Chapter: 1

Q.1 Solve Numerical problems **8**

1 A person swims 100m in the first 40s, 80m in the next 40s and 45 m in the last 20s. What is the average speed?

Ans **Given:** Total distance = 100 + 80 + 45 = 225m
Total time taken = 40 + 40 + 20 = 100sec
To Find: Average speed = ?
Formula: Average speed = Total distance covered / Total time taken
Solution: Average speed = Total distance covered / Total time taken
= 225/100
= 2.25 m/s
Ans: The person swims with an average speed of 2.25m/s.

2 An object moves 18m in the first 3s, 22m in the next 3s and 14m in the last 3s. What is the average speed?

Ans **Given:** Total distance = 18 + 22 + 14 = 54m
Total time taken = 3 + 3 + 3 = 9 sec.
To find: Average speed=? = ?
Formula: Average speed = Total distance covered / Total time taken
Solution: Average speed = Total distance covered / Total time taken
= 54/9
= 6m/s
Ans: The object moves with an average speed of 6m/s.

3 An object of mass 16 kg. is moving with an acceleration of $3m/s^2$. Calculate the applied force. If the same force is applied on an object of mass 24 kg. how much will be the acceleration?

Ans **Given:** Mass of 1^{st} body (m_1) = 16 kg
Acceleration of 1^{st} body (a_1) = $3m/s^2$
Mass of 2^{nd} body (m_1) = 24 kg
To find: Force on 1^{st} body (F_1) = ?
Acceleration of 2^{nd} body (a_2) = ?
Formula: $F = m.a$
Solution: $F_1 = m.a$
$= 16 \times 3$
$\mathbf{F_1 = 48N}$
$a_2 = F_2/m_2$
$= 48/24$
$\mathbf{a_2 = 2m/s^2}$
Ans: The force acting on the first body is 48N and the acceleration of the second body is $2m/s^2$.

4 A bullet having a mass of 10g and moving with a speed of 1.5m/s, penetrates a thick wooden plank of mass 90g. The plank was initially at rest. The bullet gets embedded in the plank and both move together. Determine their velocity.

Ans **Given:** Mass of bullet (m_1) = 10g = 0/1000kg = 0.01kg
Mass of the plank (m_2) = 90g = 90/1000kg=0.09kg
Initial velocity of the bullet (u_1) = 1.5m/s
To Find: Common velocity = ?
Formula: $m_1u_1 + m_2u_2$ = $m_1v_1 + m_2v_2$

Solution: let v_1 and v_2 be the common velocities of the bullet and the plank

$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$$
$$(0.01 \times 1.5) + (0.09 \times 0) = (0.01 \times v) + (0.09 \times v)$$
$$0.015 + 0 = v\,(0.01 + 0.09)$$
$$0.015 + 0 = 0.1\,v$$
$$v = 0.015/0.1$$
$$\mathbf{v = 0.15 m/s}$$

Ans: The plank moves with a velocity of 0.15m/s.

Q.2 **Answer the following.** **10**

1 **Complete the sentences and explain them**

The minimum distance between the start and finish points of the motion of an object is called the ..... of the object.

Ans The minimum distance between the start and finish points of the motion of an object is called the **displacement** of the object.

Displacement is the minimum distance between the start and the finish points of the motion of the object whereas distance is the actual path travelled by the object. Even if the displacement of an object is zero, the actual distance traversed by it may not be zero.

2 **Complete the sentences and explain them**

Deceleration is ..... acceleration.

Ans Deceleration is **negative** acceleration.

In deceleration, the velocity of the body goes on decreasing. Hence it is called negative acceleration or deceleration.

3 **Complete the sentences and explain them.**

During collision ..... remains constant.

Ans During collision **total momentum** remains constant.

It is the law of conservation of momentum which states that the magnitude of the total final momentum is equal to the magnitude of the total final momentum if no external forces are acting on two objects.

4 **Complete the sentences and explain them**

The working of a rocket depends on Newton's ..... law of motion.

Ans The working of a rocket depends on Newton's **third** law of motion.

According to Newton's third law, "every action force has an equal and opposite reaction force which acts simultaneously".

