Physics Questions

Latest Physics MCQ Objective Questions

Question 1:

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Which of the following shows correct relation between Mass and Inertia?

1. Inertia is directly proportional to Mass
2. Inertia is inversly proportional to mass
3. No effect on each other
4. None of the above
5. Not Attempted

Answer (Detailed Solution Below)

Option 1 : Inertia is directly proportional to Mass

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Physics Question 1 Detailed Solution

CONCEPT:

- **Inertia** is the ability of a body by virtue of which it opposes a change.
- According to **Newton's first law** of motion, an object will remain at rest or in uniform motion in a straight line unless acted upon by an external force.
  - **The inertia of rest:** When a body is in rest, it will remain at rest until we apply an external force to move it. This property is called **inertia of rest**.
  - **The inertia of motion:** When a body is in a uniform motion, it will remain in motion until we apply an external force to stop it. This property is called **inertia of motion.**

EXPLANATION:

- **Inertia is directly proportional to Mass.** So option 1 is correct.
- If the mass is high then the inertia is also high and vice versa is also true.

Question 2:

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Which of the following is not true about Viscosity?

(a) It is the property of the liquid by virtue of which it opposes the relative motion between its adjacent layers.

(b) Viscosity is not a property of gases.

(c) The viscosity of a liquid decreases with increase in pressure.

(d) The viscosity of an ideal fluid is zero.

1. a and d only
2. a, b, and c
3. a, b, c, and d
4. b, and c only
5. Not Attempted

Answer (Detailed Solution Below)

Option 4 : b, and c only

Physics Question 2 Detailed Solution

CONCEPT

Viscosity: It is the property of a fluid, by virtue of which it **opposes the relative motion** between its different layers is known as viscosity.

This force is known as the viscous force.

Mathematically, $F = -\eta A \frac{dv}{dx}$

where, η = coefficient of viscosity, A = area, dv/dx = velocity gradient.

EXPLANATION

Fluid means any **liquid or gas** that can flow.

As described above,

- It opposes relative motion between adjacent layers therefore **option 1 is correct.**
- Viscosity is the property of fluid (liquid/gas) therefore, **option 2 is incorrect.**
- $F = -\eta A \frac{dv}{dx} \Rightarrow \eta = -\frac{F}{A}\frac{dx}{dv} = P\frac{dx}{dv}$
- η ∝ P ⇒ viscosity increases pressure increases and vice versa therefore **option 3 is incorrect**
- For the ideal fluid viscosity is zero therefore **option 4 is correct.**

∴ Option 4 is correct

Question 3:

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The wavelength of the incident photons for a photoelectric emission process is increased then the photoelectric current will-

1. Increase
2. Decrease
3. Remains same
4. More than one of the above
5. None of the above

Answer (Detailed Solution Below)

Option 3 : Remains same

Physics Question 3 Detailed Solution

CONCEPT:

- **Photoelectric effect:** When light of **sufficiently small wavelength is incident** on a metal surface, **electrons are ejected from the metal instantly**. This phenomenon is called the **photoelectric effect.**
- **Photocurrent:** The rate of flow of electrons in the photoelectric emission process is called **photocurrent**.
- The **photocurrent depends on the intensity of the incident photons.**

- **Stopping potential:** The **photocurrent may be stopped** by applying a negative potential to anode w.r.t. cathode. The

minimum potential required to stop the electron emitted from metal so that its kinetic energy becomes zero.

- **Work function:** It is the **minimum amount of energy** required so that metal **emits an electron.** It is represented with **ϕ**. Its unit is **eV or joules.**
  - It has **different values for different metals.**

Einstein's equation for the photoelectric effect is given by**:**

h v = ϕ + K.E

Where h = planks constant = $6.6 \times 10^{-34} = 4.14 \times 10^{-15}$ eV-s, v = incident frequency, ϕ = work function

EXPLANATION:

- **Photocurrent depends on the intensity of the incident photons**. It is **independent of the wavelength of the incident photons**. So there will be **no effect on photocurrent by changing the wavelength** of the incident photons. So option 3 is correct.

Question 4:

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According to the special theory of relativity which one is not an absolute quantity?

