



# Questions

# Unit (1)

**(1) Write the scientific term:**

- 1- It is a motion which is regularly repeated in equal periods of time.
- 2- It is the motion of oscillating body around its rest point, where the motion is repeated through equal intervals of time.
- 3- It is the maximum displacement done by the oscillating body away from its original position.
- 4- It is the motion of an oscillating body when it passes by a fixed point on its path two successive times in the same direction.
- 5- It is the time taken by an oscillating body to make one complete oscillation.
- 6- It is number of complete oscillations made by an oscillating body in one second.
- 7- It is the disturbance that propagates and transfers energy in the direction of propagation.
- 8- It is the motion produced as a result of the vibration of the medium particles at a certain moment and in a definite direction.
- 9- It is the direction through which the wave propagate.
- 10- It is a disturbance in which the particles of the medium vibrate perpendicular to the direction of wave propagation.
- 11- It is the highest point of the particles of the medium in the transverse wave.
- 12- It is the lowest point of particles of the medium in the transverse wave.



- 13- It is a disturbance in which the particles of medium vibrate along the direction of wave propagation.
- 14- It is the area at which the particles of the medium are of highest density and pressure.
- 15- It is the area at which the medium particles are of lowest density and pressure.
- 16- It is the distance between two successive crests or troughs.
- 17- It is the distance between the centers of two successive compressions or rarefactions.
- 18- It is the maximum displacement achieved by the medium particles away from their rest positions.
- 19- It is the distance covered by the wave in one second.
- 20- It is the number of waves produced from the source in one second.
- 21- Simplest form of oscillatory motion.

### **(2) Give reason for:**

- 1- The product of frequency and periodic time equals unity.
- 2- The oscillatory motion is considered as a periodic motion.
- 3- Water waves are transverse waves.
- 4- Sound waves are longitudinal waves.
- 5- Sound waves are mechanical waves, while radio waves are electromagnetic waves.
- 6- Hearing thunder after seeing lightning though they happen at the same time.
- 7- We can't hear the sound of solar explosions occurring on the sun, but we can see the light coming out of it.



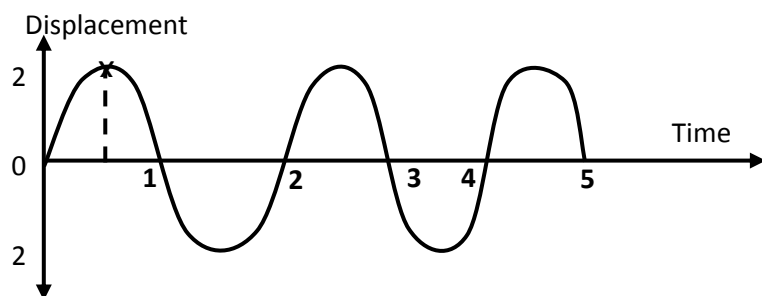
### **(3) Compare between:**

- 1) Mechanical waves and electromagnetic waves.
- 2) Transverse and Longitudinal waves.
- 3) Oscillatory and wave motion.

### **(4) Problems:**

- 1- From the opposite figure of the oscillatory motion of a simple pendulum, calculate:

- a) Amplitude
- b) periodic time
- c) frequency



- 2- Calculate the periodic time and frequency for an oscillating body that makes 500 complete oscillations in two minutes.
- 3- Calculate the wave length in metre for a visible light wave of frequency  $5 \times 10^8$  gigahertz and velocity of  $3 \times 10^8$  m/s
- 4- A longitudinal wave is produced by a spiral spin such that the distance between the first and fourth compression is 24 cm find the wave velocity if the frequency of such wave is 20 kilo Hertz.

### **(5) What's meant by:**

- 1- The time taken by spring to make 60 complete oscillations is 1 minute.
- 2- The frequency of simple pendulum is 50 Hz.
- 3- Wave length of sound wave is 30 cm.
- 4- Law of wave propagation.
- 5- Amplitude of vibrating source is 5 cm.
- 6- Wave length of transverse wave is 10 cm.

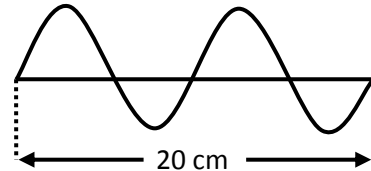


(6) Calculate the wavelength in metre for a visible light wave of frequency  $5 \times 10^8$  Megahertz, and velocity of  $3 \times 10^8$  m/s

**(7) Problems:**

1) A longitudinal wave is produced by a spiral spring such that the distance between the first and the fourth rarefactions is 18 cm.  
Find the wave velocity if the frequency of such wave is 20 Hertz.

2) From the opposite figure,  
calculate the velocity of the wave  
if its frequency is 25 Hertz.





### Important Laws:

1) Complete oscillation includes four amplitudes.

2) Periodic time =  $\frac{\text{time in seconds}}{\text{number of complete oscillations made in that time}}$

3) Frequency =  $\frac{\text{number of complete oscillations}}{\text{time in seconds}}$

4) Frequency (f) =  $\frac{1}{\text{periodic time (t)}}$

5) Frequency  $\times$  periodic time = 1

6) Wave velocity (v) =  $\frac{\text{distance covered by the wave in metres (m)}}{\text{time in seconds (s)}}$

7) Wave length =  $\frac{\text{total distance covered by waves}}{\text{number of waves}}$

8) Wave velocity (v) = Frequency (f)  $\times$  wave length ( $\lambda$ )

### Important units:

1) Amplitude  $\rightarrow$  metre (m), centimeter (cm)

2) Periodic time  $\rightarrow$  second (sec.)

