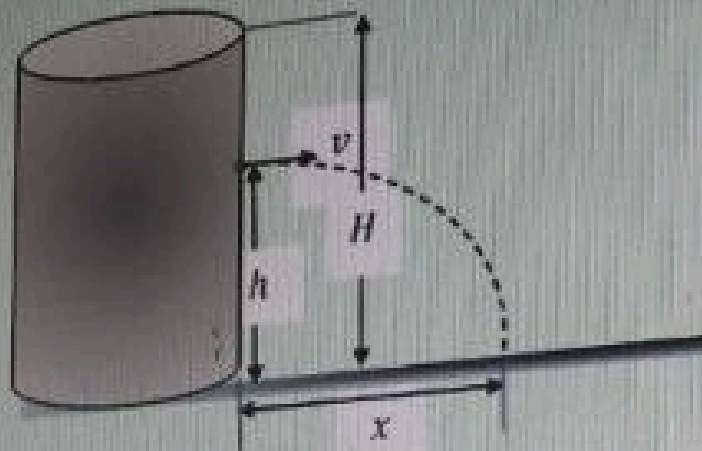
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Question 49

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A barrel of height H is fully filled with water. A bullet shot the barrel at height h above the ground and the water is projected at a horizontal speed of v as shown in the figure below.



At what horizontal distance (x) does the spilled water strikes the ground?

☐ A. $x = v \sqrt{\frac{2(H-h)}{g}}$

☐ B. $x = v \sqrt{g}$

☐ C. $x = v \sqrt{\frac{g}{H}}$

☐ D. $x = v \sqrt{\frac{2h}{g}}$

Question 50

Not yet
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For an athlete who runs on a track for a specified time interval, her distance and displacement can be different in that distance

- ☐ A. can be negative whereas displacement cannot be.
- ☐ B. is less than the magnitude of displacement.
- ☐ C. can be zero whereas the displacement cannot be.
- ☐ D. is greater than the magnitude of displacement.

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Question 51

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A collision between two particles is known as

- ☐ A. elastic if the total kinetic energy is not conserved but the total momentum is conserved.
- ☐ B. elastic if both the total kinetic energy and momentum are conserved.
- ☐ C. inelastic if the total kinetic energy is conserved but the total momentum is not conserved.
- ☐ D. inelastic if both the total kinetic energy and momentum are conserved.

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Question 52

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Which one of the following statements does **NOT** explain the contribution of technology to advancement of physics correctly?

- ☐ A. The invention of space shuttles enabled experiments in space.
- ☐ B. The development of light detectors enabled spectral analysis.
- ☐ C. The invention of x-rays enabled proper medical imaging.
- ☐ D. The development of x-rays enabled study of atomic structure.

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Question 53

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For a person with defects of vision known as hypermetropia.

- ☐ A. close objects cannot be clearly seen, so the defect can be corrected by concave lenses.
- ☐ B. far objects cannot be clearly seen, so the defect can be corrected by convex lenses.
- ☐ C. far objects cannot be clearly seen, so the defect can be corrected by concave lenses.
- ☐ D. close objects cannot be clearly seen, so the defect can be corrected by convex lenses.

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Question 54

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A parallel-plate capacitor has square metallic plates each of area 100 cm^2 separated by 1 mm . The space between the plates is filled by a dielectric of dielectric constant $k = 4$. If the plates are connected to the terminals of 12 V battery, how much charge is stored on the capacitor?

- ☐ A. 360 nC
- ☐ B. 4.25 nC
- ☐ C. 43.2 nC
- ☐ D. 1.08 nC

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Physics

Back

Question 55

Not yet
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Two spheres A and B are initially neutral. If sphere A is charged by conduction and sphere B is charged by induction, using identical negatively charged rods, which one of the following is correct about the charge of the two spheres after charging?

- ☐ A. Both spheres end up negatively charged.
- ☐ B. Both spheres end up positively charged.
- ☐ C. Sphere A ends up positively charged.
- ☐ D. Sphere B ends up positively charged.

