*** Choose the correct alternative from those given below each questions** [37]

1. Which of these is not a time measuring device?
   (A) Stopwatch (B) Pendulum (C) Thermometer (D) Quartz watch

   Ans. : (C) Thermometer

2. In a uniform motion:
   (A) Speed is zero (B) Speed increases
   (C) Speed decreases (D) Speed remains constant

   Ans. : (D) Speed remains constant

3. Which of these uses water flow to track time?
   (A) Atomic clock (B) Ghatika-yantra (C) Sundial (D) Stopwatch

   Ans. : (B) Ghatika-yantra

4. Speed = ?
   (A) Distance × Time (B) Distance / Time (C) Time / Distance (D) None of these

   Ans. : (B) Distance / Time

5. A candle clock tracks time by:
   (A) Wax dripping (B) Melting of wax (C) Temperature (D) Length of flame

   Ans. : (B) Melting of wax

6. Which watch has the highest precision?
   (A) Pendulum clock (B) Digital watch (C) Analog watch (D) Atomic clock

   Ans. : (D) Atomic clock

7. Non-uniform motion occurs when:
   (A) Speed is constant (B) Speed varies
   (C) Time is constant (D) Object rests

   Ans. : (B) Speed varies

8. Which of the following is used in cars?
   (A) Hourglass (B) Odometer (C) Sundial (D) Digital alarm

   Ans. : (B) Odometer

9. What instrument is used to measure time during school races?
   (A) Wall clock (B) Wristwatch (C) Stopwatch (D) Pendulum clock

   Ans. : (C) Stopwatch

10. Which of the following is not an ancient time measuring device?

(A) Sundial (B) Candle clock (C) Digital watch (D) Water clock

Ans. : (C) Digital watch

11. What does a sundial use to measure time?

(A) Flow of water (B) Shadow movement

(C) Firelight (D) Sound waves

Ans. : (B) Shadow movement

12. What is the basic principle of a pendulum clock?

(A) Flow of sand

(B) Oscillations having constant time period

(C) Electrical signals

(D) Rotating magnets

Ans. : (B) Oscillations having constant time period

13. Who invented the pendulum clock?

(A) Aryabhata (B) Varahamihira (C) Huygens (D) Galileo

Ans. : (C) Huygens

14. The SI unit of time is:

(A) h (B) min (C) s (D) light year

Ans. : (C) s

15. In ancient India, which instrument was used to measure time by water flow?

(A) Ghatika-yantra (B) Stopwatch (C) Candle clock (D) Hourglass

Ans.: (A) Ghatika-yantra

16. The time taken by a pendulum to complete one oscillation is called:

(A) Frequency (B) Time interval (C) Time period (D) Speed

Ans. : (C) Time period

17. Which of these clocks was inspired by Galileo's pendulum observation?

(A) Wall clock (B) Hourglass

(C) Huygens' pendulum clock (D) Talking watch

Ans. : (C) Huygens' pendulum clock

18. What is measured by an odometer?

(A) Speed (B) Distance (C) Time (D) Acceleration

Ans. : (B) Distance

19. A vehicle moving with changing speed is said to be in:

(A) Uniform motion (B) Constant motion

(C) Non-uniform motion (D) Circular motion

Ans. : (C) Non-uniform motion

20. Which motion is idealised and rarely found in real life?

(A) Non-uniform motion (B) Oscillatory motion

(C) Uniform motion (D) Random motion

Ans. : (C) Uniform motion

21. What measures the speed of a vehicle?

(A) Odometer (B) Stopwatch (C) Speedometer (D) Metre ruler

Ans. : (C) Speedometer

22. Who gave an accurate expression for time based on shadow length?

(A) Aryabhata (B) Galileo (C) Varahamihira (D) Huygens

Ans. : (C) Varahamihira

23. What is meant by average speed?

(A) Slowest speed recorded (B) Fastest speed

(C) Total distance/Total time (D) Distance per second

Ans. : (C) Total distance/Total time

24. If a cyclist moves along a straight road covers unequal distances in equal time intervals, the motion is

(A) uniform linear motion (B) non-uniform linear motion

(C) periodic motion (D) oscillatory motion.

Ans. : (B) non-uniform linear motion

25. Convert 54 km/h into m/s.

(A) 15 m/s (B) 20 m/s (C) 12 m/s (D) 18m/s.

Ans.: (A) 15 m/s

26. A vehicle is moving at a speed of 50 km/h. How much time will it take to cover a distance of 100 km?

(A) 4 hours (B) 3 hours (C) 2 hours (D) 1 hour

Ans. : (C) 2 hours

27.

Column A	Column B
1. Distance	(A) Measures distance travelled
2. Odometer	(B) km//h
3. Hour, minute, second	(C) Speed x Time
4. Speed	(D) Traditional units of time

(A) (1) – (C), (2) – (B), (3) – (D), (4) – (A) (B) (1) – (B), (2) – (A), (3) – (D), (4) – (C)

(C) (1) – (C), (2) – (A), (3) – (D), (4) – (B) (D) (1) – (C), (2) – (B), (3) – (A), (4) – (D)

Ans. : (C) (1) – (C), (2) – (A), (3) – (D), (4) – (B)

28. Which of the following cannot be used for measurement of time?

(A) A leaking tap (B) Simple pendulum

(C) Shadow of an object during the day (D) Blinking of eyes

Ans. : (D) Blinking of eyes

29. Which of the following records the distance travelled by the vehicles?

(A) Manometer (B) Odometer (C) Speedometer (D) Motometer

Ans. : (B) Odometer

30. The correct symbol to represent the speed of an object is

(A) 5 m/s (B) 5 mp (C) 5 m/s (D) 5 s/m

Ans.: (A) 5 m/s

31. Time period of a simple pendulum depends upon

(A) Weight of bob (B) Length of pendulum

(C) Both (D) None of above

Ans. : (B) Length of pendulum

32. If we denote speed by S, distance by D and time by T, the relationship between these quantities is

(A) S = D × T (B) $\top = \frac{S}{D}$ (C) $S = \frac{1}{T}$ (D) $S = \frac{T}{D}$