3) Frequency  $\rightarrow$  Hertz (Hz)

4) Kilo Hertz =  $10^3$  Hz

Mega Hertz =  $10^6$  Hz

Giga Hertz =  $10^9$  Hz

5) Wave length  $\rightarrow$  metre (m)

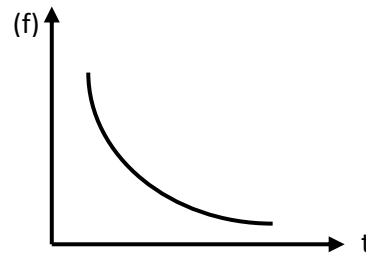
Millimeter =  $10^{-3}$  metre

6) Wave velocity  $\rightarrow \frac{\text{metre}}{\text{second}}$  m/sec

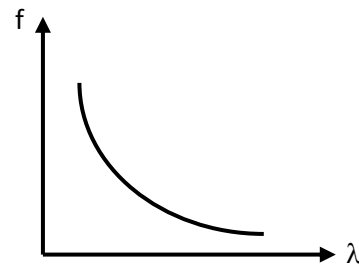


**Important graphs:**

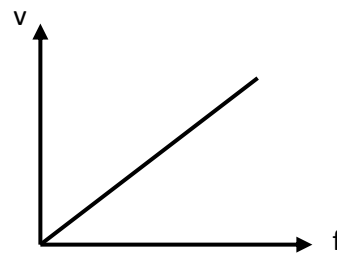
- 1) Relation between frequency and periodic time  
(inverse)



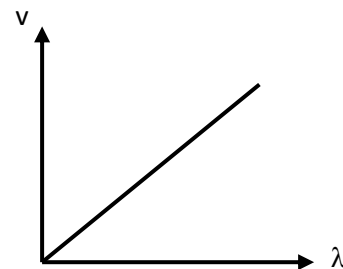
- 2) Relation between frequency and wave length  
(inverse)



- 3) Relation between velocity (v) and frequency (f)  
(direct)



- 4) Relation between velocity (v) and wave length (λ)  
(Direct)





## Unit (2)

### Lesson 1, 2

#### (1) Write the scientific term:

- 1) It is the distance which is covered by the sound waves in one second.
- 2) It is a property by which the ear can distinguish between rough and sharp voices.
- 3) It is the property by which the ear can distinguish between sounds either strong or weak.
- 4) The intensity of sound at a point varies inversely with the square of the distance between that point and the sound source.

$$I \propto \frac{1}{d^2}$$

- 5) It's the property by which the human ear can distinguish between different sounds according to the nature of source even if they are equal in intensity and pitch.
- 6) They are sound waves of frequencies ranging from 20 Hz to 20 KHz
- 7) They are sound waves of frequency less than 20 Hz.
- 8) They are sound waves of frequencies higher than (20 KHz)
- 9) They are tone that accompany the basic tone, but they are lower in intensity and higher in pitch and differ from one instrument to another.
- 10) It is the return of sound waves in the same direction due to hitting a reflecting surface.
- 11) The angle of incidence = the angle of reflection



- 12) The incident sound ray, the reflected sound ray and the perpendicular line from the point of incidence on the reflecting surface all lie on the same plane, perpendicular to the reflecting surface.
- 13) It is the direction of the line of propagation of sound wave.
- 14) It is the angle between the incident ray and the perpendicular to the reflecting surface at the point of incidence.
- 15) It is the angle between the reflected sound ray and the perpendicular to the reflecting surface at the point of incidence.
- 16) It is a repetition of sound produced due to its reflection.
- 17) It is the collection of sound at a point due to its reflection on a concave surface.

### **(2) Give reason for:**

- 1- We hear sound from all directions that surround the sound source.
- 2- Sound intensity increases when the sound source touches a resonance box.
- 3- Sound intensity in case of the presence of carbon dioxide gas as a medium is higher than that increase of air.
- 4- The human ear distinguishes between sounds from different sources even if they are equal in intensity and pitch.
- 5- The human ear can hear sounds of frequencies ranging from 20 to 20000 Hz.
- 6- Some sound waves can't be heard.
- 7- Dogs can hear all sounds produced by man.
- 8- Man can't hear sounds produced by dolphins.
- 9- When a sound ray is incident perpendicular to a reflecting surface, it reflects on itself.



- 10- Echo cannot be heard if the distance between the sound source and reflecting surface is less than 17 metres.
- 11- The voice of Imam can be heard clearly in all parts of large mosques without using microphones.
- 12- Fennec fox has large ability of hearing.
- 13- The ultra sonic waves can be used in detecting the industrial defects.
- 14- Bats can fly in the dark without colliding with any object.
- 15- A piece of moquette is put under the washing machine.
- 16- The time period between hearing the original sound and its echo should not be less than  $\frac{1}{10}$  of second.
- 17- When you use Savart's wheel, you change the speed of wheel rotation.
- 18- The infrasonic waves are used for weather forecast.
- 19- Ultrasonic waves are used to sterilize food and water.
- 20- The ultrasonic waves have medical uses.