1. time
2. mass
3. height
4. More than one of the above
5. None of the above

Answer (Detailed Solution Below)

Option 4 : More than one of the above

Physics Question 4 Detailed Solution

Concept:

- According to classical physics, the **inertial mass of a body is independent of the velocity of light**. It is regarding as a constant.
- However special theory of relativity leads us to the concept of **variation of mass with velocity**.
- It follows from the special theory of relativity that the mass m of a body moving with relativistic velocity v relative to an observer is larger than its m_0 when it is at rest.
- Some Interesting results of the special theory of relativity can be summarized as follows without going into their mathematical derivations.

Variation of mass:

The mass is also not invariant.

If a body at rest has a mass m_0 its mass when it moves with a velocity v, increases to m given by:

$$m = \frac{m_o}{\sqrt{1-\frac{v^2}{c^2}}}$$

Time Dilation:

According to classical physics, time is an absolute quantity. But according to the special theory of relativity, Time is not an absolute quantity. It depends upon the motion of the frame of reference.

If the interval of time (say ticking of a clock) between two signals in an inertial frame S be t, then the time interval between these very two signals in another inertial frame S' moving with respect to the first will be given by

$$t' = \frac{t}{\sqrt{1-\frac{v^2}{c^2}}}$$

This means that t' has increased or dilated. In other words, the clock will go slow.

Length Contraction:

The distance from the earth to a star measured by an observer in a moving spaceship would seem smaller than the distance measured by an observer on earth. i.e: (i-e S' < S).

$$L = \frac{L'}{\sqrt{1-\frac{v^2}{c^2}}} \Rightarrow L' = L\sqrt{1-\frac{v^2}{c^2}}$$

L' < L since v

Explanation:
So, from the above observation;

Mass and **Time** is not an absolute quantity according to the special theory of relativity.

Question 5:

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Special theory of relativity treats problems involving –

1. Inertial frame of reference
2. Non - inertial frame of reference
3. Non - accelerated frame of reference
4. More than one of the above
5. None of the above

Answer (Detailed Solution Below)

Option 1 : Inertial frame of reference

Physics Question 5 Detailed Solution

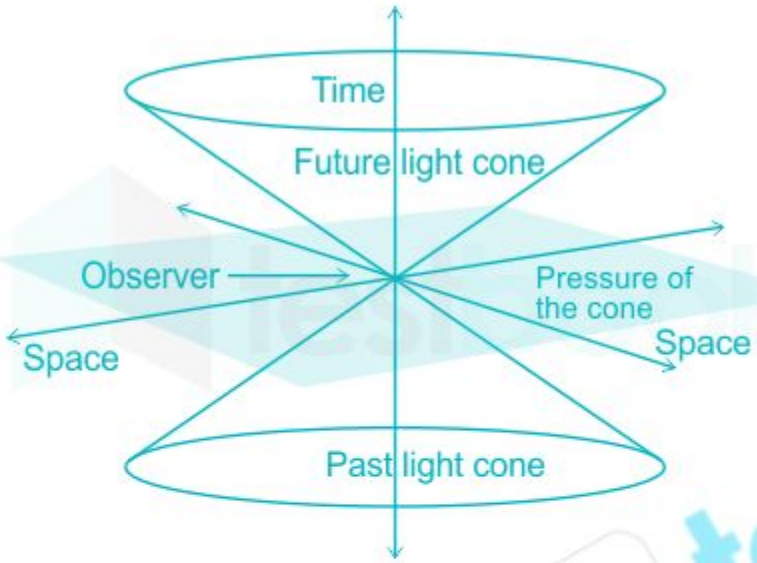
CONCEPT:

The special theory of relativity:

- **Special relativity** is a theory of the **structure of space-time**.
- **The special theory of relativity** is put forward by **Albert Einstein**.
- According to this theory, **all the physical laws should be the same in the inertial frame of reference**(non-accelerated or frame which is at rest or under uniform motion known as an inertial frame of reference).

- The **second postulate** of this theory is **the speed of light c is a constant, independent of relative motion of the source**.

($c = 3 \times 10^8$ m/s)



- **The frame of reference**: If we are observing any **moving body or anybody at rest with respect to any moving object or from any object at rest** then the object is called **frame of reference**.

