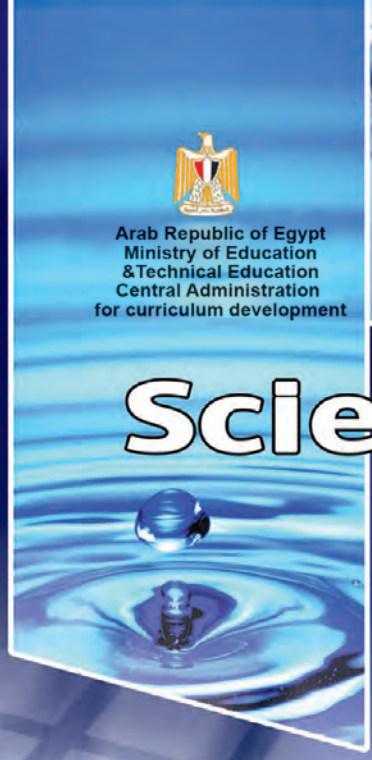

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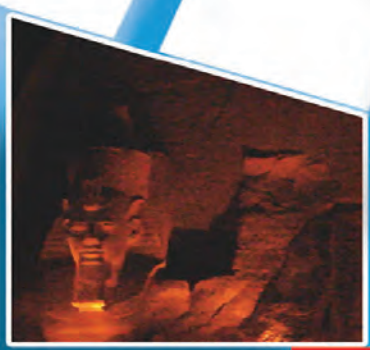
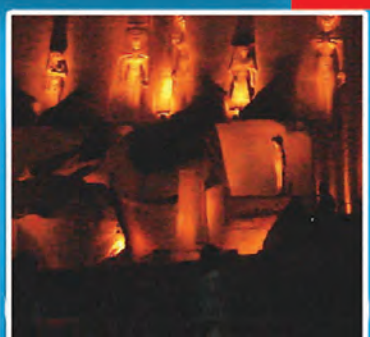


2023 - 2024

Preparatory Two



غير مصرح بتداول هذا الكتاب خارج وزارة التربية والتعليم والتعليم الفنى

Arab Republic of Egypt
Ministry of Education
&Technical Education
Central Administration for
curriculum development

Science

Think and learn

2nd prep.

First & second term

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2023 / 2024

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 والجداول، 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 فكِّر وتعلَّم، وقد تم الاسترشاد فى إعداده بآراء بعض المتخصصين فى المناهج وطرق تدريس العلوم والموجهين والمعلمين والتلاميذ، تأكيدًا 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 وللعمل، 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

Contents

Unit 1

Periodicity of Elements and their Properties

Lessons of the unit

Lesson 1 : Attempts of elements classification.
Lesson 2 : Graduation of elements properties in the modern periodic table.
Lesson 3 : Main groups in the modern periodic table.
Lesson 4 : Water.

Sources of knowledge and learning

• Books and scientific encyclopedi

1 Greal Law in Chemistry	Mare House
2 Easy Chemistry Dorothy Paul	Lebanon Bookshop
3 Water	Family Bookshop
4 Water Steve Parker	El Farouk House

Learning objectives of the unit

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

1. Follow the efforts and attempts of some scientists to classify elements (Mendleev - Moseley - Modern Periodic Table)
2. Recognize the principles of elements classification in the mode n periodic table.
3. Estimate scientists efforts in discovering , classifying and investing elements.
4. Determine the location and properties of some elements in the modern periodic table by recognizing their atomic numbers.
5. Compare the properties of groups and periods in the modern periodic table.
6. Compare between metals, nonmetals , semimetals and inert gases in their electronic configuration and chemical activity
7. Describe main groups in the modern periodic table.
8. Describe elements properties and their uses.
9. Use tools, materials and instruments in studying elements properties.
10. Recognize the importance of water and its sources.
11. Determine the chemical and natural properties of water.
12. Explain the irregularity of the natural properties of water.
13. Describe the chemical bonds among the atoms and molecules of water (covalent and hydrogen)
14. Recognize the polarization of some chemical compounds (Water-Ammonia)
15. Recognize the electrolysis of water.
16. Explain the equivalence of water.
17. Describe how water reacts with some of the elements of chemical activity series.
18. Determine water pollutants and their bad effects.
19. Determine the methods and measures for protecting water from pollution.
20. Estimate the importance of water locally and internationally.
21. Determine his/her personal responsibilities to protect water from pollution.
22. Make needed decisions to protect water from pollution.

Lesson 1

Attempts of Elements Classification

Lesson objectives

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

1. Recognize the efforts of some scientists to classify elements.
2. Recognize the principles of elements classification in the mode n periodic table.
3. Determine the location of some elements in the modern periodic table by recognizing their atomic numbers.
4. Deduce the atomic numbers of some elements by recognizing their locations in the modern periodic table.
5. Estimate the importance of discipline and organisation in our life.
6. Estimate scientists efforts in discovering, classifying and investing elements.

Points of the lesson

1. Mendleev's periodic table.
2. Moseley's periodic table.
3. Modern periodic table.

Included cases

1. Investment of environmental elements and raw materials.
2. Discipline and organisation.
3. Scientific research and its importance in discovering elements

- Many attempts are made by scientists for classification of elements to be easily studied, and find the relation between elements and their physical and chemical properties. Mendeleev's periodic table is considered as the first real periodic table for classification of the elements.

Activity (1) **Discovering the periodicity of the properties of elements.**

Enter the MOE website to carryout the activity

- The activity you did, doesn't differ from what the Russian Scientist Mendeleev did. In 1871. Fig. (1), he recorded on separately cards: the names of the elements, their atomic weights and their important properties. He arranged the similar elements in vertical columns called "groups" later. He discovered that the elements were arranged in an ascending order according to their atomic weights from left to right in the horizontal rows, which were later called "periods" and their properties are periodically repeated at the beginning of each new period. Mendeleev explained his periodic table in his book "Principles of Chemistry" In 1871, and classified the known elements until this time to be (67) elements, and he also classified each main group into two subgroups (A, B) where he found differences between their properties.

Mendeleev
Fig. (1)

To Complete the activity enter the MOE website

Enrichment information (1)

* Some elements have many forms having the same atomic numbers but differ in atomic weights which known as "Isotopes".
* Read and collect information about Scientist Mendeleev. (Use magazines , encyclopedias and the internet).

Advantages and disadvantages of Mendeleev's table.

Mendeleev predicted the ability of discovering new elements. So he left spaces (empty cells) in his table, and he corrected the wrong estimated atomic weights of some elements. He had to make a disturbance in the ascending order of atomic weights for some elements, due to putting them in groups which suit their properties, and he also would have to deal with the isotopes of one element as different elements because they are different in their atomic weights.

Enrichment information (2)

In 1871, Mendeleev predicted the properties of an unknown element and named it ICA silicon that was named germanium (Ge) and its properties was the same as Mendeleev had predicted.

Self inquiry

Did you ask yourself: Why did he put more than an element in one place?

Communication

Discuss with your classmates under the supervision of your teacher about advantages and disadvantages of Mendeleev's periodic table.

Moseley's periodic table

In 1913, the Newzealand Scientist Rutherford discovered that the nucleus of atom contains positively charged protons, the British Scientist Moseley discovered in the same year after studying the properties of x rays that the periodicity of elements properties is related to their atomic number not their atomic weights as Mendeleev believed.
So Moseley rearranged the elements in an ascending order according to their atomic number such that the atomic number of an element increases by one than the element

Enrichment information (3)

* From the discoveries which have helped Moseley to put his periodic table are :
1. Radiation activity phenomena.
2. Getting of x-rays.
3. The more knowledge about the arrangement of electrons in atoms.

before it in the same period, and he added the (nable inert gases) in the (0) zero group, and he located a place below his periodic table for the two series elements (lanthanides and actinides).

Exercise (1) Enter the MOE Website

The modern periodic table

After the Danish Scientist Bohr discovered the main energy levels fig. (2). They are 7 in the known heaviest atom so far. It was discovered also that each main energy level consists of a number of energy levels known as the energy sublevels.

* Elements are classified in the modern periodic table according to:

* Their atomic numbers and the way of filling the energy sublevels with electrons.

