



Arab Republic of Egypt  
Ministry of Education  
and Technical Education  
Central Administration  
of Book affairs

# Science

*Think and learn*

2<sup>nd</sup> prep.  
second term

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Scientific article                      Educational material  
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إشراف تربوي ومراجعة وتعديل  
مدير مركز تطوير المناهج والمواد التعليمية  
غير مصرح بتداول هذا الكتاب خارج وزارة التربية والتعليم والتعليم الفني



## المقدمة

عزيزى التلميذ / التلميذة : .....

يسعدنا أن نقدم هذا الكتاب لأبنائنا تلاميذ الصف الثانى الإعدادى، ونؤكد على أن تعلم العلوم عملية نشطة وممتعة ومثيرة للتفكير فى تنفيذ الأنشطة العملية، وتصميم النماذج والأشكال والجدول، وكتابة التقارير والبحوث البسيطة، والتقصى والتحقق من البيانات والمعلومات، وطرح الأسئلة والتأمل والتواصل، والقيام ببناء التفسيرات عن المفاهيم والظواهر الطبيعية، وتطبيق المعرفة فى المواقف الحياتية، وحل المشكلات من خلال التخطيط والتجريب والتعلم التعاونى، وهذه الإجراءات والمهارات هى التى يتناولها تعلم العلوم القائم على الاستقصاء والتعلم النشط، واستخدام مهارة التفكير العلمى والابتكارى أو الإبداعى والنقد والتأمل.

وقد تم اختيار عنوان لهذا الكتاب يعكس فلسفته، وهو **فكر وتعلم**، وقد تم الاسترشاد فى إعداده بأراء بعض المتخصصين فى المناهج وطرق تدريس العلوم والموجهين والمعلمين والتلاميذ، تأكيداً لفلسفة الكتاب وأسس بنائه وتطويره، وتم تحديد فلسفة الكتاب فى ضوء المعايير القومية للتعليم وللتربية العلمية.

ويهدف هذا الكتاب إلى مساعدة التلاميذ على إدراك العلاقة بين العلم والتكنولوجيا، وفهم تاريخ وطبيعة العلم، وتنمية مهارات التفكير والمهارات الحياتية، والفهم العلمى السليم للمفاهيم الأساسية، وتنمية الاتجاهات العلمية والقيم الاجتماعية لتحقيق التربية العلمية للمواطنة وللحياة والعمل، من خلال إثارة تفكير التلاميذ، والاستفادة من مراكز ومصادر التعلم داخل المدرسة وخارجها، بالإضافة إلى توظيف استراتيجيات التعلم النشط والتعلم البنائى .

ولتحقيق هذه الأهداف تم استخدام مداخل متنوعة فى شكل وحدات وموضوعات دراسية مترابطة ومتكاملة مع بعضها ومع المواد الدراسية الأخرى.

ويتناول كتاب الفصل الدراسى الثانى ثلاث وحدات، هى :

- الحركة الدورية
- الصوت والضوء
- التكاثر واستمرارية النوع

ونحن إذ نقدم هذا الكتاب نرجو الله أن يحقق الفائدة منه.

والله ولى التوفيق،،،

المؤلفان

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# Unit 1

## Periodic Motion

### Lessons of the Unit

**Lesson 1** : Oscillatory Motion.

**Lesson 2** : Wave Motion.

### Resources of knowledge and learning

#### • Books and scientific encyclopedia

- |   |                         |
|---|-------------------------|
| ① Simple Scientific Experiments (Physics)             | Saphere                 |
| ② Power and Motion – Steve Parker                     | Dar El-farouk           |
| ③ Everything about Science                            | Lebanon Lib. Publishers |
| ④ The encyclopedia of simple science (Nanotechnology) | Saphere                 |

# Learning objectives of the unit

By the end of studying this unit, the student should be able to:

- 1 Recognize the concept of the oscillatory motion.
- 2 Use the materials and tools precisely to define the concept of the oscillatory motion.
- 3 Conclude the properties of the oscillatory motion.
- 4 Conclude the relation between the periodic time and the number of complete oscillations.
- 5 Recognize the relation between the frequency of the vibrating body and the number of complete oscillations.
- 6 Appreciate the contribution of scientists in recognizing of the oscillatory motion.
- 7 Recognize the role of the wave in transferring energy.
- 8 Recognize the concept of wave motion.
- 9 Use the materials and tools precisely to conclude the concept of wave motion.
- 10 Use the materials and tools precisely to compare between transverse and longitudinal waves.
- 11 Classify waves according to their direction of propagation.
- 12 Classify waves according to the ability to propagate and energy transfer in space.
- 13 Compare between transverse and longitudinal waves.
- 14 Recognize the properties of wave motion.
- 15 Recognize the relation used to determine the wave velocity.
- 16 Conclude the relation between the frequency of the wave and its periodic time.
- 17 Conclude the law of wave propagation.
- 18 Compare between oscillatory motion and wave motion.
- 19 Protect the ears against the hazards of noise pollution.

# Lesson 1

## Oscillatory Motion

### Lesson objectives :

By the end of studying this lesson, the student should be able to:

- 1 Recognize the concept of the oscillatory motion.
- 2 Use the materials and tools precisely to determine the concept of the oscillatory motion.
- 3 Conclude the properties of the oscillatory motion.
- 4 Define the amplitude of an oscillation.
- 5 Conclude the relation between the periodic time and the number of complete oscillations.
- 6 Recognize the relation between the frequency of a body and the number of complete oscillations in a single second.
- 7 Appreciate the contribution of scientists in recognizing the oscillatory motion.

### Elements of the lesson :

- 1 The concept of oscillatory motion.
- 2 Graphical representation of the oscillatory motion.
- 3 Some concepts related to the oscillatory motion and its properties.

### Involved Issues:

The effect of science and technology on society.



▣ You have studied before the motion of bodies and you may know the two kinds of motion.

- What are they? .....
- What is meant by periodic motion? .....

**Examples of periodic motion:**

- Oscillatory motion.
- Wave motion.

**The concept of oscillatory motion:**

- Have you noticed the movement of a swing Fig. (1)? It goes forwards and backwards around its point of rest or position of equilibrium. This type of motion is known as oscillatory motion. You can participate with your classmates to perform the following activity.



**Motion of swing**  
Fig. (1)



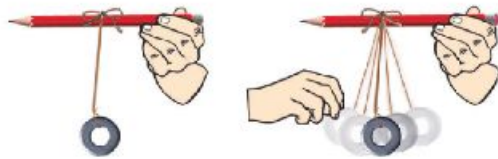
**Defining the concept of oscillatory motion.**

**Materials and tools :**

- a pencil.
- a 30 cm. long thread.
- Metallic piece with a hole

**Steps :**

- 1 Setup a simple pendulum by winding one of the thread ends at the middle of the pencil, while the other end is attached to the metallic piece (the oscillating body)
- 2 Grab the pencil with your left hand, and pull the metallic piece to the right. Then, let it go Fig. (2)



**Oscillatory Motion**  
Fig. (2)

**Observation :**

- 1 What do you observe regarding the motion of the oscillating body (The metallic piece).  
.....
- 2 What is the relation between the values of displacement of the oscillating body on either side of the equilibrium position in every oscillation?  
.....
- 3 At which position the velocity of the oscillating body becomes maximum ?  
And when it reaches the minimum value?  
.....

**Conclusion :**

- 1 The periodic motion made by the oscillating body around its point of rest, where the motion is repeated through equal intervals of time, is known as the oscillatory motion.
- 2 The velocity of the oscillating body reaches its maximum value when it passes the point of rest, and it decreases gradually as the body moves away.

**Enrichment information (I)**

- \* Examples of oscillatory motion: \_\_\_\_\_
- The movement of the Earth's crust \_\_\_\_\_ during earthquakes.
  - The movement of atoms in molecules. \_\_\_\_\_

**Wonder**

Have you asked yourself about the relation between the velocity of the pendulum and its kinetic energy?

**Communication**

Discuss with your classmates – under the supervision of your teacher – the relation between the increase in the velocity of the pendulum and its kinetic energy.

**Exercise (1)**

Put (✓) below the figure that represents an example for oscillatory motion:



**Tuning fork**  
Fig. (3)



**Stretched string**  
Fig. (4)



**Rotary top**  
Fig. (5)

**EKB**

For more Knowledge about oscillatory motion Use EKB, then discuss with your teacher and Classmates the Knowledge You Get





**Activity (2)** **Graphical representation of oscillatory motion.**

You can participate with your classmates to do the following activity.

**Materials and tools :**

- Smooth paper tape winding around two rolls.
- Weight.
- Spring.
- Nail.
- Pencil.

**Steps :**

- 1 Attach the pencil to the weight and hang the weight at one end of the spring.
- 2 Hang the other end of the spring using the nail after having it fixed to the wall, in a way that makes the pencil tip touch the paper roll exactly in the middle.
- 3 Pull the spring downwards then let it go.

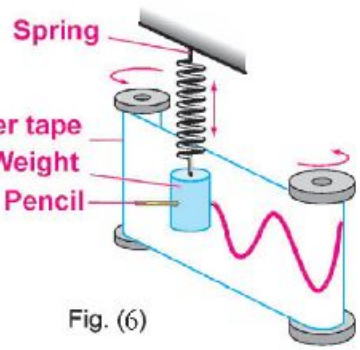


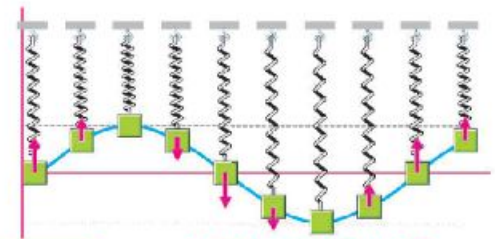
Fig. (6)

Don't forget to wind the paper roll regularly.

What is the shape formed on the paper roll?

- .....
- ▣ Oscillatory motion is represented as shown in Fig. (7).

The simple harmonic motion is considered the simplest form of oscillatory motion.



Representation of oscillatory motion (Simple Harmonic Motion)

Fig. (7)

**Concepts related to Oscillatory Motion**

Properties of oscillatory motion are expressed in terms of many concepts, like:

**1 Amplitude :**

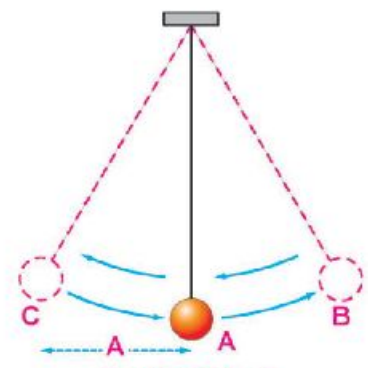
Observe the motion of the pendulum Fig. (8):

It makes maximum displacement when it reaches:

- the point (B) on the right side.
- the point (C) on the left side.

What is the relation between the values of displacements (AB) and (BA)?

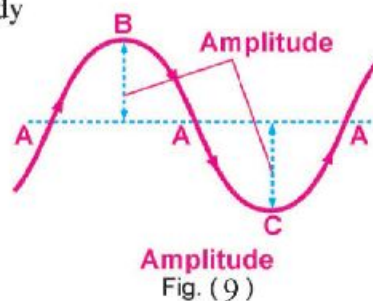
What is the relation between the values of displacements (AB) and (AC)?



Oscillation of pendulum  
Fig. (8)



The maximum displacement achieved by an oscillating body away from its point of rest is called the amplitude and is measured in meter (m). Fig. (9)



## 2 Complete oscillation:

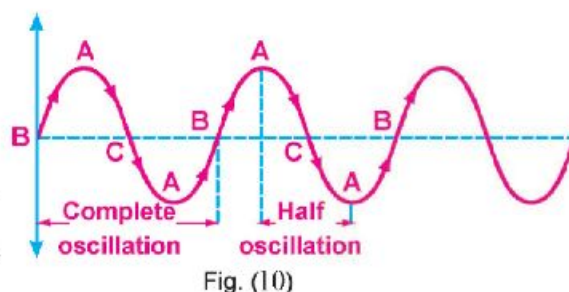
When the ball of the pendulum moves from (B) to (A) to (C) then back to (A) and finally to (B), the pendulum is said to have completed one oscillation.

This complete oscillation can be expressed as follows:

B → A → C → A → B

Then, the same cycle is repeated starting from (B).

The complete oscillation is known as the movement made by the oscillating body when it passes a single point in its path of motion, two consecutive times in the same direction Fig. (10).

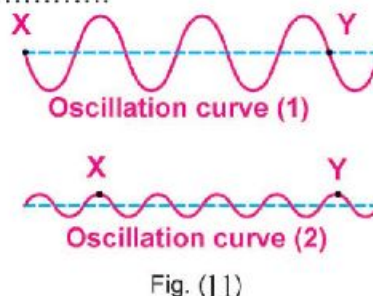


- How many amplitudes does a complete oscillation comprise in Fig. (10)?

### Exercise (2)

In Fig. (11)

1. In which graph, the amplitude is larger (1) or (2) ?
2. How many complete oscillations do exist between the points X and Y represented on both graphs?



## 3 Periodic Time (T)

The time needed by an oscillating body to make a complete oscillation is known as the **periodic time**. It is denoted by (T).

Periodic time is measured in seconds (s), and can be determined by the following relation:

$$\text{Periodic time (T)} = \frac{\text{Time (seconds)}}{\text{Number of complete oscillations}} \dots\dots\dots (1)$$



**Exercise (3)**

What is the periodic time for the pendulum oscillating in Fig. (12)?

.....

**4 Frequency (F)**

When a simple pendulum makes 50 complete oscillations in 10 seconds;  
 -How many complete oscillations the pendulum makes in 1 second,  
 which is known as *the frequency {F}*

- What is the periodic time for the pendulum?

$$T = \frac{\dots\dots\dots}{\dots\dots\dots} = \frac{\dots\dots\dots}{\dots\dots\dots} = \dots\dots\dots \text{ seconds}$$

From all of the above, we can see that frequency is the reciprocal of periodic time. This implies that frequency can be determined by the relation;

$$\text{Frequency (F)} = \frac{\text{Number of complete oscillations}}{\text{Time (seconds)}} = \dots\dots\dots (2)$$

From the relations (1) and (2) we can conclude that:  
 frequency x periodic time = 1

What kind of mathematical relationship does the Fig. (13) represent?

.....

Frequency is measured in Hertz (Hz), after the German scientist Hertz.

Multiplies of the Hertz:

Kilohertz =  $1 \times 10^3$  Hertz

Megahertz =  $1 \times 10^6$  Hertz

Gigahertz =  $1 \times 10^9$  Hertz

**Exercise (4)**

Calculate the periodic time and frequency for an oscillating body that makes 300 complete oscillations in half a minute.

Time = ..... x ..... = ..... seconds

$$T = \frac{\dots\dots\dots}{\dots\dots\dots} = \frac{\dots\dots\dots}{\dots\dots\dots} = \dots\dots\dots \text{ seconds}$$

$$F = \frac{\dots\dots\dots}{\dots\dots\dots} = \frac{\dots\dots\dots}{\dots\dots\dots} = \dots\dots\dots \text{ Hertz}$$

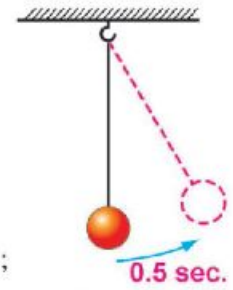


Fig. (12)

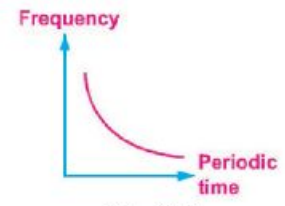


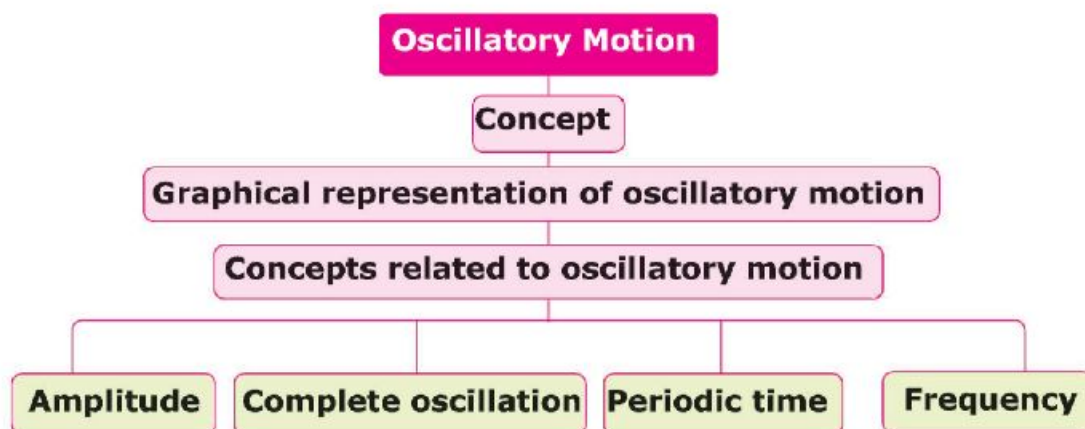
Fig. (13)



## EKB

use the EKB to get some information about the Scientist Higenz Who Design the Pendolium Watch Which Depends on That, the Pendolium Oscillates by a Fixed Oscillation What Ever the ampliuted Changed then Discuss It

## Lesson summary



- ▣ Examples of periodic motion; oscillatory motion and wave motion.
- ▣ A complete oscillation comprises 4 amplitudes.
- ▣ Frequency of an oscillating body equals the reciprocal of its periodic time.



**Lesson One Assessment**

1 Write the scientific term for each of the following statements:

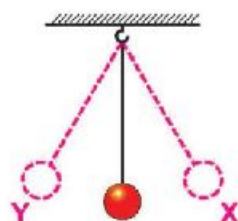
- (a) The periodic motion made a body around its point of rest, where the motion is repeated through equal intervals of time. (.....)
- (b) The number of complete oscillations produced by the oscillating body in one second. (.....)

2 Choose the right answer from those between brackets, mention the reason for you choice:

- (a) The result of multiplying the frequency of an oscillating body by its periodic time equals.....

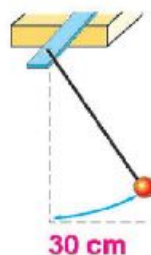
$$\left( \frac{1}{2} - \frac{1}{4} - \frac{1}{3} - 1 \right)$$

- (b) In the opposite figure; when the ball of the pendulum moves from (X) to (Y) in a duration of 0.02 seconds, the frequency equals.....Hertz



$$(0.04 - 0.02 - 25 - 50)$$

- (c) The following figures describe the oscillation of a simple pendulum of amplitude = .....



$$(30 \text{ cm} - 25 \text{ cm} - 20 \text{ cm} - 10 \text{ cm})$$

3 What is meant by ...?

- (a) The number of complete oscillations made by an oscillating body in duration of 10 seconds is 500 complete oscillations.

.....

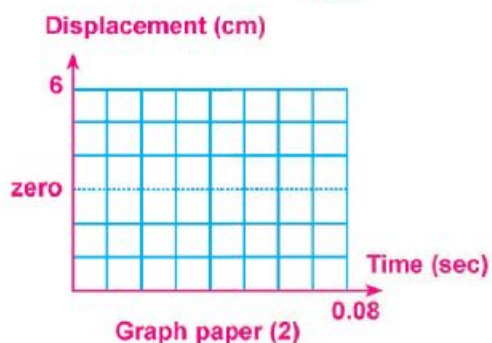
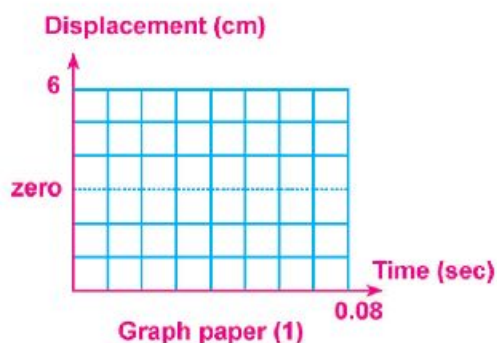
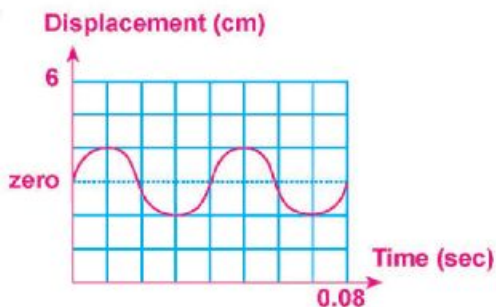
- (b) The time taken by a spring to make 60 complete oscillations is 1 minute.