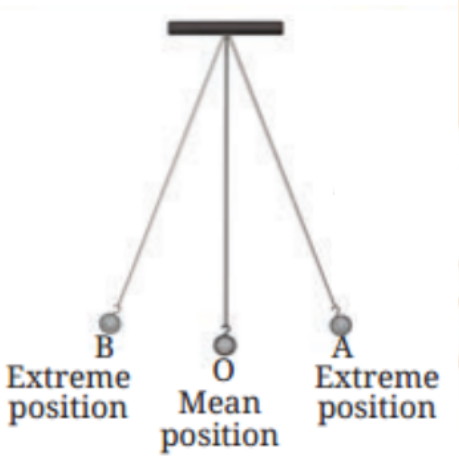
Ans. : (C) $S = \frac{1}{T}$

33. A bus travels 30 m in 5 seconds. The speed of the bus is

(A) 6 m/s (B) 5 m/s (C) 8 m/s (D) 4 m/s

Ans.: (A) 6 m/s

34. Observe the given figure.



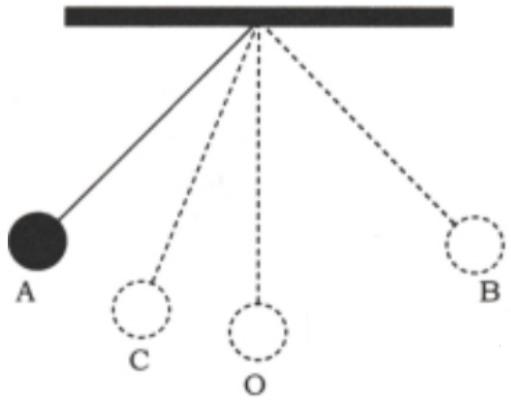
The time period of a simple pendulum is the time taken by it to travel from

(A) A to B and back to A. (B) O to A, A to Band B to A.

(C) B to A, A to B and B to O. (D) A to B.

Ans.: (A) A to B and back to A.

35. The given figure shows an oscillating pendulum



Time taken by the bob to move from A to C is f_1 and from C to O is t_2 The time period of this simple pendulum is

(A) $(t_1 + t_2)$ (B) $2\,(t_1 + 2)$ (C) $3\,(t_1 + 2_2)$ (D) $4\,(t_1 + t_2)$

Ans. : (D) $4\,(t_1 + t_2)$

36. Which of the following clocks are known to be the most precise?

(A) Pendulum clock (B) Atomic clock (C) Digital clock (D) Quartz clock

Ans. : (B) Atomic clock

37. What type of motion does the bob of a pendulum exhibit?

(A) Periodic (B) Linear (C) Circular (D) Random

Ans.: (A) Periodic

*** a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.** **[9]**

38. Assertion (A): A pendulum moves in oscillatory motion.
Reason (R): Its movement repeats in regular intervals.

(A) Both Assertion (A) and Reason (R) are true, and (R) is the correct explanation of (A).

(B) Both Assertion (A) and Reason (R) are true, but (R) is not the correct explanation of (A).

(C) (A) is true, but (R) is false.

(D) (A) is false, but (R) is true.

Ans.: (A) Both Assertion (A) and Reason (R) are true, and (R) is the correct explanation of (A).

39. Assertion (A): Sundials cannot be used at night.
Reason (R): They depend on sunlight to cast shadows.

(A) Both Assertion (A) and Reason (R) are true, and (R) is the correct explanation of (A).

(B) Both Assertion (A) and Reason (R) are true, but (R) is not the correct explanation of (A).

(C) (A) is true, but (R) is false.

(D) (A) is false, but (R) is true.

Ans.: (A) Both Assertion (A) and Reason (R) are true, and (R) is the correct explanation of (A).

40. Assertion (A): Odometer measures the speed of a car.
Reason (R): Odometer is linked to tyre rotation to track distance.

(A) Both Assertion (A) and Reason (R) are true, and (R) is the correct explanation of (A).

(B) Both Assertion (A) and Reason (R) are true, but (R) is not the correct explanation of (A).

(C) (A) is true, but (R) is false.

(D) (A) is false, but (R) is true.

Ans. : (D) (A) is false, but (R) is true.

41. Assertion (A): The SI unit of speed is m/s.
Reason (R): Speed is distance travelled per unit time.

(A) Both Assertion (A) and Reason (R) are true, and (R) is the correct explanation of (A).

(B) Both Assertion (A) and Reason (R) are true, but (R) is not the correct explanation of (A).

(C) (A) is true, but (R) is false.

(D) (A) is false, but (R) is true.

Ans.: (A) Both Assertion (A) and Reason (R) are true, and (R) is the correct explanation of (A).

42. Assertion (A): Speedometers and odometers are used together in vehicles.
Reason (R): One measures the speed, the other the total distance travelled.

(A) Both Assertion (A) and Reason (R) are true, and (R) is the correct explanation of (A).

(B) Both Assertion (A) and Reason (R) are true, but (R) is not the correct explanation of (A).

(C) (A) is true, but (R) is false.

(D) (A) is false, but (R) is true.

Ans. : (B) Both Assertion (A) and Reason (R) are true, but (R) is not the correct explanation of (A).

43. Assertion (A): If two objects cover the same distance in different times, the one that takes more time has greater speed.
Reason (R): Speed increases as time taken increases for the same distance.

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

Ans. : (D) A is false but R is true.

44. Assertion (A): The basic unit of time is second(s).
Reason (R): Quartz clock gives more accurate measurement of time as compared to other clocks.

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

Ans. : (C) A is true but R is false.

45. Assertion (A): Speedometer records the speed of the vehicle in km/h.
Reason (R): Odometer measures the distance covered by the vehicle in first hour.

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

Ans. : (C) A is true but R is false.

46. Assertion (A): The distance moved by an object in unit time is termed as its speed.
Reason (R): Faster vehicles have higher speeds.

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

Ans. : (B) Both A and R are true but R is not the correct explanation of A.