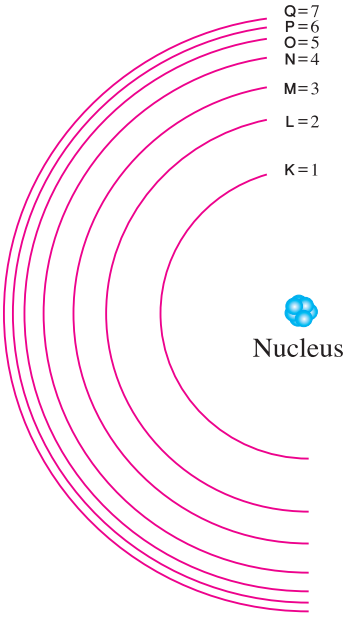
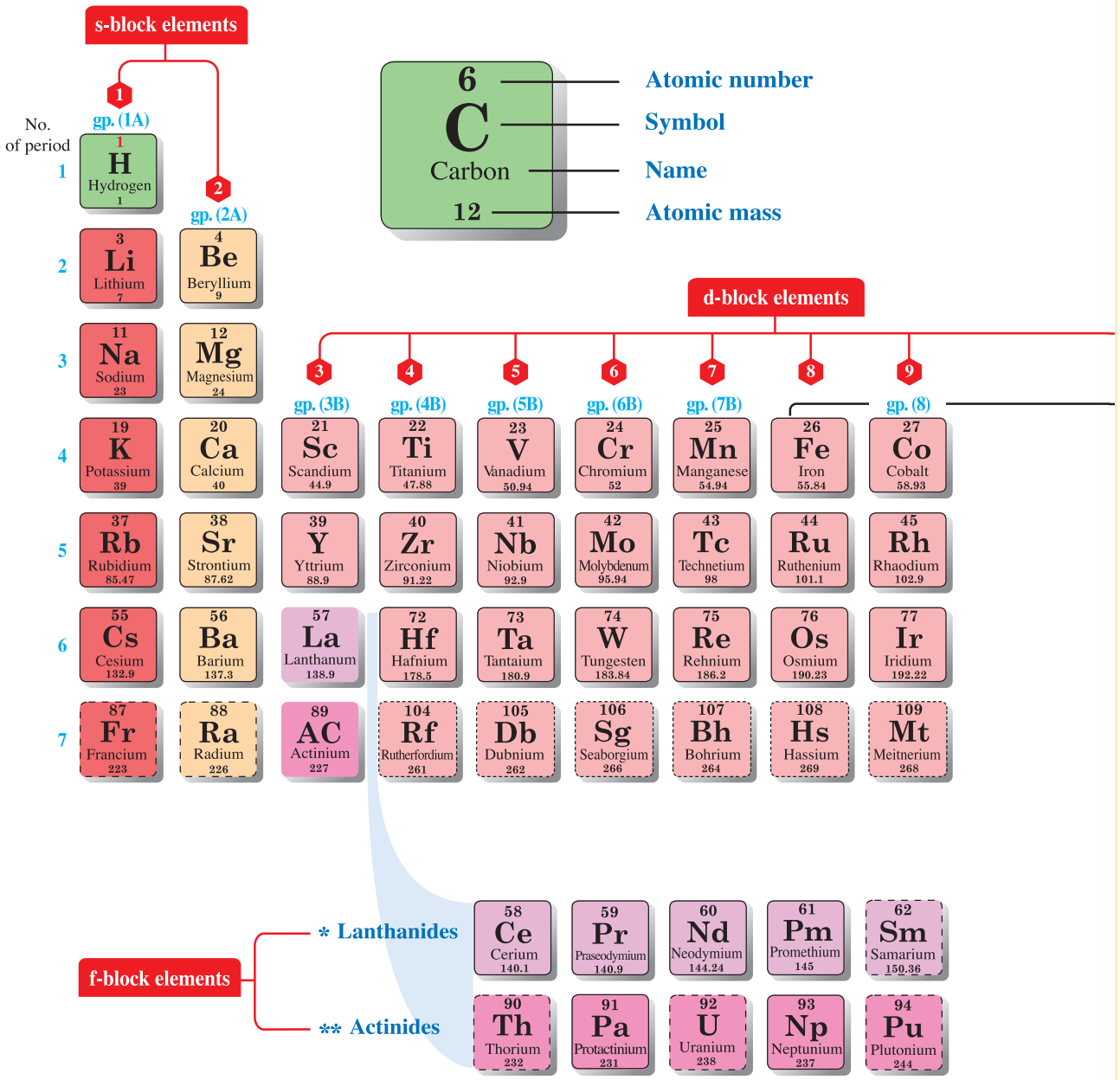


Fig. (2)

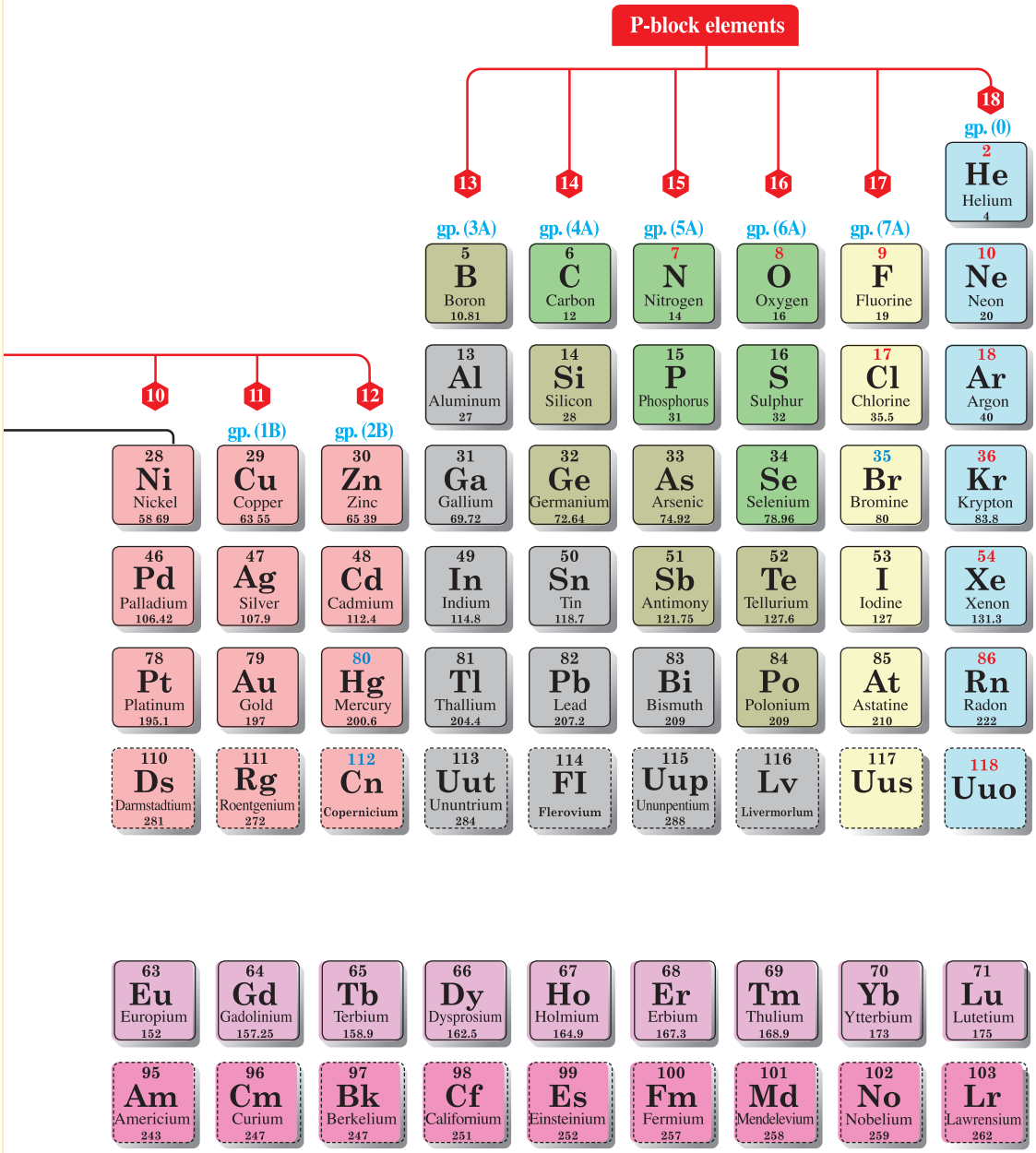
Enrichment Information (4)

Each main energy level (K,L,M,N,O,P,Q) contains a number of energy sub-levels equal to its number. For example the main fourth energy level N consists of four energy sub-levels which are s,p,d and f.



The periodic table

Fig. (3)



Alkali metals	Alkaline earth metals	Lanthanides	Actinides	Transition metals
Poor metals	Metalloids	Nonmetals	Halogens	Noble gases

State at standard tempurature and pressure

Atomic number in red: gas

Atomic number in blue: liquid

Atomic number in black: solid

solid border: at least one isotope is older than the Earth (Primordial elements)

dashed border: at least one isotope naturally arise from decay of other chemical elements and no isotopes are older than the earth

dotted border: only artificially made isotopes (synthetic elements)

no border: undiscovered

Description of the modern periodic table

Activity (2)

Description of the modern periodic table

Participate with your classmates in forming co-operating groups for studying the modern periodic table

Enter the MOE website to carryout the activity

From studying the modern periodic table:

- The number of known elements until now are 118 elements, 92 elements are abundant in the earth's crust, the rest of the elements are prepared artificially.
- Elements of (A) groups lie on the left and right of the table, you can locate their position in the modern periodic table by knowing their atomic numbers and vice versa.
- The elements of (B) groups lie in the middle of the table Starting From The Fourth Period and including 10 Groups Known as Transition elements.

Enrichment Information (5)

(1) Recently discovered elements are not found in nature but they are prepared artificially.

(2) These elements are radioactive elements, their nuclei are decayed in less than a second.