.....



4 The opposite figure represents the motion of an oscillating body. Using the figure;

- (a) Find the periodic time of the oscillating body.
- (b) Redraw the figure in graph paper 1, showing double of the frequency and the same amplitude.
- (c) Redraw the figure in graph paper 2, showing the same frequency and double of the amplitude.



5 Creative Thinking

x, y and z are three examples of oscillatory motion (motion of the pendulum, motion of the spring and the motion of a string) out of order.

If (x) doesn't represent the motion of the pendulum or the spring and (y) doesn't represent the motion of the pendulum or string, Analyze these data to find out which symbol represents each motion.

.....  
 .....

# Lesson 2

## Wave motion

### Lesson objectives

By the end of studying this lesson, the student should be able to:

- 1 Recognize the concept of a wave.
- 2 Recognize the role of the wave in transferring energy.
- 3 Recognize the concept of wave motion.
- 4 Use the materials and tools precisely to conclude the concept of the wave.
- 5 Classify waves according to direction of propagation.
- 6 Use the materials and tools precisely to compare between transverse and longitudinal waves.
- 7 Classify waves according to their ability to propagate and transfer energy in space.
- 8 Compare between transverse and longitudinal waves.
- 9 Recognize the properties of wave motion.
- 10 Recognize the concept of wave length.
- 11 Recognize the Concept of the Amplitude.
- 12 Recognize the relation used to determine the velocity of the wave.
- 13 Conclude the relation between the frequency of the wave and its periodic time.
- 14 Conclude the law of wave propagation.
- 15 Compare between oscillatory and wave motions.
- 16 Protect the ears against hazards of noise pollution.

### Elements of the lesson :

- 1 Defining a wave and its role in transferring energy.
- 2 The concept of wave motion.
- 3 Transverse and longitudinal waves.
- 4 Mechanical and electromagnetic waves.
- 5 Some concepts related to wave motion and its properties.
- 6 Law of wave propagation.

### Involved Issues:

The effect of science and technology on society.



Notice what is formed on the surface of still water when some water drops fall on that surface fig (1) .  
The propagation of concentric circles on the surface of water represents a **wave motion**.



Fig. (1)

**The role of waves in energy transfer:**

To be familiar with the role of waves in transferring energy, you firstly need to be familiar with the wave concept.

**Activity (1)**

**Defining the concept of wave and its role in energy transfer.**

Place some pieces of dominos in the form of a line as shown in Fig. (2).  
Make sure that the pieces are placed at equal distances from each other.



Fig. (2)

What happens when you push the first domino piece down?

.....

Do the pieces change position after falling?

.....

**Explanation:**

When the first domino piece falls, its energy would transfer to the next one. That falls down in turn, transferring the energy to the next piece and so on.

Energy transfer through the domino pieces continues and the pieces never change position in the line.

**Conclusion:**

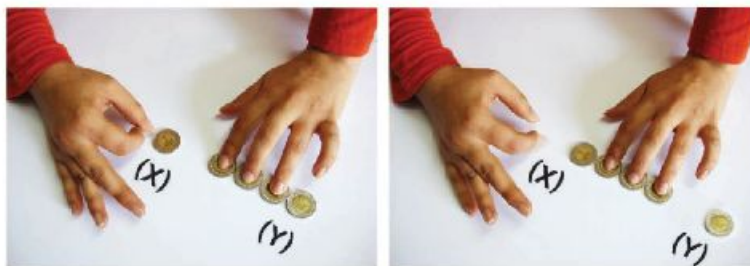
The disturbance that propagates and transfers energy in the direction of propagation is known as a **wave**.

**Exercise (1)**

How do you explain the motion of the coin (x) when the coin (y) is pushed, though they never touch?

.....

.....



(A)

Fig. (3)

(B)





**The concept of wave motion:**

To recognize the concept of wave motion, you can take part with your classmates in doing the following activity.

**Activity (2)**

**Concluding the concept of wave motion.**

**Materials and tools :**

- hollow tube 30 cm long.
- a candle.
- a burning scent stick.
- a tuning fork.

**Steps :**

- 1 Place the tube horizontally and place the candle at one of its ends and the scent stick at the other end.
- 2 Hit the tuning fork and place it near the scent stick.

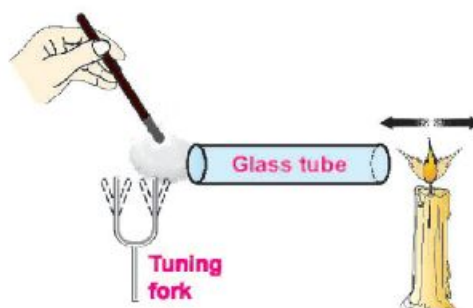


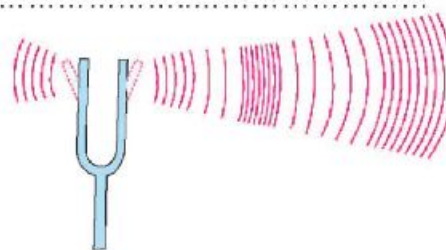
Fig. (4)

**Observations :**

- 1 What happens to the flame of the candle?  
.....
- 2 What are the waves that have transferred the energy from the tuning fork to the candle flame?  
.....
- 3 Do air particles move with the movement of sound waves through the tube?  
How could you prove this?  
.....

**Explanation :**

- 1 When the tuning fork vibrates, the produced energy is transferred in the form of sound waves.
- 2 The particles of the medium (air and smoke particles) do not move from their original places during transferring sound waves carrying energy to the candle flame.



**Sound waves emitted by a tuning fork**

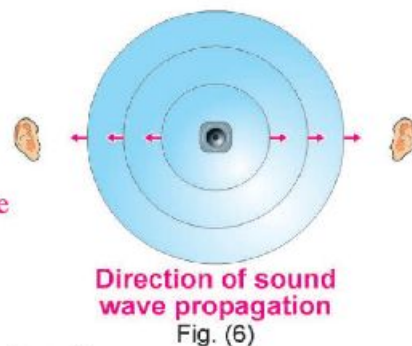
Fig. (5)



**Conclusion :**

The movement resulting from the vibration of the medium particles at a certain moment in a specific direction is known as a **wave motion**.

The direction of progression of the wave is known as the **line of wave propagation**. Fig. (6)



**Types of waves**

- Waves are classified according to the direction of vibration of medium particles relative to the direction of propagation, into:

- Transverse waves.
- Longitudinal waves.

Waves are also classified according to the ability to propagate and transfer energy, into:

- Mechanical waves.
- Electromagnetic waves.

**Transverse and longitudinal waves:**

To compare between transverse and longitudinal waves, take part with your classmates in performing the following activity.



**Activity (3) Comparison between transverse and longitudinal waves.**

**Materials and tools :**

- Spring.
- Colored tape.
- Nail.

**Steps :**



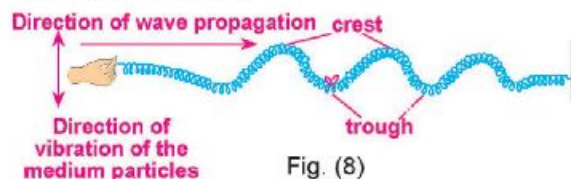
Fig. (7)

- 1 Fix one end of the spring to a wall using the nail.
- 2 Tie the colored tape at the middle of the spring.

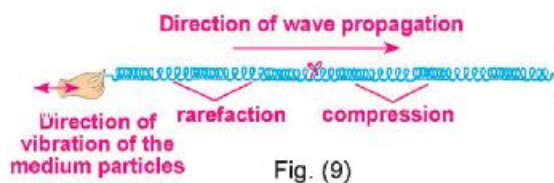
**Observations :**

- 1 Describe the direction of wave propagation (rings of the spring coil), and the direction of vibration of the medium particles (the colored tape), in:

• **The first case**  
when moving the spring coil up and down or to the right and left, perpendicular to the axis of the spring coil. Fig. (8)



• **The second case**  
when pushing and pulling the coil rings at the free end. Fig. (9)





- 2 Does the position of the rings change during wave propagation in any of the above cases?
- 3 In which case:
  - The rings go up and down forming crests and troughs consecutively? .....
  - The rings get near and far from each other forming compressions and rarefactions consecutively? .....

**Conclusion :**

- 1 The disturbance which causes the particles of the medium to vibrate perpendicular to the direction of wave propagation is known as the **transverse wave** Fig. (10), while the disturbance that causes the particles of the medium to vibrate along the direction of wave propagation is known as the **longitudinal wave** Fig. (11).
- 2 During wave propagation, the particles of the medium do not change position; however they vibrate around their point of rest.
- 3 The transverse wave is formed of crests and troughs as compared to the longitudinal waves which are formed of compressions and rarefactions Fig. (12).
- 4 The highest point in a transverse wave with respect to the horizontal is called the **crest**, while the lowest point is called the **trough**.
- 5 In longitudinal waves, the point of highest density and pressure is called **compression**, while the point of lowest density and pressure is called **rarefaction**.

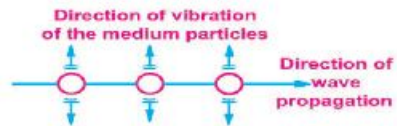


Fig. (10)

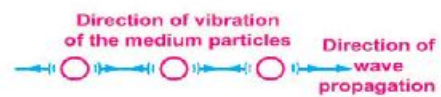


Fig. (11)

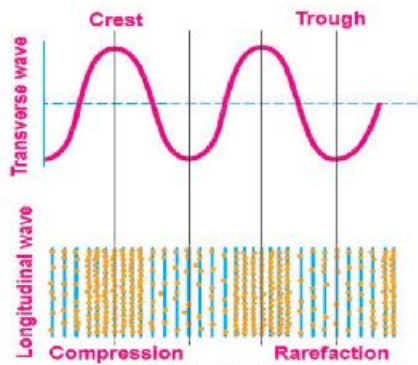


Fig. (12)

**Exercise (2)**

Compare between transverse and longitudinal waves:

Point of comparison	Transverse wave	Longitudinal wave
Definition	.....	.....
Composition	.....	.....

**EKB**

By using EKB or any available Knowledge Source, search for an Explanation of the following : we dont hear the sound of solar Explosions while we can see the produced Light From It



### Real life application **Physiotherapy tubs (Jacuzzi)**

In most health clubs you can find these tubs known as Jacuzzi Fig. (13) . Jacuzzi is a tub where water moves in the form of circular waves. It's used to treat sprains and cramps when used with hot water and nervous tension when used with cold water.



Fig. (13)

### Communication

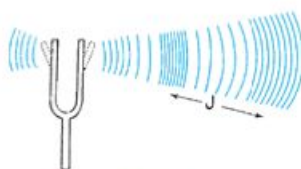
Discuss with your classmates under the supervision of your teacher, the reason behind hearing thunder after seeing lightening though they both do happen at the same time?

### Mechanical and electromagnetic waves:

- Some waves need a materialistic medium in order to propagate. These waves are known as **mechanical waves**, like transverse water waves and longitudinal sound waves.



**Water waves**  
Fig. (14)



**Sound Waves**  
Fig. (15)



**Radio waves**  
Fig. (16)

Other waves do not need the presence of any medium to propagate through as they can propagate through space. These waves are known as **electromagnetic waves**, like light waves and radio waves used in radars and they are all transverse waves.

☐ Both mechanical and electromagnetic waves propagate in different materialistic media with various velocities. However the velocity of mechanical waves is much slower than that of electromagnetic waves. Electromagnetic waves have the advantage of propagating in space with a velocity of  $3 \times 10^8$  m/s.



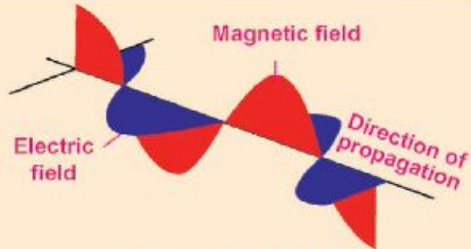
**Exercise (3)**

Compare between mechanical and electromagnetic waves.

.....

**Enrichment information and activity (1)**

- Electromagnetic waves are considered as transverse waves that can propagate in space as they are formed of an electric field and a magnetic field perpendicular to each other and to the direction of wave propagation, as well.
- Write a report about electromagnetic spectrum



Electromagnetic Fig. (17)

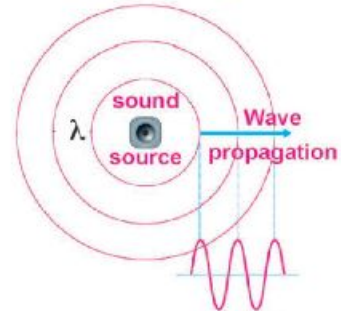
**Concepts related to wave motion:**

Oscillatory motion is similar to wave motion whether transverse or longitudinal as each can be represented as shown in the Fig. (18)

They are also similar according to some properties.

The following are some concepts that can express the properties of wave motion:

- Wavelength.
- Wave velocity.
- Amplitude.
- Frequency.



Representation of longitudinal wave Fig. (18)

**1 Wavelength ( λ ):**

The distance between the centers of two consecutive compressions or rarefactions is known as the wavelength.

Can you conclude the definition of the wavelength of a transverse wave from Fig. (19)?

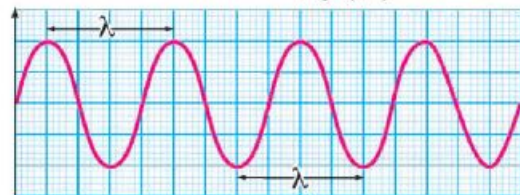


Fig. (19)

Wavelength can be expressed by the symbol (λ).

The measuring unit is the meter (m) or fractions of a meter;

Millimeter (mm) = 1 x 10<sup>-3</sup> meter

Micrometer = 1 x 10<sup>-6</sup> meter

Nanometer = 1 x 10<sup>-9</sup> meter

**Enrichment information (2)**

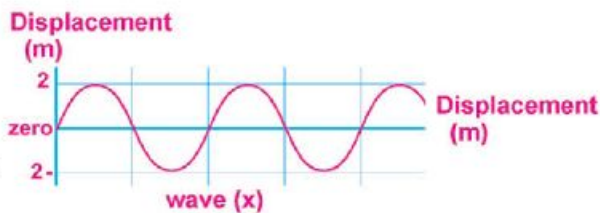
\* The following table shows the wavelengths for some electromagnetic waves:

Visible light	380 : 700 Nanometer
Infrared rays	10 <sup>3</sup> : 10 <sup>6</sup> Nanometer
Microwave	10 <sup>6</sup> : 10 <sup>9</sup> Nanometer



**2 Amplitude:**

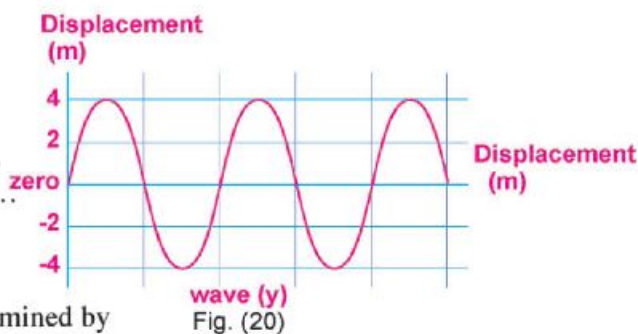
It is the maximum displacement achieved by the particles of the medium away from their points of rest.



**Exercise (4)**

Compare between the amplitude of both waves (x) and (y) shown in Fig. (20)

.....  
 .....



**3 Wave velocity (v)**

If the velocity of a wave can be determined by the relation

$$\text{Velocity (V)} = \frac{\text{Distance covered by the wave in meters (m)}}{\text{Time in seconds (s)}}$$

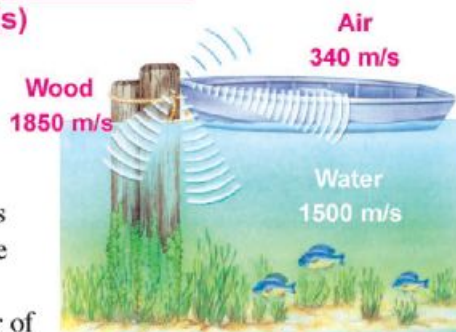
The measuring unit is meter per second (m/s)

Can you conclude a definition for wave velocity?

.....  
 .....

The velocity of a given wave is constant as it travels through the same medium. However, it differs as the nature of the medium changes Fig (21).

Wave velocity represents the velocity of the transfer of the energy carried by the wave.



**Different sound speeds in different media**  
 Fig. (21)

**4 Frequency (F):**

Regarding you have recognized the definition of frequency for an oscillating body, can you define the frequency of a wave?

.....

What is the relation between the frequency of a wave (F) and its periodic time (T)?

.....

**EKB**

the high destructive tidal waves knowns Tsunami use the EKB to make a search a bout these waves and its effect, places at which Occured and its reasons.



**Enrichment information (4)**

- A glass cup is shattered when its natural frequency is \_\_\_\_\_ equivalent with the frequency of a nearby sound source, as the amplitude of the oscillation of the cup particles becomes too large.
- This phenomenon is known as resonance.



Fig. (22)

**The law of wave propagation:**

The law of wave propagation explains the relation between the wave velocity ( $v$ ), its frequency ( $F$ ) and wavelength ( $\lambda$ ).

Wave velocity ( $v$ ) = frequency ( $F$ ) x wavelength ( $\lambda$ )

This relation is known as the law of wave propagation and it can be applied to all kinds of waves. Fig (23).

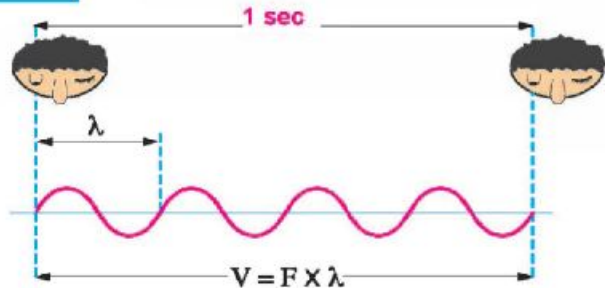


Fig. (23)

**Exercise (5)**

Calculate the wavelength in meter for a visible light wave of frequency  $6 \times 10^{14}$  Hertz and velocity  $3 \times 10^8$  m/s.

Wavelength = ..... ÷ ..... =  $3 \times 10^8$  ÷ ..... = ..... meter.

**Exercise (6)**

Compare between the oscillatory motion and the wave motion?

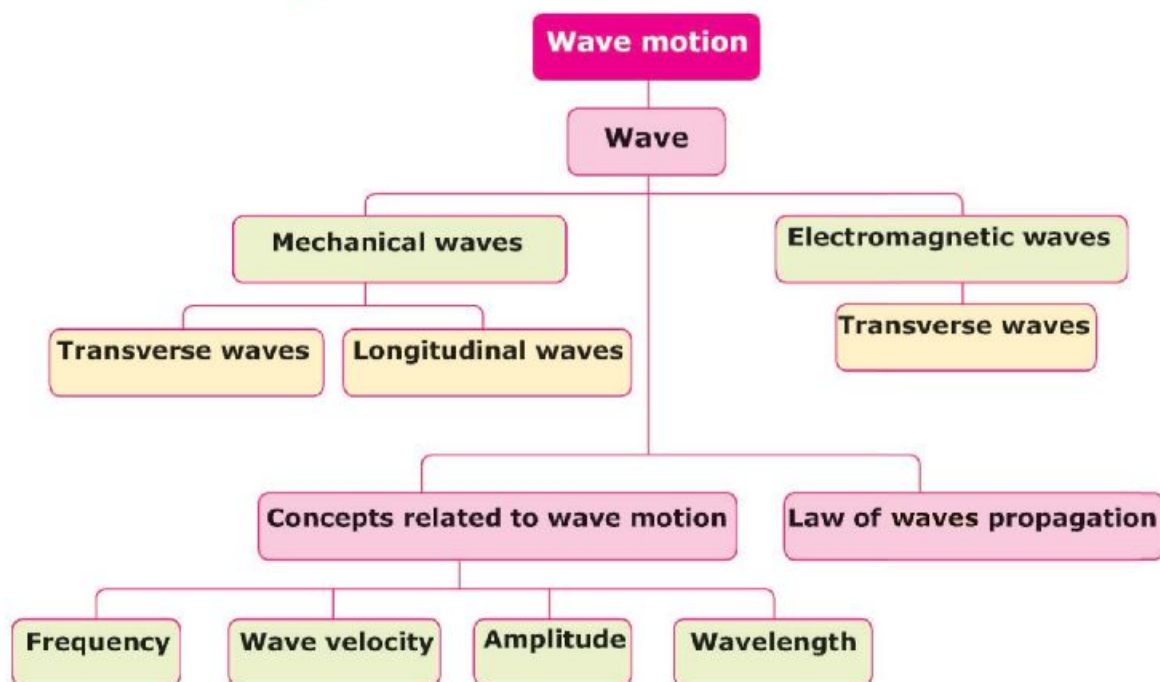
Oscillatory motion	Wave motion
.....	.....
.....	.....
.....	.....