*** State Whether The Following Sentences Are True Or False.[1 Marks Each]** **[14]**

47. A pendulum clock uses the oscillation of a rod to measure time.

Ans. : false

48. Quartz vibrations are used in sundials.

Ans. : false

49. The Ghatika-yantra was water-based.

Ans. : true

50. Digital watches were used in ancient times.

Ans. : false

51. Uniform motion means equal distances in equal intervals of time.

Ans. : true

52. Atomic clocks are the most accurate timekeeping devices.

Ans. : true

53. A stopwatch can measure milliseconds.

Ans. : false

54. The time period of a pendulum depends on its mass.

Ans. : false

55. Candle clocks use melting wax to show time.

Ans. : false

56. The longer the pendulum, the greater the time period.

Ans. : true

57. The basic unit of time is second.

Ans. : true

58. If an object moving along a straight line keeps changing its speed, its motion is called uniform.

Ans. : false

59. The symbols of units are written in plural form.

Ans. : false

60. A faster vehicle has a higher speed.

Ans. : true

*** Fill In The Blanks With Correct Alternative.[1 Marks Each]** [12]

61. One complete to-and-fromotion of a pendulum is called an _____ .

Ans. : oscillation

62. A _____ measures the time taken during sports activities.

Ans. : stopwatch

63. A speedometer measures _____ of a vehicle.

Ans. : speed

64. Ghatika-yantra was an ancient _____ clock.

Ans. : water

65. Uniform motion means _____ speed.

Ans. : constant

66. The total distance travelled divided by total time taken is called _____ .

Ans. : average speed

67. A candle clock uses _____ to tell time.

Ans. : markings

68. A quartz watch uses _____ vibrations.

Ans. : quartz

69. The distance covered by an object in _____ is called its speed.

Ans. : unit time

70. The symbols of all units are written in _____

Ans. : singular

71. The time taken by a simple pendulum to complete one oscillation is called its _____

Ans. : time period

72. The unit of speed is _____ .

Ans. : m/s

*** Answer The Following Questions In One Sentence.[1 Marks Each]** **[43]**

73. Name two ancient time measuring devices.

Ans. : Sundials: These use the position of the Sun to tell time. The shadow cast by an object on the sundial indicates the time of day.
Water Clocks: These devices measure time by regulating the flow of water into or out of a container.

74. Define time period of a pendulum.

Ans. : The time period of a pendulum is the time taken by the pendulum to complete one full oscillation.

75. What is average speed?

Ans. : Average speed is the total distance traveled divided by the total time taken.

76. Give the formula to calculate speed.

Ans. : The formula for speed is:

$$\text{Speed} = \frac{\text{Total Distance Covered}}{\text{Total Time Taken}}$$

77. What is oscillatory motion?

Ans. : Oscillatory motion is when an object moves back and forth repeatedly around a central position.

78. How was time measured when there were no clocks and watches?

Ans. : Before the invention of clocks and watches, time was measured using instruments like sundials, water clocks, hourgiasses and candle clocks.

79. For races covering the same distance, we can tell who was faster by measuring time. But how can we tell that when comparing races for different distances?

Ans. : If races cover the same distance, we can tell who was faster by measuring the time taken.

80. I once watched a part of marathon on a straight road stretch. I noticed that some people seemed to be running at the same speed during that distance while some people would speed up or slow down. How were their motion different?

Ans. : People who run at the same speed have uniform motion, but those who speed up or slow down have non-uniform motion.

81. Look at the wall clock shown in Fig. carefully. What is the smallest interval of time you can measure with it?

Ans. : One second is the smallest interval of time that we can measure using this clock.

82. Calculate the speed of a car that travels 150 metres in 10 seconds. Express your answer in km/h.

Ans. : Distance $= 150m$

Time taken $= 10s$

$$\text{SPeed } = \frac{\text{Distance covered}}{\text{Time taken}} = \frac{150m}{10s}$$

$$\text{SPeed in } km/hr = 15 \times \frac{18}{5} = 54km/h$$

83. A train travels at a speed of 25 m/s and covers a distance of360 km. How much time does it take?

Ans. : $\text{Speed } = 25m/s$

$$\text{Distance } = 360km = 3,60,000m$$

$$\text{Time taken } = \frac{\text{Distance}}{\text{Speed}} = \frac{3,60,0000m}{25m/s}$$

$$= 14,400s$$

$$\Rightarrow 240mins$$

$$\Rightarrow 4 \text{ hours}$$

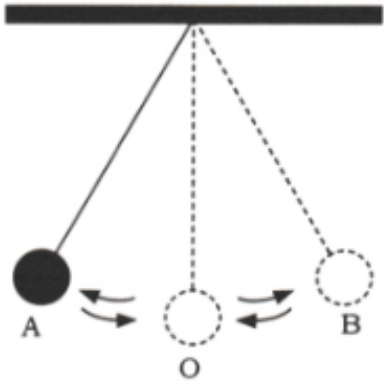
84. The fastest galloping horse can reach the speed of approximately 18 m/s. How does this compare to the speed of a train moving at 72 km/h?

Ans. : Speed of horse $= 18m/s$

Speed of train $= 72km/h = 72 \times \frac{5}{18} = 20m/s$

The train is faster by $2m/s$ than the fastest galloping horse.

85. A simple pendulum is oscillating between two points A and B as shown in Figure. Is the motion of the bob uniform or non-uniform?



Ans. : Non-uniform motion as the object is changing its motion.

86. Name the physical quantity that helps to identify which object moves faster or slower.

Ans. : Speed

87. What is speed?

Ans. : The distance covered by an object in a unit time is called its speed.

88. How did our ancestors find out the time of the day?

Ans. : Our ancestors could tell the approximate time of the day by observing at shadows.

89. What is the basic unit of time?

Ans. : Second

90. What do you mean when you say that a car is moving with a speed of 50 kilometres per hour?

Ans. : It means that the car will cover 50 kilometres distance in one hour.

91. What are the most common devices used to measure time?

Ans. : Clocks or watches are the most commonly used time-measuring devices.

92. Give an example of periodic motion.

Ans. : A well-known example of periodic motion is the motion of a simple pendulum.

93. What is a bob?

Ans. : The metallic ball in simple pendulum is called bob.

94. What is the time period of a simple pendulum?

Ans. : The time taken by the pendulum to complete one oscillation is called its time period.

95. Name the devices used by our ancestors to measure the time before pendulum clocks.

Ans. : Sundials, water clocks, hourglass and candle clocks.

96. What is speedometer?

Ans. : The device which is used to record the speed directly in km/h in the vehicles is called speedometer.

97. What is simple pendulum?

Ans. : The simple device consists of a small metallic ball and a long thread is called simple pendulum.

98. What is the function of an odometer?

Ans. : Odometer is used to measure the distance travelled by the vehicle.

99. What is the common property of most of the clocks?

Ans. : Most clocks make use of some form of periodic motion.