In this case, the escaping gases exert an equal and opposite reaction on the rocket so that it gets propelled in the forward direction.

5 **Complete the sentences and explain them**

When an object is in uniform circular motion, its ..... changes at every point.

Ans When an object is in uniform circular motion, its **direction** changes at every point.

In uniform circular motion, the speed is constant along the circumference but its direction at every point is tangential.

Q.3 **Distinguish between** **4**

1 Uniform and Non-uniform motion

Ans

	Uniform motion	Non-uniform motion
i.	If an object covers equal distances in equal intervals of time it is said to be in uniform motion.	If an object covers unequal distances in equal intervals of time it is said to be in non-uniform motion
ii.	In uniform motion, acceleration is zero	In non-uniform motion, acceleration is not zero.
iii.	Distance-time graph for uniform motion is a straight line.	Distance-time graph for non-uniform motion is not a straight line.

2 Distance and Displacement.

Ans

	Distance	Displacement
i.	Distance is the length of the actual path travelled by an object in motion while going from one point to another.	Displacement is the minimum distance between the starting and finishing points.
ii.	It is a scalar quantity	It is a vector quantity
iii.	Distance travelled is always positive	Displacement may be positive, negative or zero
iv.	It is either equal to or greater than displacement	It is either equal to or less than distance.

Q.4 **Give scientific reasons** **8**

1 When an object falls freely to the ground, its acceleration is uniform.

Ans
i. If the velocity changes by equal amounts in equal time interval s, the object is said to be in uniform acceleration.
ii. When the body falls freely on the ground, there are equal changes in velocity of the body in equal intervals of time.
iii. Thus the acceleration of the body is constant.
iv. Hence, it possesses uniform acceleration.

2 Even though the magnitudes of action force and reaction force are equal and their directions are opposite, their effects do not get cancelled.

Ans
i. This is based on Newton's third law of motion.
ii. Forces are always applied in pairs.
iii. When one object applies a force on another object, the latter object also simultaneously applies a force on the former object.
iv. Action and reaction forces act on different bodies.
v. They don't act on the same body, hence they don't cancel each other's effect.
Therefore, even though the magnitude of action force and reaction force are equal, they do not cancel each other.

3 The velocity of an object at rest is considered to be uniform.

Ans
i. The velocity of an object is said to be in uniform motion when its speed is constant all the time.
ii. For an object at rest, its speed is zero all the time.
iii. Hence, an object in a state of rest is an example of uniform motion.

Motion is relative.
i. A body is said to be in motion if it changes its position with respect to its surrounding.
ii. Motion of an object depends on the observer, hence a body may appear to be moving for one person and at the same time at rest for other.
iii. Hence, motion is relative.

Heavier objects offer more inertia.
i. According to Newton's first law of motion, 'An object continues to remain at rest or in a state of uniform motion along a straight line unless an external unbalanced forces acts on it'
ii. As mass is the quantity of matter in a body, we need to exert more force to push a heavier body.
iii. Inertia is related to the mass of the object.
iv. Hence, heavier objects offer more inertia.

The launching of a rocket is based on Newton's third law of motion.
i. Newton's third law of motion states that,' Every action force has an equal and opposite reaction force which acts simultaneously '.
ii. When the fuel in a rocket is ignited, it burns as a result of chemical reaction.
iii. The exhaust gases escape with a great force through a small opening at the tail end of the rocket.
iv. It exerts an equal and opposite reaction force on the rocket, due to which the rocket moves in the forward direction. Thus, the principle of launching of rocket is based on Newton's third law of motion.

4 It is easier to stop a tennis ball as compared to a cricket ball, when both are travelling with the same velocity.

Ans i. The above example is based on Newton's second law of motion.
ii. Momentum of an object depends on its mass as well as its velocity.
iii. Cricket ball is heavier than a tennis ball. Although they are thrown with the same velocity, cricket ball has more momentum and inertia due to its greater mass than a tennis ball.
iv. Hence, force required to stop cricket ball is more than a tennis ball.
Therefore, it is easier to stop a tennis ball than a cricket ball moving with same velocity.

