

### Chapter 3: Laws of Motion

1. Which of the following is a contact force?  
(a) Gravitational force  
(b) Electrostatic force  
(c) Magnetic force  
(d) Frictional force
2. Identify the non-contact force among the following options.  
(a) Force of friction  
(b) Force due to gravity  
(c) Force of reaction  
(d) Tension in a string
3. The property of inertia is more in  
(a) A horse cart (b) A car  
(c) A truck (d) A toy car
4. A tennis ball and a cricket ball, both are stationary. To start motion in both the balls  
(a) a less force is required for the cricket ball than for the tennis ball  
(b) a less force is required for the tennis ball than for the cricket ball  
(c) same force is required for both the balls  
(d) nothing can be said.
5. A force is required to  
(a) change the state of motion or state of rest of an object  
(b) keep the velocity of object constant  
(c) keep the object stationary  
(d) keep the object in motion
6. Identify the unit of force:  
(a)  $\text{kg m s}^{-1}$  (b)  $\text{kg m s}^2$   
(c)  $\text{kg m s}$  (d)  $\text{kg m s}^{-2}$
7. The linear momentum of an object of mass  $m$  moving with velocity  $v$  is  
(a)  $m/v$  (b)  $v/m$   
(c)  $(mv)^{-1}$  (d)  $mv$
8. Among the following, choose the object possessing the highest momentum:  
(a) Mass of 8 kg moving with velocity  $6 \text{ ms}^{-1}$   
(b) Mass of 4 kg moving with velocity  $11 \text{ ms}^{-1}$   
(c) Mass of 10 kg moving with velocity  $4 \text{ ms}^{-1}$   
(d) Mass of 45 kg moving with velocity  $1 \text{ ms}^{-1}$
9. The unit of linear momentum is  
(a) Ns (b)  $\text{kg m s}^{-2}$   
(c)  $\text{N s}^{-1}$  (d)  $\text{kg}^2 \text{ m s}^{-1}$
10. A player catches a cricket ball of mass  $0.150 \text{ kg}$  moving at a rate of  $20 \text{ m s}^{-1}$  and completes this process in  $0.1 \text{ s}$ . The force exerted by the ball on the hand of the player is  
(a)  $0.3 \text{ N}$  (b)  $300 \text{ N}$   
(c)  $30 \text{ N}$  (d)  $150 \text{ N}$
11. The correct form of Newton's second law is  
(a)  $F = \{\Delta p\}/\{\Delta t\}$   
(b)  $F = m \Delta v/\{\Delta t\} \Delta t \Delta v$   
(c)  $F = v \Delta m/\Delta t$   
(d)  $F = mv$
12. The acceleration produced in an object by a force of given magnitude depends on  
(a) size of the object  
(b) mass of the object  
(c) shape of the object  
(d) size and shape of the object

13. Newton's third law:

- (a) defines the force quantitatively
- (b) defines the force qualitatively
- (c) gives the direction of force
- (d) explains the way a force acts on an object

14. Action and reaction act on the —

- (a) same object in opposite directions
- (b) same object in same direction
- (c) different objects in opposite directions
- (d) different objects, but in the same direction

15. The gravitational force between two bodies is

- (a) always repulsive
- (b) always attractive
- (c) attractive only at large distances
- (d) repulsive only at large distances.

16. The value of universal gravitational constant,  $G$  is

- (a)  $9.8 \text{ N m}^2 \text{ kg}^{-2}$
- (b)  $6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$
- (c)  $6.67 \times 10^{-11} \text{ m s}^{-2}$
- (d)  $6.67 \text{ N kg}^{-1}$

17. Value of  $G$  on surface of earth is  $6.673 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$ , then value of  $G$  on surface of Mars will be

- (a)  $12 \times 6.673 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$
- (b)  $6.673 / 12 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$
- (c)  $6.673 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$
- (d)  $6.673 / 6 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$

18. Identify the force of attraction between two masses each of 1 kg kept at a separation of 1 m.

- (a) 9.8 N
- (b) 6.7 N
- (c) 980 N
- (d)  $6.7 \times 10^{-11} \text{ N}$

19. Identify the phenomena's which were successfully explained by the law of gravitation.

- (i) Motion of moon around the earth
- (ii) Motion of an aeroplane
- (iii) Force that binds us to the earth
- (iv) Rotation of blades in a ceiling fan

- (a) (ii), (iv)
- (b) (iv), (i)
- (c) (iii), (iv)
- (d) (i), (iii)

20. An object is projected vertically upward with an initial velocity  $u$ . If acceleration due to gravity is  $g$ , the time for which it remains in air, is ....

