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Practice Set 1 **Solution**

Classical **MECHANICS**

Topic : Linear motion, velocity, acceleration, force, Newton's laws of motion, linear momentum and impulse of force.

DDCET final exam weightage of this topic : 3 Questions (6 Marks)

Total Practice sets of this topic : $3 \text{ (sets) } \times 30 \text{ (questions) } = 90 \text{ Questions}$

Total Practice tests of this topic : $3 \text{ (exams) } \times 25 \text{ (questions) } = 75 \text{ Questions}$

Offline / Online during lecture : $4 \text{ (lectures) } \times 70 \text{ (Questions) } = 280 \text{ Question}$

Total 445 Questions to practice this topic (Third week Oct 24)

(Last week of oct and first week of nov will be Diwali holidays)



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Section 1 :

Linear motion, velocity, acceleration, force, Newton's laws of motion, linear momentum and impulse of force.

- 1 Which of the following is the SI unit of velocity?
 - A) Meter per second (m/s) ✓
 - B) Kilometer per hour (km/h)
 - C) Newton (N)
 - D) Meter per second squared (m/s²)
- 2 According to Newton's first law of motion, an object at rest remains at rest unless acted upon by a:
 - A) Balanced force
 - B) Frictional force
 - C) Net external force ✓
 - D) Centripetal force
- 3 The acceleration of an object is directly proportional to the:
 - A) Mass of the object
 - B) Velocity of the object
 - C) Net force acting on the object ✓
 - D) Momentum of the object
- 4 Which of the following represents the correct formula for linear momentum?
 - A) $p=mv$ ✓
 - B) $p=ma$
 - C) $p=Fd$
 - D) $p=mv/F$
- 5 Impulse is equal to the:
 - A) Product of mass and acceleration
 - B) Rate of change of momentum
 - C) Change in momentum ✓
 - D) Work done on the object
- 6 A body is moving with uniform velocity. What is the net force acting on it?
 - A) Equal to its weight
 - B) Greater than zero
 - C) Zero ✓
 - D) Equal to its momentum

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- 7 Which of the following is an example of Newton's third law of motion?
- A) A ball rolling on the ground slows down due to friction
 - B) A rocket propelling forward due to the expulsion of gases ✓
 - C) A car coming to a stop when brakes are applied
 - D) A ball falling freely under gravity
- 8 If the velocity of an object increases, what happens to its momentum?
- A) Decreases
 - B) Increases ✓
 - C) Remains constant
 - D) Becomes zero
- 9 Find the acceleration produced by applying a force of 30 N on an object of mass of 5 kg. [DDCET 2024]
- A) 0.6 m/s^2
 - B) 6 m/s^2 ✓ (SOLUTION AT LAST PAGE)
 - C) 6 m/s
 - D) 0.6 m/s
- 10 The rate of change of velocity is known as:
- A) Speed
 - B) Acceleration ✓
 - C) Momentum
 - D) Force
- 11 A force of 10 N is applied to a mass of 2 kg. What is its acceleration?
- A) 5 m/s^2 ✓ (SOLUTION AT LAST PAGE)
 - B) 20 m/s^2
 - C) 10 m/s^2
 - D) 2 m/s^2
- 12 If no external force acts on a system, the total momentum of the system remains:
- A) Constant ✓
 - B) Zero
 - C) Increasing
 - D) Decreasing

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- 13** A car moving with a velocity of 20 m/s comes to a stop in 5 seconds. What is its acceleration?
- A) -4 m/s^2 ✓ (SOLUTION AT LAST PAGE)
 B) 4 m/s^2
 C) -10 m/s^2
 D) 10 m/s^2
- 14** A force is said to be balanced when:
- A) It changes the state of motion of an object
 B) It causes acceleration
 C) The net force is zero ✓
 D) It increases mass
- 15** The tendency of an object to resist a change in its motion is called:
- A) Acceleration
 B) Inertia ✓
 C) Momentum
 D) Force
- 16** When a gun is fired, the bullet moves forward, and the gun moves backward. This is an example of:
- A) Newton's first law
 B) Newton's second law
 C) Newton's third law ✓
 D) Law of inertia
- 17** What is the SI unit of force?
- A) Kilogram
 B) Newton ✓
 C) Joule
 D) Watt
- 18** A car moves with a uniform velocity of 30 m/s. What is its acceleration?
- A) 30 m/s^2
 B) 10 m/s^2
 C) 0 m/s^2 ✓
 D) -30 m/s^2
- (uniform velocity means constant speed, hence change in velocity is 0. Acceleration means change in velocity hence answer is 0)