## making model activity:

By using a telephone spiral wire and wax gun, cooperate with your group classmates to make a model of transverse wave and another one of longitudinal wave and discuss them with your class teacher, then demonstrate in the science fair.

### Lesson summary



- ▣ **Wave motion** is the motion produced as a result of the vibration of the particles of the medium in a certain point and in a certain direction.
- ▣ The longitudinal waves are formed of compressions and rarefactions, while transverse waves are formed of crests and troughs.





Lesson Two Assessment

1 Complete the following statements:

- (a) Waves are classified according to the ability to propagate and transfer energy into..... and .....waves.
- (b) The crest in.....wave is equivalent to .....in longitudinal wave.
- (c) Radio waves are considered.....waves that propagate in space with a velocity of.....

2 Correct the following statements without changing the underlined parts:

- (a) Transverse wave is a disturbance that causes the particles of the medium vibrate in the same direction of wave propagation.

.....

- (b) The movement of the clock pendulum is an example for wave motion.

.....

- (c) A body of frequency 200 Hertz makes a complete oscillation in 200 seconds.

.....

3 What is meant by...?

- (a) The wavelength of a sound wave is 30 cm.

.....

- (b) The distance covered by a visible light wave in space in two seconds equals  $6 \times 10^8$  meter.

.....

4 Compare between each of the following:

- (a) Longitudinal waves and transverse waves.

.....

.....

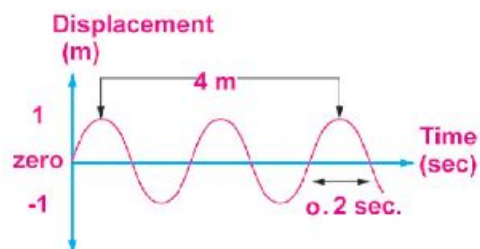
- (b) Oscillatory motion and wave motion.

.....

.....



- 5 From the opposite figure, find;
- (a) Wavelength.
  - (b) Frequency.
  - (c) Amplitude.
  - (d) Wave velocity.



- 6 Sound waves of frequency 200 Hertz and wavelength in air 1.7 meter.

Calculate:

- (a) The velocity of sound wave propagation in air.  
.....
- (b) The wavelength of these waves when they propagate in water with velocity 1500 m/s.  
.....

- 7 Creative Thinking:

Write down ten different scientific terms, where every term consists of two words, one of them is «wave».

.....  
 .....

## Unit One Assessment

**1** Choose the right answer from those between brackets:

(a) If the distance between the center of the third compression and the center of the fifth compression on the wave propagation is 20 cm,

Then, the wavelength of this wave is.....

(40 cm – 20 cm – 10 cm – 5 cm)

(b) In the opposite figure; the particles of the medium (the coil)

vibrate;.....

(to the right only – upwards only – to right and left – upwards and downwards)



(c) If the frequency of an oscillating body was 6 Hz, then the periodic time is.....seconds.

(6 – 3 – 1/3 – 1/6)

**2** Cross the odd word out. Then, state the relation among the remaining words:

(a) Sound wave – light wave – radio wave – infrared wave

.....

(b) Pendulum motion – spring motion – rotary motion – stretched string motion

.....

**3** Give reasons for each of the following:

(a) Oscillatory motion is considered as a periodic motion.

.....

(b) The waves due to vibration of strings are mechanical transverse waves.

.....

(c) We see lightening before hearing thunder.

.....

4 What are the results of .....

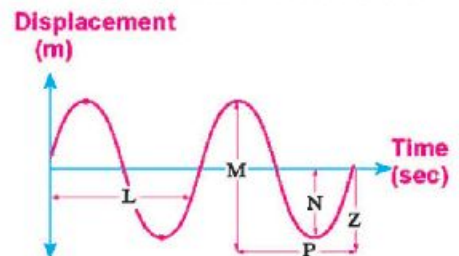
(a) The vibration of the particles of a medium in a direction normal (perpendicular) to the direction of wave propagation?  
.....

(b) The increase in the frequency of a wave to double its value with respect to the wavelength when the wave velocity is constant?  
.....

5 The opposite figure represents an oscillatory motion for a simple pendulum. Choose the letter that denotes:

(a) The oscillation of the pendulum forming 3/4 complete oscillation. (...)

(b) The amplitude (.....)



# Unit 2

## Sound and Light

### Lessons of the Unit :

**Lesson 1 :** Properties of Sound Waves.

**Lesson 2 :** Wave Nature of Light.

**Lesson 3 :** Reflection and Refraction of Light.

### Sources of knowledge and learning :

#### • Books and scientific encyclopedia

- |   |                            |
|---|----------------------------|
| ① Sound – Natalie M. Rosenisky                                | Family Library             |
| ② Light – Natalie M. Rosenisky                                | Family Library             |
| ③ Sound – Steve Parker  | Dar El-Farouk              |
| ④ Sound and Light   | Lebanon Library Publishers |
| ⑤ Questions and Answers Encyclopedia (Science and Technology) | Family Library             |

# Learning objectives of the unit

By the end of studying this unit, the student should be able to:

- 1 Identify the wave nature of sound.
- 2 Conclude some properties of sound like; sound pitch, intensity and quality of sound.
- 3 Use materials and tools to illustrate the factors affecting the pitch and intensity of sound.
- 4 Compare between sound waves according to their frequency.
- 5 Identify some real life applications for ultrasonic waves.
- 6 Appreciate the value of sound in our life.
- 7 Appreciate the importance of science and technology in sound.
- 8 Identify the wave nature of light.
- 9 Conclude the laws of reflection and refraction of light.
- 10 Describe some natural phenomena related to light reflection and refraction.
- 11 Appreciate the importance of light to human life and society.
- 12 Like to work with others in small co-operative groups.
- 13 Appreciate the value of co-operative and team work.
- 14 Appreciate the importance of science and technology in optics.
- 15 Recognize the interaction between science and technology and the society.
- 16 Become objective, honest and highly precise when carrying out scientific experiments.

# Lesson 1

## Properties of Sound Waves

### Lesson objectives:

By the end of studying this lesson, the student should be able to:

- 1 Recognize the wave nature of sound.
- 2 Identify the concept of sound pitch.
- 3 Conclude the factors on which sound pitch depends.
- 4 Use materials and tools to demonstrate the concept of sound pitch.
- 5 Use Savart – wheels to determine tunes.
- 6 Identify the concept of sound intensity.
- 7 Conclude the factors on which sound intensity depends.
- 8 Define the inverse square law in sound.
- 9 Recognize the relation between sound intensity and the amplitude of the sound source.
- 10 Recognize the effect of wind direction on the intensity of sound travelling through it.
- 11 Use materials and tools to recognize the effect of amplitude on sound intensity.
- 12 Use materials and tools to recognize the effect of surface area of a vibrating surface on sound intensity.
- 13 Use materials and tools to recognize the effect of the medium density on sound intensity.
- 14 Compare between types of sound waves according to their frequency.
- 15 Identify some of real life applications for ultrasonic waves.
- 16 Appreciate the value of co-operative and team work.
- 17 Appreciate the value of science and technology in human life.
- 18 Appreciate the importance of sound in our life.
- 19 Appreciate the power of God as expressed in the creation of man.
- 20 Appreciate the blessing (grace) of hearing.

### Elements of the lesson:

- 1 Wave nature of sound.
- 2 Properties of sound waves «sound pitch, sound intensity, sound quality».
- 3 Comparing sound waves according to frequency.

### Involved Issues:

- 1 The role of science and technology in human life and society.
- 2 Noise and sound pollution.



- What is sound? How is it produced?  
What is the wave nature of sound?

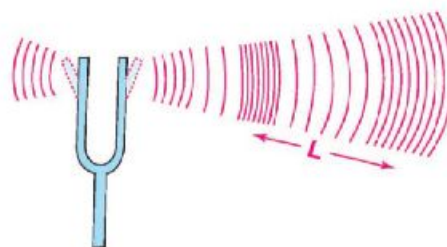
**The wave nature of sound.**

You have already know that sound is an external stimulus that affects the ear and causes hearing.

It is produced by the vibration of the bodies

Fig. (1) Sound stops as soon as the bodies stop vibrating. Sound waves are mechanical longitudinal waves that propagate in different media in the form of spheres, where the center of these spheres is the sound source itself.

Sound travels in air at a velocity 340 m/s. It may exceed or become less than this value.



Sound waves from a tuning fork  
Fig. (1)

**Exercise (1)**

What do longitudinal sound waves consist of?

.....

What is meant by the wavelength of a sound wave is 1.5 meter?

.....

Would you apply the law of wave propagation to sound waves when calculating their velocity of propagation?

.....

**Exercise (2)**

Calculate the wavelength of a sound wave propagating in sea water with velocity 1500 m/s, knowing that the frequency of the wave is 10 kilo. Hertz.

$F = 10 \times \dots\dots\dots = \dots\dots\dots$  Hertz.

$v = \dots\dots\dots \times \dots\dots\dots$

$\therefore \lambda = \dots\dots\dots \div \dots\dots\dots = \dots\dots\dots \div \dots\dots\dots = \dots\dots\dots$  meter

**Enrichment information and activity (1)**

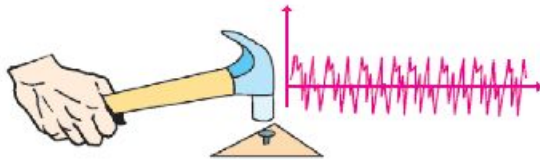
- Air temperature and humidity do affect the velocity of the propagating sound through air.





**Properties of Sound Waves:**

What can we call sound produced by a vibrating tuning Fork and that produced by hammering a nail?



**Noise**  
Fig. (2)



**Musical tone**  
Fig. (3)

- Sounds heard by the human ear are classified into two types:

- 1 Musical tones of uniform frequency and comfortable to be heard. Fig. (2)
- 2 Noise of non-uniform frequency and is uncomfortable to be heard. Fig. (3)

**Exercise (3)**

Mention (3) sound sources that can produce:

- Musical tones.....
- .....
- .....
- Noise:.....
- .....
- .....

The ears can distinguish different sounds on the basis of three characteristics (factors); which are:

- Sound pitch.
- Sound intensity.
- Sound quality.

**1 Sound Pitch:**

- With your eyes shut down, can you distinguish between?
  - The voice of a lion and a sparrow.
  - Your mister's and mistress's voices.



**Violin**  
Fig. (4)



**Drill**  
Fig. (5)



**Low pitched sound**  
Fig. (6)



**High pitched sound**  
Fig. (7)

The voice of the lion *fig (6)* is harsher than that of sparrow *fig (7)*.  
The voice of the mistress (woman) is sharper and softer than the voice of the mister.  
As the sharpness of voice increases, the level of voice gets higher.  
The level of the voice is expressed by what is known as the sound pitch.  
This can be illustrated by the following activity that you can take part in with your classmates in the co-operative group:

**Activity (1) Illustration of the concept of sound pitch.**

**Materials and tools :**

- Big sized book.
- Rubber band.
- Two pens.



Fig. (8)

**Steps :**

- 1 Tie the rubber band around the book and insert the two pens below the band, closer to the book edges. (Fig 8).
- 2 Press on the band at a distance 10 cm from one of the two pens by the forefinger of the left hand.  
Then, pluck that segment by the forefinger of the right hand.
- 3 Repeat the above step several times changing the length of the vibrating segment each time.

**Observations :**

- 1 Does the sound pitch change as the length of the vibrating segment changes?  
.....
- 2 When does the sound become sharper? And when does it become harsher?  
.....
- 3 What is the relation between the length of the vibrating segment of the band and the number of vibrations taking place in one second?  
.....



**Conclusion :**

1. Sound pitch is a property of sound by which the ear can distinguish between harsh and sharp voices.
2. Sound pitch depends on the frequency of the source, where the sharpness of sound increases as the frequency increases. On the other hand harshness of sound increases as the frequency decreases.

**Exercise (4)**

When blowing through bottles as illustrated in Fig. (9)  
When can you hear a high pitched sound? And why?



Fig. (9)

**Enrichment information (1)**

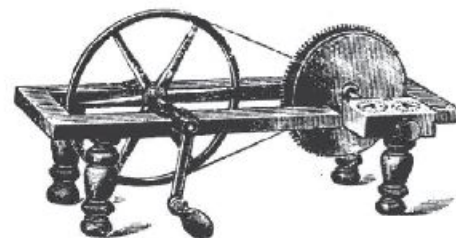
- The sound pitch of the siren of the car fire increases gradually as it approaches you and decreases suddenly as it moves away. That is due to the apparent change in the frequency of the produced sound. This phenomenon is known as Doppler's effect.



Fig. (10)

**Determining the pitch of a tone using Savart's Wheel.**

Savart's wheel is used to determine the pitch (frequency) of an unknown tone.  
How can you perform that with your friends?



**Savart's wheel**  
Fig. (11)

- 1 Listen to the tone you want to determine its pitch till your ears get used to it.
- 2 Start rotating savart's wheel at the same time one of the gear teeth will come in contact with a flexible metal sheet. Start increasing the speed of rotation till you hear a sound similar to that of the unknown tone.
- 3 Calculate the number of turns (cycles) (d) taking place in a specific duration (t) and by knowing the number of teeth of the gear (n), you can determine the frequency of the tone by the relation;

$$\text{Frequency (f) = } \frac{\text{Number of cycles (turns) (d)}}{\text{Time (t)}} \times \text{The number of the teeth (n)}$$

**Exercise (5)**

Calculate the frequency of a musical tone similar to the frequency of an emitted tone using Savart's Wheel rotated with a velocity of 960 cycles in two minutes, given that the number of teeth of the gear is 30 teeth.

$t = 2 \times \dots\dots\dots = \dots\dots\dots$ seconds

$f = \frac{N \times n}{t} = \frac{\dots\dots\dots \times \dots\dots\dots}{\dots\dots\dots} = \dots\dots\dots$ Hz

**2 Sound Intensity:**

Assume that a play was performed in an open air theatre without using any sound amplifier Fig. (12).

Would you prefer to sit in the front rows or at the back ones? And why?

When the ear is close to the sound source, it will be affected more by the sound and vice versa.

This can be explained as follows; the sound intensity at a point is the amount of energy falling perpendicular to a unit area surrounding this point in one second.



**Play in an open air theatre**  
Fig. (12)

Sound intensity is measured in Watt/meter<sup>2</sup>

**Sound intensity** is known to be a sound characteristic by which the ears can distinguish strong and weak sounds.

Due to the wide range of sound intensities heard by humans and the variance in sensitivity to sound intensity from one person to another, scientists agreed to express the level of sound intensity or noise intensity by using Decibel scale.

**Enrichment information (3)**

- Shows the relation \_\_\_\_\_ between sound intensity and noise intensity. \_\_\_\_\_

Table. (1)

Sound source	Sound intensity (watt / m <sup>2</sup> )	Sound intensity (decibel)
- Quiet sounds like whispering and rustling trees.	$1 \times 10^{-12}$	zero
- Loud sounds like the sound of a motorbike.	$1 \times 10^{-6}$	60
- Deafening sounds like that of jet planes.	$1 \times 10^3$	150



**Factors affecting sound intensity:**

- Sound intensity at a point depends on some factors, which are:
  - The distance between the sound source and the ear.
  - The amplitude of the sound source.
  - The area of the vibrating surface.
  - The density of the medium through which sound travels.
  - Direction of the wind.

**1 The distance between the source of sound and the ear :**

To identify the effect of the distance between the sound source and the ear on the intensity of sound, perform the following activity with your classmates:

**Activity (2) Identify the effect of the distance between the sound source and the ear on the sound intensity.**

**Steps :**

- 1 Stand in front of your mate who is supposed to make a sound of a certain tone.
- 2 Move away gradually from your mate...what do you notice?



Fig. (13)

**Conclusion :**

Sound intensity decreases gradually as the distance between the sound source and the ear increases.

And it is proven that sound intensity at a point is inversely proportional to the square of the distance between the source of sound and that point.

This is known as the inverse square law.

**2 The amplitude of the sound source :**

To determine the effect of the amplitude of the sound source on the sound intensity, you can take part with your classmates in performing the following activity:



**Activity (3)** To identify the effect of the amplitude of the sound source on sound intensity:

**Steps :**

- 1 Fix one end of a ruler on the edge of a table by your right hand.
- 2 Pull the other end of the ruler by the other hand, and then set it free.



Fig. (14)

What do you observe regarding sound intensity arising from the vibration of the ruler?  
.....

**Explanation:**

The amplitude of the sound source (the vibrating ruler) decreases by time.

**Conclusion :**

As the amplitude of vibration of the sound source decreases, the sound intensity gets weaker gradually.

Sound intensity is directly proportional to the square of the amplitude of vibration of the source.

**Exercise (6)**

Fig. (15) represents two sound waves. Compare between them regarding the pitch and intensity.  
.....

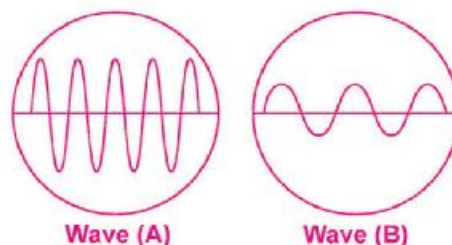


Fig. (15)

**3 The area of the vibrating surface:**

To identify the effect of the area of the vibrating surface on the produced sound intensity, take part with your classmates in the following activity:

**Activity (4)** Identify the effect of the area of the vibrating surface on the sound intensity:

- 1 Make a call to a cell phone adjusted to the vibration mode. This phone carried on the hand of your classmate. (Fig16)
- 2 Ask your partner to put the phone on an empty box, opened at one of its



Fig. (16)



sides to act as a resonance box.

- 3 Compare the sound intensity in both cases.

**Explanation:**

The resonance box increases the area of the vibrating surface with the air inside.

**Conclusion :**

Sound intensity increases when the source of sound touches a resonance body ( box ) due to the increase of the surface area of the vibrating body.

**4 The medium density :**

To identify the effect of the medium density on sound intensity traveling through this medium, you can perform the following activity with your classmates.

**Activity (5) To identify the effect of the medium density on sound intensity :**

**Materials and tools :**

- Air vacuum pump.
- Glass jar.
- Sound source ( Alarm clock )

**Steps :**

- 1 Put the alarm clock on the air vacuum pump and cover it by the glass jar (Fig.17)
- 2 Evacuate the air inside the jar partially by drawing the arm of the vacuum pump outwards.
- 3 Compare the sound intensity before and after the evacuation of air.

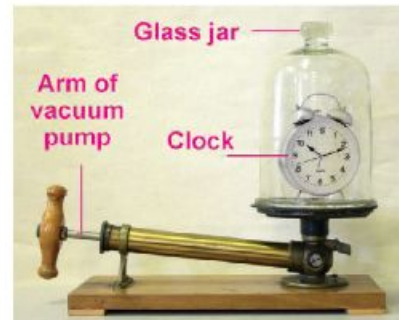


Fig. (17)

**Explanation:**

The air density decrease as you pull the air vacuum pump outwards.

**Conclusion :**

Sound intensity increases as the density of the medium through which the sound travels increases.

**EKB**

use EKB to explain the following: sound intensity of a fired shot on the top of a mountain is less than that at the ground.



### 5 Wind direction:

When the wind direction is the same as that of sound waves propagation, sound intensity increases and the intensity decreases when the wind is flowing in the opposite direction.

#### Real Life Application: Ear Plugs

Ear plugs made of silicon are sold in pharmacies. They take the shape of the external ear canal, where these plugs are used to avoid the hazards of noise in loud places.