There are two types of frame of reference:

- **Inertial frame of reference**: The **frame of reference having zero acceleration** is called the **Inertial frame of reference**.
  - This **frame of reference** will be **either in rest or will be moving with a constant velocity.**
  - Newton's **law is valid** in this **frame of reference**.
- **The non-inertial frame of reference**: The **frame of reference having non-zero acceleration** is called a **non-inertial frame of reference**.
  - **Newton's law is not valid** in this frame of reference.
  - **For example**: If we are **observing an object from a freely falling object then this will be a non-inertial frame of reference** because the **freely falling body has some acceleration.**

EXPLANATION:

- As per the postulates, the **special theory of relativity** is only **applicable to the inertial frame of reference**. Therefore option 1 is correct.

Top Physics MCQ Objective Questions

Question 6 View this Question Online >

What type of waves are light wave?

1. Transverse wave
2. Longitudinal wave
3. Both A & B
4. None

Answer (Detailed Solution Below)

Option 1 : Transverse wave

Physics Question 6 Detailed Solution

CONCEPT:

- **Wave:** The disturbance that transfers energy from one place to another is called a wave.

There are mainly **two types of waves**:

A. **Transverse waves**: The wave in which the movement of the particles is at right angles to the motion of the energy is called a transverse wave. **Light is an example** of a transverse wave.
B. **Longitudinal wave:** The wave in which the movement of the particles is parallel to the motion of the energy is called a longitudinal wave. The sound **wave** is an example of a longitudinal wave.

EXPLANATION:

- **Light-wave is a transverse wave** because its components vibrate perpendicular to its direction of propagation. So option 1 is correct.

Question 7 View this Question Online >

A 220 V, 100 W bulb is connected to a 110 V source. Calculate the power consumed by the bulb.

1. 10 W
2. 15 W
3. 20 W
4. 25 W

Answer (Detailed Solution Below)

Option 4 : 25 W

Physics Question 7 Detailed Solution

CONCEPT:

- **Electric Power**: The rate at which **electrical energy** is **dissipated** into **other forms of energy** is called **electrical power** i.e.,

$$P = \frac{W}{t} = VI = I^2R = \frac{V^2}{R}$$

Where V = Potential difference, R = Resistance and I = current.

CALCULATION:

Given - Potential difference (V) = 220 V, power of the bulb (P) = 100 W and actual voltage (V') = 110 V

- The resistance of the bulb can be calculated as,

$$\Rightarrow R = \frac{V^2}{P} = \frac{(220)^2}{100} = 484\,\Omega$$

- The power consumed by the bulb.

$\Rightarrow P = \frac{V^2}{R} = \frac{(110)^2}{484} = 25\ W$

Question 8 View this Question Online >

What will be the energy possessed by a stationary object of mass 10 kg placed at a height of 20 m above the ground? (take g = 10 m/s^2)

1. 2 J
2. 20 kJ
3. 200 J
4. 2 kJ

Answer (Detailed Solution Below)

Option 4 : 2 kJ

Physics Question 8 Detailed Solution

The correct answer is **2 kJ.**

CONCEPT:

- **Potential energy**: The energy of any object due to its position with respect to a reference point is called potential energy. It is denoted by PE.

Potential energy is given by:

PE **= m g h**.

Here, PE is the Potential Energy, m is the mass, g is the acceleration due to gravity, and h is the height at which the object is placed.

height at which the object is placed

CALCULATION:

Given that:

Mass (m) = 10 Kg

Height (h) = 20 m

P.E. = 10 x 10 x 20

P.E.= 2000 J

P.E. = **2 kJ**

Important Point

- **Kinetic energy:** The energy due to the motion of the object is called kinetic energy.
  - **Kinetic energy (KE) = 1/2 (mv^2)**
  - Where m is mass and v is velocity.
- Since the **object is stationary (at rest) so the velocity is zero. Hence the kinetic energy of the object will be zero**.
- Only the potential energy of the object will be there at the height.

Question 9 View this Question Online >

The instrument _____ is used for detecting electric current is

1. Galvanometer
2. Tube tester
3. Altimeter
4. Fathometer

Answer (Detailed Solution Below)

Option 1 : Galvanometer

Physics Question 9 Detailed Solution

CONCEPT:

Galvanometer:

- **A galvanometer** is used for **detecting current in an electric circuit.**
- The galvanometer is the device used for **detecting the presence of small currents and voltage or for measuring their magnitude.**
- The galvanometer is mainly **used in the bridges and potentiometer where they indicate the null deflection or zero current.**
- The potentiometer is **based on the premise that the current sustaining coil is kept between the magnetic field experiences a torque.**

EXPLANATION:

- From the above, it is clear that the **galvanometer** is the instrument used for **detecting the presence of electric current in a circuit**. Therefore option 1^{st} is correct.

