

A)-Write the scientific term:

- 1)-The measuring unit of the frequency.
- 2)-The motion produced as a result of the vibration of the particles of the medium in a certain moment in a definite direction.
- 3)-The motion which is regularly repeated in equal periods of time.
- 4)-The time taken by an oscillating body to make one complete oscillation.
- 5)-A type of waves that can propagate through space.
- 6)-The motion of an oscillating body when it passes by a fixed point on its path two successive times in the same direction.
- 7)-The maximum displacement of medium particles away from their positions.
- 8)-The number of complete oscillations made by an oscillating body in one second.
- 9)-The measuring unit of wave velocity.
- 10)-The distance between two successive crests or troughs.
- 11)-The direction through which the wave moves.

B)-Give reason for:

1)-We see lightning before hearing thunder.

2)-The frequency of an oscillating body decreases by increasing the periodic time.

3)-Water waves are mechanical waves, while light waves are electromagnetic waves.

4)-Metallic pots are not used in microwaves ovens.

5)-Wave motion is considered as a periodic motion.

6)-The motion of the rotator bee is not considered as an oscillatory motion.

7)-The velocity of the body is taken as a measure of its kinetic energy.

8)-Sound waves are transverse waves.

9)-The explosions occurring on the Sun surface can't be heard on the Earth.

C)-Problems:

1)-Calculate the number of complete oscillations that are made by a body in 2 minutes if its frequency is 6Hz.

2)-Calculate the periodic time of a source that makes 600 complete oscillations in one minute.

3)-Sound waves of frequency 200Hz and wavelength 1.7 m. Calculate

a. The velocity of sound waves propagation in air.

b. The wavelength of these waves of frequency 200 Hz when propagate in water with velocity 1500m/s.

4)-If an oscillating body makes 480 complete oscillations in one minute, calculate:

a. Frequency

b. Periodic time

5)-If the frequency of an oscillating body is 10 Hz, find:

a. Its Periodic time.

b. The number of complete oscillations this body makes in a minute.

A)-Complete the following statements:

1)-The frequency is ----- proportional to the periodic time.

2)-Oscillatory and wave motion is an examples of ----- motion.

3)-If the periodic time of an oscillating body is 0.2 seconds, so the time taken to do 5 complete oscillations is -----.

4)-If an oscillating body makes 20 complete oscillations in 10 seconds, its frequency equals ----- and its periodic time equals -----.

5)-In microwave ovens, the oscillating molecules of ----- present in food vibrate by the effect of -----.

- 6)-The motion of rotary is not considered as a ----- motion although it is a ----- motion.
- 7)- ----- and ----- vessels are used in microwave ovens, while ----- vessels are not used.
- 8)- The ----- is the highest point of medium particles in the transverse waves.
- 9)-The longitudinal waves consist of ----- and -----.
- 10)- ----- is the area of medium at which the medium particles are of highest density and pressure.
- 11)-Radio waves are considered from ----- transverse waves.
- 12)-Waves are classified according to the direction of vibration of medium particles relative to the direction of propagation into ----- and ----- waves.
- 13)-Waves are classified according to the ability to propagate into ----- and ----- waves.
- 14)- In the ----- waves, the particles of the medium vibrate perpendicular to the wave direction, while in the ----- waves, the particles of the medium vibrate along the wave propagation direction.
- 15)- ----- is the measuring unit of wavelength, while ----- is the measuring unit of wave velocity.
- 16)-Jacuzzi is used to treat ----- and ----- by using hot water and treat ----- by using cold water.
- 17)-The crest in the ----- waves is equivalent to the ----- in the longitudinal waves.
- 18)- ----- waves do not need a medium to propagate through such as ----- waves.
- 19)- ----- motion and ----- motion are two types of periodic motion.

- 20)-The kinetic energy of the oscillating body reaches its ----- value, when it passes its original position.
- 21) The ----- is the simplest form of oscillatory motion.
- 22) When tuning fork vibrate, ----- is produced which transfer in form ----- waves.
- 23) The complete oscillation includes displacements, each is called
- 24) Frequency is measured by unit called and its symbol is
- 25) Frequency \times Periodic time =
- 26) The maximum displacement reached by the oscillating body far from its original position is
- 27) A Pendulum makes 30 complete vibrations in 6 seconds, its frequency = and periodic time =
- 28) Kilo Hertz = HZ while Mega Hertz = HZ.
- 29) Waves are classified due to their ability to propagate in space into and
- 30) The crest in waves represented by in longitudinal waves.
- 31) Radio waves are waves which can propagate in space by speed
- 32) If the distance between the center of third compression and center of fifth compression in longitudinal wave is 20 cm, so the wave length is
- 33) In transverse waves particles vibrate in direction propagation direction.
- 34) The longitudinal wave consists of and
- 35) Particles vibrate in the longitudinal wave in direction of wave propagation.
- 36) The wave length of transverse wave equals the distance between or....

