OBJECTIVE TYPE QUESTIONS & ANSWERS

Q2. Give short Answers.

1. What is a wave?

Answer

The wave is a source of transferring energy from one place to another.

2. Differentiate between time period and frequency.

Answer

Time period

The time required by a body to complete one vibration is called its time period. It is denoted by T and measured in second.

Frequency

It is denoted by f and its unit is cycles per second or Hertz (Hz).

3. Give some importance of waves.

Answer

Some importance of waves is:

- Sound waves produce sensation of hearing.
- Heat and light reach us from the sun.
- Broadcasting of radio and television programmes is also in the form of waves.

- Help of waves can detect the defects in the human body.

4. Find the time period of one metre length of simple pendulum on the surface of earth?

Answer

$$l = 1m, g = 10ms^{-2}$$

$$T = 2\pi\sqrt{\frac{l}{g}} = 2\times 3.14\sqrt{\frac{1}{10}}$$

$$T = 2\sec$$

5. Find the time period of one metre length of simple pendulum on the surface of moon?

Answer

$$l = 1m, g = 1.6ms^{-2}$$

$$T = 2\pi\sqrt{\frac{l}{g}} = 2\times 3.14\sqrt{\frac{1}{10}}$$

$$T = 4.9\sec$$

6. Is there connection between F and x in mass spring system?

Answer

If a force F acts on a body which is displaced through a displacement x. Then according to Hook's law.

$$F \propto x$$

$$F = kx$$

Where K is a spring constant

7. Give some characteristics of SHM.

Answer

Some characteristics of SHM are:

- A body executing SHM always vibrates about its position of equilibrium.
- Its acceleration is always directed towards its mean position.
- Its acceleration is directly proportional to its displacement from the mean position.
- Its velocity is maximum at the mean position and zero on the extreme positions.

8. State Hooke's law.

Answer

According to Hooke's law

"The external force acting on the spring is directly proportional to the increase in length of the spring" Mathematically.

$$F \propto x$$

$$F = kx$$

Where K is a spring constant.

9. Give relation between the frequency and time period.

Answer

Consider a body, which performed f vibrations in one second.

So, the time period for one vibration = $\frac{1}{f}$

We know that time for one vibration is called time period. It Is denoted by T and is given by:

$$r=\frac{1}{f}$$

Or

$$F=\frac{1}{T}$$

This equation gives the relation between frequency and time period.

10. Explain the relation Fr= -Kx.

Answer

This is the relation for elastic restoring force. The negative sign shows that restoring is always directed towards the mean position or rest. Thus, acceleration is always directed towards the mean position.

11. Write the basic conditions for SHM.

Answer

The conditions for SHM are given as follows:

- The system should have elastic restoring force.
- The system should have inertia.
- The system should be frictionless.

12. Which two forces are acting on the particle when is at the extreme position?

Answer

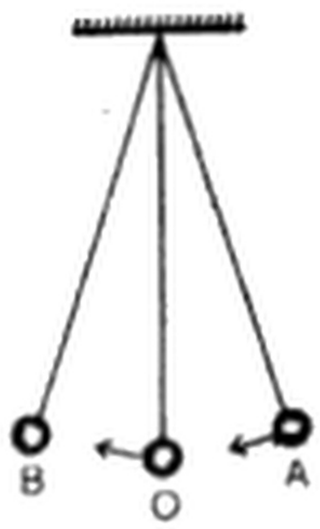
When the particle is at the extreme position, two forces are acting on it.

- The weight mg of the point mass acting vertically downward. '
- The tension T along the string.

13. What is simple pendulum?

Answer

A simple pendulum consists of a single isolated bob suspended from a frictionless support by a light inextensible string.



14. What are factors upon which the time period of simple pendulum depends?

Answer.

The relation for time period of simple pendulum Is given by

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

The time period of simple pendulum depends upon:

- The length of the string:

- The value of acceleration due to gravity.
- The time period of simple pendulum is independent of the mass of the bob.

15. Does the time period depends on the amplitude of the pendulum?

Answer

The relation for time period of simple pendulum is given by

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

This relation shows that time period of simple pendulum is Independent of the amplitude of the pendulum.

16. Which type of forces comes into play an important role in simple pendulum?

Answer

When a bob of simple pendulum moves to and fro, these forces come into play:

- Weight of the bob.
- Tension in the string.
- Air friction.

17. Give some examples of motion that shows SHM in nature.

Answer

- Motion of the bob of a simple pendulum.
- Motion of stretched string when it is plucked from its mean position.
- Vibratory motion of stretched string of musical instrument.