### 3 Quality of Sound



Tone produced from a vibrating tuning fork  
Fig. (18)



Tone produced from a violin  
Fig. (19)



Tone produced from a piano  
Fig. (20)

☐ A pure and simple tone is produced from a vibrating tuning fork, and known as the fundamental tone Fig. (18)

On the other hand, the tones produced from a violin Fig. (19) and the piano Fig. (20), even if they are equal in pitch and intensity, they are complex tones composed of a fundamental tone associated by other tones higher in pitch and lower in intensity.

These are called **harmonic tones**. These harmonic tones differ depending on the nature of the sound source.





The property, by which the ear can distinguish between different sounds according to the nature of the source, even if they were of the same pitch and intensity, is called **sound quality** Activity (6).

**Comparing sound waves according to frequency :**

Fig.(21) shows the range of sounds produced and heard by some living organisms.

Why do you think dogs are able to hear all sounds produced by humans?

.....

And why humans are unable to hear all sounds produced by dolphins?

.....

The human ears are affected by sounds of a frequency range between 20 Hz – 20 KHz According to this frequency range heard by humans, sound waves are classified into:

- **Sonic waves** of frequency range between 20 Hz – 20 KHz
- **Infrasonic waves** of frequency less than 20 Hz Such as that of storms preceding rain fall.
- **Ultrasonic waves** of frequency more than 20K Hz such as that produced by sonar devices or some animals.

Mention the names of some of such animals.

.....

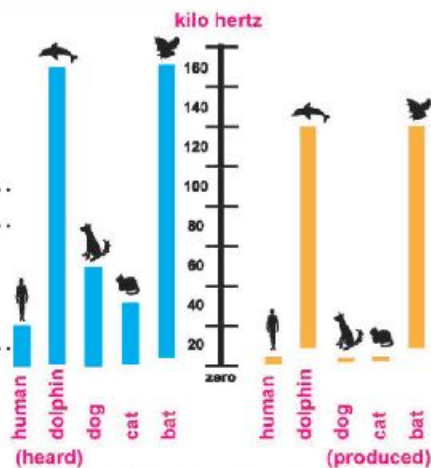


Fig. (21)

**Enrichment information (5)**

- When the Ethiopian chickens that live in Africa Fig. (22) depart their home suddenly, this gives an indication of rain fall the day after.
- This is explained by their high sensitivity to the infrasonic waves associating weather changes preceding rain fall.
- On the other hand, some sea creatures like shrimps and whales produce ultrasonic waves as sound shots to kill the fish they feed on.



Ethiopian chickens

Fig. (22)

**Real Life Application: Ultrasonic Waves**

- Ultrasonic waves are used in several medical, industrial and military fields such as:

- Breaking down kidney and ureter's stones without any surgical intervention.
- Diagnosis of male prostate gland tumors and its effect on bladder and in discovering malignant tumors. Fig. (23)
- It is also used to sterilize food, water and milk. Fig. (24) as it is characterized by its high ability to kill some types of bacteria and stop the action of some viruses.
- Recently scientists are using it in the discovery of land mines.



**Sonar**  
Fig. (23)



**Milk sterilizer**  
Fig. (24)

**Enrichment information (6)**

- When ultrasonic waves collide with land mines, they vibrate. And due to this vibration, it produces waves that travel through the earth's surface to be discovered by using a specialized laser device.

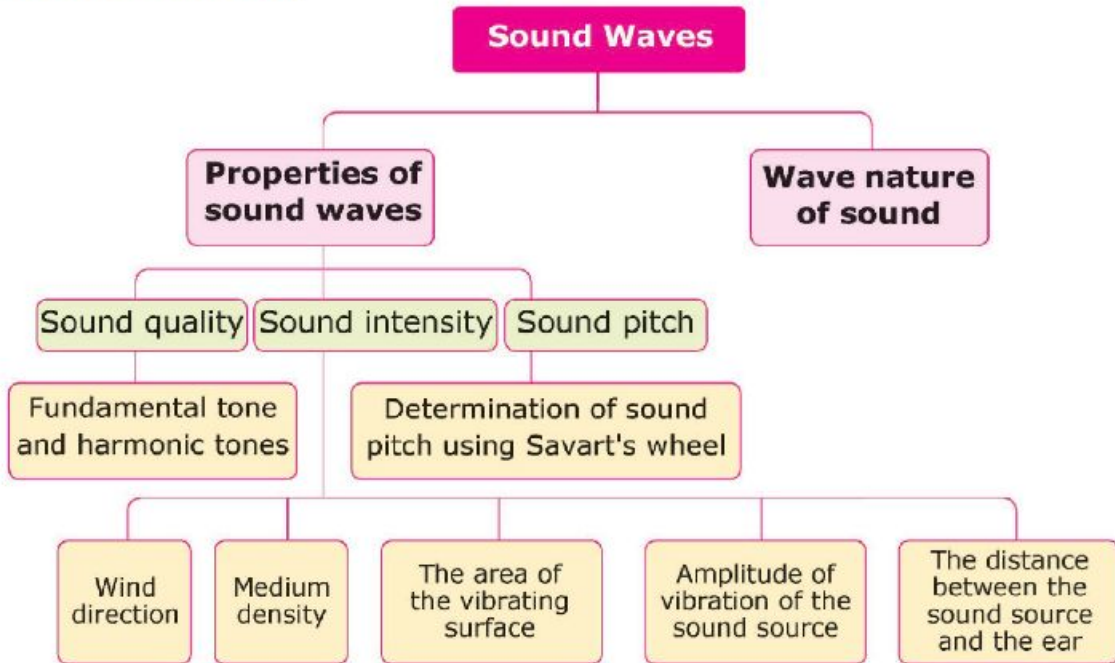
**EKB**

it is noticed that some sound sources like musical tones have an interesting and comfortable effect on human ear while others like noise has uncomfortable effect on human ear.

search through EKB for the difference between the noise and musical tones and the effect of noise on human and how to overcome it then discuss what you get with your teacher and classmates.



Lesson summary



- **Sound pitch** is the property by which the ears can distinguish between sound levels, either sharp or harsh.
- **Sound intensity** is the property by which the ears can distinguish between sounds either strong or weak.
- **Sound quality** is the property by which the ears can distinguish between sounds with respect to the nature of the source even if they are equal in pitch and intensity.

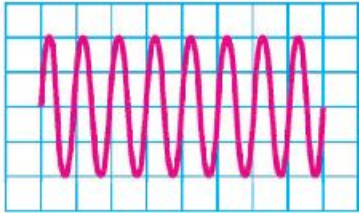


**Lesson One Assessment**

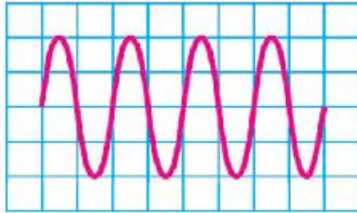
- 1 Choose the correct answer from those between brackets:
  - (a) The human ear can distinguish sounds of frequency .....  
(50 kHz – 30 kHz – 300 Hz – 5 Hz)
  - (b) A sound wave travels in air with velocity 330 m/s and has a wavelength of 0.1 m, its frequency is.....  
(330 kHz – 3300 Hz – 33 kHz – 330 Hz)
  - (c) All of the following are factors affecting sound intensity except .....  
(amplitude of vibration – frequency – medium density – wind direction)
  
- 2 What is meant by each of the following?
  - (a) Sound pitch.....
  - (b) Sonic waves.....
  - (c) The wavelength of a sound wave = 1.5 m  
.....
  
- 3 Give reasons for each of the following:
  - (a) The piano sound differs from that of a violin even if they have the same pitch and intensity.  
.....
  - (b) Sound traveling in air has less intensity than that travelling in carbon dioxide.  
.....
  - (c) The use of ultrasonic waves in milk sterilization.  
.....
  
- 4 Savart's wheel rotates with a rate of 300 cycles per minute. A sound of frequency 600 Hz is produced when an elastic plate touches the teeth of the gear. Calculate the number of teeth of the gear.  
.....  
.....
  
- 5 Illustrate using a practical activity the effect of medium density on sound intensity.  
.....  
.....  
.....



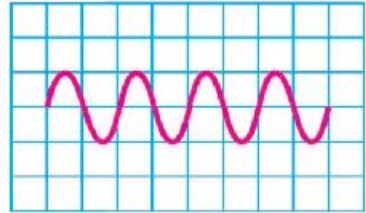
6 Using the opposite figures, compare from the point of view of sound intensity and pitch between;



Wave (A)



Wave (B)



Wave (C)

(a) sound wave (a) and sound wave (b)

.....

(b) sound wave (b) and sound wave (c)

.....

# Lesson 2

## Wave Nature of Light

### Lesson objectives

By the end of studying this lesson, the student should be able to:

- 1 Define the wave nature of light.
- 2 Define the speed of light.
- 3 Use the materials and tools to analyze white light.
- 4 Describe light behavior in different media.
- 5 Use the materials and tools to prove that light travels in straight lines.
- 6 Identify light intensity.
- 7 Recognize the inverse square law for light.
- 8 Appreciate the importance of co-operation and team work.
- 9 Appreciate the importance of optics and vision in life.
- 10 Appreciate the importance of traffic awareness and protecting the lives of people.

### Elements of the lesson

- 1 Definition of light waves.
- 2 Analysis of white light.
- 3 Light behavior in different media.
- 4 Traveling of light in straight lines.
- 5 Light intensity.
- 6 Inverse square law of light.

### Involved Issues:

Traffic awareness and protecting the lives of people.



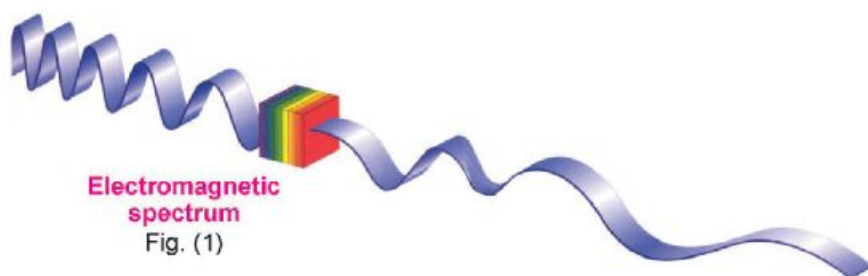
- ☐ You have studied in unit one the different types of waves and learnt that the nature of light waves differ from those of sound waves.

### Self Enquiry:

You might have asked yourself....What is the nature of light waves? What is their composition? How fast does light travel in space?

### Communication

Discuss with your classmates, under the supervision of your teacher, the answers to these questions.



Visible light is one of the waves present in the electromagnetic spectrum Fig. (1). Its wavelength ranges between 380 – 700 nanometers. The speed of light is the distance covered by light in one second.

#### Enrichment information (1)

- Al-Hassan bin Al-Haytham was the first scientist who built up the fundamentals of the science of light and optics. He discovered the phenomenon of the camera which was the base for the invention of the camera we have today. He was also the first one who explained the mechanism of vision correctly.

### Analysis of white light:

Sun is the main source of light on Earth. To know the components of light coming out of the sun (white light), you can take part in the following activity with your classmates:


**Activity**  
 (1)

**Analyzing white light**

Put a compact disk (CD) on the surface of a table. (Fig. 2), making sure that the glistening surface of the disk faces a source of white light as sun rays.

What do you notice?

.....

.....



**Compact Disks**  
 Fig. (2)

**Conclusion :**

White light consists of a mixture of seven colors known as the colors of spectrum. They are arranged in ascending order according to their frequencies as follows: red (*lowest frequency*), orange, yellow, green, blue, indigo and violet (*highest frequency*).



**Triangular prism**  
 Fig. (3)

- A glass triangular prism is used to analyze white light into the seven colors of spectrum. Fig. (3)

- Which spectral color has the least deviation (the color closer to the prism apex)?  
 .....
- Which spectrum color has maximum deviation (the color closer to the prism base)?  
 .....

**Enrichment information (2)**

Table (1)

Color of light	Violet	Indigo	Blue	Green	Yellow	Orange	Red
Wavelength (nanpmeter)	350 : 400	400 : 450	450 : 500	500 : 550	550 : 600	600 : 650	650 : 700

Table (1) shows the wavelengths of the components of white light.

The German scientist Max Planck proved in 1900 that the energy of light wave consists of packets (quanta) of energy known as photons.

The energy of the photon is directly proportional to the frequency of the light wave.

Photon energy  $\propto$  the photon frequency

- The energy of the photon = constant x the frequency of the photon.  
 This constant value is known as Planck's constant.

**Enrichment information (3)**

- Max Planck is a German scientist who gave his life for physics and music. He is the founder of the quantum theory. In 1918 he won Nobel Prize.





**Exercise (1)**

Which one has a greater energy; the photon of red light or the photon of the violet light? Given that the frequency of red light is less than that of violet light.



Fig. (4)

.....  
 .....

**Real Life Application: Spot Lights**

Light can be used in home decorations like the use of spot lights to illuminate artifacts, and ornamented lamps that bring happiness and joy to the place, also the use of stand lamps that concentrate light for reading. (Fig. 5)



Fig. (5)

**Activity (2) Light Behavior in Different Media:**

Participate with your classmates in doing the following activity, where one of you should record the observations on how clear or unclear the vision is, in the following cases, by placing a (✓) mark in the appropriate cell in table (2).

Cases of looking at.....	Range of vision		
	Clear	Unclear	Unseen
1. The title of a book placed on the desk.	✓	.....	.....
2. The title of the book when placing a layer of clear plastic on it.	.....	.....	.....
3. The title of the book when placing many layers of clear plastic on it.	.....	.....	.....
4. The title of the book when placing a plant leaf on it.	.....	.....	.....
5. A coin in a glass of water.	.....	.....	.....
6. A coin in a glass of milk.	.....	.....	.....
7. The filament of a lamp whose bulb is made of flint glass.	.....	.....	.....

**Conclusion :**

- 1 According to the ability of media to allow light to pass through, they are classified into:
  - **Transparent medium:** that permits the light to pass through it, as air and pure water.
  - **Opaque medium:** that does not permit light to pass through it.
  - **Translucent medium:** permits only a part of the light to pass through it and absorbs the remaining part, as flint glass.
- 2 As the thickness of the transparent medium increases, its permeability for light decreases.

**Exercise (2)**

How could you explain the inability to see fishes at the bottom of the river Nile, though water is a transparent medium?

.....



Fig. (6)

**Traveling of light in straight lines:**

Light propagates through transparent media in straight lines Fig. (6). The thickness of these lines can be controlled. You can participate with your classmates to carry out the following activity:

**Activity (3)**

**Demonstrate the propagation of light in straight lines**

**Materials and tools :**

- Four cards.
- Pieces of plasticine.
- White paper plate.
- Light pen.

**Steps :**

- 1 Make an identical hole at the middle of three cards.
- 2 Fix the four cards using plasticine on the white paper plate, where the holes lie on the same line. Fig. (7)
- 3 Allow light of the light pen to pass towards the hole of card (a).

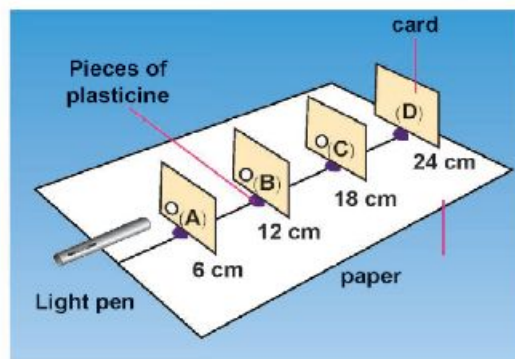


Fig. (7)

**EKB**

use EKB to explain that lunar eclipse and solar eclipse are two phenomena explained on basis of travelling of light in straight lines. then demonstrate what you get with your teacher and classmates



**Observations:**

- 1 What do you see on the card (d)?  
.....
- 2 What do you expect to happen to the area of the formed light spot, if the size of the holes increase?  
.....
- 3 Can a light spot be formed on card (c) if card (b) is moved slightly to the left?  
.....

**Conclusion:**

Light can travel through transparent media in the form of straight lines, whose size (thickness) can be controlled.

**Light Intensity (Brightness)**

To identify the concept of light intensity (brightness) for a given surface, perform the following activity with your classmates:



**Illustrating the concept of light intensity.**

**Steps :**

- 1 Stand at 1 m apart from a wall in a dark room and direct the light of a torch towards it.
- 2 Repeat the above step several times, increasing the distance between you and the wall each time. Fig. (8)

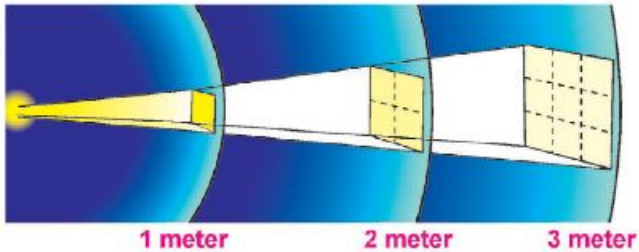


Fig. (8)

What do you observe?  
Regarding the light intensity of the light spot formed on the wall as the distance between you and the wall increases?  
.....

**Explanation :**

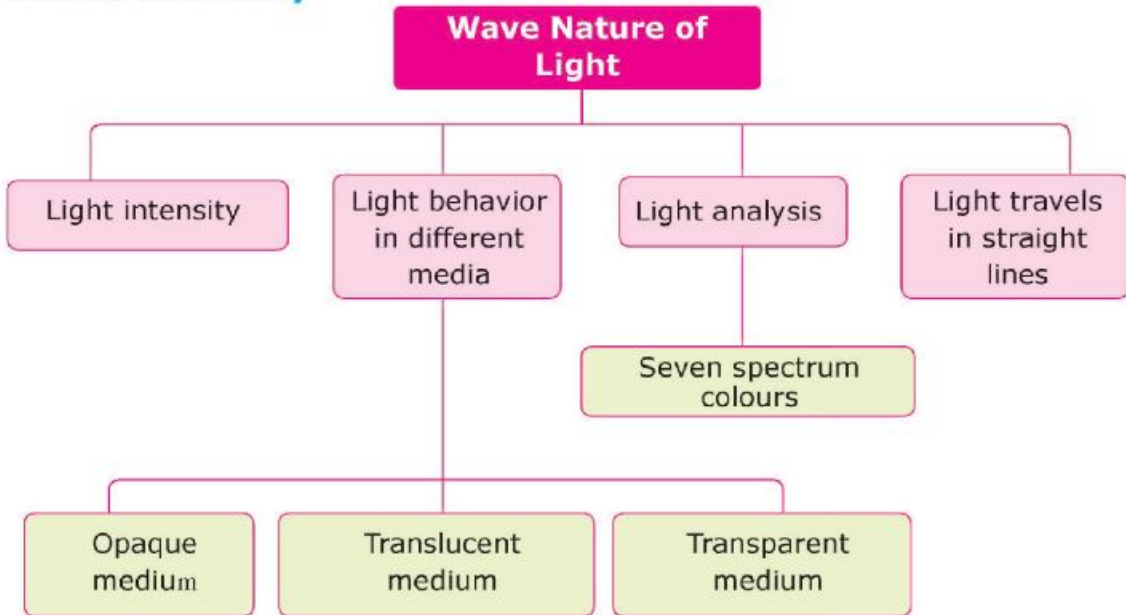
Light emitted from a source propagates in all directions, and as the distance between the wall and the light source increases, the quantity of light incident on the unit area of the surface decreases.

**Conclusion :**

- 1 The amount of light incident normally onto a unit area of a surface in one second is called **light intensity**.
  - 2 Light intensity of a surface decreases as the distance between the surface and the light source increases.
- ☐ Light intensity of a surface is inversely proportional to the square of the distance between the surface and the source of light which is known as the **inverse square law of light**.



Lesson summary



- **The speed of light:** is the distance covered by light in one second.
- The energy of a photon = Planck's constant x the frequency of the photon.
- Light travels in different transparent media in the form of straight lines.
- **Light intensity:** is the quantity of light falling perpendicular to a unit area of a surface in one second.