100. A spaceship travels 36,000 km in one hour. Express its speed in km/s.

Ans. : 1 h = 60 min
1 min = 60 s
1 h = 3600 s
Distance = 36,000 km
Speed = 36000/3600 km/s
= 10 km/s

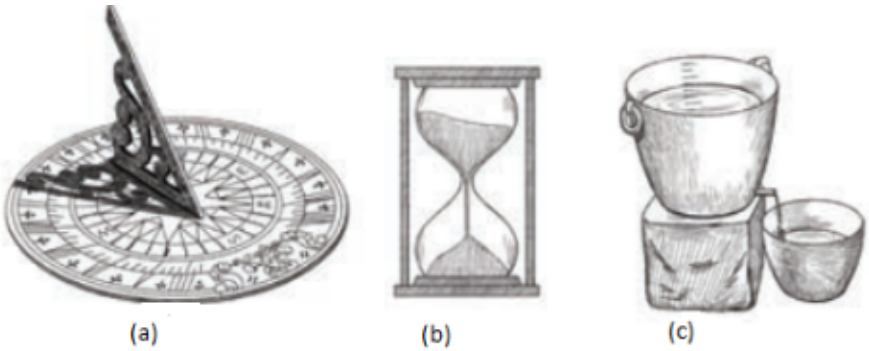
101. What do you mean by average speed?

Ans. : The total distance covered by an object divided by the total time taken is called average speed.
Average speed = Total distance covered/Total time taken

102. What is an oscillation?

Ans. : An oscillation is the movement of a pendulum from its one extreme position to the other extreme position and then back to the former position.

103. Observe the following figures and identify them.



Ans. : (a) Sundial at Jantar Mantar, Rajasthan.
(b) Sand clock
(c) Water clock

104. In which unit is the distance measured by an odometer usually expressed?

Ans. : The distance measured by an odometer is usually expressed in kilometres (km).

105. Which ancient device used sand to measure time?

Ans. : The ancient device that used sand to measure time is a sand clock (or hourglass).

106. What type of motion does a pendulum exhibit?

Ans. : A pendulum exhibits oscillatory motion.

107. What is a sundial?

Ans. : A sundial is an ancient device that measures time by the position of the shadow cast by the Sun.

108. What is the basic unit of speed?

Ans. : The basic unit of speed is metre per second (m/s).

109. A car travels 60 km in 30 minutes. What is its speed in km/h?

Ans. : he speed of the car is 120 km/h because speed = distance ÷ time = 60 ÷ 0.5 = 120 km/h.

110. What makes a train faster compared to a cycle?

Ans. : A train is faster than a cycle because it moves a greater distance in the same amount of time.

111. Name the physical quantity which helps to know which object is faster or slower.

Ans. : Speed

112. If we say that a train is moving at 40 kilometres per hour, what do you mean by this statement?

Ans. : It means that train covers 40 km in one hour.

113. Name the device which is used to record the speed directly in km/h in vehicles.

Ans. : Speedometer

114. Name the most common device which is used to measure the time.

Ans. : Watch or clock

115. On which factor does the time period of a simple pendulum depends?

Ans. : Length of a pendulum

*** consists of questions of 2 marks each.** **[58]**

116. Differentiate between uniform and non-uniform motion.

Ans. :

Feature	Uniform Motion	Non-Uniform Motion
Definition	Constant speed along a straight line	Changing speed along a straight line
Speed	Remains the same	Varies (increases or decreases)

117. Name two units used to measure time.

Ans. : (1) Second (s): This is the SI unit of time.
(2) Minute (min): A minute is equal to 60 seconds.

118. How does the length of a pendulum affect its time period?

Ans. : The time period of a pendulum is directly related to its length. According to the formula

$T = 2\pi\sqrt{\frac{L}{g}}$

increasing the length (L) increases the time period (T), causing the pendulum to swing slower. Therefore, longer pendulums have longer time periods, and shorter pendulums have shorter time periods.

119. Give an example of oscillatory motion.

Ans. : A swing in motion: When you push a swing and let it go, it moves back and forth. This back-and-forth movement around a central point is a classic example of oscillatory motion.

120. State the SI unit of speed and time.

Ans. : (1) The SI unit for time is the second, and its symbol is s.
(2) The SI unit for speed is metre per second, and it's expressed as m/s.

121. What are the features of an ideal uniform motion?

Ans. : An object is in ideal uniform motion when it moves along a straight line at a constant speed. This means it covers equal distances in equal intervals of time, without any changes in speed or direction.

122. How is a stopwatch different from a wall clock?

Ans. : A stopwatch measures specific time intervals with high precision, starting and stopping to time events, while a wall clock continuously displays the current time for general timekeeping. Stopwatches are used for measuring durations in experiments or sports, whereas wall clocks serve to indicate the time of day for daily activities.

123. Why is a digital stopwatch preferred over an analog one in athletic events?

Ans. : Digital stopwatches are favored over analog ones in athletic events due to their superior precision and ease of use. They offer millisecond-level accuracy, eliminate parallax reading errors, and provide clear digital displays, ensuring more reliable and consistent time measurements critical for fair competition.

124. How can we use speed to estimate time in daily life activities?

Ans. : To estimate time, use the formula: Time = Distance/Speed. For example, if your school is 10 km away and you travel at 20 km/h, it will take about 0.5 hours (30 minutes) to reach there. This helps in planning daily activities by estimating travel time between different locations.

125. A runner's speed increases with time. Is it uniform or non-uniform motion? Justify.

Ans. : If a runner's speed increases with time, it is non-uniform motion.
Uniform motion means the runner would cover equal distances in equal intervals of time, keeping the speed constant. However, since the runner is speeding up, they cover more distance in each successive interval of time, indicating non-uniform motion.

126. Why is uniform motion considered ideal but rare in reality?

Ans. : Uniform motion is considered an ideal concept because it simplifies the understanding and calculation of movement, assuming a constant speed in a straight line. However, it is rare in reality because external forces like friction and varying conditions such as changes in terrain or external disturbances constantly affect the speed of moving objects, making perfectly uniform motion uncommon in everyday situations.

127. Design a way to record time using only shadows and a stick.

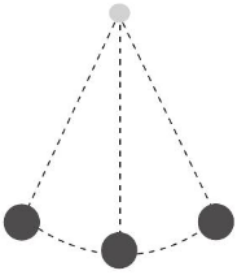
Ans. : Place a stick vertically in the ground on a flat surface in sunlight. Mark the tip of the shadow at regular intervals throughout the day. The changing position and length of the shadow indicate the passage of time. This method forms the basic principle of a sundial.