(3) Use Excel Program in drawing a table that explains periods and groups of periodic table.

Exercise (2)

Enter the MOE website

Life application **House library**

- Form a bookstore at your home
(Use Family Library - school library).
Apply what you have studied about the elements classification in arranging them in horizontal rows and vertical columns.
including the subject of the book (scientific, historical, religious, ...) and making an index for the books to facilitate the search process.

House library figure (4)

Activity (3) **Determination of the position of an element in the periodic table by knowing its atomic number**

Participate with your classmates in the co-operating group to do the activity.

Enter the MOE website

Conclusion :

1. Number of period of the element = Number of energy levels occupied by electrons in its atom.
2. Number of the group of the element = Number of electrons in the outermost energy level in its atom.

Exercise (3)

Enter the MOE website

Activity (4) **Determination of the atomic number of the element by knowing its location in the periodic table.**

Enter the MOE website to carryout the activity

Conclusion :

1. The atomic number of an element = Sum of the number of electrons which rotate around the nucleus of its atom and also = The number of protons in the nucleus.
2. The atomic number of an element is a whole number increasing through periods from element to the following element by (1).

Activity(5) Development of scientific and life concepts

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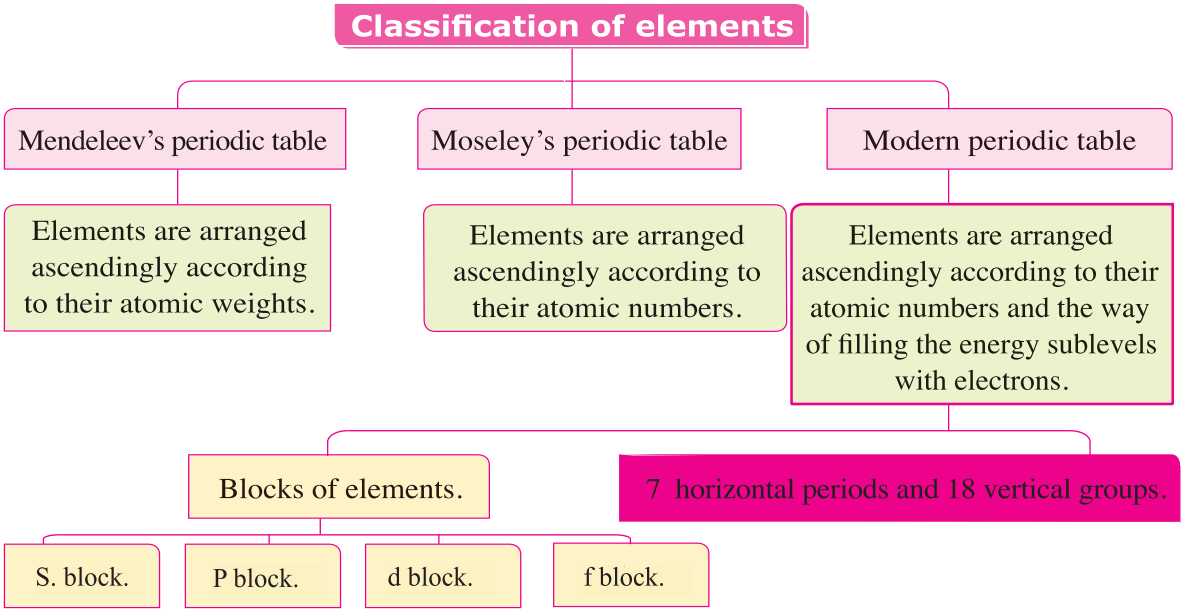
Lesson summary



- Each main energy level contains a number of energy sublevels.
- Transition elements start to appear in the fourth period.
- Number of period of the element = Number of energy levels occupied by electrons.
- Number of group of the element = Number of electrons in the outermost energy level in its atom.

For extra activity and practice,go to the MOE website

Lesson 2

Graduation of Elements in the Modern Periodic Table

lesson objectives :

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

1. Determine the properties of some elements by knowing their atomic numbers.
2. Compare between some elements according to the electronic configuration and the chemical activity.
3. Identify metals, nonmetals and metalloids.
4. Compare between the properties of the groups and the periods in the periodic table.
5. Identify the polarity of some chemical compounds.
6. Identify the behaviour of some metals of the chemical activity series with water.
7. Use tools and substances discovering the chemical properties of metals and nonmetals.

Points of the lesson :

1. Atomic size property.
2. Electronegativity property.
3. Metallic and nonmetallic property.
4. Chemical activity series.
5. Chemical properties of metals.
6. Chemical properties of nonmetals.

Included cases :

1. Using of the elements and environmental resources.
2. Graduation of responsibilities of both personal and social decisions.
3. Integration of responsibilities and roles.

This lesson discusses the graduation of some elements properties in the periods and the groups (A) in the periodic table and the relation between these properties and the electronic configuration of elements.

1 Atomic size property :

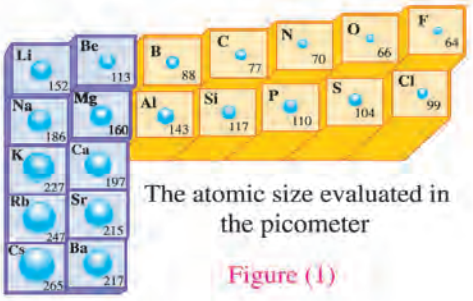
The atomic size is determined by knowing the atomic radias. and measured in picometre = 1×10^{-2} m

1- Picometre equalize one part of million million part of meter. = 1×10^{-12} m

Activity (1) **Discovering of the graduation of atomic size in the periodic table.**

Think carefully with your colleagues in the co-operating group (figure 1)

Enter the MOE website



The atomic size evaluated in the picometer

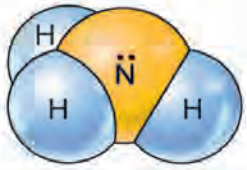
Figure (1)

From the previous, we conclude that:

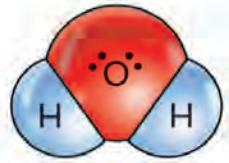
1. The atomic size of the same period decreases by the increase of their atomic numbers. Due to the increase of the attraction force between positive nucleus and the electrons in the outermost energy level.
2. The atomic size of the same group increases by the increase of their atomic numbers due to the increase of the number of the energy levels in the atoms.

2 The electronegativity property:

It is defined as the ability of the atom in the covalent molecule to attract the electrons of the chemical bond towards itself. as that in water molecule and ammonia molecule Figure (2) that are known as a"polar compounds".



Polar ammonia molecule



Polar water molecule

Figure (2)

The Polar Compound is a Covalent Compound where The difference in electronegativity between its elements is relatively large

Self inquiry

Did you ask yourself about the relationship between the electronegativity and the polarity of some compounds like CH_4 methane gas, H_2S hydrogen sulphide?

Communication

Discuss with your classmates and your teacher the owner of idea for classification elements into metals and nonmetals.

Enrichment information (1)

the covalent bond is described as pure when the electronegativity difference between the two joined atoms equal zero.
What is the kind of covalent bond in oxygen molecule ?

3 The metallic and nonmetallic property:

– Elements are divided into 4 main kinds, which are :

- Metals.
- Nonmetals.
- Semimetals (Metalloids).
- Inert gases.

Metals are characterized by that their outermost shells contain less than (4) electrons and tend to lose these electrons during the chemical reaction. To reach the nearest inert gas preceding them in the periodic table, forming positive ions.

Enter the MOE website

Some elements have both properties of metals and nonmetals which are known as metalloids.

Like Boron - Silicon - germanium - Arsenic - Antimany - Tellurium

Activity (2) Discovering the graduation of the metallic and nonmetallic properties in the periodic table.

Enter the MOE website

From the previous, we can conclude :

- The period starts with strong metal, as the atomic number increases in the same period the metallic property decreases gradually until we reach semimetals and then nonmetals start appear and as the atomic number increases, the nonmetallic property increases until we reach the strongest nonmetal in group 7A.
- Metallic property of the same group increases by the increase of the atomic number as we go from up to down (as in group 1A) due to the increase of the atomic size, while nonmetallic property decreases (as in group 7A)

Exercise (1)

Enter the MOE website

The chemical properties of metals :

To know the chemical properties of metals, participate with your classmates in the co-operating group under the supervision of your teacher to do the following activity.

Activity (3) Discovering the chemical properties of metals.

Substances and tools :

- Magnesium strip.
- Water.
- A jar filled with oxygen.
- Violet litmus indicator solution
- Test tube.
- Dilute hydrochloric acid.
- Holder.

Steps :

1. Put a piece of magnesium strip in the test tube, then add the dil. hydrochloric acid.
2. Heat another piece of magnesium strip using the holder till glowing and put it in the jar filled will oxygen fig (3).
3. Add some water to the jar with shaking.

Burnning of magnesium in oxygen
Figure (3)

Observations :

1. Does magnesium oxide dissolve in water ?
2. What is the effect of adding drops of violet litmus to the solution formed in the jar fig (4) ?