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- 19 The impulse experienced by an object is equal to:
- A) The work done on the object
 - B) The change in the object's kinetic energy
 - C) The change in momentum of the object ✓
 - D) The weight of the object
- 20 The force required to stop a moving object depends on:
- A) The mass of the object
 - B) The velocity of the object
 - C) Both mass and velocity ✓
 - D) The shape of the object
- 21 If a force is applied to an object and there is no motion, what kind of force is it?
- A) Balanced force ✓
 - B) Unbalanced force
 - C) Centripetal force
 - D) Impulsive force
- 22 What happens to acceleration if force is doubled and mass remains constant?
- A) It doubles ✓
 - B) It halves
 - C) It remains the same
 - D) It becomes zero
- 23 What does Newton's first law of motion define?
- A) Force
 - B) Inertia ✓
 - C) Momentum
 - D) Acceleration
- 24 A ball dropped from a height falls freely under the influence of:
- A) Friction
 - B) Gravity ✓
 - C) Air resistance
 - D) Magnetic force

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- 25 What happens to the momentum of a system when two objects collide and stick together?
- A) It remains the same ✓
 - B) It increases
 - C) It decreases
 - D) It becomes zero
- 26 What does the slope of a velocity-time graph represent?
- A) Speed
 - B) Acceleration ✓
 - C) Displacement
 - D) Momentum
- 27 Which of the following affects the inertia of an object?
- A) Its volume
 - B) Its velocity
 - C) Its mass ✓
 - D) Its temperature
- 28 An object is thrown vertically upwards. At the highest point, its velocity is:
- A) Maximum
 - B) Zero ✓
 - C) Negative
 - D) Equal to acceleration
- 29 A car and a truck have the same momentum. Which one has greater velocity?
- A) Car ✓
 - B) Truck
 - C) Both have equal velocity
 - D) Cannot be determined
- 30 What force keeps a satellite moving in a circular orbit around Earth?
- A) Friction
 - B) Gravitational force ✓
 - C) Magnetic force
 - D) Electrical force

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QUESTION 9 SOLUTION :

Newton's Second Law:

$$F = ma \text{ (Force = mass} \times \text{acceleration)}$$

Given:

$$\text{Force (F)} = 30 \text{ N}$$

$$\text{Mass (m)} = 5 \text{ kg}$$

Solve for acceleration (a):

$$a = F / m$$

$$a = 30 \text{ N} / 5 \text{ kg}$$

$$a = 6 \text{ m/s}^2$$

QUESTION 11 SOLUTION :

Newton's Second Law:

$$F = ma \text{ (Force = mass} \times \text{acceleration)}$$

Given:

$$\text{Force (F)} = 10 \text{ N}$$

$$\text{Mass (m)} = 2 \text{ kg}$$

Solve for acceleration (a): $a = F / m$

$$a = 10 \text{ N} / 2 \text{ kg}$$

$$a = 5 \text{ m/s}^2$$

QUESTION 13 SOLUTION :

Formula:

$$\text{acceleration (a)} = (\text{final velocity (vf)} - \text{initial velocity (vi)}) / \text{time (t)}$$

Given:

$$\text{Initial velocity (vi)} = 20 \text{ m/s}$$

$$\text{Final velocity (vf)} = 0 \text{ m/s (since it comes to stop)}$$

$$\text{Time (t)} = 5 \text{ seconds}$$

$$\text{So, } a = (0 \text{ m/s} - 20 \text{ m/s}) / 5 \text{ s}$$

$$a = -20 \text{ m/s} / 5 \text{ s}$$

$$a = -4 \text{ m/s}^2$$