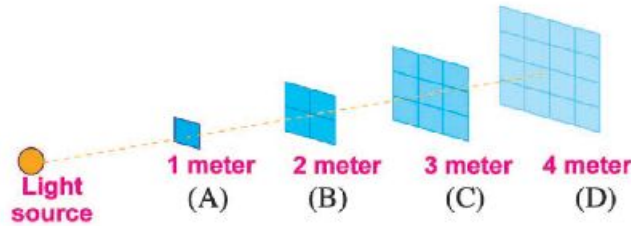


**Lesson Two Assessment**

- 1 Choose the correct answer from those between brackets:
  - (a) Light waves are ..... .  
(mechanical transverse – electromagnetic longitudinal – electromagnetic transverse)
  - (b) The human skin is considered .....medium.  
(transparent – opaque – translucent)
  - (c) Photon energy – plank’s constant .....  
(Wavelength - Amplitude - Frequency )
  
- 2 Choose the unsuitable word or statement out, and then express the rest of the words or statements with something proper:
  - (a) Yellow / blue / white / violet / red  
.....
  - (b) Light travels in straight lines / the speed of light differs in different media / white light consists of seven simple colors / light travels in materialistic media only / the thickness of a light beam can be controlled.  
.....
  
- 3 Give reasons for each of the following:
  - (a) The energy of red light photon is less than that of orange light photon.  
.....
  - (b) The inability to see the impurities present in black honey.  
.....
  
- 4 What's meant by .....?
  - (a) Visible light.  
.....
  - (b) Light intensity.  
.....
  
- 5 Explain an activity to demonstrate that light travels in straight lines in transparent media.  
.....  
.....  
.....  
.....  
.....



- 6 In the opposite figure, the light intensity of the surface at point (A), equals the unity. Choose from the following values



$$\left( \frac{1}{2} \cdot \frac{1}{3} \cdot \frac{1}{4} \cdot \frac{1}{6} \cdot \frac{1}{9} \cdot \frac{1}{12} \cdot \frac{1}{16} \right)$$

what is suitable to be the light intensity at the points, (B), (C) and (D)?

.....

.....

.....

- 7 Creative Thinking:

Glass manufacturing factories in Egypt produce different types of glass, like transparent (clear) glass, flint glass and reflecting glass.

Mention some uses for each type, stating the reason.

# Lesson 3

## Reflection and Refraction of Light

### Lesson objectives

By the end of studying this lesson, the student should be able to:

- 1 Define the concept of light refraction.
- 2 Identify the laws of light reflection.
- 3 Use the materials and tools to deduce the laws of light reflection.
- 4 Identify some technological applications of light reflection.
- 5 Conclude the concept of light refraction.
- 6 Describe the angle of incidence, the angle of refraction and the angle of emergence.
- 7 Use the materials and instruments to prove the concept of light refraction.
- 8 Conclude the concept of optical density of a transparent medium.
- 9 State the laws of light refraction.
- 10 Define the absolute refractive index of a transparent medium.
- 11 Enumerate natural phenomena that are related to light refraction and reflection.
- 12 Appreciate the role of science and technology in human life and society.

### Elements of the lesson

- 1 Concept of light reflection.
- 2 The two laws of light reflection.
- 3 Technological applications of light reflection.
- 4 The concept of light refraction and the related concepts.
- 5 The laws of light refraction.
- 6 Natural phenomena related to light reflection and refraction.

### Involved Issues:

Developing and good use of our resources





**Self Enquiry:**

Have you asked yourself, what was the reason behind the formation of shadows when the objects lie in the path of light? Fig. (1)



Fig. (1)

**Communication**

Think with your classmates under the supervision of your teacher about the reason of forming inverted images of the trees and buildings on the road when rain falls. Fig. (2)

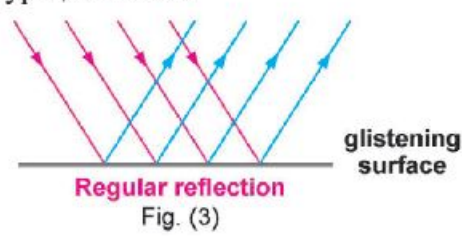
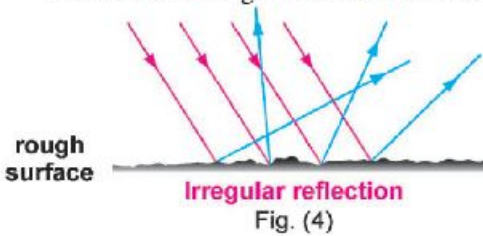
All these observations are attributed to the phenomenon of light reflection, where light waves return back to the same medium of incidence when they meet a reflecting surface.



Fig. (2)

**Types of light reflection:**

- Reflection of light is classified into two types, which are:



**1 Regular reflection:**

In this uniform reflection, incident light rays reflect in one direction when they meet a uniform glistening surface. Fig. (3), like the surface of a plane mirror or a thin sheet of aluminum (foil)

**2 Irregular reflection:**

In the non-uniform reflection, the light rays return in different directions when they fall on a rough surface. (fig. 4), like a leaf of a tree or a piece of leather.

**Enrichment information (1)**

The surface of a clean mirror can not be seen as it reflects the incident light rays regularly. On the other hand a dirty mirror surface can be seen as it reflects light in an irregular manner.



**Exercise (1)**

What is the type of reflection when light falls on each of:

- a woolen jacket? .....
- a stainless steel sheet? .....

**Laws of Light Reflection :**

To identify the laws of light reflection, you can participate with your classmates in performing the following activity.



**Identification of the laws of light reflection**

**Materials and tools :**

- Plane mirror. • Protractor. • Laser pen.

**Warning:** Avoid exposing the eyes to direct Laser

**Steps :**

- 1 Put the protractor in a vertical position perpendicular to the surface of the horizontal plane mirror placed on the surface of a table.
- 2 Direct a laser beam from the laser pen to pass the protractor surface at an angle of  $30^\circ$  and falls on the mirror at the point of incidence (a)

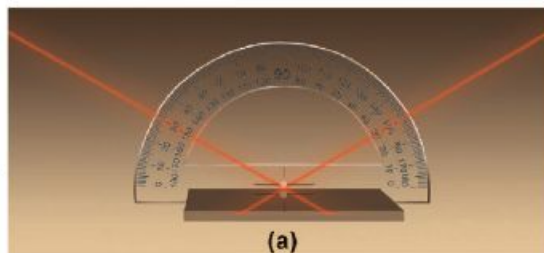


Fig. (5)

**Observations:**

- 1 What is the name of the confined angle ( $x$ ) between the incident ray and the normal at the point of incidence? What is its value?  
.....

- 2 What is the reading of the protractor at which the reflected ray passes the protractor? What is the value of the angle of reflection?  
.....

- 3 What is the relation between the angle of incidence and the angle of reflection?  
.....

- 4 What will happen when the light ray is incident:
  - a. by an angle of incidence  $45^\circ$  .....

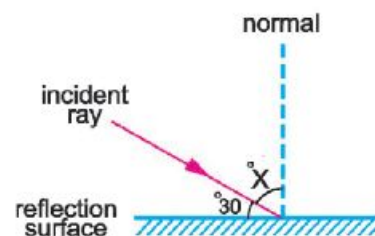


Fig. (6)



b. perpendicular to the surface of the mirror .....

- 5 Do the incident light ray, the reflected light ray and the normal at the point of incidence to the reflecting surface lie in one plane or more than one plane?  
.....

**Conclusion :**

- 1 Reflection of light is governed by two laws, illustrated in Fig. (7).

The laws of light reflection:

a. **The first law:**

The angle of incidence = the angle of reflection

b. **The second law:**

The incident light ray, the reflected light ray, and the normal at the point of incidence to the reflecting surface, all lie in the same plane perpendicular to the reflecting surface.

- 2 When a light ray is incident perpendicular to the reflecting surface, it reflects back on itself, because the angle of incidence = the angle of reflection, equals zero. Fig. (8)

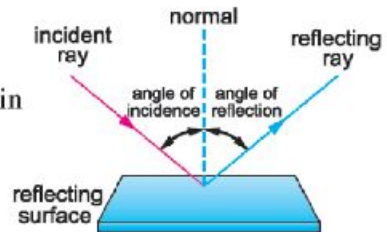


Fig. (7)

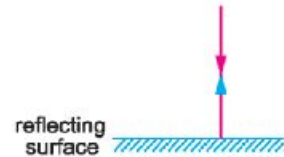


Fig. (8)



## Refraction of Light

How can you explain the changing path of a barrel pushed from asphalt to sand, then back again to asphalt? Fig. (9)

Does the velocity of the barrel vary on asphalt from that on sand?

- ▣ As Light travels from a transparent medium as air to another transparent medium as glass, behaves like the barrel that travelled from asphalt to sand. This phenomenon is known as **refraction of light**. Fig. (10)
- ▣ The ability of the **transparent medium to refract** light, is called the optical density of the medium.
- ▣ The optical density of a medium differs from one medium to another according to the speed of light in it. Before identifying the laws of refraction of light, Firstly, we have to define the concept of light refraction and some of the related concepts illustrated in the following activity :

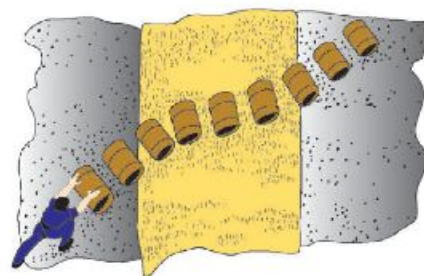
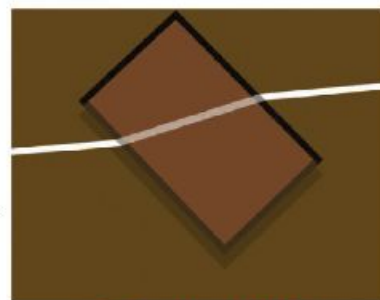


Fig. (9)



Refraction of light

Fig. (10)

### Activity (2)

## Demonstration of light refraction and some related concepts

### Materials and tools :

- Thick rectangular glass block.
- Pencil.
- Protractor.
- White paper sheet.
- Ruler.
- Laser pen.

(Warning: Never expose the eye directly to laser)



**Steps :**

- 1 Put the rectangular glass block on the white paper sheet and mark the around the block using the pencil.
- 2 Direct a ray from the laser pen to the point of incidence (a) on the periphery of the rectangular prism and draw its path using the pencil and the ruler to represent the incident ray.
- 3 Draw the path of the emergent ray from the point (b) on the opposite side of the rectangular prism.
- 4 Remove the rectangular prism and join the two points (a) and (b) with a straight line to represent the refracted ray.
- 5 Draw at ( a ) and ( b ) dotted vertical lines, each represents the normal at the point of incidence on the boundary surface .

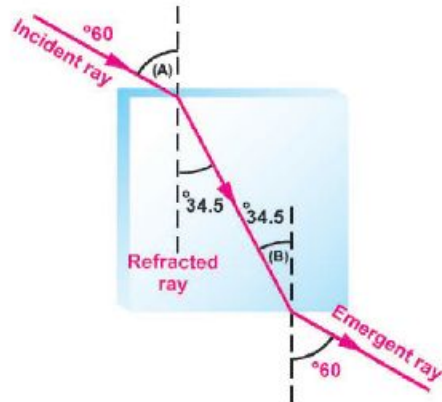


Fig. (11)

**Observations:**

- 1 What happened to the light ray when it travelled from air into glass then from glass into air ?  
.....
- 2 Deduce the name of the angle between each of :
  - The incident ray and the normal at the point ( a ) (.....)
  - The refracted ray and the normal at the point ( a ) (.....)
  - The emergent ray and the normal at the point ( b ) (.....)

**Conclusion :**

- 1 Changing the path of light when it travels from a transparent medium to another transparent one of different optical density is called **light refraction**.
- 2 The **angel of incidence** is the angle between the incident light ray and the normal at the point of incidence on the interface.
- 3 The **angel of refraction** is the angel between the refracted light ray and the normal at the point of incidence on the interface.
- 4 The **angle of emergence** is the angel between the emergent light ray and the normal at the point of emergence on the boundary surface.

### Laws of Light Refraction

- When a light ray travels from a less optically dense medium as air to a more optically dense medium as glass, it refracts towards the normal at the point of incidence on the separating surface between the two media

Which is greater angle of incidence or angle of refraction?

.....

- When a light ray travels from a more optically dense medium such as glass to less optically dense medium as air, it refracts away from the normal at the point of incidence on the separating surface between the two media fig.

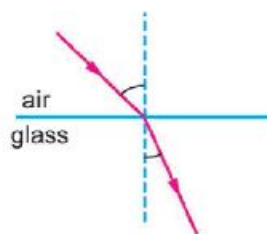


Fig. (12)

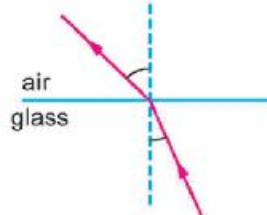


Fig. (13)

#### Exercise (2)

What would happen when a light ray is incident perpendicular to the separating surface between two transparent media of different optical densities?

.....

The ratio between the speed of light in air to that in another transparent medium is known as The absolute refractive index of that medium (n)

$$\text{The absolute refractive index (n)} = \frac{\text{Speed of light in air}}{\text{Speed of light in medium}}$$

The absolute refractive index of any transparent medium is always greater than one because the speed of light in air is always greater than that in any other transparent medium.

The medium of great absolute refractive index is described as being of higher optical density and vice versa.

#### Exercise (3)

Calculate the velocity of light in glass given that the velocity of light in air equals  $3 \times 10^8$  m/s and the absolute refractive index of glass is 1.5

The absolute refractive index of glass = .....

$$\text{The velocity of light in glass} = \frac{\dots\dots\dots}{\dots\dots\dots} = \frac{3 \times 10^8}{\dots\dots\dots} = \dots\dots\dots \times 10^8 \text{ m/s}$$

#### Enrichment information (3)

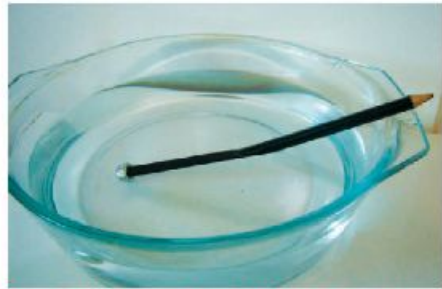
The ratio between the absolute refractive index of a medium to the absolute refractive index of another medium is known as the relative refractive index.



**Natural phenomena related to Reflection and Refraction of light**

**1 Apparent shapes of objects**

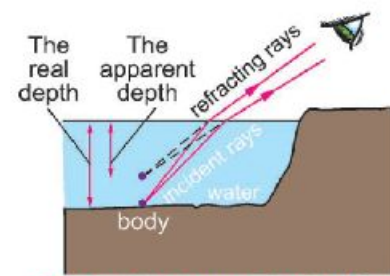
A pencil partially immersed in water appears as being broken . Fig. (14) that is due to the refraction of light rays coming from the immersed part in water .



**Pencil's image due to light refraction**  
Fig. (14)

**2 Apparent positions of objects:**

The submerged object in water – as a fish – is seen in an apparent position slightly above its real position Fig. (15) due to the refraction of the light rays, coming from the object, away from the normal where the eye sees the fish on the extensions of the refracted rays.



**Real and apparent depth of an object placed in water**  
Fig. (15)

**3 Mirage:**

A natural phenomenon takes place on the desert roads at noon especially in the summer times. Objects on the road sides seem as if they had inverted images on a wet area due to reflection and refraction of light.



**Mirage on road**  
Fig. (16)



**Mirage on road**  
Fig. (17)

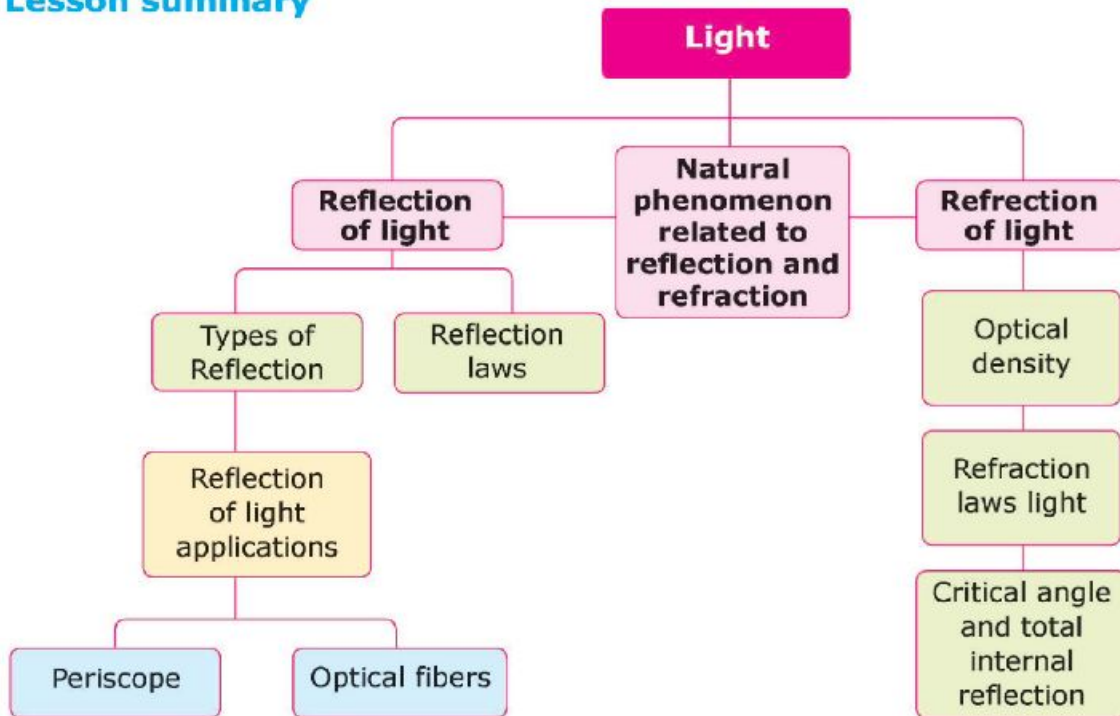
**EKB**

search in the EKB for an explanation of the Mirage phenomenon including some photos and videos.  
then demonstrate what you get with your teacher and classmates.





Lesson summary



- **Reflection of light:** rebound of light waves in the same medium on meeting a reflecting surface.
- **Refraction of light:** changing the path of light when it travels from a transparent medium to another transparent one of different optical density.
- **The absolute refractive index of a transparent medium:** is ratio between the speed of light in air to its speed in this medium.



### Lesson Three Assessment:-

1 Write down the scientific term for each of the following statements:-

- (a) The ability of the medium to refract light rays. (.....)
- (b) The reflection in which the light rays recoil in one direction when falling on a glistening surface. (.....)

2 Complete the following statements:-

- (a) Angle of ..... is the angle between the refracted light ray and ..... at the point of incidence on the separating surface.

3 What is meant by .....?

- (a) Absolute refractive index of water is 1.33
- .....

4 Give reason for:-

- (a) Occurrence of mirage phenomenon in desert regions at noon.
- .....

- (b) The light ray that falls perpendicular on a glistening surface reflects on itself.
- .....

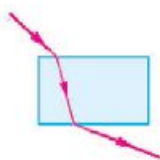
5 Calculate the absolute refractive index of diamond given that the speed of light in it =  $1.25 \times 10^8$  m/s.

.....

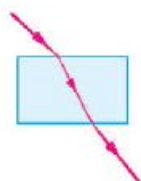
.....



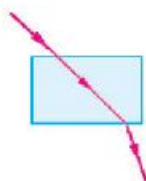
6 Choose from the following figures the one that express correctly the refraction of light in a rectangular glass block and mention the reason.



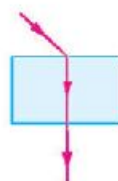
(A)



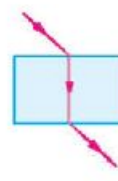
(B)



(C)



(D)



(E)

.....

.....

## Unit two Assessment

1 Write down the scientific term for each the following statements:

- (a) Sound waves of frequencies less than 20 Hz. (.....)
- (b) A medium does not allow light rays to penetrate through. (.....)
- (c) Changing the path of light when travel from a transparent medium to another transparent medium of different optical density. (.....)
- (d) The incident sound ray, reflected sound ray and the normal at the point of incidence on the reflecting surface all lie in one plane perpendicular to the reflecting surface. (.....)

2 Choose the correct answer between brackets, with scientific explanation:

- (a) Sound of frequency 200 Hz is.... .... than sound of frequency 100 Hz.  
(sharper / stronger / harsher / weaker)  
.....
- (b) When the distance between the source of light and the surface as a wall decreases, the light intensity on the surface.....  
(decrease / increases / doubled / remains constant)  
.....
- (c) .....waves are used in medical examinations and identification of embryo sex and condition.  
(sonic / infrasonic / ultra sonic / sonic and ultrasonic)  
.....