128. Read the passage and answer the questions :
In an experiment, Riya uses a pendulum of different lengths to observe time periods.
Q.1. What happens when the length increases?
(a) Time period decreases

(b) Time period increases
(c) No change
(d) Speed increases
Q.2. Which factor affects the pendulum's time period most?
(a) Mass (b) Shape
(c) Length (d) Material

Ans. : (b) Time period increases
(c) Length

129. Observe the diagram of a pendulum's oscillation.
(a) Label the extreme positions and the mean position.
(b) What does one full swing represent?



Ans. : self

130. Distinguish between uniform and non-uniform motion using the example of a car moving on a straight highway with no traffic and a car moving in city traffic.

Ans. : Uniform motion: If an objects covers equal distances in equal distance in equal intervals of time, its motion is said to be uniform. A car moving on a straight highway with no traffic is an example of uniform motion.
Non-uniform motion: If an object covers unequal distances in equal interval of time, its motion is said to be non-uniform. A car moving in a traffic is an example of nonuniform motion.

131. A runner completes 400 metres in 50 seconds. Another runner completes the same distance in 45 seconds. Who has a greater speed and by how much?

Ans. : Runner 1:
Distance $= 400m$,
Time $= 50s$
$\text{SPeed } = \frac{\text{Distance covered}}{\text{Time taken}} = \frac{400m}{50s} = 8m/s$
Runner 2:
Distance $= 400m$,
Time $= 50s$
$\text{SPeed } = \frac{\text{Distance covered}}{\text{Time taken}} = \frac{400m}{45s} = 8.89m/s$
Difference $= 8.89 - 8 = 0.89m/s$
Hence, speed of runner 2 is greater by approximately $0.89m/s$.

132. A train travels 180 km in 3 h. Find its speed in:
(i) km/h
(ii) m/s
(iii) What distance will it travel in 4h if it maintains the same speed throughout the journey?

Ans. : Distance $= 180km$, time $= 3h$

(i) Speed $= \frac{\text{Distance}}{\text{Time}} = \frac{180km}{3h} = 60Km/h$

(ii) Speed in $m/s = 60 \times \frac{5}{18} = 16.677m/s$

(iii) Time $= 4h$, Speed $= 60km/h$

Distance $=$ Speed $\times$ Time

$= 60 \times 4 = 240km$

133. A car covers 60 km in the first hour, 70 km in the second hour, and 50 km in the third hour. Is the motion uniform? Justify your Answer :
Find the average speed of the car.

Ans. : The car covers different distances in each hour. Hence, the motion of the car is nonuniform.

Total distance $= 60km + 70km + 50km = 180km$

Total time $= 3$ hours

$$\text{Average speed} = \frac{\text{Total distance travelled}}{\text{Total time taken}}$$

$= \frac{180km}{3h} = 60km/h$

Hence, the average speed of the car is $60km/h$.

134. Which type of motion is more common in daily life—uniform or non-uniform? Provide three examples from your experience to support your answer.

Ans. : In our daily life, most motions are nonuniform because object do not move at the same speed all the time. Their speed changes due to factors like traffic, rough or uneven roads and other obstacles.

Examples :

Travelling in a bus on an uneven road

Playing cricket

Walking through a crowded market

135. Explain how Galileo contributed to the development of clocks.

Ans. : Once Galileo was sitting in a church. He noticed that a lamp suspended from the ceiling with chain was moving slowly from one side to other. He was surprised to find that his pulse beat the same number of times during the interval in which the lamp completed one oscillation. He found that a pendulum of a given length takes always the same time to complete one oscillation. This observation led to the development of pendulum clocks and other watches.

136. On the basis of the following table, calculate the speed of the car between 9:00 AM to 10:00 AM time interval.

Table: Odometer reading at different times of the journey

Time (AM)	Odometer reading	Distance from the starting point
8:00 AM	36540 km	0 km
8:30 AM	36560 km	20 km
9:00 AM	36580 km	40 km
9:30 AM	36600 km	60 km
10:00 AM	36620 km	80 km

Ans. : Initial time = 9.00 AM
Final time = 10:00 AM
Initial reading = 36580 km
Final reading = 36620 km
Total distance = 36620 – 36580 = 40 km
Total time taken = 9:00 AM – 10:00 AM = 1 h
We Know That
Speed = Total distance covered/Total time tahen
= 40 km/1h = 40 km/h

137. Explain uniform and non-uniform linear motion with daily life examples.

Ans. : Uniform linear motion: An object is said to be in uniform linear motion if it covers equal distances in equal intervals of time along a straight line. For example, a person walking on a straight at the same speed. Non-uniform linear motion: An object is said to be in non-uniform linear motion if it cover unequal distances in equal intervals of time along a straight line. For example, a car moving on a straight road with changing speed.

138. Why can not sundials be used at night to measure time?

Ans. : Sundials cannot be used at night because they rely on the position of the Sun to cast a shadow, and there is no sunlight at night to form a shadow.

139. If an object travels different distances in equal time intervals, how do we calculate speed?

Ans. : If an object travels different distances in equal time intervals, its speed is non-uniform. To calculate the speed in each interval, we divide the distance covered in that interval by the time taken.

$$\text{Speed} = \frac{\text{Distance covered in the interval}}{\text{Time taken in the interval}}$$

140. What type of motion is shown by a person running at a uniform speed on a straight road? Explain.

Ans. : The motion is uniform linear motion because the person moves in a straight line and covers equal distances in equal intervals of time.

141. How can we compare the speeds of two objects to determine which one is moving faster?

Ans. : We can compare the speeds of two objects by calculating the distance covered by each in the same time or by dividing the distance travelled by the time taken. The object with the greater speed is moving faster.

142. What is a water clock and how was it used to measure time in ancient times?

Ans. : A water clock is an ancient time-measuring device in which water flows from one container to another at a constant rate. The amount of water collected in a container indicates the passage of time.

143. A car travels 100 km in the first 2 hours and then covers another 50 km in the next 1 hour. Calculate the average speed of the car's for the entire journey.

Ans. : The total distance travelled = 100 + 50 = 150 km.
The total time taken = 2 + 1 = 3 hours.
Average speed = Total distance ÷ Total time = 150 ÷ 3 = 50 km/h.

144. What is meant by one oscillation of a simple pendulum? How is it measured?

Ans. : One oscillation of a simple pendulum is the complete movement of the pendulum from its mean position to one extreme, back to the mean, then to the other extreme, and finally back to the mean position. It is measured using a stopwatch or by counting the time taken for multiple oscillations and dividing by the number of oscillations.