- (a)  $u/g$
- (b)  $ug$
- (c)  $2u/g$
- (d)  $u/2g$

21. An object falling freely from rest reaches ground in 2 s. If acceleration due to gravity is  $9.8 \text{ m s}^{-2}$ , the velocity of the object on reaching the ground will be —

- (a)  $9.8 \text{ m s}^{-1}$
- (b)  $4.9 \text{ m s}^{-1}$
- (c)  $19.6 \text{ m s}^{-1}$
- (d) 0

22. An object is moving along a straight path in an accelerated motion. Choose the correct statement from the following:

- (a) Its speed keeps changing
- (b) Its velocity always changes
- (c) It always goes away from the earth
- (d) A force is always acting on it

23. The acceleration of free fall on the Moon is  $1/6$  of the acceleration of free fall on the Earth. Two pieces of rock, A and B, have the same volume. A is placed on the Moon and B is placed on Earth. If both of them have the same weight, what is the ratio of A's density to B's density?

- (a) Cannot be determined
- (b) 1 : 6
- (c) 6 : 1
- (d) 1 : 1

24. According to the third law of motion, action and reaction

- (a) act on either body at normal to each other
- (b) have same magnitude and directions
- (c) always act on different bodies in opposite directions
- (d) always act on the same body

25. A goalkeeper in a game of football pulls his hands backwards after holding the ball shot at the goal. This enables the goal keeper to

- (a) increase the rate of change of momentum
- (b) decrease the rate of change of momentum
- (c) reduce the force exerted by the ball on hands
- (d) exert larger force on the ball

26. The inertia of an object tends to cause the object

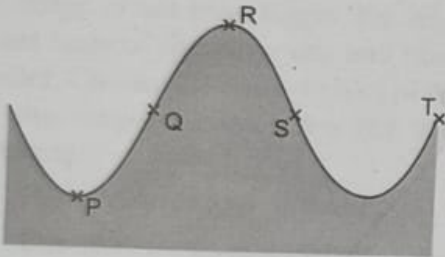
- (a) to decrease its speed
- (b) to increase its speed
- (c) to decelerate due to friction
- (d) to resist any change in its state of motion

27. Inertia is the resistance of an object to any change in its state of motion, including a change in direction. Which property is a measure of the body's inertia?

- (a) Weight
- (b) Density
- (c) Volume
- (d) Mass



## Chapter 7: Sound

- The speed of sound in air at  $0^\circ\text{C}$  is nearly:
  - $450\text{ m s}^{-1}$
  - $330\text{ m s}^{-1}$
  - $5100\text{ m s}^{-1}$
  - $1450\text{ m s}^{-1}$
- Sound propagates in air in the form of:
  - Longitudinal wave
  - Transverse wave
  - Both longitudinal and transverse wave
  - Neither longitudinal nor transverse wave
- The speed of light in air is:
  - $3 \times 10^8\text{ m s}^{-1}$
  - $330\text{ m s}^{-1}$
  - $5100\text{ m s}^{-1}$
  - $3 \times 10^{10}\text{ m s}^{-1}$
- A man can hear the sound of frequency:
  - 1 Hz
  - 1000 Hz
  - 200 kHz
  - 5 MHz
- Identify the points shown in the diagram of a wave travelling on the pond which are one wavelength apart?
 
  - P and R
  - Q and T
  - Q and S
  - S and T
- The properties of ultrasound that make it useful, are:
  - High power and high speed
  - High power and good directivity
  - High frequency and high speed
  - High frequency and bending around the objects
- SONAR makes use of:
  - Infrasonic sound
  - Ultrasound
  - Ordinary sound
  - Light
- Choose the correct statement from the following:
  - Sound and light both require medium for propagation
  - Sound can travel in vacuum, but light cannot
  - Sound needs medium, but light does not need medium for its propagation
  - Sound and light both can travel in vacuum
- Select the correct unit for wavelength from the following:
  - nm
  - Hz
  - dB
  - ns
- Choose the correct statement about the speed of sound:
  - It travels fastest in liquids
  - It travels fastest in a vacuum
  - It travels fastest in solid
  - It travels fastest in gases
- Why do we hear sound when a ball strikes the floor?
  - the air particles from the floor flow into our ears.
  - the wavelength of the sound wave is large enough to produce the sound.
  - the air particles from the floor vibrate and produce longitudinal waves which reach into our ears through the air
  - the air particles from the floor vibrate and produce transverse waves to flow which reach into our ears through the air
- A flash of lightning and the corresponding thunderclap are detected 5 s apart. Calculation reveals that the lightning struck about 1600 m away. Identify the assumption on which the calculation is based:
  - Light travels  $320\text{ m s}^{-1}$  faster than sound
  - Sound reaches us almost instantaneously, but light travels at  $320\text{ m s}^{-1}$
  - Light reaches us almost instantaneously, but sound travels at  $320\text{ m s}^{-1}$
  - The sound of the thunder was emitted 5 s after the flash
- A star explodes in outer space. Choose the correct option for the waves from the exploding star which do not reach the Earth?
  - Infra-red
  - Sound
  - Light
  - Radio
- Choose the true statements for sound from the following:
  - Sound waves are produced by vibration.
  - Sound waves have an approximate speed of  $280\text{ m s}^{-1}$

C. Sound waves are longitudinal waves.

- (a) A and C only (b) B and C only  
(c) A and B only (d) A, B and C

15. John blows a whistle that has a frequency of 10000 Hz. John's friend Roshni cannot hear the sound from the whistle while she has normal hearing. What could be a reason why she cannot hear the sound?