3 Write down the mathematical relation that joins between each of the following:

- (a) The speed of sound ( $v$ ) and the depth of body under water surface ( $d$ ) using reflection of sound .....
- (b) The photon frequency and its energy .....
- (c) The sound frequency ( $f$ ), the number of teeth of the gear in Savart's wheel ( $n$ ).....  
.....

4 What are the results due to each of the following?

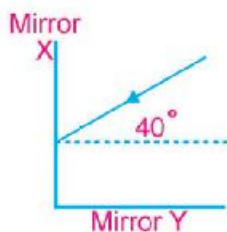
(1) Incidence of light rays on a rough surface.....

(2) Incidence of a white light ray on one face of a triangular glass prism  
.....

5 What is the scientific basis on which each of the following depends?

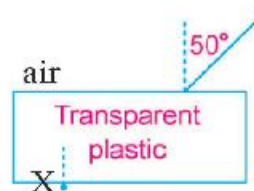
(1) The strings of a musical lute are fixed on a hollow wooden box.....

6 Complete the path of rays in each of the following figures according to what is written below each:



A-Determination of the angle of reflection of the ray on mirror (Y)

.....



C- Calculating the angle of emergence from point (x) given that the optical density of air is less

.....

# Unit 3

## Reproduction and continuity of species

### Lessons of the Unit :

**Lesson 1 :** Reproduction in plants.

**Lesson 2 :** Reproduction in man.

### Resources of knowledge and learning :

#### • Books and scientific encyclopedia

- |                           |                                |
|---------------------------|--------------------------------|
| ① An approach to botany   | Jean and Dorothy Paul.         |
| ② Reproduction and growth | Dr. Richard walker.            |
| ③ Simple science          | The age of cloning.            |
| ④ Life and man            | Translated by Mejahed Maamoon. |

# Learning objectives of the unit

By the end of studying this unit, the student should be able to:

- 1 Explain the structure of a flower (bisexual – male and female).
- 2 Deduce the functions of the bisexual flower's organs.
- 3 Determine the sex of the flower.
- 4 Deduce the types and methods of reproduction in plants.
- 5 Use the materials and tools needed to study the germination of a pollen grain.
- 6 Determine the concept of fertilization in plants.
- 7 Deduce the methods of asexual reproduction in plants.
- 8 Appreciate the importance of reproduction in plants in preserving species.
- 9 Appreciate the importance of plants in our life.
- 10 Appreciate the importance of science and technology in sound.
- 11 Explain the structure of male and female genital system in man.
- 12 Deduce the functions of male and female organs of the genital system in man.
- 13 Compare between the functions of the human male and female genital system.
- 14 Draw an illustration for the sperm and ovum.
- 15 Identify some of the human genital system diseases in male & female human beings.
- 16 Preserve his health by preventing infection by the diseases of the genital system.
- 17 Commit to the healthy and right sexual attitudes.
- 18 Commit to the right religious and social ethics connected to the human nature.
- 19 Bear responsibility in preserving man own health and genital system.
- 20 Positively participate in social decision making regarding health issues concerned with preservation of man's health and birth control.

# Lesson 1

## Reproduction in plants

### Lesson objectives:

By the end of studying this lesson, the student should be able to:

- 1 Describe the structure of the bisexual, male and female flowers.
- 2 Identify the functions of the calyx, corolla, androecium and gynoecium.
- 3 Determine the sex of the flower.
- 4 Deduce the two types of reproduction in plants.
- 5 Describe the steps of sexual reproduction in plants.
- 6 Describe the types of flower pollination.
- 7 Identify the methods of mixed pollination.
- 8 Deduce the concept of fertilization in plants.
- 9 Use the materials and tools to study the germination of a pollen grain..
- 10 Define asexual reproduction in plants.
- 11 Conclude the types of vegetative reproduction in plants.
- 12 Appreciate the importance of reproduction in the continuity of species in plants.
- 13 Appreciate the importance of plants in our lives.
- 14 Appreciate the importance of science and technology in man's life and the society.

### Elements of the lesson:

- 1 Structure of a typical flower.
- 2 The sex of the flower.
- 3 Types of reproduction in plants.

### Involved Issues:

Good Use of Resources and Their Development





- Walk around with your classmates in a public park or your school garden and watch the flowers with their joyful colors. Fig. (1)



Fig. (1)

**The structure of a typical flower:**

- A flower arises from a flowering bud, usually emerging from the axils of the leaf known as bract, and the axis may carry a number of flowers known as the inflorescence. Fig. (2)

To identify the structure of the typical flower, participate with your classmates in the co-operative group, in performing the following activity:



**Inflorescence**  
Fig. (2)

**Activity (1)**

**Identify the structure of a typical flower:**

Get a flower Fig. (3) examine it to identify its parts.

- Color the opposite figure of a typical flower. Fig. (4), using the same real colors of the original flower you have, then write down the labels matching with the parts of the floral whorl listed in table (1).



Fig. (3)

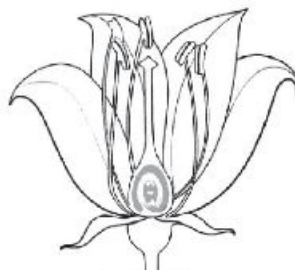


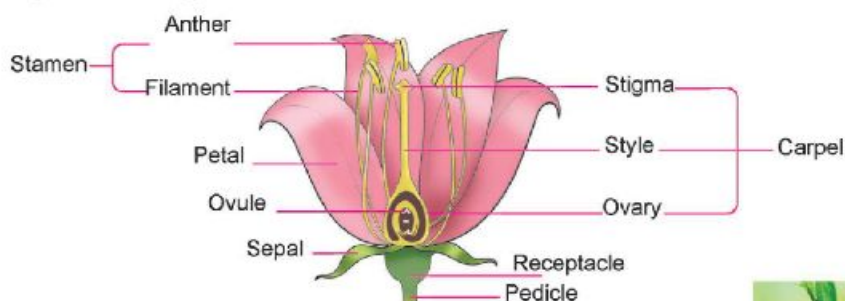
Fig. (4)



Table (1)

Floral whorl	Leaves of the Floral whorl	Description
Calyx	Sepals	Small green leaves, surrounding the flower from outside.
Corolla	Petals	Bright colored scented leaves.
Gynoecium	Stamen	Fine threads, ending with a bulge.
Androecium	Carpels	A hollow tube like a flask, that lies in the center of the flower.

From activity (1), you can recognize that a typical flower, Fig. (5), has a thin, fine neck ending by a **bulging** receptacle carrying floral leaves in **four different floral whorls**, which are the calyx, corolla, gynoecium and androecium.



The structure of a typical flower  
Fig. (5)

### 1 The calyx:

The outer whorl of floral leaves is known as the calyx and its leaves are called sepals. Fig. (6), it's green in color and its function is to protect the internal parts of the flower specially before blooming.



Sepals surround the petals  
Fig. (6)

### 2 The corolla

The whorl following the calyx, its leaves are called petals, Fig. (7) which is colorful and scented to attract insects, which help in the process of reproduction. The corolla function is to protect the reproductive organs.



The corolla petals  
Fig. (7)



**Exercise (1)**

Compare between, wallflowers (Manthoor) flower and Petunia flower from the point of view of separation or fusion of the sepals and petals.

Table (2)

	Sepals	Petals
Wallflowers	.....	.....
Petunia	.....	.....

**Enrichment information (1)**

The sepals of corolla and petals of calyx might be of the same shape and color as in onion flower. That's why we call the two whorls together the Perianth.

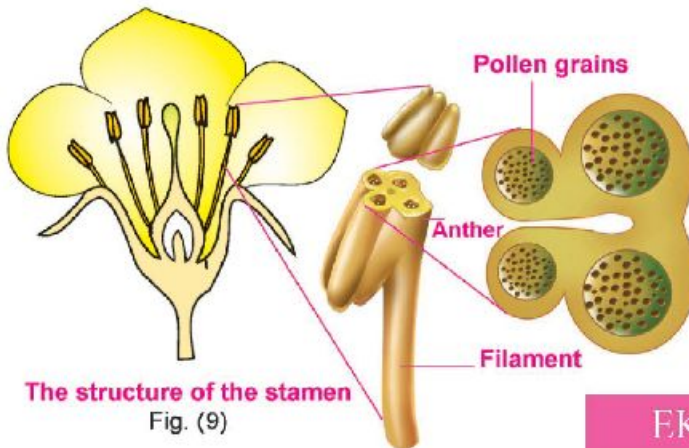
**3 Androecium:**

The whorl following the corolla. Its leaves are called stamen, Fig. (8).

The stamen consists of a fine filament ending by a sac known as the anther which is divided into two parts, each of which has two chambers containing pollen grains, Fig. (9).



The stamens of the androecium  
Fig. (8)



The structure of the stamen  
Fig. (9)

**4 Gynoecium:**

The fourth and innermost whorl of the flower. Its leaves are called carpels, which resembles the flask in shape and is formed of a bulge known as the ovary, Fig. (10), connected to a tube called the style which has an opening called the stigma. The ovary contains the ova.

**EKB**

hay fever a disease infecting people have allergy to pollen grains. the symptoms of this disease are inflammation of the mucus membrane of the nose causing continuous sneezing use EKB to make a research about the discovery of this disease, and ways of protection of patients.

**Exercise (2)**

- Why the androecium is considered the male reproductive organ ?
- What is the name of the female reproductive organ in the flower?

**The sex of the flower:**

To identify the sex of the flower, participate with your classmates in the co-operative group, to perform the following activity:

**Activity (2)**

**Identify the sex of the flower.**

Examine samples of different flowers, like roses, wallflowers, petunia, peas, etc.....  
Do all contain the male and female reproductive organs?

- Most flowers like tulip, petunia and wallflowers contain male and female reproductive organs together. This type of flowers is known as Bisexual (hermaphrodite) flowers, and its symbol is ♀♂
- On the other hand some flowers contain only the male reproductive organ (androecium), and are said to be male flowers and has the symbol ♂ Fig. (11), unlike the female flower which contains only the gynoecium and its symbol is ♀, Fig. (12). The fore-mentioned flowers are known as unisexual flowers, like palms, maize and pumpkins.

**Exercise (3)**

Mention the sex of each of the following flowers:



Flower: .....  
Fig. (13)



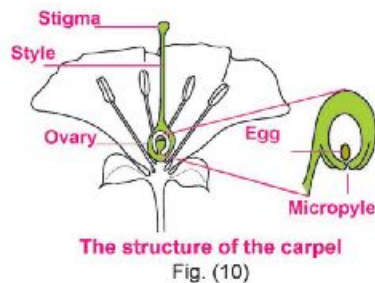
Flower: .....  
Fig. (14)



Flower: .....  
Fig. (15)

**Real Life Application: Drying-flowers**

Pick up a bunch of flowers, and remove the lowermost leaves from the flower pedicle, and organize them in groups to be tied by the pedicle, (fig.16). Hang them in an upside down position in a dark, well ventilated room for one week.



The structure of the carpel  
Fig. (10)



Palm tree with a male flower  
Fig. (11)



Palm tree with a female flowers  
Fig. (12)



Drying - Flowers  
Fig. (16)



**Reproduction in plants :**

**Self enquiry:**

- Have you ever asked yourself, what are the types of reproduction in plants?  
Plants reproduce by flowers or by their green parts.  
In the following lesson we will discuss both types in details.

**First: sexual reproduction in plants**

**Communication**

Discuss with your classmates, under the supervision of your teacher, the following questions:

- Have you ever tried cultivating bean or lupine seeds?
- How were these seeds formed?
- Why do flowers disappear after seeds formation?

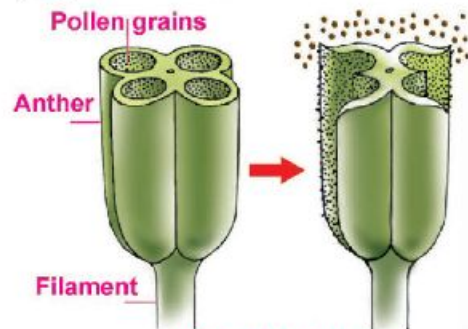
The **flower** is a short stem where the leaves have been modified to form the genital (reproductive) organs, which in turn form seeds inside fruits.

- Name the reproductive organ in flowering plants?

Sexual reproduction in plants takes place in two steps: pollination and fertilization.

**1 Pollination:**

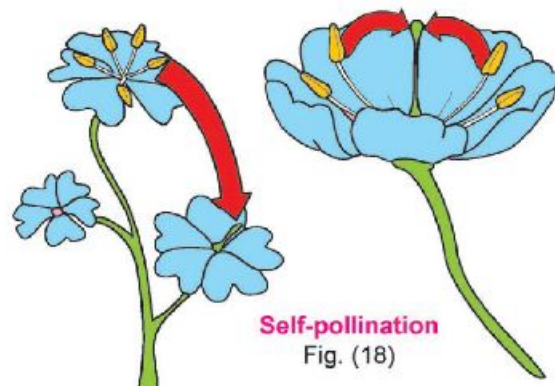
When pollen grains mature and become well developed, the anther splits up longitudinally, releasing pollen grains in the air, Fig. (17). The process of the transfer of pollen grains from anthers of a flower to the stigma is called pollination.



L.S. in the anther  
Fig. (17)

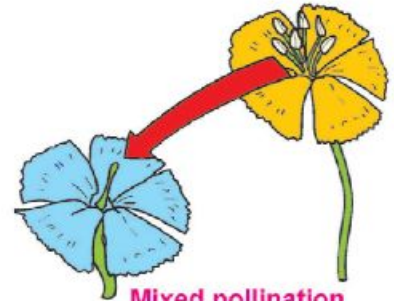
**Types of pollination:**

When pollen grains transfer from the anther to the stigma in the same flower or in another flower but in the same plant, this is called auto (self) pollination Fig. (18).





☐ On the other hand when pollen grains transfer from the anther of one flower to the stigma of another one on a different plant, this is called mixed pollination. Fig. (19).



**Mixed pollination**  
Fig. (19)

**Exercise (4)**

Conclude the type of pollination in each of the following flowers:

1. The flowers of sunflower plant where their anthers and stigmas never grow at the same time. (.....)
2. The flowers of barley plant, which never bloom before being fertilized. (.....)
3. The unisexual flowers of maize. (.....)
4. The flowers of flax plant where their anthers and stigmas grow at the same time. (.....)

**research activity:** using the internet or any available resources, write a research about some flowers that are pollinated by insects.

**The methods of cross pollination:**

The pollen grains are transferred from one flower to another by many ways:

**1 pollination by air:**

Observe Fig. (20) with your classmates.....what do you conclude?

Flowers pollinated by air are characterized by the presence of hanging anthers, easily opened by air and their stigmas are feathery- like and sticky to catch pollen grains. Fig. (20)



**Anthers & stigmas of air pollinated flowers**  
Fig. (20)

Air pollinated flowers produce huge numbers of pollen grains to compensate what are lost in air Fig. (21). The pollen grains of such flowers are light in weight, dry and can be easily carried by air currents.



**The transfer of pollen grains by wind**  
Fig. (21)

**Enrichment information**

Maize plant produces about 50 millions of pollen grains.

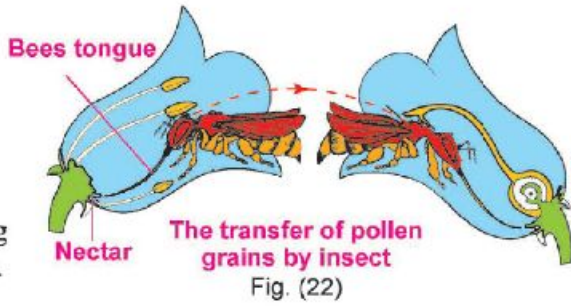


**2 Pollination by insects:**

Observe Fig. (22) with your classmates.....what do you conclude?

The flowers pollinated by insects are characterized by colored, scented petals to attract insects, like bees, to feed on its nectar. The pollen grains of such flowers are characterized by being sticky or having coarse surfaces to stick to the insect's body.

Fig. (22)



**3 Artificial pollination:**

It means pollination taking place by the help of man; as it occurs when the Gardener spread palm tree's pollen grains over their female flowers.

**2 Fertilization:**

Fertilization in plants means, the fusion of the male cell (pollen grain) with the (female cell) ovum. How does this happen?

Participate with your classmates in the co-operative group, in performing the following activity:

**Activity (3) Pollen grain germination:**

**Materials and tools :**

- Diluted sugar solution.
- Glass slides and covers.
- Water.
- Microscope.



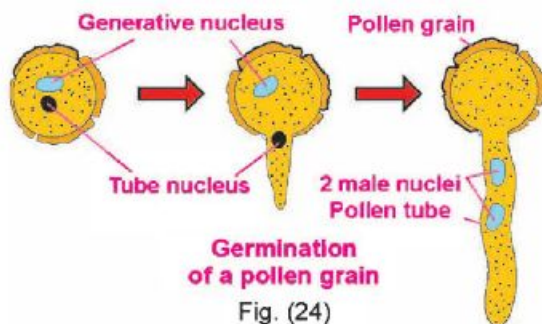
**Microscope**  
Fig. (23)

**Steps :**

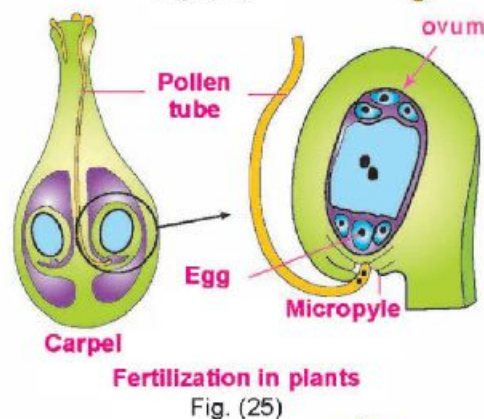
- 1 Put a drop of the diluted sugar solution onto a glass slide, then add pollen grains, and cover them with a glass cover.
- 2 Repeat the previous step, replacing diluted sugar solution with water.
- 3 Put both slides in a dark warm place for half an hour.
- 4 Examine both slides using the microscope Fig. (23), What do you observe? .....  
 .....  
 • Does the pollen grain show any change after adding the diluted sugar solution drop?  
 .....  
 • What is the relation between what you have observed and what happens when the pollen grain falls on the stigma of a flower?.....  
 .....  
 • What is your explanation?



After pollination, the pollen grain stick to the stigma, this secretes a sugary solution. The pollen grain then begins to germinate forming a **pollen tube** containing two male nuclei Fig. (24).



The pollen tube extends through the style and reaches the ovum by the micropyle opening in the ovary Fig. (25). The tip of the pollen tube degenerates in order that one of the two male nuclei fuses with the egg to form a fertilized ovum which is known as **the zygote**. The zygote in turn undergoes a process of successive divisions to form the embryo inside the ovum, which develops to become a seed at the same time the ovary grows to become the **fruit**.



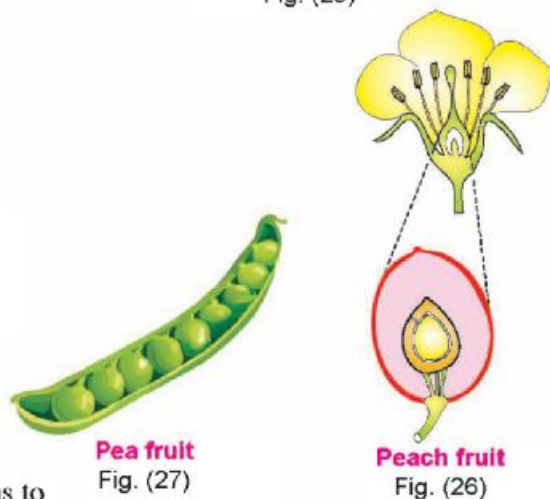
- Fruits differ from each other according to the nature of the ovary, if the ovary contains one ovum; it gives rise to a fruit with a single seed inside it, like olive and peaches. Fig. (26)
- However, an ovary with many ova, gives rise to a fruit with many seeds inside it, like beans and peas. Fig. (27)

**Exercise (5)**

After fertilization is completed, what happens to the wall of the ovary and the oval membrane?

.....

.....







**Second: Asexual reproduction in plants**

- Can plants reproduce without the presence of flowers?

Some plants can reproduce without the presence of flowers by means of parts of the roots, stems, leaves or buds, which is known as **vegetative reproduction**.

Vegetative reproduction may be natural or artificial.