18. Why does a pendulum lose time in summer and gain time in winter?

Answer

The relation for time period of simple pendulum is given by;

$$T = 2\pi\sqrt{\frac{1}{g}}$$

This relation shows that the time period of a simple pendulum is directly proportional to the square root of the length.

In summer due to increase in temperature the length of simple pendulum increases and the time period of simple pendulum also increases.

In winter due to decrease in length, its time period decreases and hence it gains time.

19. What happens to the frequency of pendulum, as its oscillations die down from large amplitude to small?

Answer

In the oscillations of simple pendulum. The dissipation effect due to frictional forces is present. The amplitude of motion of bob gradually becomes smaller and smaller due to air friction. Hence the friction has also affected in reducing the frequency slightly

20. What is the use of simple pendulum?

Answer

Simple pendulum can be used to determine the value of g because the time period T and the length of the pendulum can be directly measured. If we take proper precautions during the experiment." the accurate value of g can be determined by using Simple pendulum.

21. Do the oceanic waves contain a form of energy?

Answer

Yes. Oceanic waves contain kinetic energy. Sometimes the huge energy of oceanic waves causes the destruction of ships and coastal areas, This, waves energy is also used to produce tidal energy.

22. What is the frequency of seconds pendulum?

Answer

In SHM, the frequency and time period are related as

$$F = \frac{1}{T}$$

As the time period of seconds pendulum is 2 sec. Therefore, its frequency will be

$$F = \frac{1}{2} = 0.5 \text{ Hz}$$

23. How with the help of Ripple tank produces straight waves?

Answer

On setting vibrator on the plate starts vibrating and straight waves are generated on the water surface. With the help of light, the image of the water waxes is obtained on the white paper or screen. The crests of the waves appear as bright lines because they behave like, convex lens and they converge the light rays while the troughs of the waves appear as dark lines because they behave like concave lens and they converge the light rays while

the troughs of the waves appear as dark lines because they behave like concave lens and they diverge the light rays.

24. How with the help of ripple tank produces the circular waves?

Answer

It generates circular waves the vibrator bar is raised up and a knob 9 attached to its lowered in such a way that it touches the water surface.

When the vibrator is set on, circular waves are produced.

25. Prove that the product of time period and frequency is unity.

Answer

In SHM, the frequency and time period are related as:

$$F = \frac{1}{T}$$

Or $$T \times f = 1$$

26. Why the amplitude of simple pendulum is kept small?

Answer

The relation for the time period of simple pendulum is:

$$T = 2\pi\sqrt{\frac{1}{g}}$$

It was assumed that 6 is small then the relation $\sin\theta \approx \theta$ holds good. The θ can be small only if amplitude is small. Thus, we must keep the amplitude small.

27. Show that the expression for acceleration of a body executing SHM.

In mass-spring system, the restoring force is given by:

$$F - kx.....(i)$$

If the acceleration a is produced by force F, then according to Newton's second law of motion

$$F = ma.....(ii)$$

By comparing (i) and (ii) then we get

$$ma = -kx$$

$$a = \frac{k}{m} \times x$$

$$a = -(cons\tan t) \times x$$

$$a\ \alpha\ -x$$

Thus, acceleration at any instant of a body executing SHM is directly proportional to the displacement and is always directed towards its mean position.

28.How long must a simple pendulum be in order to have a period 01' one second?

Answer

$$T = 1\sec$$

$$G = 9.8ms^{-2}$$

$$l = ?$$

We know that,

$$T = 2\pi\sqrt{\frac{1}{g}}$$

$$T^2 = 4\pi^2 \times \frac{\lambda}{Y}$$

$$l = \frac{g \times T^2}{4\pi^2}$$

$$L = \frac{9.8 \times (1)^2}{4 \times (3.14)}$$

$$L = 0.25m = 25cm$$

29. Does the acceleration of simple harmonic oscillator remain constant during its motion?

The acceleration of simple harmonic oscillator is:

$$a = -(\text{constant}) \times x$$

$$a \propto -x$$

Where x is the displacement from the mean position.

This relation shows that:

- The acceleration is zero at the mean position i.e. x = 0.
- The acceleration is zero at the extreme position.

30. Can we realize an ideal simple pendulum?

Answer

We cannot realize an ideal simple pendulum. An ideal simple pendulum consists of heavy but small metallic bob suspended from a rigid frictionless support by means of long, weightless and inextensible?

31. What happens to the period of simple pendulum if its length is doubled?

Answer

The time period of simple pendulum is given by:

$$T = 2\pi\sqrt{\frac{1}{g}}$$

If its length is doubled, then T' = 1.41 T

This shows that the time period of simple pendulum increases 1.41 times, if the length of pendulum is doubled.