Additional Information

Instrument	Used to
Altimeter	Measure the **altitude** of an object.
Tube tester	Used to test characteristics of vacuum tubes.
Fathometer	Measure the depth of water.

Mistake Point

Difference between Ammeter and Galvanometer:

- The ammeter shows **only the magnitude** of the current.
- The galvanometer shows **both the direction and magnitude of the current.**

Question 10 View this Question Online >

A body of 20 kg is lying at rest. Under the action of a constant force, it gains a speed of 7 m/s. The work done by the force will be _____.

1. 490J
2. 500J
3. 390J
4. 430J

Answer (Detailed Solution Below)

Option 1 : 490J

Physics Question 10 Detailed Solution

The correct answer is **490J**

CONCEPT:

- **Work-energy theorem:** It states that the sum of **work done by all the forces acting on a body** is equal to the **change in the kinetic energy** of the body i.e.,

Work done by all the forces = K_f - K_i

$W = \frac{1}{2}mv^2 - \frac{1}{2}mu^2 = \Delta K$

Where v = final velocity, u = initial velocity and m = mass of the body

CALCULATION:

It is given that,

Mass (m) = 20 kg

Final Velocity (v) = 7 m/s and initial velocity (u) = 0 m/s

According to the work-energy theorem,

⇒ **Work done = Change in K.E**

⇒ W = Δ K.E

Since initial speed is zero so the **initial KE will also be zero**.

⇒ Work done (W) = Final K.E = 1/2 mv^2

⇒ W = 1/2 × 20 × 7^2

⇒ W = 10 × 49

⇒ W = **490J**

Question 11 View this Question Online >

What is the force between two small charged spheres having charges of 2 × 10^{-7} C and 3 × 10^{-7} C placed 30 cm apart in the air?

1. 5 × 10^{-6} N
2. 8 × 10^{-5} N
3. 3 × 10^{-4} N
4. 6 × 10^{-3} N

Answer (Detailed Solution Below)

Option 4 : 6 × 10^{-3} N

Physics Question 11 Detailed Solution

CONCEPT:

Coulomb's law in Electrostatics –

- **Coulomb's law** state's that force of interaction between two stationary point charges is **directly proportional** to the **product of the charges**, and **inversely proportional** to the **square of the distance** between them and acts along the straight line joining the two charges.

Force (F) $\propto q_1 \times q_2$

$F \propto \frac{1}{r^2}$

$F = K\frac{q_1 \times q_2}{r^2}$

Where K is a constant = 9×10^9 Nm^2/C^2

EXPLANATION:

Given – $q_1 = 2 \times 10^{-7}$ C, $q_2 = 3 \times 10^{-7}$ C and r = 30 cm = 30×10^{-2} m

Force is equal to

$F = (9 \times 10^9) \times \frac{2\times10^{-7}\times3\times10^{-7}}{(30\times10^{-2})^2}$

$\Rightarrow F = \frac{54\times10^{-5}}{900\times10^{-4}} = 6 \times 10^{-3}N$

Question 12 View this Question Online >

A car, initially at rest travels 20 m in 4 sec along a straight line with constant acceleration. Find the acceleration of car?

1. 4.9 m / s^2

2. 2.5 m / s^2

3. 0.4 m / s^2

4. 1.6 m / s^2

Answer (Detailed Solution Below)

Option 2 : 2.5 m / s^2

Physics Question 12 Detailed Solution

CONCEPT:

- **Equation of motion**: The mathematical equations used to find the final velocity, displacements, time, etc of a moving object without considering force acting on it are called equations of motion.
- These equations are only valid when the acceleration of the body is constant and they move on a straight line.

There are **three equations of motion**:

V = u + at

$V^2 = u^2 + 2aS$

$S = ut + \frac{1}{2}at^2$

Where, V = final velocity, u = initial velocity, s = distance traveled by the body under motion, a = acceleration of body under motion, and t = time taken by the body under motion.