37) Radio waves are waves, while the sound is waves.

38) The transverse wave consists of and

39) ----- is example for oscillatory motion, but ----- is example for wave motion.

40) ----- waves don't need medium to propagate, as ----- waves.

41) ----- and ----- is example for periodic motion

B)-Mention the mathematical relation between each of the following

1)-Frequency and periodic time.

2)-The frequency and the number of complete oscillations.

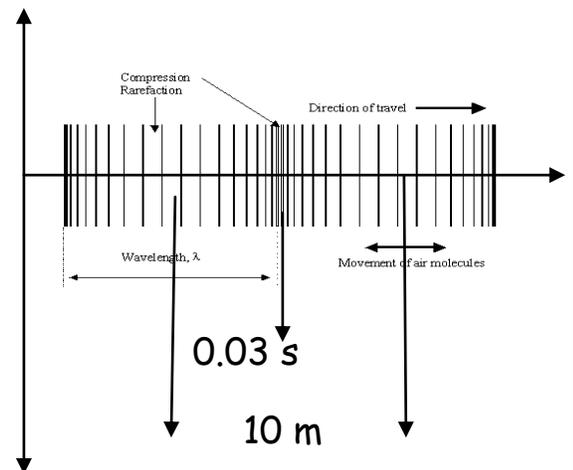
C)-Mention the measuring units of the followings:

1)-Frequency 2)-Amplitude 3)-Wave velocity 4)-Periodic time

A)-From the opposite figure calculate the wavelength and the velocity of the longitudinal waves:

Wavelength = -----m.

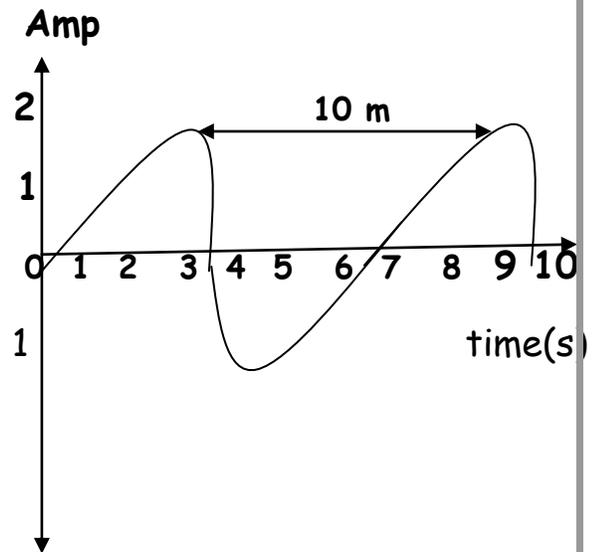
Wave velocity = ----- m/s.



B)-From the opposite figure, Answer:

1)-The wavelength = ----- meter.

2)-The periodic time = ----- sec



7) Mention the function of :

1- Optical fibers

2- Jacuzzi (physiotherapy tubes) 3- Radio waves

4- Triangular glass prism

What is meant by?

1- Number of complete vibrations made by vibrating body in time of 10 seconds is 500.

2- The amplitude is 6 cm.

3- Frequency of tuning fork is 600 complete vibrations / second.

4- The Periodic time of simple pendulum is 0.01 second.

5- The time of 60 complete vibrations is one minute.

6- Wave length of longitudinal wave is 25cm.

7- Wave length of transverse wave is 2 meters.

8- The light velocity is 3×10^8 m/sec.

Choose the correct answer:

1)-Light waves are ----- waves.

(mechanical transverse - electromagnetic transverse - electromagnetic longitudinal - mechanical longitudinal)

2)-Light -----.(travels in straight lines - consist of compressions and rarefactions - can't be analyzed)

3)-White light is a mixture of ----- colors.(five - six - seven - eight)

4)-The medium which doesn't allow light to pass through is called ----- medium. (transparent - semi transparent - opaque- no correct answer)

5)-All of the followings are examples of transparent media except -----.

(air - tissue paper - glass - clear water)

6)----- color has the lowest deviation. (Green - Violet - Red - Yellow)

7)-By increasing the thickness of the transparent medium, the quantity of light that passes through it -----.