The effect of adding violet litmus to magnesium oxide solution
Figure (4)

Conclusion :

1. Some metals react with dilute acids forming salt of acid and hydrogen gas fig (5) .

$$\underset{\text{Magnesium}}{Mg} + \underset{\text{Hydrochloric acid}}{2HCl} \xrightarrow{\text{Dil.}} \underset{\text{Magnesium chloride}}{MgCl_2} + \underset{\text{Hydrogen}}{H_2\uparrow}$$

magnesium reacts with hydrochloric acid.
Figure (5)

2. Metals react with oxygen forming metallic oxides which are known as basic oxides.

$$\underset{\text{Magnesium}}{2Mg} + \underset{\text{Oxygen}}{O_2} \xrightarrow{\Delta} \underset{\text{Magnesium oxide}}{2MgO}$$

3. Basic oxides which dissolve in water form alkalis:

$$\underset{\text{Magnesium oxide}}{MgO} + \underset{\text{Water}}{H_2O} \longrightarrow \underset{\text{Magnesium hydroxide}}{Mg(OH)_2}$$

Enrichment information (2)

A mixture of MgO , $MgCl_2$ and H_2O in making stones for making blades of knives which are very thin. (Sharpening knives).

▣ Metals are arranged descendingly according to their Chemical activity known as "chemical" activity series, the chemical activity of metals with water is different according to their position in the series as shown in the table (3).

Table (3)

K Potassium and Na Sodium	React instantly with water and H_2 evolves which burn with a pop sound
Ca Calcium and Mg Magnesium	React very slowly with cold water.
Zn Zinc and Fe Iron	React in high temperature with water vapor only.
Cu Copper and Ag Silver	Don't react with water.

Enrichment information (3)

High concentration of sodium ions Na^+ in the body causes high blood pressure so high blood pressure patients are recommended to decrease using table salt in foods.

Read and collect information about the importance of the different elements in food .

Life application | Cleaning silver tools

go to the MOE website

The chemical preperties of nonmetal:

To know the chemical preperties of nonmetal elements. Participate with your classmate under the supervision of you teacher to do the following activity:

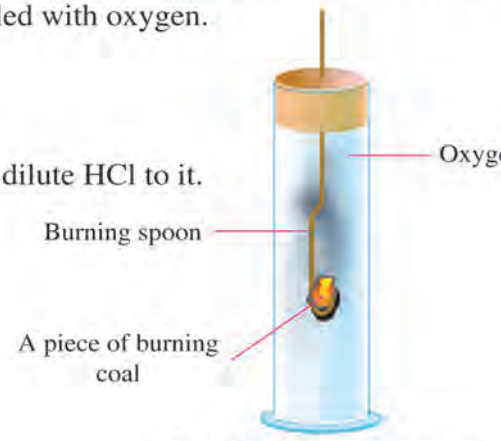
Activity (4) Discovering the chemical properties of nonmetals.

Substances and tools :

- Two pieces of coal (Carbon).
- Burning spoon.
- Violet litmus indicator solution
- Two test tubes.
- A jar filled with oxygen.
- Dilute hydrocholric acid.

Steps :

1. Put a piece of carbon in the test tube, then add dilute HCl to it.
2. Heat the other piece of carbon in the burning spoon till it burns, then put it in the oxygen jar fig (6)
3. Add some water in the jar with shaking.



Burning of carbon in oxygen

Figure (6)

4. Does a reaction take place between carbon with the acid?

5. What is the effect of adding drops of violet litmus solution to the formed solution in the jar figure (7)?

Observations :

1. Does a reaction take place between carbon with the acid ?
2. What is the effect of adding drops of violet litmus solution to the formed solution in the jar figure (7) ?

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Conclusion :

- Nonmetals don't react with acids.
- Nonmetals react with oxygen forming non-metal oxides. Most of them are known as acidic oxides.

$$\underset{\text{Carbon}}{C} + \underset{\text{Oxygen}}{O_2} \xrightarrow{\Delta} \underset{\text{Carbon dioxide}}{CO_2}$$

- The nonmetal oxide dissolves in water forming acids.

$$\underset{\text{Carbon dioxide}}{CO_2} + \underset{\text{Water}}{H_2O} \longrightarrow \underset{\text{Carbonic acid.}}{H_2CO_3}$$

The effect of adding violet litmus solution to the acidic solution
Figure (7)

Enrichment information (4)

Some element oxides like aluminium oxide Al_2O_3 are called amphoteric oxides because they react with acids as basic oxides react with bases as acidic oxides and give in both cases salt and water.

Lesson summary

Graduation of the elements properties in the periodic table

- **Atomic size**
  - Increases by increasing the atomic number in the same group.
  - Decreases by increasing the atomic number in the same period.
- **Metallic property**
  - Increases by increasing the atomic number in the same group.
  - Decreases by increasing the atomic number in the same period.
- **Electronegativity**
  - Polar compounds as water and ammohia

- Electronegativity : Is the ability of an atom in the covalent compound to attract electrons of the bond to itself.
- Water and ammonia gas are from the examples of polar compounds.
- The properties of semimetals look like the properties of both metals and nonmetals.
- Chemical activity series : Is the descending arrangement of elements according to their chemical activities.

For extra activity and practice,go to the MOE website

Lesson 3

The Main Groups in the Modern Periodic Table

Lesson objectives :

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

1. Determine the valency of alkali metals.
2. Describe the behaviours of alkali elements in the chemical reactions.
3. Deduce the general properties of alkali metals.
4. Determine the valency of alkali Earth metals.
5. Describe the behaviour of alkali Earth metals in chemical reactions.
6. Deduce the general properties of alkali Earth metals.
7. Compare between the properties of alkali metals and alkali Earth metals.
8. Define halogen group.
9. Deduce the general properties of halogens.
10. Appreciate the importance of alkali metals and alkali Earth metals in our life.
11. Describe the properties of elements and their uses.
12. Appreciate the role of scientists and their efforts in studying elements and their uses in our life.

Points of the lesson

1. Alkali metals group.
2. Alkali Earth metals group.
3. Halogen group.
4. Inert gases group.
5. Properties of elements and their uses.

Included cases :

1. Making use of elements, resources and environmental ores.
2. Appreciating the role of science, scientists and scientific research in our life.

Some of the main groups in the periodic table are characterized by Specific names as explained in this lesson.

Description of some groups.

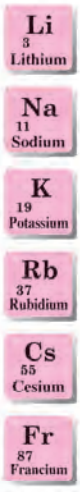
1 Alkali metals group (Group 1A) :

Observe and think carefully about the position of alkali metals in the periodic table (Fig.1) group 1A lies in the Far left of the periodic table (Fig.2) and their metals are named alkali metals because they react with water forming alkali solutions.

$$2\,Na + 2\,H_2O \longrightarrow 2\,NaOH + H_2$$

Sodium Water Sodium hydroxide Hydrogen

The place of the alkali metals group in the periodic table.
Figure (2)



Alkali metals
Figure (1)

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Enrichment information (1)

*Although hydrogen gas exists in group 1A , it is a nonmetal because its atom is remarkably small and it's a gaseous element.

*Search for the other similarities between hydrogen, metals and nonmetals.

Activity (1) Discovering the properties of alkali metals

Substances and tools :

• A very small piece of sodium. • A very small piece of potassium. • Filter paper. • Basin. • Water.

Steps :

1. Take out a sodium piece (pea size) from the kerosene in which sodium is kept. fig. (3)
2. Roll the sodium piece in the filter paper and put it carefully in the water basin.
3. Repeat the previous steps with potassium.

Figure (3)

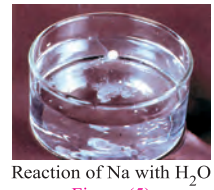
4. Why are Na and K kept under kerosene?
5. Which is stronger when reacting with water Na or K? Fig. (4 ,5)
6. Do Na and K float on the surface of water or sink in it ?

Enrichment information (2)

Lithium is not kept under kerosene because it floats on the surface of it and it is immediately burns so it is kept in paraffin oil.

Enter the MOE website

From the previous, we can deduce the general properties of alkali metals as follows.



Reaction of Na with H_2O
Figure (5)

Reaction of K with H_2O
Figure (4)

General properties of alkali metals :

1. They are mono-valent elements because their outermost shells contain (1) electron.
2. They tend to lose their valency electron forming positive ions that carries one positive charge.
3. They are chemically active elements so they are kept under kerosene or paraffin to prevent their reaction with the moist air.
4. Their chemical activity increases by the increase of atomic size. Cesium (Cs) is considered as the most active metal in general.
5. They are good conductors of heat and electricity.
6. Most of them have low density fig (5)

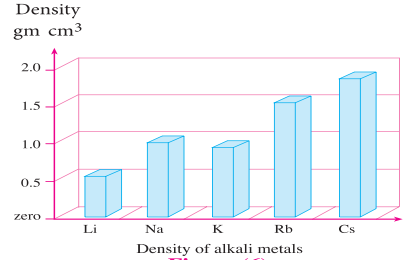


Figure (6)

Exercise (1)

Enter the MOE website

2 Halogens group (7A)

Observe and think carefully about the position of halogens group in the periodic table (Fig 7), the group 7A lies on the right side of the periodic table, it is one of (p) block groups, the nonmetals of this group are called halogens (Fig 8).

