

**Question:1**

Why do we need to measure time?

**Solution:**

All our activities depend on time. On a day to day basis, we need to perform and manage various activities which require the measurement of time. For example, to know the duration of a journey, to meet the schedules in work, to know whether its day or night, to know the heartbeat, to know the amount of time taken by the computer to perform an operation etc. Hence it is very important to measure the time.

**Question:2**

Write a short note on the different types of clocks used from ancient times to the present.

**Solution:**

From the ancient times, people are measuring the time in their own ways. Ancient people used calendars similar to the present ones to measure time. Later on sundials and hour glass were used to keep a track of time. Apart from this, water clocks were also used in some parts of the world. But all these devices were not able to measure the time accurately. Later on, Christian Huygens in 1656 developed pendulum clock that showed a reliable time measure than the earlier ones. Later on, atomic clocks were invented that showed the measurement of time accurately.

**Question:3**

Explain the factors on which the time period of a simple pendulum depends.

**Solution:**

Time period of a simple pendulum is defined as the time taken by the pendulum to complete one oscillation. Based on the observations made on the oscillations of a simple pendulum, it can be concluded that, the time period of a simple pendulum is,

- i* Directly proportional to the length of the string used to suspend the bob.
- ii* It does not depend on the mass of the bob used.
- iii* it also does not depend on the extension to which the bob of the pendulum is displaced.

**Question:4**

How can we determine the speed of an object from its distance-time graph?

**Solution:**

A distance time graph well explains the speed of an object. In a distance time graph, the slope of the graph indicates the speed of the object.

- i* If the slope of the graph is steeper then it indicates that the object is moving with a high speed.
- ii* A flat line in the graph shows the speed of the object is zero.

*iii* A curved line in the distance time graph shows that the motion of the object is not uniform.

*iv* A straight line in the distance time graph indicates that the motion of the object is uniform.

### **Question:5**

Define the following terms.

1. Clock
2. Motion
3. Periodic motion
4. Pendulum
5. Speed
6. Uniform motion

### **Solution:**

1. Clock: Clock can be defined as a device that measures time.
2. Motion: Motion is defined as the change of position of a body with respect to time.
3. Periodic motion: Periodic motion is a motion that reoccurs in fixed intervals of time.
4. Pendulum: A bob with a small mass, suspended freely from a fixed support so that it can swing to and fro under the influence of gravity is called a pendulum.
5. Speed: Speed can be defined as the distance travelled by an object in unit time.
6. Uniform motion: If an object covers equal distances in equal intervals of time, then the object is said to be in uniform motion.

### **Question:6**

Which one of these is not used for measuring time?

- a* Pendulum
- b* Hour glass
- c* Meter scale
- d* Sundial

### **Solution:**

- c* Meter scale.

Meter scale is used to measure the length of an object.

**Question:7**

Which one of these is not a unit of time?

- a* m/s
- b* Week
- c* Month
- d* year

**Solution:**

- a* m/s

Meter/second is not a unit of time.

**Question:8**

Which one of these is periodic motion?

- a* Rotation of the Earth about its axis
- b* Revolution of the moon about the Earth
- c* To and fro movement of a vibrating spring
- d* All of these

**Solution:**

- d* All of these.

Periodic motion is a motion that repeats in equal intervals of time.

**Question:9**

In a pendulum, when the bob moves from one position and comes back to the same position, it is said to complete

- a* one revolution
- b* one rotation
- c* one frequency
- d* one oscillation

**Solution:**

- d* One oscillation.

In a pendulum, the bob is said to complete one oscillation, when it moves from one position and comes back to the same position.

**Question:10**

In a distance-time graph, uniform motion will be a

- a* curved line
- b* straight line
- c* a circle
- d* a bent line

**Solution:**

*b* Straight line.

In a distance – time graph, the straight line represents uniform motion of an object.

**Question:11**

What is average speed?

**Solution:**

If an object's speed varies with time, then the speed of the object is calculated by dividing the total distance covered by the object by total time taken by the object to cover the distance. This gives the average speed of the object.

**Question:12**

Name two types of clocks used in ancient times.

**Solution:**

In ancient times, people used to measure the time using different devices. Among them, the most used devices were sundials and hourglass.

**Question:13**

Name two units of time other than the SI unit.