**(3) Complete the following:**

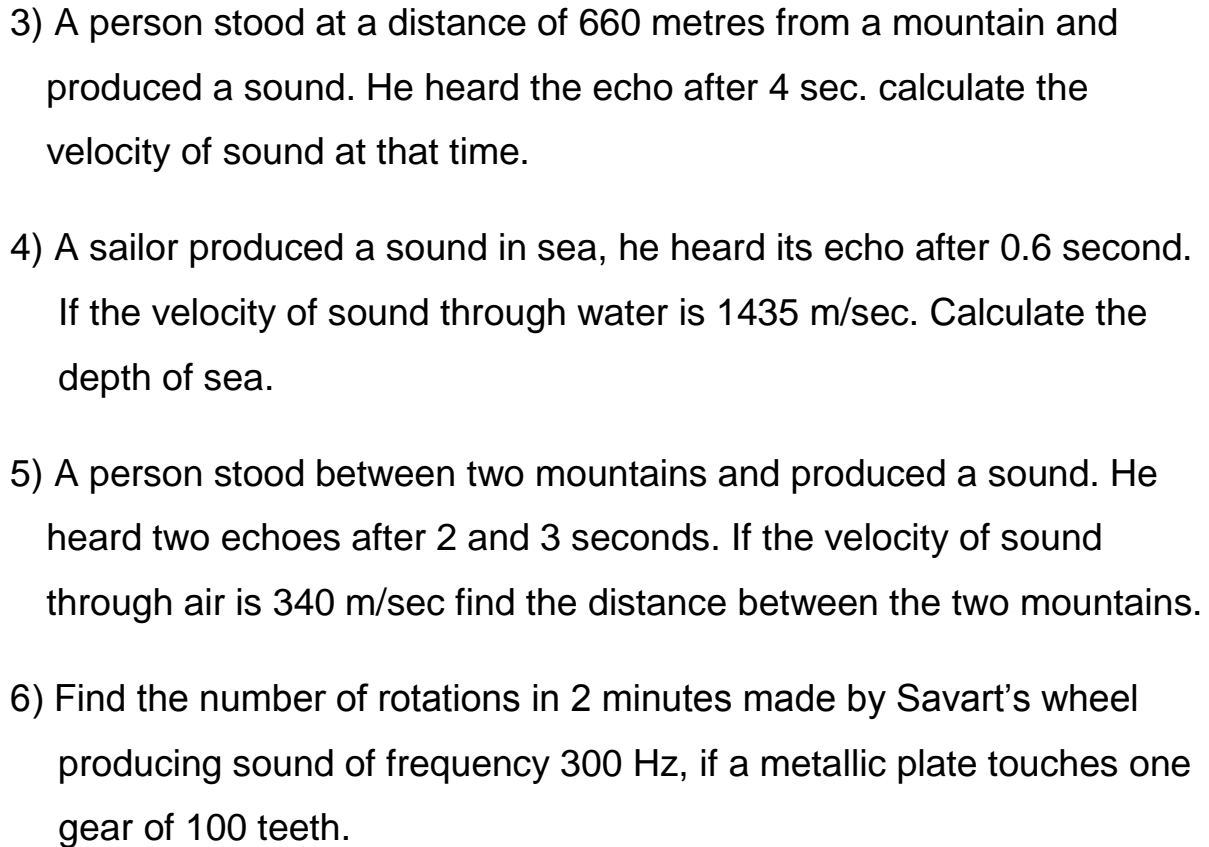
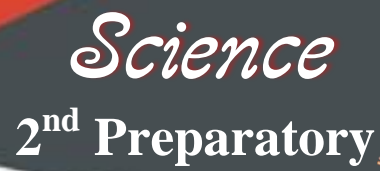
- 1- The velocity of sound through air depends on ..... , ..... ,  
.....
- 2- Sounds can be classified into two groups which ....., .....
- 3- The voice of women is .....pitched as it is .....
- 4- The voice of men is ..... pitched as it is .....
- 5- As the sharpness of voice ....., the level of voice (pitch) gets  
.....
- 6- The sharp tones have .....frequency, while the harsh tones  
have ..... frequency.
- 7- The frequency ..... by .....the length of air column.



- 8- By increasing the ..... the frequency increase and the sound becomes .....
- 9- The measuring unit of sound intensity is .....
- 10- Noise intensity is measured in unit known as .....
- 11- By increasing the amplitude 3 times the intensity of sound increases .....
- 12- The string are fixed above an empty wooden box in guitar to .....
- 13- Sound intensity is ..... proportional to the density of medium.
- 14- Types of sound waves ..... and .....
- 15- Some animals such as ....., .....and ..... can hear ultra sonic waves.
- 16- The angle of ..... = the angle of reflection.
- 17- The human ear cannot distinguish between two successive sounds if the period between them is less than .....
- 18- From the applications of echo ....., ....., ..... , .....
- 19- Sonar set is used to produce ..... waves, while hydrophone set is used to ..... the ..... waves.

#### **(4) Problem:**

- 1) Calculate the wave length of a sound wave propagating through sea water with velocity 1500 m/sec knowing that its frequency is 10 kilo hertz.
- 2) Calculate the number of gear's teeth, if the wheel rotates with speed 180 cycles / minute and the frequency in Savart's wheel is 120 Hz.





### Important laws:

$$1) \text{ Sound frequency (f)} = \frac{\text{number of cycles (d)}}{\text{time in seconds (t)}} \times \text{number of gear's teeth (n)}$$

Savart's wheel is used to determine the frequency of an unknown tone.

$$2) \text{ Speed of rotation} = \frac{\text{number of rotation (turns)}}{\text{time (t)}}$$

### 3) Inverse square law of sound

$$l \propto \frac{1}{d^2}$$

$I$  : intensity of sound

D: distance between that point and the sound source

4) The velocity of sound ( $v$ ) =

$$\frac{\text{twice the distance between the source of sound and the reflecting surface}}{\text{the average time of echo in seconds}}$$

$$\therefore V = \frac{2d}{t}$$

### 5) The depth of sea

$$\text{Depth} = \frac{\text{velocity of ultra sonic waves} \times \text{echo time}}{2}$$

$$D = v \times \frac{t}{2}$$



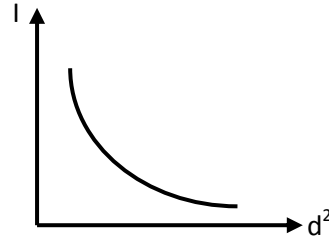
### Important graphs:

- 1) The relation between intensity of sound and square distance.

Inverse square law of sound

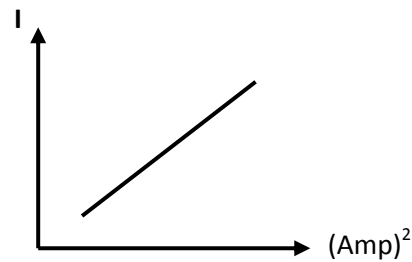
(Inverse relation)

$$I \propto \frac{1}{d^2}$$



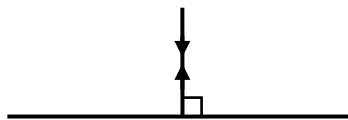
- 2) The relation between amplitude and intensity of sound.

(Direct relation)



- 3) Sound intensity is **directly proportional** to the density of medium which travels sounds.