Lecation of halogens group in the periodic table
Figure (7)

Halogen elements
Figure (8)

i.e salts formations, because they react with metals forming salts.

$$2K + Br_2 \longrightarrow 2KBr$$

Potassium Bromine ⟶ Potassium bromide

Enrichment information (4)

*Chlorine is used in the manufacture of correctors substance, it is a very volatile liquid, on using, it becomes dry quickly, leaving a white substance on the paper surface.

Figure (9)

General properties of halogen elements :

1. They are mono-valent nonmetals ... Why ? .....
2. They exist as diatomic molecules F_2 , Cl_2 , ...
3. They are chemically active elements, so they do not exist individually in nature but they exist in chemical compounds, except astatine which is prepared artificially.
4. Each element in the group replaces the element below it in their solutions.

$$\underset{\text{Chlorine}}{Cl_2} + \underset{\text{Potassium bromide}}{2KBr} \longrightarrow \underset{\text{Potassium chloride}}{2KCl} + \underset{\text{Bromine}}{Br_2}$$

$$\underset{\text{Bromine}}{Br_2} + \underset{\text{Potassium iodide}}{2KI} \longrightarrow \underset{\text{Potassium bromide}}{2KBr} + \underset{\text{Iodine}}{I_2}$$

5. The physical state is graduated from the gaseous state (Flourine , Chlorine) to the liquid state (Bromine) to solid state (Iodine).

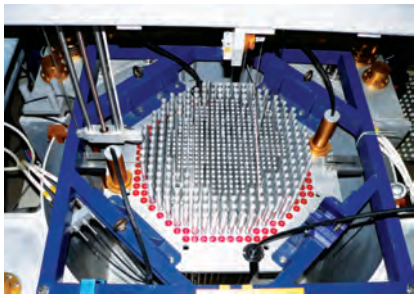
Exercise (2)

Enter the MOE website

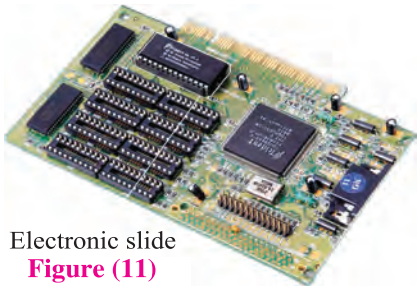
The properties of elements and their uses

The uses of elements or their compounds depend on their properties. You have studied before some of traditional uses for known elements. Now you will know the uses of some elements in the modern techniques.

1. Sodium is used in liquid state as it is a good conductor of heat. It is used also in transferring heat from inside the nuclear reactor to outside to obtain vapour energy required to generate electricity (Fig10).
2. Silicon slides are used in manufactureing of computer because they are semi-conductors which their conductivity of electricity depends on the temperature.
3. Liquified nitrogen is used in preservation of the cornea of the eye because it has a low boiling point (-196 ºC.)
4. The radioactive cobalt 60 is used in food preservation because gamma rays which come out from it prevent the reproduction of microbial cells without an effect on human.



Core of nuclear reactor
Figure (10)



Electronic slide
Figure (11)

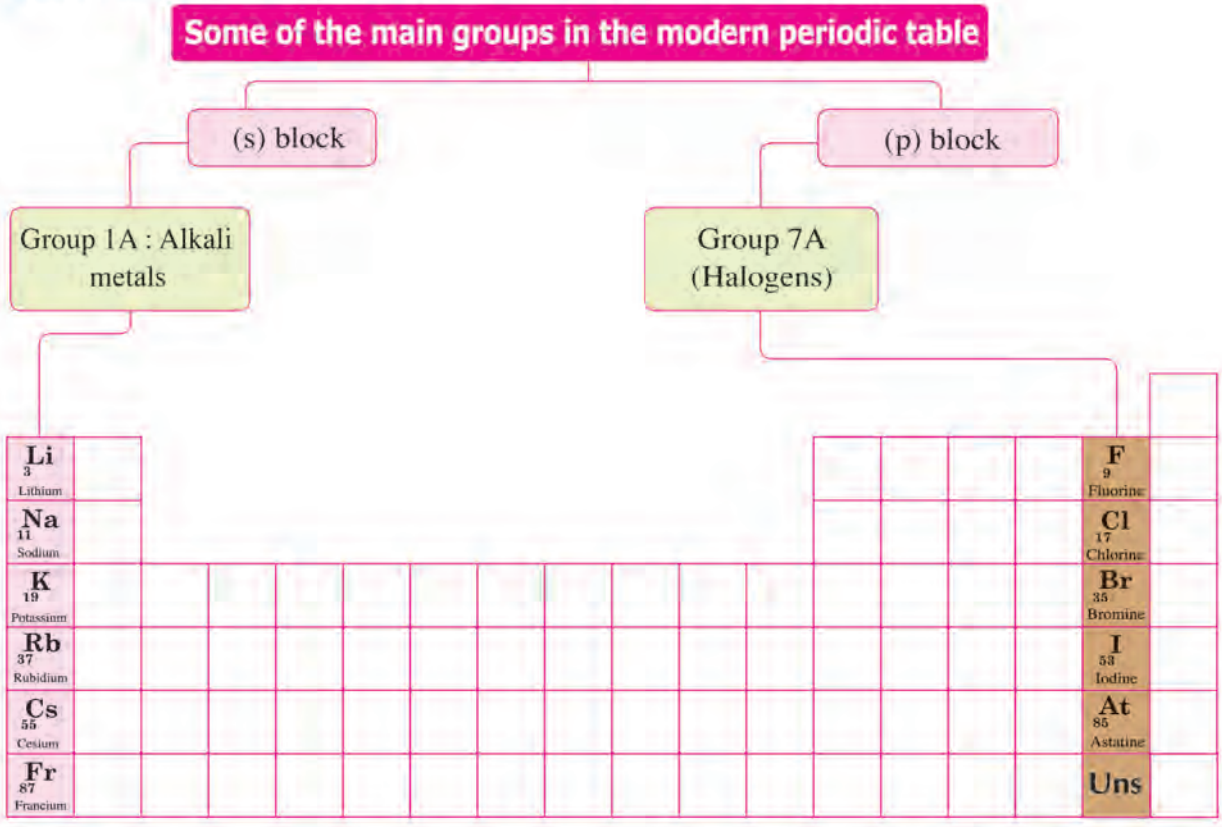
Enrichment information (5)

Dr: Moustafa El-Sayed

The Egyptian Scientist Dr: Moustafa El-Sayed got the highest American medal in science for his efforts in the Nano technology in 29th September 2008. (Nano) applying this technology in using gold in the treatment of cancer disease.

Sterilization of meats by gamma rays
Figure (12)

Lesson summary



- Alkali metals are mono-valent
- In halogen group each element replaces the element which below it in its salt solution.

For extra activity and practice,go to the MOE website

Lesson 4

Water

Lesson objectives

At the end of this lesson, The student should be able to :

1. Identify the bonds between its atoms and water molecules.
2. Identify the physical and chemical properties of water.
3. Explain the abnormality of physical properties of water.
4. Identify the electrolysis of water.
5. Explain why water is neutral.
6. Identify the water pollutants and their harms.
7. Identify how to keep water from pollution.
8. Appreciate the importance of water in our life.

Points of the lesson :

1. Structure of water.
2. Properties of water.
3. Water pollution.

Included issues

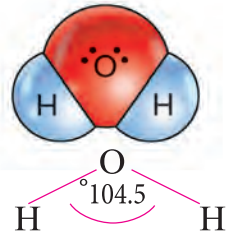
1. Decrease of water and wars because of it.
2. Rationalization of consuming of water.
3. Nile water pollution.
4. Citizenship and protecting of water from pollution.

According to your previous study, you know that water is necessary for the survival of all living organisms. Water is so important in agriculture, industry and personal uses.

Water structure :

You studied before that water :

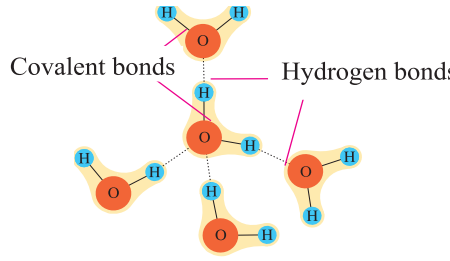
Molecule is composed of the combination of one oxygen atom with two hydrogen atoms to form two single covalent bonds , the angle between them is 104.5º. Fig (1).



Water molecule

Figure (1)

Due to large electronegativity of oxygen compared with hydrogen, a weak electrostatic attraction is originated between water molecules which is called hydrogen bond. Fig (2).



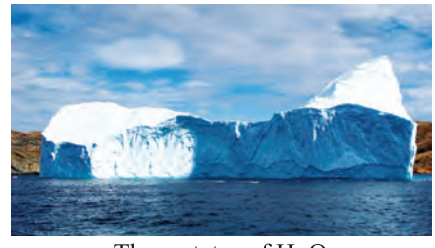
Bonds between atoms and molecules in water

Figure (2)

Although these hydrogen bonds are weaker than the covalent bonds in the same molecules, they are considered to be the most important factors which are responsible for abnormality of water properties.