**Solution:**

The standard unit of measurement of time is seconds. Other than this unit, minutes and hours are also used to measure the time.

**Question:14**

What are the parts of a simple pendulum?

**Solution:**

A simple pendulum consists of mainly three parts. A bob, which is having a small mass, a string which suspends the bob and a fixed support to which the string containing the bob is tied firmly.

**Question:15**

Fill in the blanks with the correct words.

1. A motion that repeats itself at equal intervals of time is called .....  
*periodic motion / pendulum*
2. Motion is the change in the position of a body with respect to .....*distance / time*
3. The slope of the distance-time graph of a body gives its ..... *speed / distance travelled*
4. If the speed of a body is zero, its distance-time graph will be a straight line parallel to the ..... *distance / time axis*.
5. A curved distance-time graph represents ..... *uniform / non – uniform* motion.

**Solution:**

1. Periodic motion.

Periodic motion is a motion that repeats in equal intervals of time.

2. Time.

Motion can be defined as the change in the position of a body with respect to time.

3. Speed.

In a distance time graph, the slope of the graph indicates the speed of the object.

4. Time.

If a distance time graph shows a straight line parallel to time axis, then the speed of the object will be zero.

5. Non-uniform motion.

Non uniform motion is represented by a curved line in a distance time graph.

**Question:16**

Convert the following as directed.

*a* 3720 seconds to minutes

*b* 24 hours to seconds

*c* 1 year 365 *days* to hours

**Solution:**

*a* Conversion of 3720 seconds to minutes.

Given 3720 seconds.

$$60 \text{ seconds} = 1 \text{ minute}$$

To convert 3720 seconds to minutes divide 3720 by 60

$$\text{That is } 3720 \text{ seconds} = 3720/60 \text{ minutes}$$

= 62 minutes.

Therefore 3720 seconds is equal to 62 minutes.

*b* Conversion of 24 hours to seconds.

Given 24 hours.

1 hour = 60 minutes.

1 minute = 60 seconds.

That is 1 hour =  $60 \times 60 = 3600$  seconds.

To convert 24 hours to seconds, multiply 24 by 3600.

That is 24 hours =  $24 \times 3600$  seconds

= 86400 seconds.

Therefore 24 hours is equal to 86400 seconds.

*c* Conversion of 1 year 365 *days* to hours.

Given 1 year = 365 days.

1 day = 24 hours.

To convert 365 days into hours, multiply 365 by 24.

That is 1 year =  $365 \times 24$  hours.

= 8760 hours.

Therefore 1 year is equal to 8760 hours.

### **Question:17**

A train, travelling at uniform speed takes 10 hours to cover a distance of 1200 km. Express its speed in km/h and m/s.

### **Solution:**

Distance covered by the train = 1200 km

Time taken by the train to cover a distance of 1200 km = 10 h.

The speed of the train is  $= 1200/10 = 120$  km/h

To convert this in m/s,

1 km = 1000 m, 1 hour = 3600 seconds.

1200 km =  $1200 \times 1000$  m = 1200000 m.

10 h =  $10 \times 3600$  sec = 36000 seconds

Therefore, speed =  $1200000/36000$  m/s

= 33.3 m/s

**Question:18**

A rocket travels at a speed of 15,000 m/s. Express this speed in km/h.

**Solution:**

To convert from m/s to km/h, multiply the speed in km/h by 18/5.

$$\text{speed (in km/h)} = 15000 \times \frac{18}{5} = 54000 \text{ km/h}$$

**Question:19**

Amit's school bus travels at 36 km/h and Sushma's school bus travels at 11 m/s, whose school bus travels faster?

**Solution:**

Amit's school bus travels at 36 km/h.

Sushma's school bus travels at 11 m/s.

Two quantities can be compared easily when they are measured in same units.

Convert 36 km/h to m/s:

$$\text{Amit's bus travels at } 36 \times \frac{5}{18} = 10 \text{ m/s}$$

Therefore Sushma's school bus travels faster

**Question:20**

Show that 1 km/h = 5/18 m/s.

**Solution:**

$$1 \text{ km} = 1000 \text{ m}$$

$$1 \text{ h} = 3600 \text{ s}$$

$$\text{Therefore, } 1 \text{ km/h} = 1000 / 3600 \text{ m/s} = 5/18 \text{ m/s}$$