- 4) When sound ray is incident perpendicular to a reflecting surface, it reflects on itself because the angle of incidence = angle of reflection = zero





## Unit (2)

### Lesson (3, 4)

#### (1) Write the scientific term:

- 1) It is the distance covered by the light in one second
- 2) It is the one of the components of electromagnetic spectrum of wave length ranges between 380 – 700 nanometres.
- 3) It is the splitting of white light into seven colours called spectrum colours.
- 4) It is the quantity of light falling perpendicular to a unit area of surface in one second.
- 5) The light intensity of surface is inversely proportional to the square of the distance between the surface and the source of light.
- 6) It is the returning back of light waves in the same medium on meeting reflecting surface.
- 7) It is the reflection of rays when they meet (fall on) a smooth (uniform) and glistening reflecting surface, where the incident light rays are reflected in one direction.
- 8) It is the reflection of light ray when they fall on a rough (non-uniform) reflecting surface, where the incident light rays are reflected in different directions.
- 9) It is a narrow beam which is represented by a straight line, it intersects with the reflecting surface at the point of incidence.
- 10) It is a narrow beam which is represented by a straight line that is reflected from the reflecting surface at point of incidence.



- 11) It is the angle between the incident light ray and the line perpendicular to the reflecting surface at the point of incidence.
- 12) It is the angle between the reflected light ray and the line perpendicular to the reflecting surface at the point of incidence.
- 13) It is the change in light path when it travels from a transparent medium to another transparent medium of different optical density.
- 14) It is the ability of the transparent medium to refract the light.
- 15) It is the angle between the refracted light ray and the normal at the point of incidence on the interface.
- 16) It is the angle between the emergent light ray and the normal at the point of emergence on the interface.
- 17) It is the ratio between the velocity of light through air to the velocity of light through another transparent medium.
- 18) It is the angle of incidence of a light ray which travels from high optical dense medium to the lower one which results in it being refracted at  $90^\circ$  to the normal.
- 19) It is the return of light ray when it is incident in a medium of larger optical dense by an angle larger than the critical angle of this medium.
- 20) It is a natural phenomenon that takes place on the desert roads at noon especially in the summer times where objects on the road sides seem as if they had inverted images on wet area.

**(2) Compare between:**

- 1) Transparent, translucent and opaque medium.
- 2) Regular and Irregular reflection.



**(3) Give reasons for:**

- 1) Although water is a transparent medium we cannot see fish at the bottom of the river Nile.
- 2) Book is an opaque medium.
- 3) The intensity of light increases four times when the distance between the light source and you decreases to its half value.
- 4) The incident light ray which falls perpendicular on a reflecting surface, reflects on itself.
- 5) The absolute refractive index of any transparent medium is always greater than one.
- 6) A pencil which is partially immersed in water appears as being broken.
- 7) The submerged object in water is seen in an apparent position slightly above its real position.
- 8) To pick up a coin which has fallen in a deep beam we must look at it vertically.
- 9) Light can travel through free space.
- 10) Formation of spectrum colors.
- 11) The energy of red light photon is less than that of orange light photon.
- 12) The energy of violet photon has the maximum energy in spectrum colours.
- 13) The optical density of a medium differs from a medium to another.
- 14) When light ray travels from air to water it refracts near the normal.
- 15) Sometimes, when light ray is incident in transparent medium, it refracts tangent to the separating surface.
- 16) Occurrence of total internal reflection in a transparent.
- 17) Occurrence of mirage phenomenon in desert regions at noon.

**(4) Mention used for:**

- 1) Periscope                      2) Optical fibers                      3) Light

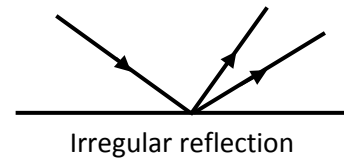
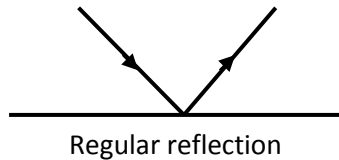


### Important laws:

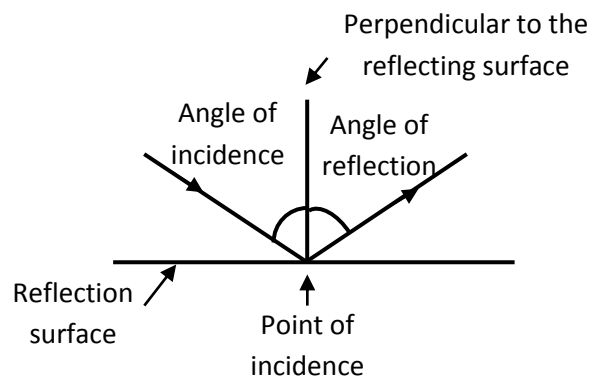
- 1) Energy of photon = planck's constant  $\times$  frequency of photon
- 2) Absolute refractive index of medium =  $\frac{\text{velocity of light through air}}{\text{velocity of light through medium}}$

### Important drawing:

(1)



(2) Reflection



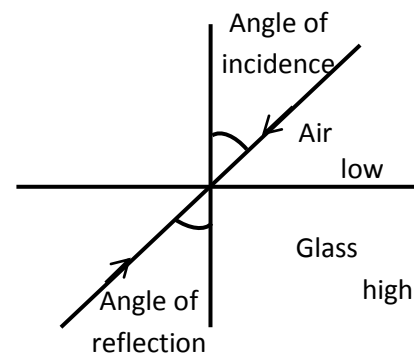
(3) Light ray travels from:

Medium (1) < medium (2)

Lower than

In optical density it refracts

- near the normal
- angle of incidence is > angle of refraction  
a greater than





(4) Light travels from:

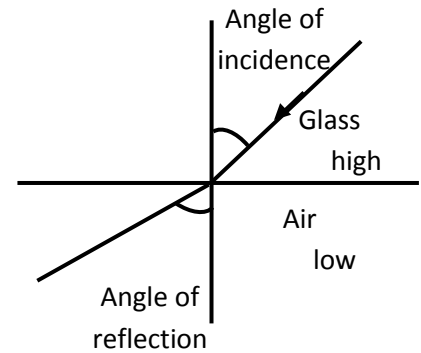
Medium (1) > medium (2) in

greater than

- optical density, it refracts far from the normal.