Q.5 **Give examples** **2**

1 Give examples of circular motion. (any 4)

Ans i. Movement of artificial satellite around the earth.
ii. Motion of moon around the sun.
iii. Motion of earth around the sun.
iv. Motion of seconds hands of a watch.
v. Athlete moving on a circular path.

Q.6 **Solve Numerical problems** **3**

1

u(m/s)	a(m/s^2)	t(sec)	v=u + at(m/s)
2	4	3	.....
.....	5	2	20
u(m/s)	a(m/s^2)	t(sec)	s=ut+1/2at^2(m)
5	12	3	.....
7	.....	4	92
u(m/s)	a(m/s^2)	t(sec)	V^2=u^2 +2as(m/s)^2
4	3	.....	8
.....	5	8.4	10

Ans

u(m/s)	a(m/s^2)	t(sec)	v=u + at(m/s)
2	4	3	**14**
10	5	2	20
u(m/s)	a(m/s^2)	t(sec)	s=ut+1/2at^2(m)
5	12	3	**69**
7	**8**	4	92
u(m/s)	a(m/s^2)	t(sec)	V^2=u^2 +2as(m/s)^2
4	3	**8**	8
4	5	8.4	10

Q.7 **Extra data (Not to be Use)** **5**

1 Match the columns I , II and III

I	II	III
Negative acceleration	The velocity of the object remains constant	A car initially at rest reaches a velocity of 50km/hr in 10sec.
Positive acceleration	The velocity of the object decreases	A vehicle is moving with a velocity of 25m/s.
Zero acceleration	The velocity of the object increases.	A vehicle is moving with a velocity of 10m/s, stops after 5 seconds.

Ans

Negative acceleration	The velocity of the object decreases	A vehicle is moving with a velocity of 10m/s, stops after 5 seconds.
Positive acceleration	The velocity of the object increases	A car initially at rest reaches a velocity of 50km/hr in 10sec.
Zero acceleration	The velocity of the object remains constant	A vehicle is moving with a velocity of 25m/s.

Q.8 **Answer the following in detail** **5**

1 Take 5 examples from your surroundings and give explanation based on Newtons laws of motion.

Ans **Example 1:**

When we are travelling by a bus, we experience backward jerk as the bus starts moving from rest. This is in accordance with Newton's first law of motion.

Explanation:

i. A body resists change in its state of rest or of motion due to inertia.

ii. When the bus is at rest, inside the bus we are also at rest.

iii. As the starts moving, the portion of the our body which is in contact with the bus acquires velocity, but the upper part of the body tries to remain at rest.

iv. As a result, we exert an inertia of rest and get a backward jerk, when the bus moves in the forward direction.

Example 2:

A carpet when lifted up and given jerks, dust falls out of it. This is in accordance with Newton's first law of motion.

Explanation:

i. When we dust a carpet, by lifting it, the carpet is set into motion.

ii. While the dust remains in its state of rest due to inertia of rest.

Example 3:

While catching a ball, cricketer moves his hands backwards. This is in accordance with Newton's second law of motion.

Explanation:

i. In the act of catching the ball, by drawing hands backward, cricketer allows longer time for his hands to stop the ball.

ii. By Newton' s second law of motion, force applied depends on the rate of change of momentum.

iii. Taking longer time to stop the ball ensures smaller rate of change of momentum.

iv. Due to this, the cricketer can stop the ball by applying smaller amount of force and thereby not hurting his hands.

Example 4:

A book kept on a table remains stationary. This is in accordance with Newton's third law of motion.

Explanation:

i. A book kept on a table has some weight. This weight is the force acting on the table.

ii. By Newton's third law of motion, every action has an equal and opposite reaction.

iii. Thus, the table also exerts an upward force on and balances weight of the book..

iv. Thus, both the forces are balanced and there is no displacement.

Hence, a book kept on a table remains stationary.

Example 5:

An air filled ballon held in hand when released, moves forward. This is in accordance with Newton's third

law of motion.

Explanation:

i. As air is released out in downward direction, it applies equal and opposite force on balloon pushing it forward.