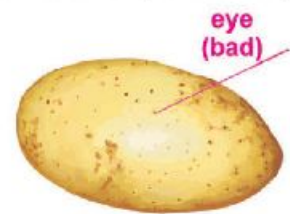
**1 Natural vegetative reproduction:**

Plants reproduce by vegetative reproduction in many ways like; reproduction by rhizomes, offshoots, chromes, tubers and bulbs. From which we'll study:

**Reproduction by tubers:**

- A tuber is a root like sweet potatoes or a underground stem like potatoes Fig. (28).

Participate with your co-operative group in doing the following activity:



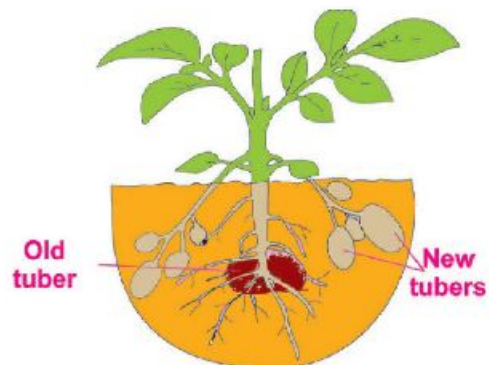
**Potato tuber**  
Fig. (28)

**Activity (4)**

**Identify reproduction by tubers**

- 1 Cut a tuber of potato into multiple slices, where each slice should contain a bud or more.
- 2 Cultivate these parts and water them regularly. **What to do observe after one week?** .....

Some buds grow forming a root system, and a shoot system, and after a while new tubers grow. Fig. (29)



**Reproduction by tubers**  
Fig. (29)



**2 Artificial vegetative reproduction:**

**1 Reproduction by cutting:**

- The cut is a part of a stem, taken from a plant for the purpose of reproduction. It's more common for the cut to be a branch carrying many buds, Fig. (30)

Participate with your classmates in the following activity:



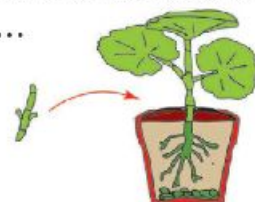
**A cut**  
Fig. (30)

**Activity (5)**

**Identify reproduction by cutting**

- 1 From the nearest flower house, get cuts of different plants, like grapes, roses, sugar cane, etc.
- 2 Cultivate them in a pot or a can full of soil, keeping in your mind a bud or more, should appear above soil surface. Water the cut what do you observe after two weeks?  
.....

☑ The buds buried inside the soil, grow to form roots, while the buds above the surface of the soil grow to form the shoot system of the plant. Fig. 31. These shrubs are then transferred to the soil to grow more efficiently.



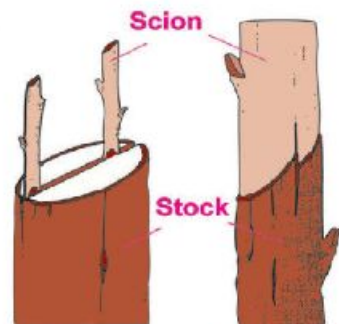
**Reproduction by cutting**  
Fig. (31)

**2 Reproduction by grafting:**

In reproduction by grafting, an individual plant is selected containing more than one bud, known as scion, to be put on another one known as the stock.

**Methods of reproduction by grafting:**

- **Grafting by attachment:** where the scion is attached to the stock, Fig. (32) as it occurs in mango trees.
- **Grafting by the wedge:** where the scion in the form of a wedge (pencil shaped) is inserted into a cleft in the stock Fig. (33) as it occurs in large trees.



**Grafting by wedge**  
Fig. (33)

**Grafting by attachment**  
Fig. (32)



In either cases, the scion and the stock are tied up tightly together, where the insert feeds on the juice of the origin, and the arising fruits belong to the scion. This type of reproduction is only applicable for plants highly similar to each other, like orange and naring, apples and pears, peaches and apricots.

**3 Tissue culture:**

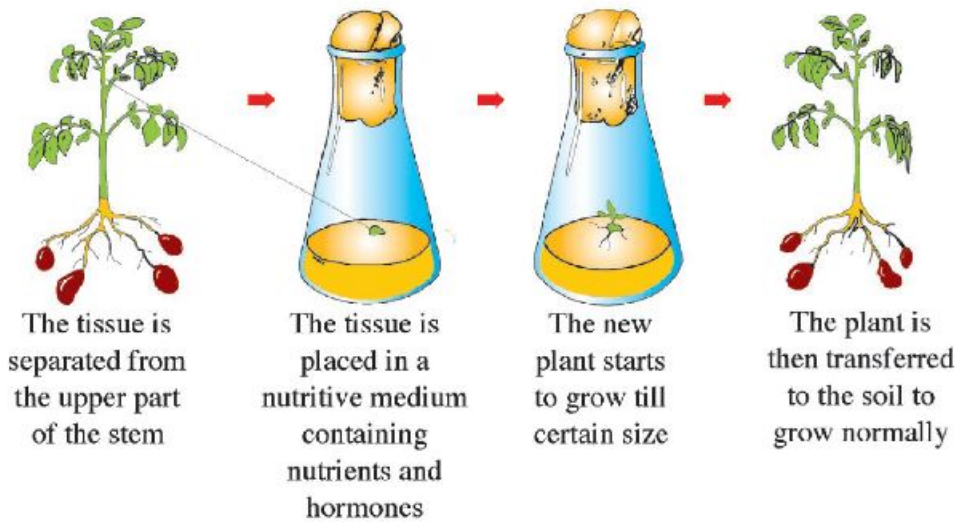
The scientists have developed a process of multiplying a small part of a plant to get many identical parts. This process is known as **tissue culture**. Fig. (34)

**EKB**

Glucing Stem is a Disease Which, Infect Bitter Orange Tree, Which Doesn't Infect Naring. That's Why Reproduction by Grafting is Useful

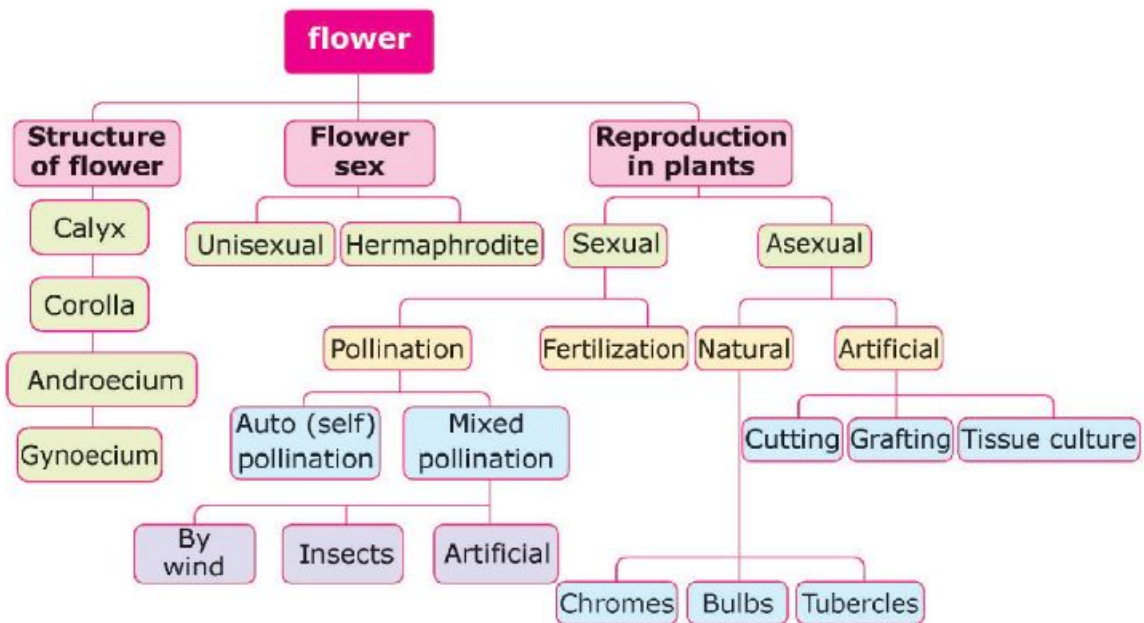
When the Disease Spreads in Orange is the Scion While Bitter Orange is the Stock.

From More Information Use the EKB



**Tissue culture from potato stem**  
Fig. (34)

## Lesson summary



- Androecium is the male organ in the flower, while gynoecium is the female organ.
- The hermaphrodite (bisexual) flower carries both male and female organ.
- The flower is a short stem, in which the leaves are modified to form reproductive organs.
- After fertilization, the ovary develops to become the fruit, and the ovum to become the seed.
- **Tissue culture:** a new evolved method of using a small tissue part of any plant to get many identical parts to be used or cultivated later.



**Lesson One Assessment**

1 Write the scientific term for each of the following:

- (a) Short stem where the leaves developed and modified into reproductive organs. (.....)
- (b) The cell resulting from the fusion of the pollen grain and the ovum nuclei. (.....)
- (c) A new method to produce large numbers of plants from a small part of it. (.....)

2 Choose from the column (b) and (c), what's suitable for column (a):

(a)	(b)	(c)
<b>Floral whorl</b>	<b>Consists of</b>	<b>Function</b>
1. Calyx	1. Stamen	1. Male organ in a flower.
2. Corolla	2. Sepals	2. Female organ in a flower.
3. Androecium	3. Carpels	3. Protects the inner parts of a flower.
4. Gynoecium	4. Petals	4. Attract insects to the colored leaves.

3 Exclude the unsuitable word, then write down the relation between the rest of the words:

- (a) Stigma /stamen/style/ovary .....
- (b) Cuttings/ pollination/layering / grafting .....

4 What happens to each of the following after fertilization .....

- (a) Ovary .....
- (b) Zygote .....

5 Give reasons for each of the following :

- (a) Palm flowers are unisexual.  
.....
- (b) Auto pollination can't happen in sunflowers.  
.....
- (c) Flowers pollinated by insects produce coarse pollen grains.  
.....

6 The opposite figure shows a flower being pollinated by wind (air):

(a) Write the labels for each of x and y.

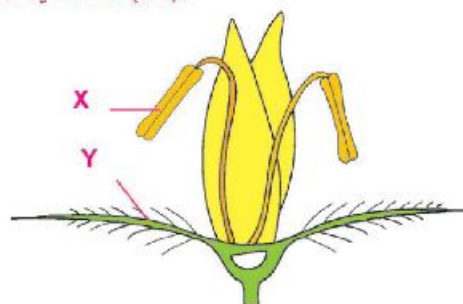
.....

(b) Mention two characteristics that make this flower pollinated by wind (air).

.....

(c) Explain how cross pollination happens in this flower.

.....



# Lesson 2

## Human Reproduction

### Lesson objectives:

By the end of studying this lesson, the student should be able to:

- 1 Recognize the structure of the genital system in human male.
- 2 Recognize the structure of the genital system in human female.
- 3 Conclude the function of the genital organs in human male.
- 4 Conclude the functions of the genital organs in human female.
- 5 Compare between the functions of female and male genital organs.
- 6 Describe the structure of the sperm.
- 7 Describe the structure of the ovum.
- 8 Conclude the concept of fertilization in humans.
- 9 Recognize some sexually transmitted diseases.
- 10 Recognize the different ways of preservation against sexually transmitted diseases.
- 11 Preserve health against the hazards of infection by sexually transmitted diseases.
- 12 Commit to healthy sexual habits.
- 13 Commit to the scientific, religious and social ethics.

### Elements of the lesson:

- 1 Male genital system.
- 2 Female genital system.
- 3 The concept of fertilization in humans.
- 4 The structure of the sperm and the ovum.
- 5 Venereal diseases and methods of prevention.

### Involved Issues:

- 1 Preventive health and therapy.

☐ The process of reproduction aims to secure the existence and continuity of living organisms' species and to prevent them from extinction. You might be enquiring... why can't man reproduce by asexual methods?

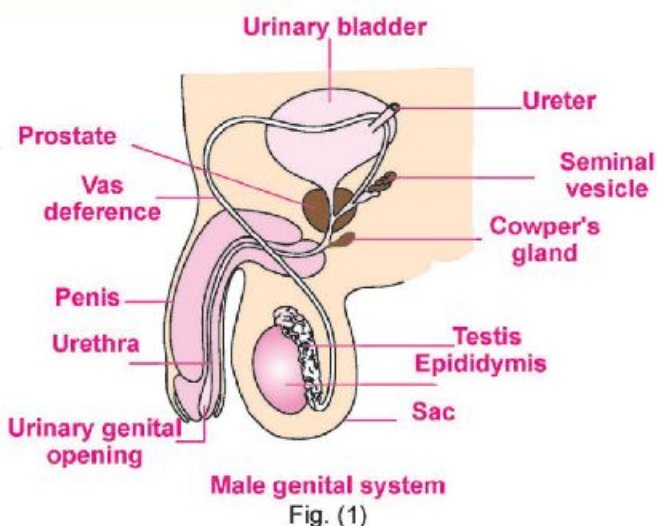
The offspring coming out through asexual reproduction are identical to the parent. While in humans, each and every individual has to be very special and different from others. That's why humans reproduce sexually – by mating – by means of two different persons – the male and female – using special system called **reproductive or genital system**. The structure of the genital system in male and female differ completely as each has its specific function.

**First: Genital system in male:**

☐ Take part with your classmates in the co-operative group under supervision of your teacher in performing the following activity, to be familiar with the structure of the male genital system by using one of the learning aids.

**Activity (1) Identify the male genital system**

- 1 Make use of an illustration for the male reproductive system - Fig. (1) Observe and mark the main components.
- 2 Trace the track of the sperm starting from the testicles.
- 3 What do you expect to happen to the journey of the sperm, if the vas deferens were cut?



☐ The human male genital system consists of; the testes, vas deferens, the urethra passing through the penis, in addition to associated glands.

**1 The testes:**

The testes are two glands, elliptical in shape and their function is to produce sperms and the male hormone known as testosterone, responsible for the appearance of secondary sexual characters in males, known as **signs of puberty**.



Some of the puberty sings

What are the male puberty signs shown in Fig. (2)?

.....





**The signs of puberty in the human male include;**

Hair growth in certain areas of the body as well as the moustache and beard, harshness of voice, the growth and development of the genital organs, growth of bones and enlargement of muscles. Fig. (2)

The testes are enclosed inside a sac is known as scrotum outside the body hanging between the thighs. Its function is to regulate and preserve the temperature of the testes two degrees below the normal temperature of the inside f the body, which is the optimum temperature for the growth and development of sperms.

**Enrichment information (1)**

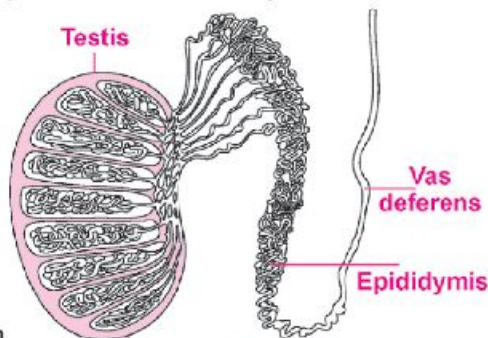
The testes of the elephant are present inside the body cavity. That's why it is surrounded by some cooling system that preserves the optimum temperature for the testes to function efficiently and produce healthy sperms.

**Exercise (1)**

What do you expect to happen if the testes where present inside the body and didn't come out during the development of the embryo?

**2 Vas deferens :**

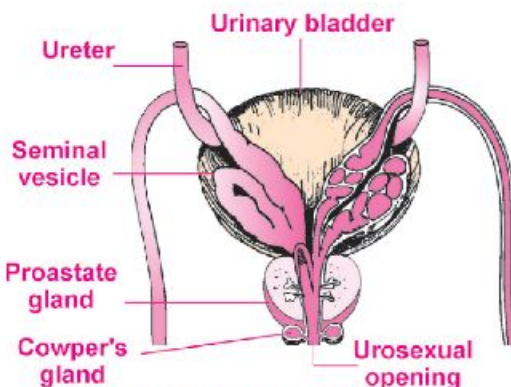
Attached to each testicle is a group of fine highly looped tubes known as the epididimis, where the sperms continue the final stages of growth and development and storage. The epididimis continues in the form of a long single tube known as the vas deferens. This tube helps transfer the sperms from the testes to the urethra.



The connection of the vas deference  
Fig. (3)

**3 The associated glands:**

Three kinds of glands are connected to the human male genital system, which are the seminal vesicles, the prostate and Cowper's glands Fig. (4). The secretions of these glands go with the sperms to form an alkaline fluid known as the seminal fluid. This fluid helps in neutralizing the acidity of the urethra, so that the sperms don't die during passing through it. It also contains a lot of nutrients that help nourishing the sperms and keep them alive and facilitates their flow.



The associated gland to the genital system  
Fig. (4)

**Enrichment information (2)**

The prostate is a muscular gland surrounding the urethra at the site of connection with the urinary bladder and it might be enlarged in some men above forty years. This leads to increasing pressure on the urethra which eventually causes difficulty in urination and needs to be removed surgically.

**4 The penis :**

It's an organ composed of a sponge-like tissue, the urethra passes through it and it ends by urosexual opening, through which the semen goes out as well as urine but never at the same time.

**Second : The female genital system:**

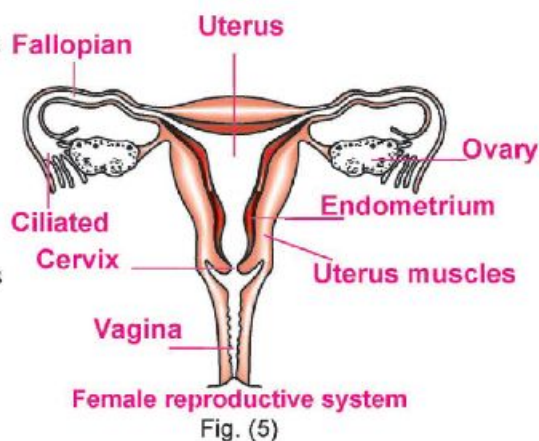
- ▣ The genital system in female differs from that in male in many aspects, mostly in being adapted to carry the embryo during the period of pregnancy.

Take part with your classmates in the co-operative group under supervision of your teacher in performing the following activity to be familiar with the structure of the human female genital tract using some learning aids:

**Activity (2)****Identify the structure of the female genital system in man**

- 1 Make use of a 3D model or an illustration showing the human female reproductive system. Fig. (5)
- 2 Observe and trace the track of the ovum starting at the ovaries.
- 3 What do you expect to happen to the journey of the ovum if the fallopian tubes become obstructed or surgically tied?

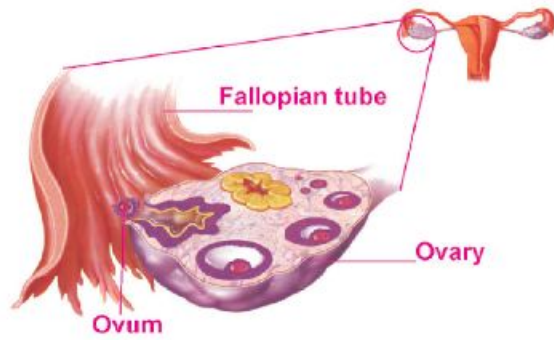
- ▣ The human female genital system consists of two ovaries, fallopian tubes, the uterus and the vagina.





**1 The ovaries:**

The ovaries are two glands, each one is in the size of a peeled almond like and they lie inside the body in the lower part of the abdominal cavity from the back. The ovaries are responsible for the production of the ova, one ovum every 28 days, produced by each ovary mutually in a process known as ovulation. Fig. (6) The ovaries are also responsible for the secretion of the female hormones, namely;



**The production of the ova and ovulation**  
Fig. (6)

- **Estrogen:** which is responsible for the appearance of secondary sexual characters in female
- **Progesterone:** which is necessary for the continuity of pregnancy.

**Signs of puberty in females:**

The growth of armpit and pubic hair, softness of voice, growth and development of breasts, fat accumulation in certain parts of the body, start of menstrual cycle which takes part every 28 days as long as no pregnancy happens. Menstrual cycle starts at the age of 11: 14 years of age and stops at the age of menopause 45: 55 years.

**Exercise (2)**

Calculate the number of ripen ova, that an adult woman can produce during 35 years, and what do you know about menopause?

.....

**2 fallopian tubes:**

Each starts with a funnel shaped opening with finger like processes and ended by joining the uterus at its upper corners. These tubes are adapted to receive the ovum and deliver it to the uterus Fig. (7). This is aided by the contractions and relaxations of the muscles present in the wall of the tubes as well as the movement of the lining cilia.