→ angle of incidence is < angle of refraction

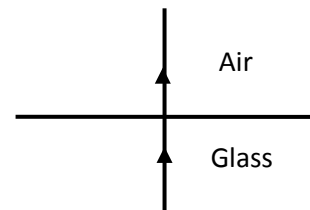
less than



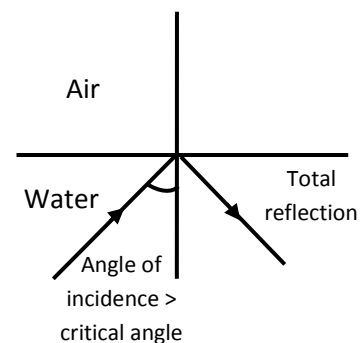
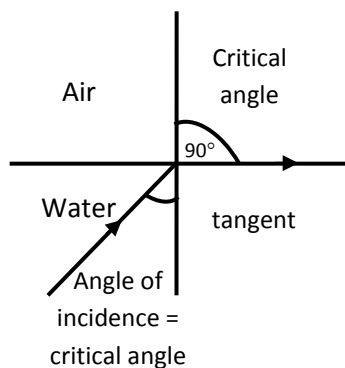
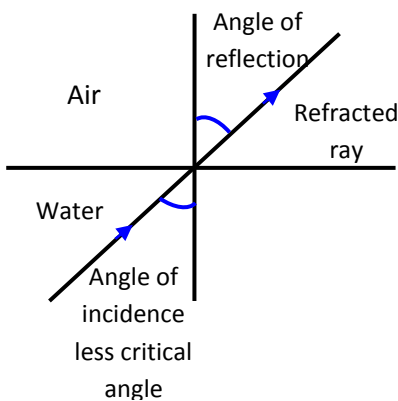
**Note:** glass > water > Air in optical density

(5) light ray falls perpendicular it pass the

other medium without refraction



(6) Critical angle and total internal reflection Air



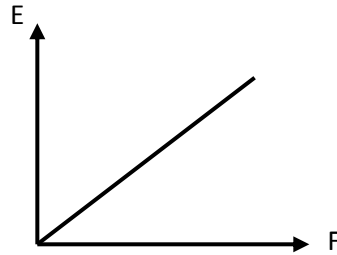


### Important graphs:

(1)

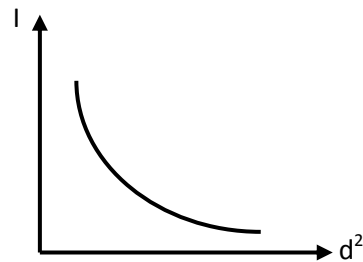
- relation between energy frequency of light wave

Directly



(2)

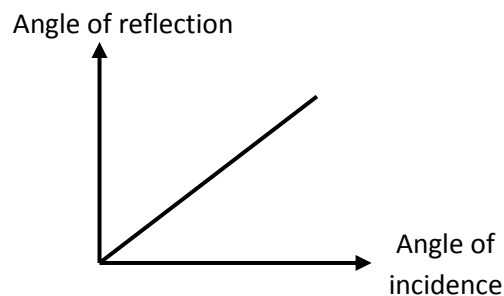
- inverse square  
law of light



(3)

- Relation between angle of reflection &  
angle of incidence

(Direct)





## Unit (3)

### **(1) Write the scientific term for each of the following:**

- 1- Short stem where the leaves developed and modified into reproductive organs. (.....)
- 2- An organ in a flower that consists of an ovary, a style and stigma. (.....)
- 3- The flower that contains both pistils and stamens. (.....)
- 4- Small particles that spread in the air to fertilize the ovules in plants. (.....)
- 5- A plant which is pollinated by man. (.....)
- 6- A plant structure that changes into a seed after fertilization process. (.....)
- 7- New techniques the kind of seeds to obtain desirable traits. (.....)
- 8- A group of green leaves in flowers, each of them is called a sepals. (.....)
- 9- The male reproductive organ in a flower. (.....)
- 10- Fluid secreted by sexual glands. (.....)
- 11- Funnel shaped tube lined with cilia. (.....)
- 12- Female organ that pear shaped with thick elastic muscular walls. (.....)
- 13- The time between infection of microbes and appearance of symptoms. (.....)
- 14- The cell formed due to combination of sperm and ovum. (.....)
- 15- Male hormone secreted by testis. (.....)



### **(2) Complete:**

- 1- The flower arises from a floral ....., which emerges from the axial of a leaf called .....
- 2- The corolla attracts ..... to the flower which helps in ..... process.
- 3- Each stamen consists a fine ..... ending in a sac known as the .....
- 4- Types of pollination are ..... pollination and ..... pollination.
- 5- After fertilization, the ovary grows forming the ..... while the ovule converts into the .....
- 6- Hermaphrodite flowers take the symbol ....., while male flower take the symbol .....
- 7- The cut is a part of ....., stem or .....
- 8- The human male reproductive system consists of ....., two vas deferens ..... and penis.
- 9- Each testis is connected to a group of fine convoluted tubes known as ..... which extends in the form of single tube known as .....
- 10- The ..... hormone in males and ..... hormone in female are responsible for the appearance of secondary sex characters.
- 11- The menstrual cycle starts at age in female ..... and stops at the age of .....
- 12- The two fallopian tubes are open in the ..... corners of the .....
- 13- The sperm consists of ....., middle part and .....
- 14- The middle part of the sperm contains ..... responsible for energy production needed for the sperm.
- 15- ..... and ..... are examples of genital diseases which don't arise from sexual contact.