Properties of water :

Water is a unique substance due to its existence in three states at the same time fig. (3) and it has many physical and chemical properties like :-



Three states of H_2O

Figure (3)

1 Good polar solvent :

Participate with your co-operative group under the supervision of your teacher to do the following activity.

Activity (1) **Identifying water as a polar solvent.**

1 Identifying water as a polar solvent.

* Three beakers.
* Table sugar.
* Table salt.
* Food oil,
* Stirring spoon.

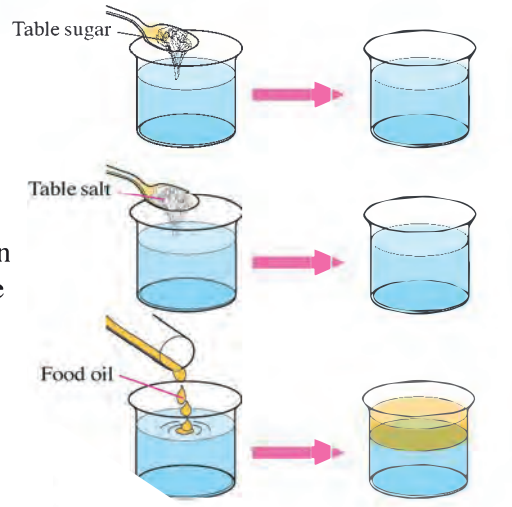


Figure (4)

Steps :

1. Fill the beakers with equal amounts of water.
2. Put in the first beaker a spoon of table sugar, a spoon of table salt in the second beaker and oil drops in the third beaker fig. (4).
3. Stir the contents of the three beakers.
4. What are substances which dissolved in water?
5. What are the tastes of the first solution and the second Solutions when you tast it with the tip of your tongue?
6. What is the substance that does not dissolved in water?

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Conclusion :

1. Some substances dissolve in water, while others don't dissolve in it.
2. Water is a good polar solvent for most ionic compounds (as table salt) and for some covalent compounds (as sugar) which form hydrogen bonds with water.

2 High boiling and freezing points.

It was supposed that the boiling point of water is less than (100°C) and the freezing point is less than zero celsius. But the pure water at the normal atmospheric pressure boils at (100°C) and freezes at zero ..... Why ?

High boiling and freezing points is due to the presence of hydrogen bonds between water molecules.

3 Water has low density when it freezes :

The density of water when it is in a solid state is lower than its density when it is in a liquid state because when the temperature decreases less than 4°C, the water molecules are collected by hydrogen bonds forming. large-sized hexagonal crystals with many spaces between them fig. (5). So ice floats on the surface of water in the frozen zones which make marine organisms still alive

Hexa crystal of ice
Figure (5)

Self inquiry

Did you ask yourself about the reason of explosion of closed bottles which completely filled with water in the freezers?

Figure (6)

Enrichment information (2)

Density of salt water is higher than the density of fresh water so swimming in the sea is easier than swimming in the poles.

Search Activity

Search for and investigate why the Dead Sea in Palestine was called by that name, write a report and keep it in the portfolio.

Life application **Dissolving the ice of the freezer quickly.**

Turn off fridge, put a hot water container in the freezer and close the fridge.

(you can use the hair dryer to direct a hot air current to ice and it melts quickly).

4 It has neutral effect on both of litmus papers

Participate with your classmate to do the following activity which explains the neutralization of water.

Activity (2) Discovering the neutralization of water

Substance and tools

* Basin containing pure water.
* Two litmus papers (red - blue).

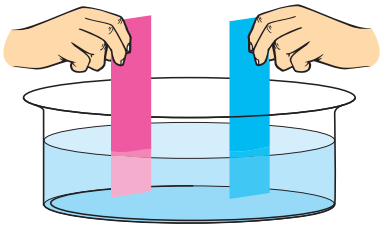

Figure (7)

Steps :

What is the effect of putting both of litmus papers in pure water ? (Fig. 7).

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From the previous we conclude that

The pure water has a neutral effect on both of litmus papers (red and blue).

5 Electrolysis of water

Activity (3) Investigating the process of electrolysis of water.

Substances and tools

* A round piece of foam plate.
* Sodium carbonate spoon.
* Empty plastic bottle.
* Battery 4.5 v.
* Two test tubes.
* Two pencils.
* Water.
* Two copper wires.
* Wax gun.

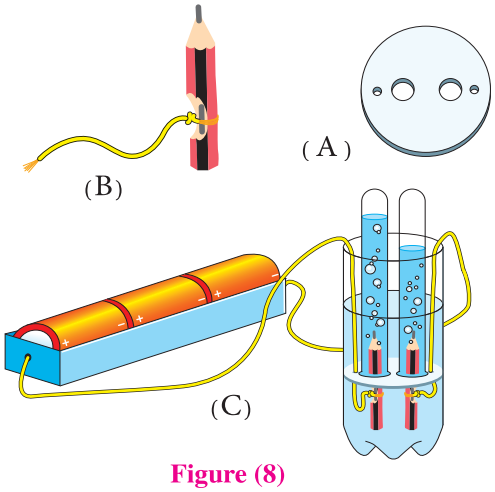

Figure (8)

Steps :

1. Cut the top of the plastic bottle and fill it to its middle with water and dissolve sodium carbonate in it.
2. Make a hole in the foam as in fig. (8)

3 Remove carefully the wooden part of the two pencils until graphite appears, coil the copper wire around them as in fig. (8 B). Cover the bared part by wax gun.

4 Form the apparatus as in fig. (8 C) and close the circuit for 10 minutes.

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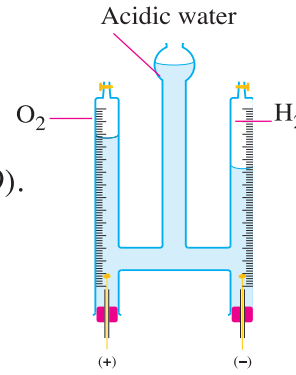
Conclusion :

(1) Acidified water decomposes by electricity into two elements hydrogen and oxygen and the volume of hydrogen is twice the volume of oxygen.

$$\underset{\text{Water}}{2H_2O} \xrightarrow{\text{Electrolysis}} \underset{\text{Hydrogen}}{2H_2\uparrow} + \underset{\text{Oxygen}}{O_2\uparrow}$$

(2) Hydrogen evolves above the cathode, while oxygen evolves above the anode. Hoffman's voltameter is used in electrolysis of water fig. (9).



Hoffman voltameter apparatus

Figure (9)

Exercise (1)

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Water pollutants and their harms

- Environmental pollutants are divided generally into two kinds :

* Natural pollutants: Their sources are natural phenomena like occurence of volcanoes fig. (10), lightning accompanied by thunderstorms and death of living organisms.
* Artificial pollutants : Their sources are the different human activities.

Volcanic activity

Figure (10)

Exercise (2)

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Water pollution is divided into (4) main parts

1 Biological pollution:

It is originated from mixing of human and animal wastes with water flg (11) and that causes many diseases such as Bilharzia, typhoid and that hepatitis.

Polluted Nile is due to animal stools

Figure (11)

2 Chemical pollution:

It is originated from discharging of factories wastes **fig (12) and sewage in canals , rivers , and seas fig (13)** the increase of some elements concentration causes great harms. Eating fish which contains high ratios of lead causes the death of brain cells, drinking water which contains high ratio of mercury leads to blindness. Arsenic increases the rate of infection by liver cancer.

Discharging of factories wastes in the canals

Figure (12)

3 Thermal pollution:

It is originated from the rise of temperature of some marine zones which use water for cooling the nuclear reactors which destroy the marine organisms found in them due to separation of dissolved oxygen in water flg (14)

Discharging sewage in canals

Figure (13)

4 Radiant pollution:

It is originated from leakage of radioactive substances from the nuclear reactors or dumping of the atomic wastes in seas and oceans.

Figure (14)

Protection of water from pollution :

- Many behaviours and percautions for protecting water from pollution in Egypt :

1. Getting rid of the phenomenon of discharging of sewage, factories wastes and dead animals in rivers or canals.
2. Development of water purification stations (fig. 15 and making periodic analysis to determine the rate of its validity for drinking.
3. Spreading environmental awareness among people about protection of water from pollution.
4. Disinfecting drinking water tanks above buildings periodically. (fig. 16
5. Don't store the tap water in empty plastic bottles of mineral water because they react with chlorine gas which is used in disinfecting of water, so the rate of cancer infection increases.

Water purification station

Figure (15)

Water tank

Figure (16)

A case for discussion **Water = Life**

Wars may break out due to fresh water, at the same time some people don't keep water resources well. Discuss with your classmates under the supervision of your teacher this case. Use these questions in the discussion.

1. Did you try the feeling of being thirsty?
2. What is your role and responsibility for the unfixed water tap at school or at home?
3. What do you feel about when you see victims of drought in Africa in the broadcast?
4. What should you do when you find a person throwing wasteing in the Nile?
5. What are your suggestions for keeping water of the Nile?