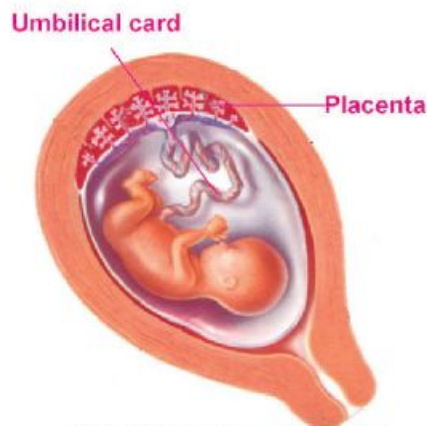


**The motion of ovum in fallopian tube**  
Fig. (7)



### 3 The uterus:

The uterus lies in the pelvic cavity between the urinary bladder and the rectum. It's a pear shaped hollow organ, with a muscular wall, that can expand during the stages of fetal growth during pregnancy Fig. (8). The uterus is lined by a mucus membrane rich in blood capillaries to form the placenta responsible for nourishment of the embryo during pregnancy by the umbilical cord.



Nourishing the embryo in the uterus  
Fig. (8)

### 4 The vagina:

The vagina extends from the uterus and ends by the external genital opening. It's a muscular tube that expands during labor to deliver the baby. Fertilization in humans

## fertilization in man

### Self enquiry:

how reproduction occur in man and how fertilization occurs?

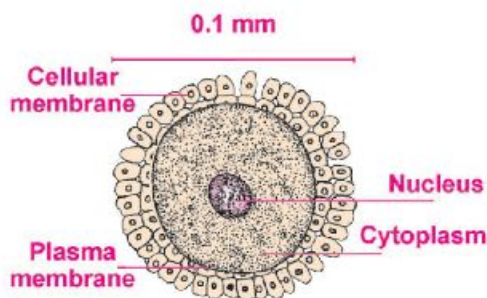
### Communication

Discuss with your classmates under supervision of your teacher, the answer of the Previous questions

- ☐ Before identifying the concept of fertilization in humans, you should firstly be familiar with the structure of the ovum and the sperm.

### Structure of the ovum:

The ovum is a static spherical cell Fig. (9) it's relatively large in size (the size of a sesame seed) due to storage of nutrient materials. It is composed of; a nucleus, which contains half of the genetic material for the species (chromosomes), the cytoplasm which stores food and nutrients. The cell is coated from outside by an intact cell membrane.



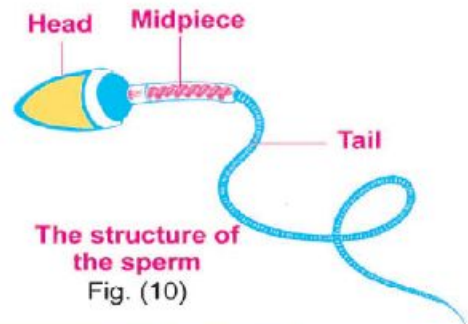
The structure of the ovum  
Fig. (9)



**Structure of the sperm :**

From Fig. (10), can you recognize the main components of the sperm? What are they?

- The sperm is considered very small by compare to the ovum.
- The sperm is composed of the **head**, containing a nucleus with half of the genetic material (chromosomes), the **middle part** which contains mitochondria responsible for energy production needed for the movement of the sperm. The **tail** is thin and long and is responsible for swimming and movement of the sperm to reach the ovum.



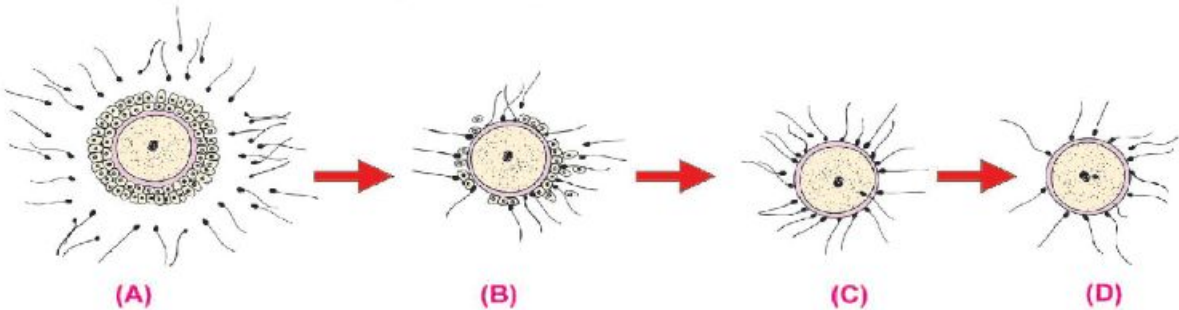
The structure of the sperm  
Fig. (10)

**Enrichment information (3)**

The testes of the adult human male produce about 2 billions sperms per day. The lifetime of a single sperm inside the female vagina ranges from 2 to 6 hours. This period can extend to reach up to 3 days if the sperm managed to break through the cervix and enters the uterus, where it feeds on uterine secretions.

**Fertilization and embryo formation :**

- You knew that the body of any living organism consists of cells; each cell contains a nucleus that comprises the genetic material of the species. The genetic material, **chromosomes**, carries **genes** which are responsible for the hereditary traits of the organism.  
The ovum and sperm differ in structure from any other cell in the body, regarding the number of chromosomes in the nucleus of each, where each of the nucleus of the ovum and the sperm contains only half the genetic material.



Steps of fertilization  
Fig. (11)

- During mating, the male secretes billions of sperms, the move from the vagina to the uterus and then to fallopian tubes. On the other hand, the female produces only one ovum in the 14<sup>th</sup> day from the begining of menstruation.



The sperms rush towards the ovum, at the beginning of fallopian tubes,(Fig. 11a). The head of the sperm secretes a material that dissolves the wall of the ovum and facilitates its penetration, (Fig. 11b), (Fig. 11c).

After the process of successful penetration, the ovum encloses itself by a membrane that prevents any other sperm from penetration. (Fig. 11d).

The nuclei of the sperm and ovum fuse together to form the fertilized ovum known as the zygote that contains a nucleus with 23 pairs of chromosomes. The zygote then transfers to the uterus to be implanted in its wall and start the journey of embryo formation and development, by being divided several times to form a clump of cells that continue to grow and specialized into different types of tissues.

The new born baby will carry the genetic traits of his parents.



Fertilization process  
Fig. (12)



The formation of embryo  
Fig. (13)

**Exercise (3)**

Conclude the concept of fertilization in human.

- ▣ The duration between fertilization and delivery is known as the pregnancy. This period lasts for 9 months.

**Enrichment information**

- In case of failure of fertilization, the endometrium falls down and the rich blood capillaries detach causing blood to flow out of the vagina in a process known as the menstruation.



## Diseases of the genital system :

- Genital system diseases in male and female are classified into two types:
  - **First type:** diseases not arising from sexual contact like; uterine cancer, prostate cancer, puerperal sepsis
  - **Second type:** diseases arising from sexual contact, sexually transmitted diseases STDs, like: gonorrhea, syphilis and AIDS

In this unit we will only study puerperal sepsis as an example of the first type and syphilis as an example of the second type.

### 1 Puerperal sepsis :

The bacteria responsible for puerperal sepsis are transferred by droplets from a person infected with bacteria, and suffering severe throat infection or tonsillitis, to a mother who's just given birth to a child, or from an infected wound. The incubation period of the disease ranges from one day to four days, which is the duration between start of infection and appearance of symptoms.

Symptoms severe increase in body core temperature, chilling, pallor, severe acute pains in the lower abdomen associated by bad smelling secretions from the uterus.



**Spherical bacteria**  
Fig. (14)

### Enrichment information (5)

The bacteria causing puerperal sepsis can be transferred to the patient by her own throat secretions. That's why a pregnant woman suffering any respiratory disease should be treated first before delivery especially in the last two months to avoid autoinfection. Suggest some ways and preventive methods to prevent puerperal sepsis.

**Prevention:** is achieved by commitment to good sterilization methods for surgical and personal tools, as well as wearing masks during delivery. Another approach is by preventing visits to the mother after delivery, especially if the visitors were or appeared to be suffering from respiratory diseases. The mother should also be kept warm and avoid exposure to cold air currents.



**2 Syphilis :**

Syphilis is caused by a special type of bacteria, that's transferred either from an infected person by sexual contact. The bacteria can also be transferred from the pregnant woman to her embryo. through umbilical Cord and during delivery Fig. (15)

Incubation period two to three weeks

Symptoms:

- The formation of a painless hard ulcer on the head of the penis in males and in the vagina and the upper part of the cervix in females.
- Dark brass colored rash appears on the back and hand of the patients. Fig. (16)

If the patient wasn't treated as soon as the symptoms appear, the patient could develop tumors in different parts of the body like the liver, bones and parts of the genital system. The brain may also be damaged and the patient eventually dies.

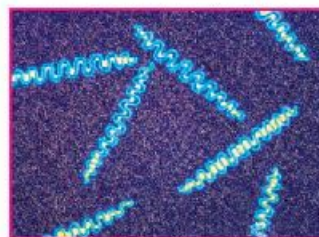
Syphilis can be treated in all the fore-mentioned stages.

How Can we prevent the disease

.....

**The effect of Smoking and addiction on the genital system :**

- 1 - Decrease the formation male hormone in man and female hormone in woman.
- 2 - Lead to the death of the embryos and recent born babies.
- 3 - the intake of drugs by pregnant mother lead to the increase of deformation rate is the em



**Spiral bacteria**  
Fig. (15)



**The hand of patient of syphilis**  
Fig. (16)

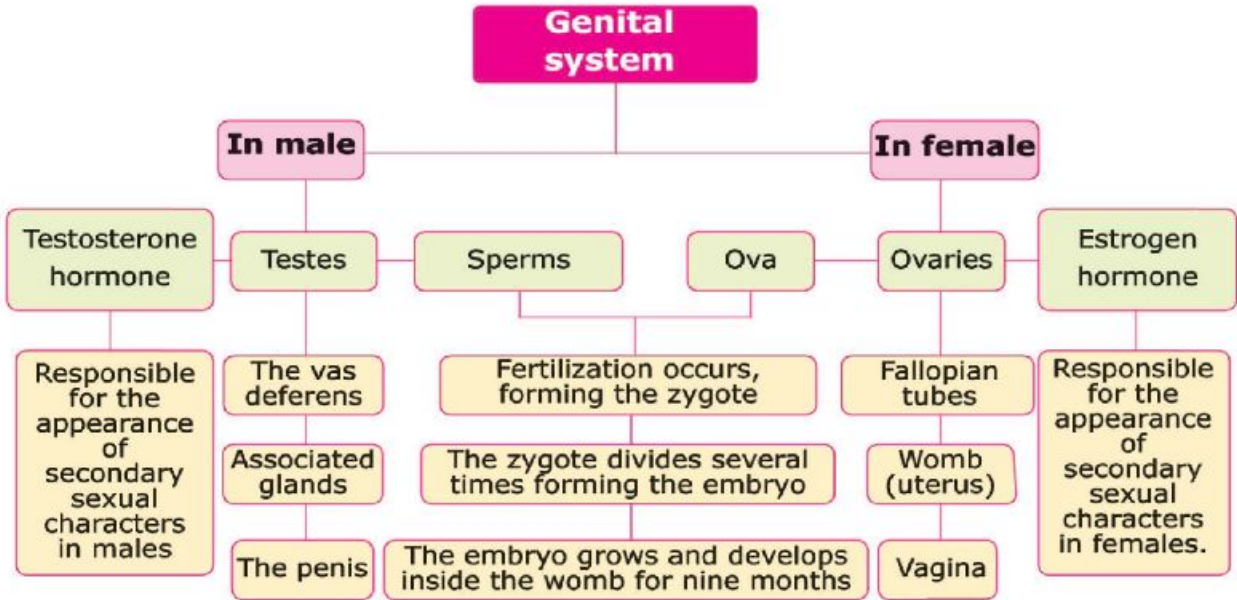
**Real Life Application: Healthy toilet seat cover**

A plastic medical cover in the form of an elliptical plastic frame – sold in pharmacies – is to be used in public toilets to avoid infection by some skin and genital diseases.





Lesson summary



- Three glands are associated with male genital system: two seminal vesicles, Cowper's glands, and the prostate.
- The ovum is a static, large sized cell with respect to the sperm.
- Among the diseases of the genital system are puerperal sepsis and syphilis.



**Lesson Two Assessment**

**1** Complete the following statements:

- (a) The sperm consists of....., middle part and.....
- (b) The ..... hormone in males and the ..... hormone in females are responsible for the appearance of secondary sexual characters.
- (c) .....glands and .....gland are from the glands associated with the male genital system.

**2** Choose the correct answer from those between brackets:

- (a) Fertilization occurs when.....is formed  
(embryo – zygote – endometrium – ovum)
- (b) An ulcer appears at the tip of the penis in males .....infection.  
(syphilis – gonorrhoea – puerperal sepsis – German measles)
- (c) The right ovary in the human female, produces a mature ovum every..... days.

(24 – 28 – 34 – 56)

**3** Give reasons for each of the following:

- (a) The man, whose testicles are still present inside the abdominal cavity, is infertile (sterile).

**4** Compare between the ovum and the sperm through three points of comparison.

Point of comparison	Ovum	Sperm
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....



5 Study the following figure which represents the female genital system, then answer the following questions:

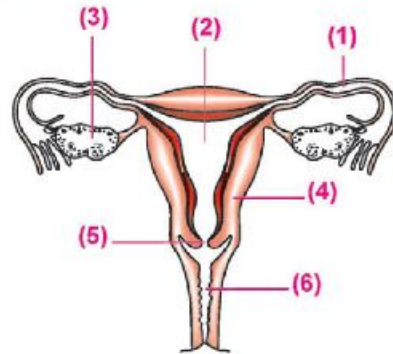
(a) Replace the numbers present on the figure by the suitable labels.

(b) What's the organ in which;

(i) Ova are produced.

(ii) The ovum is fertilized.

(iii) The embryo is delivered to life.



6 Mention the symptoms of syphilis and the preventive methods.

.....  
.....

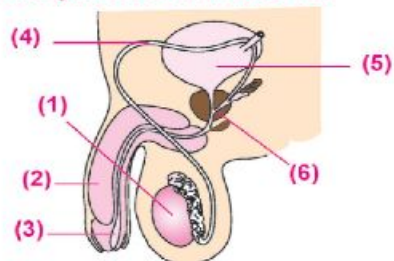
7 Creative thinking:

Write down as far as you know about the methods of prevention against diseases of the genital tract.

.....  
.....

## Unit three Assessment

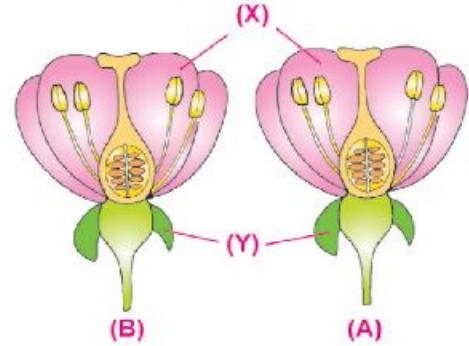
- 1** Write the scientific term for each of the following
- (1) An oval shaped gland that produces male cells. (.....)
  - (2) The process of producing ova from the ovaries mutually every 28 days. (.....)
  - (3) The reproduction of some plants by parts of the roots, stem or leaves. (.....)
- 2** Correct the following sentences without changing the underlined words:
- (1) The wall of the ovary after pollination forms the wall of the fruit.  
.....
  - (2) The progesterone enzyme is responsible for pregnancy to continue.  
.....
  - (3) Reproduction by tuber happens in orange and bitter orange.  
.....
  - (4) The ovum is a mobile cell, of a relatively large size.  
.....
- 3** Extract the unsuitable word, the write the relation between the rest of the words:
- (1) sepals/petals/tubers/crapels.  
.....
  - (2) AIDS/ gonorrhea/ syphilis/ measles.  
.....
- 4** Give reasons for each of the following:
- (1) Man can't reproduce asexually.  
.....
  - (2) The petals of corolla are colorful and scented.  
.....
- 5** What's meant by each of the following?
- (1) The sperm carries half of the genetic material of the species.  
.....
  - (2) Tissue culture of a carrot plant.  
.....
- 6** Study the opposite figure, which represents the male genital system, then answer the following:
- (1) Replace the numbers with the suitable labels.
  - (2) Write the number of the part, in which:
    - (a) Sperms are produced.
    - (b) Secretion of semen
    - (c) Transfer sperms from the testes to the penis.



7 Draw an illustration showing the structure of the female human ovum.

8 The opposite figure shows two flowers of two plants of the same species:

- (1) What's the function of the parts x and y?
- (2) Pollen grains from the flower (a) are transferred to the ova in flower (b):
  - (a) What's the type of pollination that happened?
  - (b) What's the sex of flower (a)?



## قائمة المراجع المستخدمة في تأليف الكتاب







### المراجع العربية






- (١) موسوعة المشاهدة العيانية (الكيمياء) - أحمد شفيق الخطيب - مكتبة لبنان ناشرون
- (٢) القانون العظيم في الكيمياء - د. تريفونوف - دار مير للطباعة والنشر
- (٣) الموسوعة العلمية المعاصرة - أحمد شفيق الخطيب - دار مير للطباعة والنشر
- (٤) الأرض تدافع عن نفسها (الماء) - بامبلا جرانت - مكتبة الأسرة
- (٥) دليل استخدام معاميل العلوم المتطورة للمرحلة الإعدادية - وزارة التربية والتعليم
- (٦) الكيمياء في خدمة الإنسان - رولاند جاكسون - الهيئة المصرية العامة للكتاب
- (٧) التلوث البيئي وأثره على صحة الإنسان - د. محمد السيد أرناؤوط - مكتبة الأسرة
- (٨) قصص ومطرائف عن الفلزات - ترجمة عيسى مسوح - دار مير للطباعة والنشر
- (٩) سلسلة ألقا العلمية (الأعاصير والعواصف) - نيكولا باربر - مكتبة العبيكان
- (١٠) بيتنا مستقبلا (أزمة المناخ) - أكاديميا
- (١١) المناخ والطقس - إبراهيم حلمي - دار الشرق العربي
- (١٢) السلامة من الكوارث الطبيعية - جمال صالح - دار الشروق
- (١٣) موسوعة الأجيال (الطبيعة) - الأجيال للترجمة والنشر
- (١٤) استكشف العالم والكون (الغابات) - مكتبة لبنان ناشرون
- (١٥) موسوعة الأرض المبسطة (الغابات) - مكتبة لبنان ناشرون








### المراجع الأجنبية

- (1) HOLT Chemistry - HOLT RINEHART WINSTON
- (2) Chemistry - J A Hunt and A sykes - Longman
- (3) Chemistry (PRINCIPLES and REACTIONS) - Harcourt
- (4) Chemistry - ZUMDAHL ZUMDAHL - HOUGHTON MIFFLIN
- (5) KEY SCIENCE (Chemistry) - Eileen Ramsden - Stanley Thornes
- (6) ASTRONOMY - John D. Fix - M Mosby
- (7) Environmental GEOLOGY - Carla - WCB
- (8) BIOLOGY (PRINCIPLES & EXPLORATIONS) - HOLT RINEHART WINSTON
- (9) BIOLOGY (The unity and Diversity of life) - Wads Worth

قائمة بالروابط الخاصة بموضوعات العلوم للصف الثاني الإعدادي  
الفصل الدراسي الثاني

QR	عنوان الفيديو	الوحدة
	<b>Amplitude</b>	<b>First Periodic motion</b>
	<b>Properties of waves</b>	
	<b>Tones and frequency</b>	
	<b>Types of waves</b>	
	<b>Sound waves</b>	
	<b>Waves and transfer of energy</b>	

	<b>Nature of Light</b>	<b>Second Sound and Light</b>
	<b>Characteristics of light waves</b>	
	<b>Properties of light</b>	
	<b>Reflection and Refraction</b>	
	<b>Light refraction</b>	

	<b>Introduction about Reproduction</b>	<b>Third Reproduction and species survival</b>
	<b>Structure of flower</b>	
	<b>Pollination by insects</b>	
	<b>Pollination by air</b>	
	<b>How does human reproduce?</b>	
	<b>The male genital system</b>	
	<b>The female genital system</b>	