**(3) Choose the correct answer:**

- 1- The flower a modified .....  
 a) stem                      b) leaf                      c) root                      d) branch
- 2- The floral leaves of typical flower are arranged in whorls .....  
 a) two                      b) three                      c) four                      d) five
- 3- ..... products pollen grains.  
 a) carpel                      b) style                      c) stamen                      d) petal
- 4- In the flower, the organ which produces ovules is the .....  
 a) anther                      b) receptacles                      c) ovary                      d) calyx
- 5- All of the following are unisexual flowers except .....  
 a) tulip                      b) palm                      c) maize                      d) pumpkins
- 6- Sexual reproduction in plants take place in .....  
 a) seeds                      b) corolla                      c) calyx                      d) vegetative parts
- 7- Mixed pollination in plant trees is carried out by .....  
 a) insects                      b) seeds                      c) air                      d) water
- 8- After fertilization, the ovary develops forming the .....  
 a) seed                      b) flower                      c) fruit                      d) leaf
- 9- Grafting by attachment can be carried to the ..... trees.  
 a) grape                      b) sugarcane                      c) rose                      d) mango
- 10- Tissue culture is process of multiplying small parts of plant to get many ..... parts.  
 a) different                      b) similar                      c) identical                      d) small
- 11- All of the following are parts of male reproductive system except  
 a) vas defense                      b) uterus                      c) testes                      d) penis
- 12- The right ovary in the female human produces a mature (ripe) ovum every ..... days.  
 a) 24                      b) 28                      c) 34                      d) 56
- 13- ..... hormone is responsible for the occurrence and continuity of pregnancy.  
 a) Estrogen                      b) Testosteron                      c) Progesterone                      d) Thyroxin



- 14- The ..... is a muscular tube that expands during the labour.  
 a) uterus                      b) vagina                      c) ovary                      d) fallopian tube
- 15- Chromosomes carry ..... which are responsible for the hereditary traits of the species.  
 a) ribosomes      b) centrioles      c) genes                      d) centrosome
- 16- The head of sperm secretes ..... to dissolve the cellular membrane of ovum.  
 a) hormones      b) semen                      c) fluids                      d) enzymes
- 17- Fertilization occurs when ..... is formed.  
 a) embryo                      b) zygote                      c) ovum                      d) endometrium
- 18- The first stage of human embryo development takes ..... weeks.  
 a) 5                      b) 6                      c) 7                      d) 8

#### **(4) Give reason for:**

- 1- The petals of corolla are colorful and scented.
- 2- The gynoecium is the female reproductive organ of the flower.
- 3- Palm flowers are unisexual.
- 4- Auto pollination can't happen in sunflowers.
- 5- The stigma of air pollinated flowers are feathery like and sticky.
- 6- Flowers pollinated by insects produce coarse pollen grains.
- 7- Tissue culture is a good method for plant reproduction.
- 8- Man can't reproduce a sexually.
- 9- The presence of testes outside the body in a sac-like structure called the scrotal sac.
- 10- The seminal fluid is alkaline.
- 11- The uterus is suitable organ for growth the embryo.
- 12- The mother can feel the movement of her fetus starting from the third stage of fetus development.



# Model Answers

## Unit (1)

### (1) Write the scientific term:

- |  |                         |
|--|-------------------------|
| 1- Periodic motion                               | 2- Oscillatory motion   |
| 3- Amplitude                                     | 4- Complete oscillation |
| 5- Periodic time                                 | 6- Frequency            |
| 7- Wave  | 8- Wave motion          |
| 9- Line of wave propagation                      | 10- Transverse wave     |
| 11- Crest  | 12- Trough              |
| 13- Longitudinal wave                            | 14- Compression         |
| 15- Rarefaction                                  |                         |
| 16- Wave length ( $\lambda$ ) of transverse wave |                         |
| 17- Wavelength of longitudinal wave              |                         |
| 18- Amplitude of wave                            |                         |
| 19- Wave velocity                                |                         |
| 20- Wave frequency                               |                         |
| 21- Simple harmonic motion                       |                         |

### (2) Give reason for:

- 1- Because the frequency is inversely proportional to the periodic time  
where:  $\text{Frequency} = \frac{1}{\text{periodic time}}$
- 2- Because the motion of oscillating body is repeated through equal intervals of time.
- 3- Because the water particles vibrate in a direction perpendicular to the direction of wave propagation.



- 4- Because the medium (air) particles vibrate along the direction of waves propagation.
- 5- Because sound wave need a medium to propagate and they don't propagate through vacuum while radio waves don't need medium to propagate.
- 6- Because the light of lightning is from electromagnetic waves, while the sound of thunder is mechanical waves, where the speed of electromagnetic waves is much greater than the speed of mechanical waves.
- 7- Because the sound is mechanical waves which need a medium to propagate through while the light is electromagnetic waves which can propagate through vacuum.

**(3) Compare between:**

- ## 1) Mechanical waves and electromagnetic waves.

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



### 2) Transverse and Longitudinal waves

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

### 3) Oscillatory and wave motion

Points of comparison	Oscillatory	Wave
1- Definition	- it is the motion that is produced by oscillating body at the two sides of its original position.	- It is the motion produced as a result of the vibration of the medium particles at a certain moment and in a definite direction.
2- Velocity	- is maximum when the oscillating body passes its rest position. - is minimum when it goes far from its rest position.	- the wave has a definite velocity along the direction of propagation.
3- Examples	- Pendulum motion - motion of spiral spring	- sound waves as mechanical longitudinal wave. - light waves as electro-magnetic transverse waves.



#### (4) Problems:

- 1-
  - a) Amplitude (x) = 2 cm
  - b) periodic time (t) = 2 seconds → time of oscillation
  - c) frequency (f) =  $\frac{1}{t} = \frac{1}{2} = 0.5 \text{ Hz}$

2-  $T = 2 \times 60 = 120$  seconds

$$\text{Periodic time} = \frac{\text{time (t) seconds}}{\text{No. of complete oscillations}}$$
$$= \frac{120}{500} = 0.24 \text{ seconds}$$

$$\text{Frequency} = \frac{1}{t} = \frac{1}{0.24} = 4\text{Hz}$$

3- Frequency =  $5 \times 10^8 \times 10^9 = 5 \times 10^{17}$  Hz

$$\text{Wave length } (\lambda) = \frac{\text{wave velocity } (v)}{\text{frequency } (f)} = \frac{3 \times 10^8}{5 \times 10^{17}} = 0.6 \times 10^{-9} \text{ metre}$$

- 4- 3 waves are formed between the first and fourth rarefactions

$$\therefore 4 - 1 = 3$$

$$\therefore \text{Wave length } (\lambda) = \frac{24}{3} = 8 \text{ cm} = 0.08 \text{ m}$$

Frequency (f) =  $20 \times 10^3$  Hz.

$$\therefore \text{Wave velocity (v)} = \text{wave length } (\lambda) \times \text{wave frequency}$$
$$= 0.08 \times 20 \times 10^3 = 1600 \text{ m/sec}$$



**(5) What's meant by:**

- 1- The periodic time of spring is  $\frac{60}{60} = 1$  sec.
- 2- Number of complete oscillation made by pendulum in one sec is 50 complete oscillations.
- 3- Distance between centers two successive comprssions or centers of 2 successive rarefactions is 30 cm.
- 4- Law of wave propagation.

$$V = F \times \lambda$$

$v$  : velocity of wave

F: frequency of wave

$\lambda$ : wave length of wave

- 5- Maximum displacement achieved by medium particles away from their rest positions is 5 cm.
- 6- Distance between two successive crests or two successive troughs in such wave is 10 cm.