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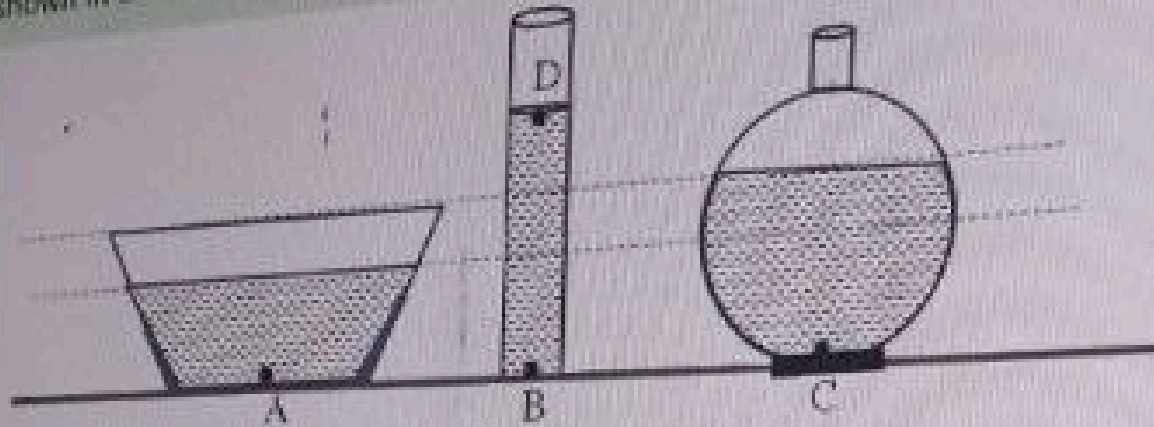
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Question 56

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Three different shapes of containers are filled with water at different levels and opened to the atmosphere as shown in the following figure.



At which point does a student measure the highest pressure?

- ☐ A. At point B
- ☐ B. At point C
- ☐ C. At point D
- ☐ D. At point A

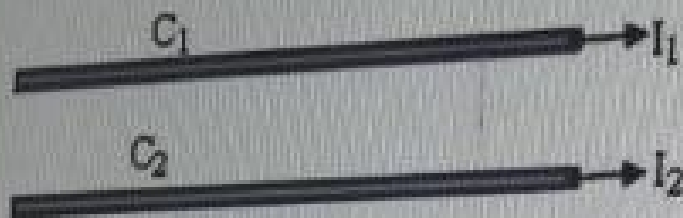
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Question 57

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Given two parallel conductors C_1 and C_2 carrying currents in the same direction as shown in the figure below.



The force between the two conductors is attractive because the

- ☐ A. magnitude of magnetic field produced by I_1 at C_2 is the same as that produced by I_2 at C_1 .
- ☐ B. direction of magnetic field produced by I_1 at C_2 is opposite to that produced by I_2 at C_1 .
- ☐ C. magnitude of magnetic field produced by I_1 at C_2 is different from that produced by I_2 at C_1 .
- ☐ D. direction of magnetic field produced by I_1 at C_2 is the same as that produced by I_2 at C_1 .

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Question 58

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A square wire loop with a side length 12 cm is placed in such a way that its area vector makes an angle of 60° with the magnetic field of 10 T. If the loop is slowly pulled out of the magnetic field in 6 s, how much electromotive force is induced in the loop during this time?

- ☐ A. 24 mV
- ☐ B. 17.2 mV
- ☐ C. 12 mV
- ☐ D. 20.9 mV

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Question 59

Not yet
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Lenses form images by refraction of light rays from the object such that the position, size, and nature of the image is determined from a point where the refracted rays or their extensions meet. After refraction from lens, a light ray

- ☐ A. through the optical center will emerge parallel to the principal axis.
- ☐ B. through the principal focus will emerge parallel to the principal axis.
- ☐ C. parallel to the principal axis will emerge without any deviation.
- ☐ D. parallel to the principal axis will emerge through the optical center.

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Question 60

Not yet
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Co-planar vectors are vectors which are

- ☐ A. lying in the same plane.
- ☐ B. perpendicular and lying in two parallel planes.
- ☐ C. parallel and lying in two parallel planes.
- ☐ D. lying in different planes.

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