(decreases - increases - remains constant - no correct answer)

8)-In ----- reflection, the reflected rays are reflected in many directions. (irregular - uniform - regular - total internal)

9)-The ----- is the change in the direction of light rays when light passes from a transparent medium to another transparent medium.

(light reflection - light refraction - light absorption - light separation)

10)-Light refraction is due to the difference in ----- through different media. (sound intensity - light velocity - nature of surface - all the previous answers)

11)-When a light ray travels from air to water, it -----.

(passes without refraction - reflects - refracts)

12)-Light is reflected ----- when it falls on a smooth bright surface.(regularly - irregularly - refracted - scattered)

13)-If the angle between the incident light ray and the reflected light ray is 90, so the angle of incidence equals -----(0 - 30 - 45 - 90)

Write the scientific term:

1)-The returning of light waves in the same medium on meeting a reflecting surface.

2)-The angle between the incident light ray and the line perpendicular to the reflecting surface at the point of incidence.

3)-The reflection in which the light rays recoil in many directions when fall on a rough surface.

4)-The reflection in which the light rays recoil in one direction when fall on a smooth surface.

5)-A natural phenomenon that takes place on desert roads, where the objects on the road sides seem as if they had inverted images on a wet area.

6)-The ratio between the velocity of light through air to the velocity of light through another transparent medium.

7)-The changing of the path of light when travels from a transparent medium to another transparent medium of different optical density.

8)-The ability of the medium to refract light rays.

9)-A mixture of seven spectrum colors.

10)-The medium which allows only a part of light to pass through and we can see objects through it.

11)- A structure used to separate the white light into seven spectrum colors.

Give reasons for:

1)-Light can travel through free space.

2)-Aluminum foil is an opaque medium.

3)-A clear glass is a transparent medium.

4)-When a light ray travels from glass to air, it refracts far from the normal.

5)-The pencil which is partially immersed in water appears as being broken.

6)-The absolute refractive index for any transparent medium is always greater than one.

7)-Occurrence of mirage phenomenon in desert region at noon.

8)-The energy of red light photon is less than that of orange light photon.

Complete the following statements:

1)-Media are classified according their ability to allow light to pass through into ----- medium, ----- medium and opaque medium.

2)-The glass cup is an example of transparent medium, while flint glass is an example of ----- medium.

- 3)-The spectrum colors start with -----colour and end with ----- color.
- 4)-Energy of photon = ----- constant \times -----.
- 5)-By increasing the ----- of transparent medium, the quantity of light that passes through it -----.
- 6)-Light is an external factor that affects the eye causing the sense of ---
- 7)-The distance covered by light in one second is called -----.
- 8)-The glass prism is used to analyze the ----- light into ----- colors.
- 9)-Light is ----- waves that travel through free space with velocity ----- km/sec.
- 10)-If the absolute refractive index of a medium is 1.5 and the velocity of light through air is 3×10^8 m/s, therefore the velocity of light through this medium is -----.
- 11)-The angle of ----- is the angle between the emergent light ray and the -----at the point of incidence on the interface.
- 12)-When we look at a coin in a glass of water, its ----- position appears to be lower than the ----- position.
- 13)-The ability of the transparent medium to refract light is called the ----
-----of the medium.
- 14)-If the angle of incidence is more than the angle of refraction, this means that the light ray travels from a medium of ----- optical density to another of ----- optical density.
- 15)-The incident light ray, the ----- light ray and the normal to the surface of reflection at the point of incidence, all lie in one plane -----
to the ----- surface.
- 16) Light is considered as waves. Their wave length ranges between :Nanometer.

- 17) is the distance traveled by light in one second.
- 18) The white light consists of colors started with and ended by.....
- 19) Energy of light quantum = × frequency.
- 20) Increasing the thickness of medium decreasing the of light through it.
- 21) The light propagates in air aslines.
- 22) Light intensity is the amount of light that falls on the unit area in one second.
- 23) Light intensity proportional with square of distance between surface and
- 24) Air is medium, while milk ismedium
- 25) We can use to analyze light.
- 26)-The angle of ----- is the angle between the refracted light ray and the -----at the point of incidence on the interface.
- 27) ----- light ray has the highest frequency, while ----- light ray has the lowest frequency.
- 28) Media can classified according to pass of light into -----, ----- and -----
- 29) Optical ----- used in manufacture of medical -----
- 30) Red color has ----- deviation and has ----- wavelength, violet color has ----- deviation and has ----- wavelength
- 31) the medium permits light to pass through is -----
- 32) the energy of red ray is ----- than orange ray.