Lesson summary :

Water H_2O

Its sources
wells - (rivers - seas - oceans) - rains

Fields of its uses :
* Personal field.
* Industrial field.
* Agricultural field.

Chemical structure :
* Water molecule. H_2O
* Consists of binding of one oxygen atom with two hydrogen atoms.
* Presence of hydrogen bonds.

Pollutants:
* Biological pollutions.
* Chemical pollution.
* Thermal pollution.
* Radiant pollution.

* Important properties
* Good polar solvent :
- High boiling and freezing point.
- Low density on cooling.
- It is neutral for both of litmus papers.
- Electrolysis of water into its two elements oxygen and hydrogen.

* Hydrogen bond is considered one of the most important factors that are responsible for the abnormality of water.
* Hoffman's voltameter apparatus is used in the electrolysis of water.

For extra activity and practice,go to the MOE website

Unit 2

The Atmosphere and protecting Planet Earth

Unit lessons :

Lesson 1 : The Atmospheric Layers.

Lesson 2 : Erosion of Ozone Layer and Global warming.

Learning Resources :

1. The air – stiv barkar Dar El-Farouk
2. The air – Dr. Abd El Baset Elgamal – Safer
3. Weather disasters – El Dar El hadesa For publishing and distribution
4. Climate Crisis – Nigel Hocks – Academia

Unit objectives

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

1. Know the concept of atmospheric pressure and layers of atmospheric envelope.
2. Interpret the change of atmospheric pressure with changing height above sea level.
3. Appreciate the importance of instrumets that measure atmospheric pressure.
4. Describe the characteristics of atmospheric layers.
5. Compare among the characteristics of atmospheric layers.
6. Conclude the importance of each layer of atmosphere.
7. Recognize the importance of studying each layer of the atmosphere.
8. Appreciate the role of scientist to reach devices measuring atmospheric pressure.
9. Know the composition of Ozone gas.
10. Conclude the steps of Ozone formation.
11. Aware of the importance of the Ozone layer of the human and living organisms.
12. Desribe hurmful effects for pollutants of Ozone layer.
13. Determine ways te protect Ozone layer.
14. Follow up the procedures and solutions, to the problems of ozone depletion.
15. Describe the global warming phenomenon and greenhouse effect.
16. Identify greenhouse gases.
17. Explain increase the temperature of atmospheric envelope of earth.
18. Determine the negative effects resulted from the rising temperature of the earth's atmosphere.
19. Follow up the percedures and solution to problems of global warming phenomenon.
20. Appreciate greatress of God in providing the atmosphere and air for living organisms.

Lesson 1

The Atmospheric Layers

Lesson objectives :

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

1. Know the concept of atmospheric pressure.
2. Interpret the change of atmospheric pressure with changing height above sea level.
3. Understand the change of atmospheric pressure with changing height above sea level.
4. Appreciate the importance of instruments that measure atmospheric pressure.
5. Mention the importance of altimeter.
6. Know atmospheric layers.
7. Mention the characteristics of atmospheric layers.
8. Compare among the characteristics of atmospheric layers.
9. Determine the importance of each layer of the atmosphere.

Lesson subjects :

1. Atmospheric pressure.
2. Change of atmospheric pressure with height above sea level.
3. Atmospheric layers.

Included issues :

1. Instability of weather.
2. Laws and rules of the internet communication.

Atmospheric pressure

The Earth is surrounded by a gas envelope that rotates with it about its axis, and extends 1000 km above sea level. It is known as atmosphere.
The weight of air column of an atmospheric height on a unit area is called air pressure or atmospheric pressure. It is measured in a unit called a bar. The bar equals 1000 millibar (mbar).

Normal atmospheric pressure at sea level equals 1013.25 millibar.

Enrichment Information (1)

* The internal pressure of human body equals the atmospheric pressure.
* How does climbing heights or diving deep in ocean affect eardrum?

Change of atmospheric pressure with change in height above sea level :

Share your cooperative group in performing the following activity:

Activity (1) **Proving how atmospheric pressure changes with changing height above sea level.**

Materials and tools:

- 4 big books.
- 3 pieces of modelling clay with different colors.
- 6 plastic sheets.

Figure (1)

Procedure:

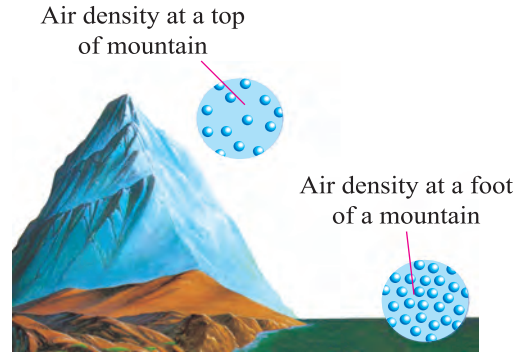
1. Form the modelling clay into 3 identical balls.
2. Put clay balls between the plastic sheets and the books.

Enter The MOE Website

As the weight (pressure) of books increases due to their number (height), the change in balls' shape increases.
Likewise, atmospheric pressure increases as the height of air column increases.
It was found that :
50% of atmosphere mass occurs in the area between sea level and 3 km high. Meanwhile, 90% of its mass is concentrated in the first 16 km above sea level.

Answer the following questions by entering the MOE website

- What is the effect of the height decrease of an atmospheric air column on its weight?
- What is the effect of rising up above sea level on the air density?



Air density at a top of mountains
Figure (2)

Exercise (1)

Enter The MOE Website

Altimeter in aeroplanes
Figure (3)

Enrichment Information (2)

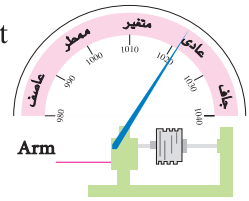
The greatest atmospheric pressure that ever recorded so far on the earth's surface was in January 1968 in Siberia when it reached 1080 millibar. On the other hand, the lowest pressure was 870 millibar where it is recorded in the eye of the tropical hurricane "typhoon" in 1979.

Exercise (2)

Enter The MOE Website

Real life application **Barometer to determine today's weather**

The possible day's weather can be estimated directly with an instrument known as Aneroid (fig. 4). It is a type of barometers, which i used to measure atmospheric pressure.



Aneroid
Figure (4)

Layers of atmospheric envelope

Atmospheric envelope is divided into several layers according to the changes in the atmospheric pressure and temperature they are illustrated by the following activity.

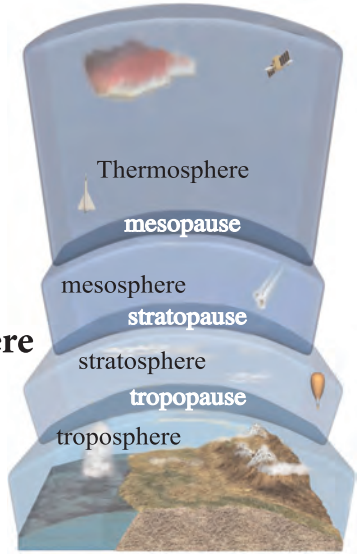
Activity (2) **Recognizing atmospheric layers:**

Study and investigate figure (5)

Enter The MOE Website

The atmosphere consists of four layers

Troposhere - Stratosphere - Mesosphere - Thermosphere



Atmospheric layers
figure (5)

First layer : Troposphere

Troposphere is the first layer of the atmosphere. It means the disturbed layer where most of the weather changes occur in this layer.

To know the characteristics of the troposphere, share your working group in performing the following activity:

Activity (3) Concluding the characteristics of the troposphere.

Investigate figure (6) carefully with the help of your group and conclude the characteristics of the troposphere by answering the following questions:

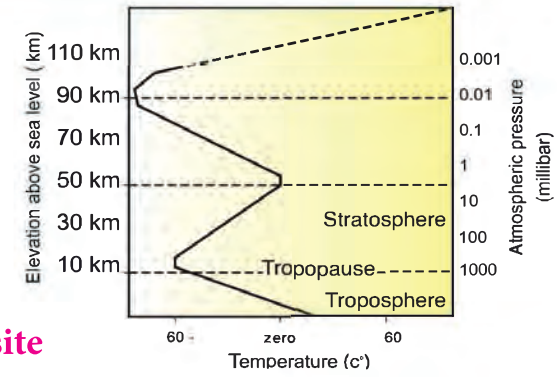


Figure (6)

To complete the activity enter the MOE website

Characteristics and importance of the troposphere:

1. It extends 13 km above sea level to the tropopause.
2. As we go up, the temperature decreases by a rate of 6.5 °C per 1 km until it reaches the lowest value of about (-60 °C) at tropopause.
3. Atmospheric pressures decreases as we go higher, where it reaches about 100 millibar nearly.
4. It contains about 75% of the atmosphere mass. This explains why all atmospheric phenomena like rain, wind, clouds …. etc (fig.7) that forms the weather conditions, and consequently up the climate, occurs in this layer and affects the activities of living organisms.