- (a) The amplitude is too large.  
(b) The amplitude is too small.  
(c) The frequency is too high.  
(d) The frequency is too low.

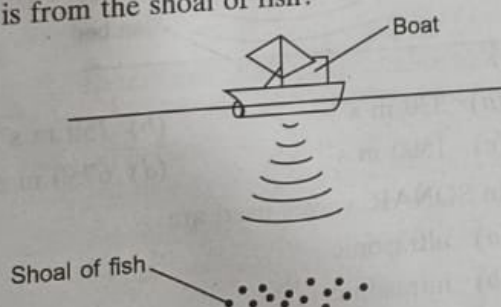
16. The speed of sound in air ( $v_a$ ), water ( $v_w$ ) and steel ( $v_s$ ) is different. Choose the correct option showing the speed of sound in descending order:

- (a) speed of sound in air ( $v_a$ ), speed of sound in steel ( $v_s$ ), speed of sound in water ( $v_w$ )  
(b) speed of sound in air ( $v_a$ ), speed of sound in water ( $v_w$ ), speed of sound in steel ( $v_s$ )  
(c) speed of sound in water ( $v_w$ ), speed of sound in air ( $v_a$ ), speed of sound in steel ( $v_s$ )  
(d) speed of sound in steel ( $v_s$ ), speed of sound in water ( $v_w$ ), speed of sound in air ( $v_a$ )

17. Ultrasound is used in a hospital to scan a patient. Ultrasound refracts at the boundary between muscle and bone because it travels at a greater speed in bone. Which change takes place when the ultrasound travels from muscle into bone?

- (a) The frequency of the wave decreases.  
(b) The frequency of the wave increases.  
(c) The wavelength of the wave decreases.  
(d) The wavelength of the wave increases.

18. A pulse of sound is produced at the bottom of a boat which travels through the water. It is reflected from a shoal of fish and reaches the boat again after 1.4 s. The speed of sound in the water is 1500 m/s. How far below the bottom of the boat is from the shoal of fish?



- (a) 525 m (b) 1050 m  
(c) 2100 m (d) 4200 m

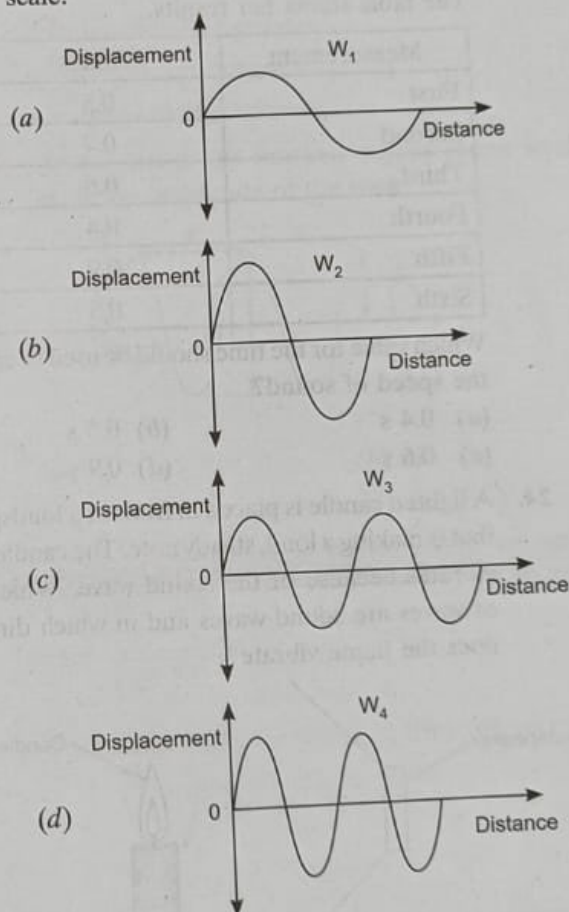
19. Which range is approximately correct for the audio frequencies that can be detected by a healthy human ear?

- (a) 2 Hz to 2000 Hz  
(b) 2 Hz to 20000 Hz  
(c) 20 Hz to 2000 Hz  
(d) 20 Hz to 20000 Hz

20. Which waves are longitudinal?

- (a) light waves from a lamp  
(b) microwaves in an oven  
(c) water waves on the surface of a pond  
(d) sound waves from a trumpet

21. The diagram shows four waves drawn to the same scale.



Which statement is correct?

- (a) The amplitude of wave  $W_1$  is the same as the amplitude of wave  $W_3$ .  
(b) The amplitude of wave  $W_4$  is double the amplitude of wave  $W_2$ .  
(c) The wavelength of wave  $W_2$  is double the wavelength of wave  $W_1$ .  
(d) The wavelength of wave  $W_4$  is the same as the wavelength of wave  $W_2$ .