*** consists of questions of 3 marks each.** **[45]**

145. Read the passage and answer the questions :
Arjun observes two cyclists covering the same distance at different speeds.
Q.1. Who has higher average speed?
(a) One who takes less time
(b) One who pedals slower
(c) One with more gears
(d) One who rests more
Q.2. If both reach at same time but use different paths, what can be different?
(a) Speed (b) Distance
(c) Both (a) and (b) (d) None of these
Q.3. What does a speedometer show during this observation?
(a) Constant speed
(b) Variable speed
(c) Distance only
(d) Acceleration only

Ans. : (a) One who takes less time
(c) Both (a) and (b)

(b) Variable speed

146. Note the distance between the two stations and the time taken by the different trains to cover such distance. Calculate speeds of the trains and find the fastest and slowest train.

Ans. : → We need to gather the following information for each train

→ **Distance** between the two stations (in kilometers).

→ **Time Taken** by the train to cover that distance (in hours).

Calculate the Speed

→ Speed $= \frac{\text{Distance}}{\text{Time}}$

→ Make sure our units are consistent. If the distance is in kilometers (km) and time is in hours (h), the speed will be in kilometers per hour (km/h).

Compare the Speeds

→ Once we have calculated the speed for each train, compare the values.

→ Fastest Train: The train with the highest speed (largest numerical value) is the fastest.

→ Slowest Train: The train with the lowest speed (smallest numerical value) is the slowest

147. Data for an object covering distances in different intervals of time are given in the following table. If the object is in uniform motion, fill in the gaps in the table.

Time (s)	0	10	20	30		50		70
Distance (m)	0	8		24	32	40		56

Ans. : In uniform motion, object covers equal distances in equal intervals of time. Hence, the speed of an object remains constant throughout the motion.

Time (s)	0	10	20	30	40	50	60	70
Distance (m)	0	8	16	24	32	40	48	56

The object covers 8 m in every 10 seconds. Hence, the speed of an object remains constant at 0.8 m/s throughout the motion.

148. Data for the motion of an object are given in the following table. State whether the speed of the object is uniform or non-uniform. Find the average speed.

Ans. :

Time interval (s)	Distance (m)
0-10	6 – 0 = 6
10-20	10 – 6 = 4
20-30	16 – 10 = 6
30-40	21 – 16 = 5
40-50	29 – 21 = 8
50-60	35 – 29 = 6

60-70	42 – 35 = 7
70-80	45 – 42 = 3
80-90	55 – 45 = 10
90-100	60 – 55 = 5

The object exhibits non-uniform motion, because it covers unequal distances in equal time intervals.

$\text{Total distance travelled } = 60m$

$\text{Total time taken } = 100s$

$\text{Average speed } = \frac{\text{Totaldistance}}{\text{Totaltimetaken}}$

$= \frac{60}{100}$

$= 0.6m/s$

149. A vehicle moves along a straight line and covers a distance of 2 km. In the first 500 m, it moves with a speed of 10 m/s and in the next 500 m, it moves with a speed of 5 m/s. With what speed should it move the remaining distance so that the journey is complete in 200 s? What is the average speed of the vehicle for the entire journey?

Ans. : Total distance $= 2km = 2000m$,

Total time $= 200$

Step 1: Time taken to cover the first 500 m

$\text{Time } = \frac{\text{Distance}}{\text{Speed}} = \frac{500}{10} = 50s$

Step 2: Time taken to cover the next 500 m

$\text{Time } = \frac{500}{10} = 100s$

Step 3: Remaining distance $= 2000 - 1000 = 1000m$

Remaining time $= 200 - 150 = 50s$

Step 4: Speed required to cover the remaining 1000 m

$\text{Speed } = \frac{1000}{50} = 20m/s$

Step 5: Average speed $= \frac{\text{Totaldistance}}{\text{Totaltimetaken}} = \frac{2000}{200} = 10m/s$

150. Table : Finding the speed of trains Name of the railway station nearest to your place of stay Delhi.

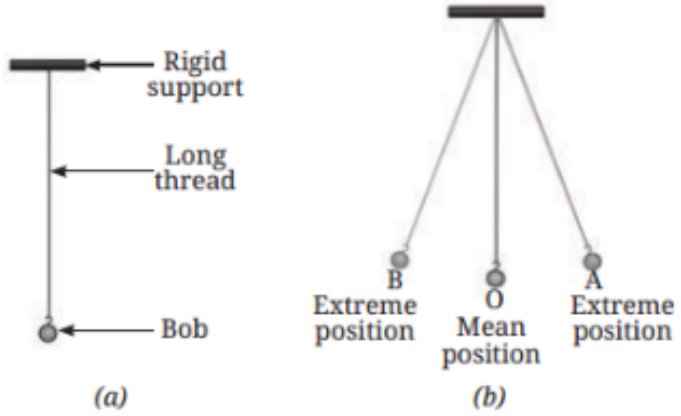
Name of the train	Name of the next station	Distance till the next station (km)	Time taken till the next station(N)	Speed of the train between these two stations (km/h)
Vande Bharat	Ambala Cantt.	214	2h 12 min	
Shatabdi Express	Aligarh	158	1h 30 min	
Tejas Express	Kota	465	2h	
Shan-e-Punjab	Panipa	99	1h 25 min	

Ans. :

Name of the train	Name of the next station	Distance till the next station (km)	Time taken till the next station(N)	Speed of the train between these two stations (km/h)
Vande Bharat	Ambala Cantt.	214	2h 12 min	97.27
Shatabdi Express	Aligarh	158	1h 30 min	105.33
Tejas Express	Kota	465	2h	232.5
Shan-e-Punjab	Panipa	99	1h 25 min	69.88

151. What is a simple pendulum? Explain how does it perform oscillatory motion.

Ans. : A simple pendulum consists of a small metallic ball or a piece of stone suspended from a rigid stand by a thread. The metallic ball is called bob of the pendulum.



When the bob of the pendulum is released after taking it slightly one side, it starts to move to and fro. The to-and-fro motion of a simple pendulum is an example of an oscillatory motion.

152. Ravi travels from his house to the market. On Monday, he takes an auto and covers 6 km in 20 minutes. On Tuesday, he rides his bicycle and covers the same distance in 40 minutes.
(i) What is his speed while going by auto in km/h?
(ii) What is his cycling speed in m/s?
(iii) What is his average speed for both trips in km/h?