**(6) Calculate the wavelength in metre for a visible light wave of frequency  $5 \times 10^8$  Megahertz, and velocity of  $3 \times 10^8$  m/s**

Frequency =  $5 \times 10^8 \times 10^6 = 5 \times 10^{14}$  Hz

$$\begin{aligned}\text{Wavelength } (\lambda) &= \frac{\text{wave velocity (V)}}{\text{Frequency (F)}} = \frac{3 \times 10^8}{5 \times 10^8} \\ &= 0.6 \times 10^{-6} = 6000 \times 10^{-10} \text{ metre.}\end{aligned}$$



### **(7) Problems:**

- 1) A longitudinal wave is produced by a spiral spring such that the distance between the first and the fourth rarefactions is 18 cm.

Find the wave velocity if the frequency of such wave is 20 Hertz.

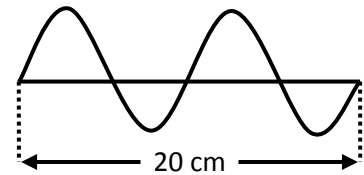
#### **Solution:**

3 waves are formed between the first and fourth rarefactions.

$$\therefore \text{Wavelength } (\lambda) = \frac{18}{3} = 6 \text{ cm} = 0.06 \text{ m}$$

$$\begin{aligned} \therefore \text{Wave velocity } (V) &= \text{Wavelength } (\lambda) \times \text{Wave frequency } (F) \\ &= 0.06 \times 20 = 1.2 \text{ m/sec.} \end{aligned}$$

- 2) From the opposite figure, calculate the velocity of the wave if its frequency is 25 Hertz.



#### **Solution:**

The figure shows two waves of length 20 cm.

$$\therefore \text{The wavelength } (\lambda) = \frac{20}{2} = 10 \text{ cm} = 0.1 \text{ m}$$

$$\begin{aligned} \therefore \text{Wave velocity } (V) &= \text{Wavelength } (\lambda) \times \text{Wave frequency } (F) \\ &= 0.1 \times 25 = 2.5 \text{ m/sec} \end{aligned}$$



## Unit (2)

### Lesson 1, 2

#### (1) Write the scientific term:

- |                                   |                                     |
|-----------------------------------|-------------------------------------|
| 1) Sound velocity                 | 2) Sound pitch                      |
| 3) Sound intensity                | 4) Inverse square law of sound      |
| 5) Sound quality (type)           | 6) Sonic waves                      |
| 7) Infra sonic waves              | 8) Ultrasonic waves                 |
| 9) Harmonic tones                 | 10) Sound reflection                |
| 11) First law of sound reflection | 12) Second law of sound reflection  |
| 13) Sound ray                     | 14) Angle of incidence of sound ray |
| 15) Angle of reflection           | 16) Echo                            |
| 17) Concentration of sound        |                                     |

#### (2) Give reason for:

- 1- Because the sound travels through air as pulses of compressions and rarefactions whose centre is the sound source.
- 2- Due to the increase of the surface area of vibrating body.
- 3- Because the density of carbon dioxide gas is more than that of air since the intensity of sound is directly proportional to density of medium.
- 4- Due to the harmonic tones that associate the fundamental tone of the source of sound and are lower in intensity and higher in pitch.
- 5- Because the ear transmits the effect of these waves to the brain which translates them into sound and audible tones.



- 6- Because the frequencies of these waves are lower than 20 Hz or more than 20000 Hz, so the human ear cannot hear them as the effects of such waves cannot be translated by the brain into audible tones.
- 7- Because man produces sounds of frequencies less than 20 kilo Hertz and dogs can hear sounds up to 50 kilo Hertz.
- 8- Because dolphins produce sounds up to 120 kilo hertz, while man can hear sounds of frequencies up to 20 kilo hertz only.
- 9- Because the angle of incidence = the angle of reflection = zero.
- 10- Because the time between hearing the main sound and its echo will be less than  $\frac{1}{10}$  of a second and the human ear cannot distinguish between the two successive sounds.
- 11- Because the surface of large mosques are concave which concentrate the reflected sound waves and make the sound more clear and more intense.
- 12- Because it has large and concave ear pinna that concentrate the reflected sound and make it more clear and more intense.
- 13- Because the waves reflected from the areas which contain air bubble have a different intensity than those reflected from well welded areas.
- 14- Because they produce ultra sonic waves that reflect on the surface and barriers then receive them back and locate their positions, thus the avoid colliding with them.
- 15- To absorb the noise produced due to vibration instead of its reflection from the glistening surfaces of walls.
- 16- Because the human ear cannot distinguish between two successive sounds if the period between them is less than 0.1 sec.
- 17- To change the frequency of the produced sound.



- 18- Because these waves accompany the blowing of storms that preceding rainfall.
- 19- Because they have high ability to kill some types of bacteria and stop the action of some viruses.
- 20- Because they are used for breaking down of kidney and ureter's stones and also for diagnosis of male prostate tumors.

