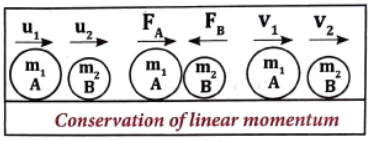
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Answers Key:

Long Answers

1. Inertia is of three types
   (i) Inertia of rest.
   (ii) Inertia of motion.
   (iii) Inertia of direction
   (i) **Inertia of rest:** The resistance of a body to change its state of rest is called inertia of rest Eg: When you vigorously shake the branches of a tree some of the leaves and fruit are detached and they fall down.
   (ii) **Inertia of motion :**The resistance of a body to change its state of motion is called inertia of motion. Eg: An athlete runs some distance before jumping. Because, this will help him jump longer and higher
   (iii) Inertia of direction: The resistance of a body to change its direction of motion is called inertia of direction. Eg : When you make a sharp turn while driving a car, you tend to lean sideways
2. Law states that "There is no change in the linear momentum of a system of bodies as long as no net external force acts on them"
   Proof:



Conservation of linear momentum

   Let two bodies A and B having masses m1 and m_2 move with initial velocity u_1 and u_2 in a straight line
   Let the velocity of the first body be higher than that of the second body. i.e., $u_1 > u_2$
   During an interval of time t second, they tend to have a collision. After the impact, both of them move along the same straight line with a velocity v_1 and v_2 respectively.
   Force on body B due to A,
   $F_A = m_2 (v_2 - u_2)/t$
   Force on body A due to B,
   $F_B = m_1 (v_1 - u_1)/t$
   By Newton's III law of motion
   Action force = Reaction force
   $F_B = -F_A$

$$\frac{m_1(v_1 - u_1)}{/} = \frac{-m_2(v_2 - u_2)}{/}$$

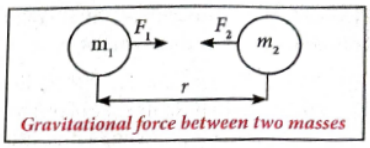
$$\mathbf{m_1v_1 + m_2v_2 = m_1u_1 + m_2u_2 - \cdots - (A)}$$

   The above equation confirms in the absence of an external force, the algebraic sum of the momentum after collision is numerically equal to sum of the momentum before collision. Hence the law of conservation of linear momentum is proved.
3. **Universal law of gravitation:**
   This law states that every particle of matter in this universe attracts every other particle with a force.
   This force is directly proportional to the product of their masses and inversely proportional to the square of the distance between centers of these masses.
   The direction of the force acts along the line joining the masses.
   Derivation:
   Let m_1 and m_2 be the masses of two bodies A and B placed at r metre apart in space
   Force F m_1 X m_2
   F $1/r^2$
   On combining the above two expressions

$$F \propto \frac{m_1 \times m_2}{r^2}$$

$$F = \frac{Gm_1 \times m_2}{r^2} \text{ or } \frac{Gm_1m_2}{r^2}$$

   Where G is universal gravitational constant. Its value in S unit is 6.674 X 10^{-11}N m^2 kg^{-2}



Gravitational force between two masses

Short Answer

4. **Newton's Second Law of motion:**
   "The force acting on a body is directly proportional to the rate of change of linear momentum of the body and the change in momentum takes place in the direction of the force."
   (i) Let"m" be the mass of a moving body, moving along a straight line with an initial speed'u'.
   (ii) After a time interval of 't second, the velocity of the body changes to 'v due to the impact of an unbalanced external force F
   (iii) Initial momentum of the body P_1 = mu
   (iv) Final momentum of the body P_1= mv

(v) Change in momentum $\triangle p = P_1 - P_1 = mv - mu$
By Newton's second law of motion
Force, F $\propto$ rate of change of momentum
F $\propto$ change in momentum /time

$$F \propto (mv - mu)/t$$
$$F = km(v - u)t$$

Here, k is the proportionality constant
k= 1 in all system of units. Hence

$$F = \frac{m(v-u)}{t}$$

Since, acceleration = change in velocity / time
a= (v-u) /t.
(vi) Hence, we have F= m x a
Force = mass x acceleration

Very Short Answer

5.

No	Mass	Weight
(i)	It is the quantity of matter contained in the body.	It is the gravitational force exerted on' a body due to the gravity.
(ii)	It is a scalar quantity	is a vector quantity.
(iii)	SI unit is kg (kilogram)	SI unit is N (newton)
(iv)	Mass of a body remains the same at any point on the Earth	Weight of a body varies from one place to another place on the Earth.
(v)	Measured using a physical balance	Measured using a spring balance.

6. (i) According to Newton's second law, "the force acting on a body is directly proportional to the rate of change of linear momentum of the body and the change in momentum takes place in the direction of the force"
(ii) F= m xa (Force = mass x acceleration)

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QUESTION BANK 365

Choose the correct answer

7. (c) mass of the object
8. (c) change of momentum
9. (c) 98 x 10^4 dyne
10. (d) both a and c
11. (c) F/4

Match the following

12.

	Column l	-	Column II
(a)	Newton's I law	-	Stable equilibrium of a body
(b)	Newton's II law	-	Law of force
(c)	Newton's III law	-	Flying nature of bird
(d)	Law of conservation of linear momentum	-	propulsion of a rocket