32. What will be the time period of simple pendulum at the center of the Earth?

Answer

When the length of pendulum is adjusted such that *l* =R, the bob will be at the center of the Earth. We know that at this position the value of g is zero i.e. g = 0

$$T = 2\pi\sqrt{\frac{1}{g}}$$

Thus, when length of simple pendulum is adjusted such that the bob is at the centre of the Earth. The time period of the simple pendulum will be infinity.

33. How refraction in wave occurs?

Answer

The refraction in wave occurs due to the change in speed of wave in the other medium.

34. What is vibratory motion? Give some examples.

Answer

Such a type of motion in which a body moves to and fro about a mean position is called Vibratory motion. Some examples of vibratory motion are given as

- Spring-mass system.
- Motion of pendulum.
- Rolling steel ball in a curved dish.

35. Why does the hub of a swinging pendulum comes to rest after sometime?

Answer

The bob of a simple pendulum comes to rest after some time due to following reasons:

- Some energy is lost due to friction in air.
- The energy lost goes into the surrounding air as the heat energy.

36. Why does they vibrating body move away from the mean position?

Answer

During vibratory motion the body experiences restoring force which brings it towards mean position where it has maximum velocity. According to law of inertia the body tries to continue its motion which moves it again away from mean position.

37. Explain the relation between velocity and acceleration of a body performing SHM?

Answer

The velocity and acceleration of a body performing SHM are inversely proportional to each other. At mean position velocity is maximum. Whereas acceleration is minimum.

At the extreme position the velocity is minimum whereas acceleration is maximum.

38. What is second pendulum?

Answer

A second pendulum is a pendulum, which completes one vibration in two seconds.

Thus, the time period of second pendulum is two seconds.

39. Why total energy of vibrating simple pendulum at its mean position is in kinetic energy form?

Answer

Total energy of vibrating simple pendulum at its mean position is in kinetic energy form because at the mean position.

The velocity of pendulum is maximum.

Its height is zero.

Thus, at the mean position vibrating pendulum has.

K.E = maximum and PE = minimum.

40. Define amplitude.

Answer

The maximum displacement on either side of the mean position of an oscillating body is called amplitude.

41. What is wave motion?

Answer

Wave in a medium is due to the generated disturbance which causes' the constituent particles to repeat its to and fro motion about its mean position in equal interval of time, and this disturbance is passed over from one end of the medium to the other.

Example

Waves are produced when one cud of stringy_ is moved up and down.

42. Define spring constant. Give its unit?

Answer

Some energy is lost due to friction in air.

The energy lost goes into the surrounding air as the heat energy.

$$K = \frac{F}{x}$$

Its unit is Nm^{-1}

43. What is SHM?

Answer

The type of vibratory motion in which the acceleration of a body executing SHM is directly proportional to the displacement from the mean position and always directed towards the mean position.

44. What is elastic restoring force?

Answer

It is the force, which brings the body back towards the mean position.

45. Differentiate between mechanical wave and electromagnetic wave?

Answer

Mechanical waves

The waves, which require a material medium for their propagation, are known as mechanical waves.

Example

- Waves generated in rope
- Waves generated in water
- Waves generated in strings

Electromagnetic waves

The waves, which do not require a material medium for their propagation are known as electromagnetic waves.

Example

Heat waves, light waves, x-rays etc..

46. Write the differences between transverse and longitudinal waves?

Answer

No.	Transverse waves	No.	Longitudinal waves
1	In this type of wave, particles of the medium move perpendicular to the direction of propagation of the waves.	1	In this type of wave, particles of the medium move along the direction of propagation of the waves.
2	These waves consist of crests and troughs	2	These waves consist of compressions and rarefactions.
3	The distance between two consecutive crests or troughs is known as one wavelength.	3	The distance between two consecutive compressions or rarefactions, known as one wavelength.
4	Examples: water waves, light waves	4	Examples: sound waves, waves

47. Prove that $v = f\lambda$?

Answer

If the speed of wave is v and the time period' of producing wave is T second, then the distance covered by the wave will equal to the wavelength A, i.e.

$$\lambda = vT$$

$$\lambda = v \times \frac{1}{f}$$

$$f\lambda = v$$

$$v = f\lambda$$

48. What is refraction of a wave?

Answer

When waves enter from one medium to another, a part of it is reflected in the same medium while the other- part is transmitted into the other medium, is known as refraction.

49. Define diffraction?

Answer

The bending of waves around the comers or obstacles is called diffraction.

50. What is the condition for diffraction?

Answer

Diffraction of waves can only be observed clearly if the size of the slit or obstacle is equal to the wavelength of the wave.

51. What is interference?

Answer

When panicles of medium are subjected to two or more than two waves simultaneously, then effect being produced is called interference.