**(3) Complete the following:**

- 1- temperature of air, air pressure , the humidity in air.
- 2- musical tones, noise.
- 3- high - sharp.
- 4- low - rough.
- 5- increase - higher.
- 6- high - low
- 7- increases - decreasing
- 8- speed of rotation - high pitched (sharp).
- 9- watt /m<sup>2</sup>
- 10- decibel.
- 11- 9 times.
- 12- increase the sound intensity.
- 13- directly
- 14- audible - non audible.
- 15- bats, dogs - dolphins
- 16- incidence
- 17- 0.1 sec.
- 18- determination of the velocity of sound through air, detecting industrial defects, medical diagnosis, concentration of sound.
- 19- ultrasonic - receive - reflected



### (4) Problem:

1) Velocity (v) = frequency (f) × wave length (λ)

Frequency = 10 kilo hertz =  $10 \times 10^3$  Hz

∴ wave length =  $\frac{v}{f} = \frac{1500}{10^4} = 0.15 \text{ m} = 15 \text{ cm}$

2) F = 120 Hz

Speed of rotation = 180 cycles\minute

Time = 1 minute =  $1 \times 60$

∴ Frequency (f) =  $\frac{\text{number of cycles (d)}}{\text{time in seconds}} \times \text{number of gear's teeth (n)}$

$120 = \frac{180}{1 \times 60} \times \text{no of gear's teeth (n)}$

∴ Number of gear's teeth =  $\frac{60 \times 120}{180} = 40 \text{ teeth}$

3)  $v = \frac{2d}{t} = \frac{2 \times 660}{4} = 330 \text{ m/sec}$

4)  $d = \frac{tv}{2} = \frac{0.6 \times 1435}{2} = 430.5 \text{ m}$

5) The distance between the person and the first mountain =  $\frac{v t_1}{2}$

$= \frac{340 \times 2}{2} = 340 \text{ m}$

- the distance between the person and the second mountain =  $\frac{v t_2}{2}$

$= \frac{340 \times 3}{2} = 510 \text{ m}$

- the distance between two mountains =  $510 + 340 = 850 \text{ metres}$

6) Frequency =  $\frac{\text{No.of rotations} \times \text{no.of gear's teeth}}{\text{time (in seconds)}}$

$300 = \frac{\text{No.of rotations} \times 100}{2 \times 60}$

No of rotations =  $\frac{300 \times 2 \times 60}{100} = 360 \text{ rotations}$



## Unit (2) Lesson (3, 4)

### (1) Write the scientific terms:

- |   |                               |
|---|-------------------------------|
| 1) The speed of light                   | 2) The visible light          |
| 3) Analysis of white light              | 4) Light intensity            |
| 5) The inverse square law of light      | 6) Light reflection           |
| 7) Regular (uniform) reflection         |                               |
| 8) Irregular (non-uniform) reflection   | 9) The incident light ray     |
| 10) The reflected light ray             | 11) Angle of incidence        |
| 12) Angle of reflection                 | 13) Light refraction          |
| 14) Optical density of medium           | 15) The angle of refraction   |
| 16) The angle of emergence              |                               |
| 17) Absolute refractive index of medium |                               |
| 18) Critical angle                      | 19) Total internal reflection |
| 20) Mirage                              |                               |

### (2) Compare between:

- 1) Transparent, translucent and opaque medium.

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



## 2) Regular and Irregular reflection

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

### (3) Give reasons for:

- 1) Because the thickness of water at that point (bottom) is larger enough to prevent light to pass through.
- 2) Because it doesn't permit light to pass through and objects can't be seen behind it.
- 3) Because is light intensity is inversely proportional to the square of the distance between them.
- 4) Because the angle of incidence and the angle of reflection equal zero.
- 5) Because the velocity of light through air is always greater than that through any other transparent medium.
- 6) Due to the refraction of light rays coming from the immersed part in water.
- 7) Due to the refraction of light rays coming from the object away from the normal where, the eye sees the extensions of these refracted rays.
- 8) Because the incident light ray perpendicular to the interface between air and water, it passes without refraction so the apparent position is the real position.
- 9) Because it is electromagnetic waves which do not need medium to travel through.
- 10) Due to splitting of white light into seven spectrum colours.



- 11) Because the frequency red light is less than that of orange light and the energy is directly proportional to the frequency.
- 12) Because it has the maximum frequency in spectrum colors.
- 13) Because velocity of light changes from one transparent medium to another.
- 14) Because air is a transparent medium of lower optical density than water.
- 15) Because the angle of incidence equals critical angle of the transparent medium.
- 16) Because the angle of incidence is more than the critical angle of the medium.
- 17) Due to occurrence of a several refractions then total internal reflections in the different air layers in density and temperature.

#### **(4) Mention used for:**

##### **1) Periscope:**

- a- Used in submarines to see what is going on the water surface.
- b- To see events happening behind a wall
- c- to monitor the dangerous chemical reactions in laboratory.

##### **2) Optical fibers:**

Used in medicine as they are used in manufacture of medical endoscopes used by doctors to diagnose some diseases and visualize injury inside the body.

##### **3) Light:**

Is used in home decorations like spot light to illuminate artifacts and stand lamps that concentrate light for reading.



## Unit (3)

### (1) Write the scientific term for each of the following:

- |                       |                    |                    |
|-----------------------|--------------------|--------------------|
| 1- flower             | 2- gynoecium       | 3- Bisexual flower |
| 4- pollen grains      | 5- palm trees      | 6- ovule           |
| 7- Tissue culture     | 8- calyx           | 9- Androecium      |
| 10- seminal fluid     | 11- fallopian tube | 12- uterus         |
| 13- Incubation period | 14- zygote         | 15- Testosterone   |

### (2) Complete:

- |                              |   |
|------------------------------|---|
| 1- bud – bract               | 2- insects - pollination                |
| 3- filament – anther         | 4- self pollination – mixed pollination |
| 5- fruit – seed              | 6- ♀ - ♂                                |
| 7- Root – leaf               | 8- two testes – genital glands          |
| 9- Epididymis – vas deferens | 10- Testosterone – Estrogen             |
| 11- 11.14 – 45.55            | 12- upper – uterus                      |
| 13- the head – the tail      | 14- mitochondria                        |
| 15- Gonorrhea - syphilis     |   |

### (3) Choose the correct answer:

- |                  |            |           |
|------------------|------------|-----------|
| 1- leaf          | 2- four    | 3- stamen |
| 4- ovary         | 5- tulip   | 6- seeds  |
| 7- insects       | 8- fruits  | 9- mango  |
| 10- identical    | 11- uterus | 12- 28    |
| 13- progesterone | 14- vagina | 15- genes |
| 16- enzymes      | 17- zygote | 18- 6     |