B)-Write down the mathematical relation that joins between:

- 1)-The photon frequency of a wave and its energy.
- 2)-The absolute refractive index of a medium and the velocity of light through this medium.

C)-Mention the uses of each of the following:

- 1)-Periscope.

- 2)-Optical fibers.

D)-Show by drawing:

- 1)-The path of a light ray that falls on a reflecting surface with an angle of incidence equals 30° .
- 2)-The path of a light ray falling perpendicular on a reflecting surface.

F)-Problems:

- 1)-Calculate the absolute refractive index of diamond given that the speed of light through it is 1.25×10^8 m/s. Knowing that the velocity of light through air is 3×10^8 m/s.

- 2)-If the absolute refractive index of water is $4/3$ and the velocity of light through water is 2.25×10^8 m/s calculate the velocity of light through air.

What happen?

- 1- Light ray travels from air to glass.
- 2- White light falls on triangular prism
- 3- Move free end of spiral spring perpendicular to its axis.
- 4- Light passes from water to air (with drawing).
- 5- Light ray falls perpendicular on reflecting surface.
- 6- The oscillating body passes through its rest position.
- 7- Parallel ray fall on a rough surface.
- 8- Parallel ray fall on a smooth surface.
- 9- The distance between light source and surface doubled concerning the light intensity.
- 10- The frequency of wave doubled at constant velocity concerning the wavelength.
- 11- The decrease in frequency and velocity of wave to quarter respect to wavelength.
- 12- Increase the thickness of transparent medium.
- 13- Light ray travels from more dense medium by angle of incidence larger than critical angle.
- 14- The particles of the medium vibrate in a direction normal [perpendicular] to the direction of wave propagation.

Compare between: 1) Transparent, translucent and opaque medium.

opaque medium.	translucent medium	Transparent medium
<ul style="list-style-type: none"> - doesn't permit light to pass through. - objects can't be seen through opaque medium. - Ex: foil paper – milk – wood - cartoon 	<ul style="list-style-type: none"> - permits only a part of light to pass through and absorb the remaining part. - objects can be seen through translucent medium less clearly than the transparent one. - Ex: tissue paper – flint glass 	<ul style="list-style-type: none"> - permits most light to pass through - objects can be seen clearly through it. - Ex: Air – glass cup

2) Regular and Irregular reflection

Irregular reflection	Regular reflection
<ul style="list-style-type: none"> - light fall on rough refracting surface - incident light ray are reflected indifferent directions 	<ul style="list-style-type: none"> - light fall on smooth surface - incident light ray are reflected in one direction

3) Periscope and light fibers

<u>P.O.C</u>	<u>Periscope</u>	<u>light fibers</u>
<u>Idea of operation</u>	Regular light reflection on mirrors	Total internal reflection
<u>Uses</u>	Submarines under water See danger chemical reactions	<u>Make endoscope used in :</u> Diagnose diseases High risk operation

(4) Compare between oscillatory (vibrational) motion and wave motion

P.O.C	Wave motion	Oscillatory motion
Definition	- It is the motion produced as a result of the vibration of the medium particles at a certain moment and in a definite direction.	- It is the motion that is produced by oscillating body at the two sides of its original position.
Velocity	- has a constant velocity.	- The velocity is maximum when it passes its rest position. - The velocity is minimum when it goes far from its rest position.
Examples	- sound waves. - Light waves .	- Pendulum's motion - Motion of spiral spring.

5) Transverse and Longitudinal waves

Longitudinal	transverse	Point of comparison
It is a disturbance in which the particles of medium vibrate along the direction of wave propagation.	It is a disturbance in which the particles of medium vibrate perpendicular to the direction of wave	1- Definition
compressions and rarefactions	crests and troughs	2- Composition
Distance between center of two successive compressions	Distance between two successive crests	3- Wavelength
Sound waves	water waves	4- Examples

6) Mechanical waves and electromagnetic waves.

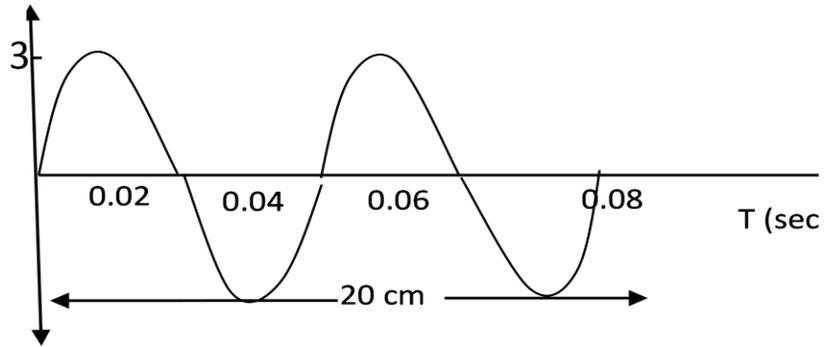
Electromagnetic waves	Mechanical waves
2- They do not need medium to propagate.	1- They need medium to propagate.
2- They propagate through vacuum (free space)	2- They don't propagate through vacuum (free space)
3- They are all transverse waves.	3- They are transverse waves or longitudinal waves.
4- Their speed is great the speed of light = 3×10^8 m/sec Examples: light waves – radio waves (used in radars)	4- Their speed is relatively low. Examples: sound waves (longitudinal) – water waves (transverse)