Ans. : Given: Distance $= 6km$ Distance

(i) Speed $= \frac{\text{Distance}}{\text{Time}}$

Time $= 20$ minutes $= 0.33$ hours

Speed $= \frac{6}{0.33} = 18.18km/h$

(ii) Distance $= 6km = 6000m$,

Time $= 40$ minutes $= 2400$ seconds

Speed $= \frac{6000}{2400} = 2.5m/s$

(iii) Total distance $= 6km + 6km - 12km$

Total time taken - 0.33 hours + 0.66
hours $= 0.99$ hours

Average speed $= \frac{12km}{0.99 \text{ hours}} = 12.12km/h$

153. During a science experiment, a student sets up a simple pendulum in the lab. She observes that the pendulum completes 40 complete oscillations in 80 seconds.
(i) Calculate the time period of the pendulum.
(ii) If the number of oscillations is doubled, but the total time also becomes double, will the time period change? Explain.

Ans. : Given: Number of oscillations $= 40$,
Total time $= 80$ seconds
(i) Time period $(T) =$

$T = \frac{80}{40} = 2$ seconds
(ii) If the number of oscillations becomes 80 and total time becomes 160 seconds.

$T = \frac{160}{80} = 2$ seconds
So, the time period remains the same. This is because the time period depends on the length of the pendulum, not on how many oscillations we count.

154. Draw a diagram of (a) wall clock (b) table clock (c) digital clock. On what principle do all clocks work?

Ans. :

All of these clocks work on the principle of periodic motion.

155. The smallest time interval that can be measured with commonly available clocks and watches is one second. However, special clocks are available that can measure time intervals smaller than a second. Some of these can measure time intervals as small as one millionth or even one billionth of a second.
1. A micro-second is a very small time interval. Write its value in fraction of a second.
2. Define time period.
3. What is the basic unit of time?

Ans. : 1. One millionth of a second
2. Time taken by the pendulum to complete one oscillation is called time period.
3. Second

156. Rohit and Mohit start walking at the same time. Rohit covers 2 km in 30 minutes and Mohit covers 1 km in 30 minutes. Calculate their speeds in km/h and identify who is walking faster.

Ans. : Rohit: 2 km in 30 min = 2 ÷ 0.5 = 4 km/h
Mohit: 1 km in 30 min = 1 ÷ 0.5 = 2 km/h
Rohit is walking faster.

157. A pendulum completes 30 oscillations in 60 seconds. Find its time period. If the mass of the bob increases but the length of the pendulum remains the same, what will be the new time period?

Ans. : Time period $T = \frac{\text{Total time}}{\text{Number of oscillations}} = \frac{60}{30} = 2s$
The time period of a simple pendulum does not depend on the mass of the bob.
Therefore, the new time period remains 2 s.

158. A bus travels 40 km in 1 hour and 20 minutes, whereas the same distance is covered by a car in 60 minutes. What is the ratio of the speed of the car to the bus?

Ans. : Bus speed = 40 ÷ (80 ÷ 60) = 40 ÷ 1.33 ≈ 30 km/h
Car speed = 40 ÷ 1 = 40 km/h
Ratio of car to bus speed=40:30=4:3

159. Aanya goes from her home to school. On the first day, she walks 4 km in 50 minutes and on the next day, she goes by cycle and covers the same distance in 15 minutes.
(i) Find her walking speed in m/s.
(ii) Find her cycling speed in km/h.
(iii) What is her average speed through the entire trip?

Ans. : (i) Walking speed in m/s:
Distance = 4 km = 4000 m, Time = 50 minutes = 50 × 60 = 3000 s
Speed $= \frac{\text{Distance}}{\text{Time}} = \frac{4000}{3000} = 1.33m/s$
(ii) **Cycling speed in km/h:**
Distance = 4 km, Time = 15 minutes = 0.25 h
Speed $= \frac{4}{0.25} = 16km/h$
(iii) Average speed for the entire trip:
Total distance = 4 + 4 = 8 km, Total time = 50 + 15 = 65 minutes = 65 ÷ 60 = 1.083 h
Average speed $= \frac{8}{1.083} \approx 7.38km/h$

*** consists of questions of 5 marks each.** **[45]**

160. What are the three ancient time measuring devices and how do they function?

Ans. : Sundials are one of the earliest ways people measured time.
→ They work by using the position of the Sun.
→ A sundial has a flat surface and a stick (called a gnomon) that casts a shadow. As

the Sun moves across the sky, the shadow moves too. The flat surface has markings that show the hours of the day.

→ So, by looking at where the shadow falls, people could tell what time it was.

(2) **Water Clocks**:

→ Water clocks were another ancient way to measure time, especially useful because they could work when the sun wasn't out.

→ These clocks measure time by the regulated flow of liquid into or out of a container.

→ There were generally two types: in one, water dripped out of a container, and markings on the inside of the container showed how much time had passed as the water level went down.

→ In another type, water dripped into a container, and the rising water level indicated the time.

(3) **Hourglasses**:

→ Hourglasses are simple and reliable devices that measure the passage of time.

→ An hourglass consists of two glass bulbs connected by a narrow neck. One bulb is filled with sand, which flows through the neck into the other bulb.

→ Once all the sand has flowed to the bottom, it indicates that a specific amount of time has passed.

→ Hourglasses were commonly used for timing events, like speeches, cooking, or even work shifts.

161. Define average speed and explain how it is calculated.

Ans. : → Average speed is the total distance an object travels divided by the total time it takes to travel that distance. It tells you how fast an object moves on average over its entire journey, even if its speed changes along the way.

→ To calculate average speed,

→ Average Speed $= \frac{\text{Total Distance Covered}}{\text{Total Time Taken}}$

To Calculate Average Speed

→ First, determine the total distance the object has traveled.

→ Next, find the total time it took to travel that distance.

Example: Suppose a car travels 120 kilometers in the first 2 hours and then 80 kilometers in the next 3 hours.

→ Total Distance = 120 km + 80 km = 200 km

→ Total Time = 2 hours + 3 hours = 5 hours

→ Use the formula for average speed:

→Average Speed $= \frac{200km}{5h} = 40km/h$

→ So, the average speed of the car is :40/km/h

162. Why is it important to use SI units while recording measurements?

Ans. : → Using SI units is super important in science, engineering, and everyday life because it makes sure everyone is on the same page. SI, which stands for the

International System of Units, gives us a standard set of units like meters for length, kilograms for mass, and seconds for time. The significance includes:

→ SI units are recognized and used almost everywhere in the world.