EXPLANATION:

Given that:

Initial velocity (u) = 0

Distance (S) = 20 m

Time (t) = 4 sec

Use $S = ut + \frac{1}{2}at^2$

$20 = 0 + \frac{1}{2} \times a \times 4^2$

acceleration = a = 20/8 = 2.5 m/s^2

Question 13 View this Question Online >

A particle of charge e and mass m moves with a velocity v in a magnetic field B applied perpendicular to the motion of the particle. The radius r of its path in the field is _____

1. $\frac{mv}{Be}$
2. $\frac{Be}{mv}$
3. $\frac{ev}{Bm}$
4. $\frac{Bv}{em}$

Answer (Detailed Solution Below)

Option 1 : $\frac{mv}{Be}$

Physics Question 13 Detailed Solution

CONCEPT:

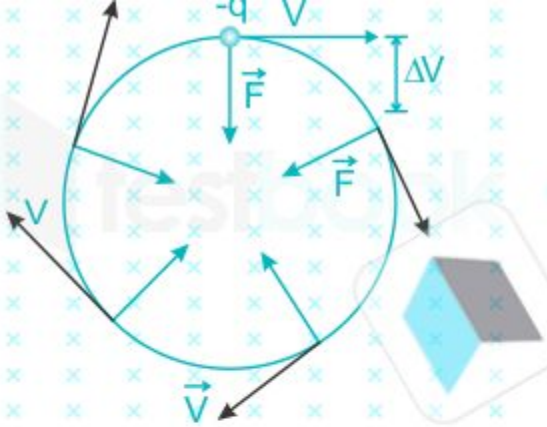
- When **moving through a magnetic field, the charged particle experiences a force.**
- When the direction of the velocity of the charged particle is perpendicular to the **magnetic field:**
  - Magnetic force is always perpendicular to velocity and the field by the Right-Hand Rule.
  - And the particle starts to follow a curved path.
  - The particle continuously follows this curved path until it forms a complete circle.
  - This magnetic force works as the centripetal force.

- Centripetal force (F_C) = Magnetic force (F_B)

$\Rightarrow qvB = mv^2/R$

$\Rightarrow R = mv/qB$

where q is the charge on the particle, v is the velocity of it, m is the mass of the particle, B is the magnetic field in space where it circles, and R is the radius of the circle in which it moves.



EXPLANATION:

Given that particle has charge e; mass = m; and moves with a velocity v in a magnetic field B. So

- **Centripetal force (F_C) = Magnetic force (F_B)**

$\Rightarrow qvB = mv^2/R$

$\Rightarrow R = \frac{mv}{qB}$

$\Rightarrow r = \frac{mv}{Be}$

So the correct answer is **option 1.**

Question 14 View this Question Online >

How much work is done in moving a charge of 5 C across two points having a potential difference of 16 V?

1. 65 J
2. 45 J
3. 40 J
4. 80 J

Answer (Detailed Solution Below)

Option 4 : 80 J

Physics Question 14 Detailed Solution

Option **4** is correct

CONCEPT:

- **Electric potential (V)**: The amount of work done to move a unit charge from a reference point (or infinity) to a specific point in an electric field without producing an acceleration is called electric potential at that point.

$$\text{Electric potential (V)} = \frac{\text{Work done (W)}}{\text{Charge (q)}}$$

- **Electrostatic Potential Energy:** The amount of work done to move a charged particle from infinity to a point in an electric field is known as the potential energy of that charged particle.

CALCULATION:

Given that:

Electric charge (q) = 5 C

Potential difference (V) = 16 V

Work done (W) = charge (q) × potential difference (V)

Work done (W) = 5 × 16 = 80 J

Question 15 View this Question Online >

An ammeter is connected in _____ with the circuit.

1. parallel
2. series
3. both parallel and series
4. None of the above

Answer (Detailed Solution Below)

Option 2 : series

Physics Question 15 Detailed Solution

Explanation:

Ammeter:

- It is a device used to measure the current in a circuit.
- It is generally **connected in series in a circuit.**
- This is because the current remains the same when devices are connected in series.
- The ideal **ammeter has low resistance** because the reading will change as an extra resistance is added in series.

Additional Information

Voltmeter:

- It is a device used for measuring the electric potential difference between two points in an electric circuit.

- It is connected in parallel across the two points to measure the voltage drop between the points.
- This is because the potential difference remains the same if devices are connected in parallel.
- The **voltmeter has high resistance** because the overall resistance will not change if low resistance path is offered to the current in form of voltmeter.