7) Light reflection and light refraction:

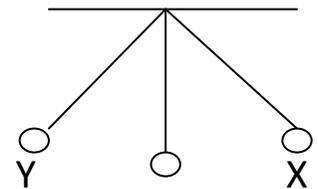
<u>Light reflection</u>	<u>light refraction</u>
Rebounding of light waves on meeting reflecting surface	Change of light path between 2 transparent media
The angle of reflection equals the angle of incidence	The angle of refraction not equals the angle of incidence

Calculate:

- 1- Wavelength ()
- 2- Frequency ()
- 3- Amplitude (A)
- 4- Wave velocity (V)
- 5- periodic time



In the opposite figure; when the ball on the pendulum moves form (x) to (y) in a duration of 0.02 seconds, the frequency equals.....Hertz (0.04 – 0.02 – 25 – 50)

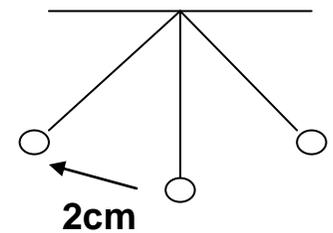


In the opposite figure, the pendulum takes 0.4 sec to make 2 complete oscillation, calculate :

Amplitude

Periodic time

Frequency

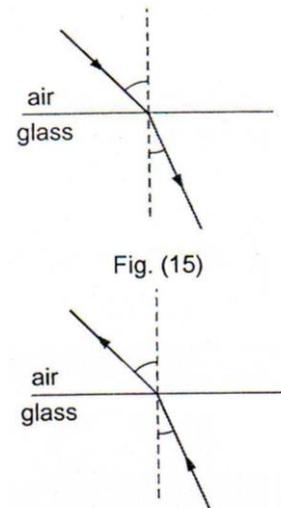


Important units:

- 1) Amplitude → metre (m), centimeter (cm)
- 2) Periodic time → second (sec.)
- 3) Frequency → Hertz (Hz)
- 4) Kilo Hertz = 10^3 Hz
Mega Hertz = 10^6 Hz
Giga Hertz = 10^9 Hz
- 5) Wave length → metre (m)
Millimeter (mill) = 10^{-3} metre
- 6) Wave velocity → m/sec

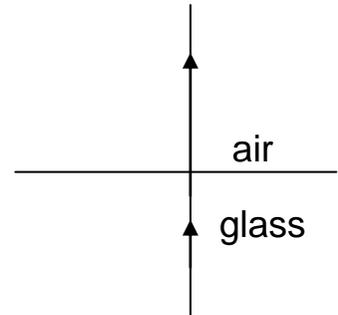
Important drawing:

- (1) Light ray travels from: Medium of lower to higher optical density **it refracts near the normal**
 - angle of incidence is greater than angle of refraction
- (2) Light ray travels from: Medium of higher to lower optical density **it refracts far from the normal**
 - angle of incidence is less than angle of refraction

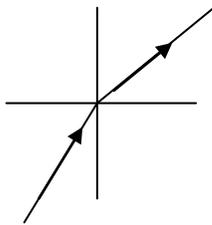
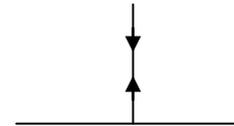


3- Reflection (Regular and irregular)

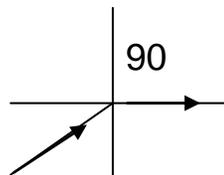
(4) light ray falls perpendicular it pass the other medium without refraction



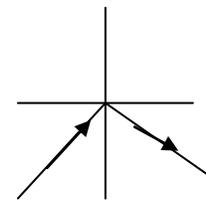
(5) light ray falls perpendicular on reflecting surface it reflects on itself



Angle of incidence
Less than critical angle
reflection)



Angle of incidence
equal to critical angle



Angle of incidence
greater than critical angle
(Total internal reflection)