→ This means that scientists, engineers, and people from different countries can easily understand and compare measurements without confusion.

→ The SI system is based on powers of 10, which makes conversions and calculations much simpler.

→ example, converting meters to kilometers is just a matter of multiplying or dividing by 1000.

→ Using SI units reduces the chance of errors in measurements and calculations.

→ When everyone uses the same units, it's easier to ensure that results are accurate and reliable.

→ SI units provide a common language for expressing measurements.

→ This makes it easier for people in different fields to communicate and share information effectively.

→ Using SI units promotes fair and consistent trade practices between countries.

→ When measurements are standardized, it's easier to ensure that products meet quality standards and are priced fairly.

163. Explain the use of speedometer and odometer with examples.

Ans. : → A speedometer is an instrument in vehicles that shows the vehicle's instantaneous speed.

→ It measures how fast the vehicle is moving at a particular moment. The speed is usually displayed in kilometers per hour (km/h) or miles per hour (mph).

Example: When you're driving a car, the speedometer needle points to "60 km/h," meaning you are traveling at 60 kilometers per hour at that instant. If the needle changes to "80 km/h," you've accelerated and are now moving faster.

(2) Odometer

→ An odometer is an instrument used to record the total distance a vehicle has traveled.

→ It continuously adds up the distance as the vehicle moves, usually displayed in kilometers (km) or miles (mi).

Example: When you buy a new car, the odometer usually reads zero (or a very small number). After a year of driving, the odometer might read "15,000 km," meaning you've driven a total distance of 15,000 kilometers over that year.

164. Jaya's school is 2.4 km from her house. It took her 10 min to reach her school riding on her bicycle. Calculate the speed of the bicycle in m/s. $[4m/s]$

Ans. : 1. **Convert Distance to Meters**:

→ Jaya's school is 2.4 km from her house. Convert this distance to meters:

→ $2.4km \times 1000\frac{m}{km} = 2400m$

→ So, the distance is 2400 meters.

2. Convert Time to Seconds:

→ It took Jaya 10 minutes to reach her school. Convert this time to seconds:

→ $10min \times 60\frac{s}{min} = 600s$

→ So, the time is 600 seconds.

→ Now Calculate Speed:

→ Speed $= \frac{\text{Distance}}{\text{Time}}$

→ Put the values

→ Speed $= \frac{2400m}{600s} = 4m/s$

→ Therefore, Jaya's speed on her bicycle is

→ $4m/s$

165. The speed of bicycle of Kavya is $4m/s$ and it took her 15 min to reach her school riding on her bicycle. Calculate the distance (in km) between her house and school. [3.6 km]

Ans. : → Speed of Kavya's bicycle:$4\frac{m}{s}$

→ Time taken to reach school:15 min

→ First, we need to convert the time from minutes to seconds:

→ $15min \times 60\frac{s}{min} = 900s$

→ So, Kavya took 900 seconds to reach school.

→ Now, use the formula for distance:

→ Distance $=$ Speed $\times$ Time

→ Put values

→ Distance $= 4\frac{m}{s} \times 900s = 3600m$

→ So, the distance is 3600 meters.

→ Now, convert the distance from meters to kilometers:

→ $3600m \times \frac{1km}{1000m} = 3.6km$

→The distance between Kavya's house and school is 3.6 kilometers.

166. Samir is going to a city in a car, moving at a speed of $60km/h$. If it takes him $1 1/2$ to reach the city. How far is that city? [90 km]

Ans. : → Speed of the car:$60\frac{km}{h}$

→ Time taken:$1\frac{1}{2}h = 1.5h$

→ using the formula:

→ Distance $=$ Speed $\times$ Time

→ Put a values

→ Distance $= 60\frac{km}{h} \times 1.5h$

→ Multiply the speed by the time:

→ Distance=90km

167. A bus is travelling at a speed of $50km/h$. How much time will it take to cover a distance of 225 km ? $\left[4\frac{1}{2}h\right]$

Ans. : → Speed of the bus=50km/h

→ Distance to be covered=225 km

→ Time taken to cover the distance = ?

→ We know the formula:

→ Speed $= \frac{\text{Distance}}{\text{Time}}$

→ Now, plug in the values

→ Time $= \frac{225km}{50km/h}$

→ Now, calculate the time:

→ Time=4.5 hours

168. Make simple pendulums of different length and note their time periods and state the relation between length and time period of it.

Ans. : → Create multiple pendulums by attaching a bob to different lengths of string (e.g., 20 cm, 40 cm, 60 cm, and 80 cm).

→ Measure the length from the point of support to the center of the bob.

→ Displace the bob slightly and release.

→ Use the stopwatch to measure the time for 10 complete oscillations (to reduce error).

→ Divide the total time by 10 to get the time period T for one oscillation.

→ Repeat the measurement at least three times for each pendulum length and calculate the average time period.

→ Create a table with columns for "Length (L)" and "Time Period (T)".

→ As the length of the pendulum increases, the time period also increases.

→ Notice that the time period is not directly proportional to the length.

→ Instead, the time period is proportional to the square root of the length.

→ The relationship between the length L and the time period T is given by:

$T = 2\pi\sqrt{\frac{L}{g}}$

→ Where T is the time period

→ L is the length of the pendulum

→ g is the acceleration due to gravity (approximately)

→ $9.8m/s^2$

→ The time period of a simple pendulum is directly proportional to the square root of its length.

→ This means longer pendulums have longer time periods.

*** Match the Following.** **[8]**

Column A	Column B
169. Sundial	(a) Used in vehicles to measure distance
170. Stopwatch	(b) Oscillatory motion

171. Odometer	(c) Shadow-based clock
172. Atomic clock	(d) Measures very short time intervals
	(e) Most accurate

Ans. : (1-c,2-d,3-a,4-e)

Column A	Column B
173. Speed	(a) Sundial
174. Modern clock	(b) Periodic
175. Ancient time measuring instrument	(c) km/h
176. Simple pendulum	(d) Quartz

Ans. :

Column A	Column B
1. Speed	(c) km/h
2. Modern clock	(d) Quartz
3. Ancient time measuring instrument	(a) Sundial
4. Simple pendulum	(b) Periodic

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