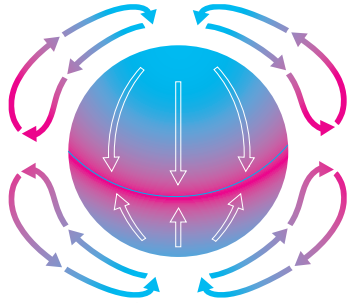
Enrichment Information (3)

Troposphere thickness is 13 km. It is an average thickness as it is about 8 km above poles and 18 km at the equator.


Clouds and winds
Figure (7)

5 It contains about 99% of the atmospheric water vapour, which organizes the earth's temperature.

6 The air movement in this layer is vertical (fig. 8) as the warm air currents go up and the cold currents go down.



Air currents
Figure (8)

Self inquiry

Have you ever asked about the characteristics of the hieghts and low areas, relative to sea level, in Egypt ? Where they are?

Communication

By the guide of your teacher, discuss with your classmates, the advantages and disadvantages of living in these areas?

To complete the activity enter the MOE website

Exercise (3)

Enter The MOE Website

Second layer: Stratosphere

Stratosphere is the second atmospheric layer, which is also called ozone atmosphere Why?

Activity (4) Concluding the characteristics of the Stratosphere.

Investigate figure (9) carefully with the help of your group and conclude the characteristics of the stratosphere by answering the following questions in the MOE website

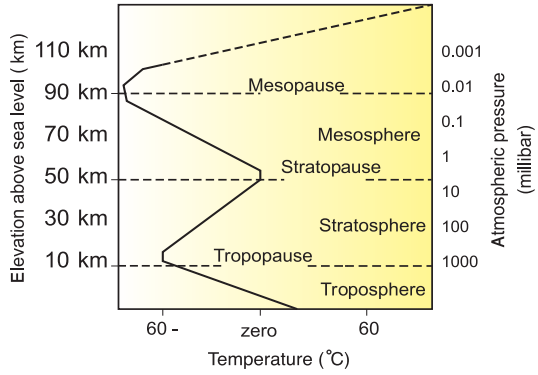


Figure (9)

Characteristics and importance of the stratosphere:

1. It extends from tropopause (13 km above sea level) to the stratopause (50 km) with thickness of 37 km.
2. At the lower part, the temperature is constant and measure (– 60° C), then increases gradually until it reaches 0° C at the end of the layer. This is due to the absorption of ultraviolet radiation (emitted from The Sun) by the ozone layer that is present in the upper part of the layer.
3. The atmospheric pressure decreases on going higher where it reaches the smallest value (0.001 of the normal pressure at sea level) at the end of the layer.
4. It contains most of the atmospheric ozone which is concentrated between 20 - 40 km above sea level.
5. The lower part does not contain clouds or suffer from any weather disturbances. The air moves in this part horizontally, making it suitable for flying planes (fig. 10)

Flying in the stratosphere
Figure (10)

Third layer: Mesosphere

– Mesosphere is the third atmospheric layer.

– It means the middle layer. It is the coldest layer.

Enrichment Information (4)

Although meteors burn in the mesosphere, spaceships don't burn during passing through it as they have a conical front that disperses heat and tails made of an insulated material.

Characteristics and importance of the mesosphere:

1. It is extended from the stratopause (50 km above sea level) to the mesopause (85 km) with thickness of about 35 km.
2. Temperature decreases with height rate until reaches (– 90° C) at its end.
3. This layer is much vacuumed as it contains only a limited amount of helium and hydrogen gases.
4. Meteors are formed in this layer due to friction with air molecules (fig.11)

Formation of meteors in the mesosphere
Figure (11)

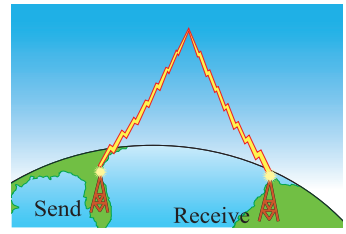
Fourth layer: Thermosphere

Thermosphere is the fourth atmospheric layer. It means the heated layer as it is the hottest layer of the atmosphere.

Characteristics and importance of the thermosphere :

1. It extends from the mesopause to 675 km above sea level with a thickness of about 590 km.
2. Temperatures increase rapidly with going higher until it reaches about 1200º C.
3. Its upper part contains charged ions. The distribution of the charged ions extends until 700 km above sea level; in a part known as ionosphere.

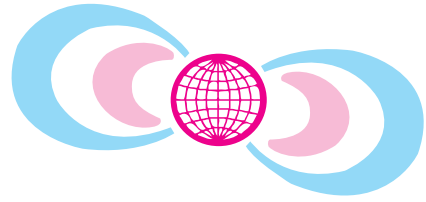
- Ionosphere plays an important role in wireless communication and broadcasting as it reflects radio waves that are transmitt d by communication centers and radio stations (fig.12)



Reflection of radio wave from the ionosphere
Figure (12)

- Ionosphere is surrounded by two magnetic belts known as Van Allen Belts (fig.13). These two belts play an importa t role in dispersing the harmful charged cosmic radiation away from the Earth. In the same time, they cause the Aurora phenomenon, which appears as brightly coloured light curtains at both the North and South poles of the Earth (fig.14)

Aurora phenomenon Figure (14)

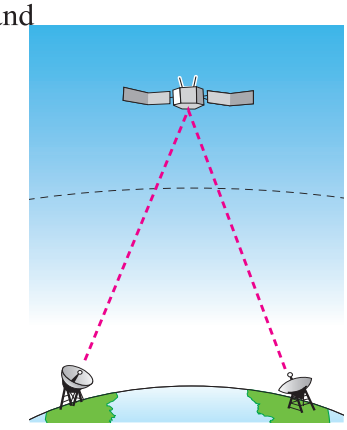


Van Allen Belts
Figure (13)

The atmosphere is inserted into the outer space via an area known as the Exosphere. This is the area where satellites float around the Earth (fig. 15) and transmit weather condition information and TV prvograms.

Enrichment Information (5)

* The Egyptian Satellite (Nile sat) transmits a number of different educational channels that you can watch on digital space channels.
* Record the dates of broadcasting of the educational material you study on the educational channels during a week and distribute them among your classmates to benefit from them



Role of satellites in wireless communication
Figure (15)

A case for Discussion **Space channels**

Space channels use satellites to transmit media and commercial materials. Some of them is useful and acceptable. Others contradict morals and religion principles.

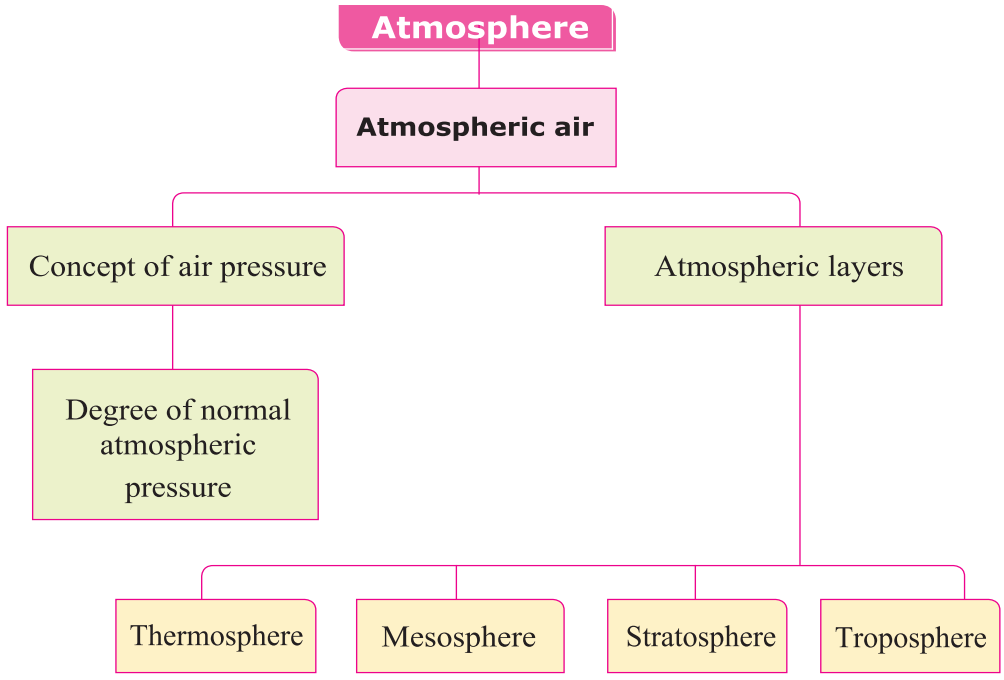
Guided by your teacher, discuss this issue with your classmates. Use the following questions as part of a discussion subject:

- What are the channels that you watch? Why?
- What are the interesting programs that you watch in these channels?
- Does one of your friends watch channels that transmit obscene material?
- How do you deal with such channels in a civilized manner?

Search activity : The effect atitude above sea level on human life

Lesson summary

Enter The MOE Website



- Atmospheric pressure is the weight of air column on a unit area.
- Normal atmospheric pressure (at sea level) equals 1013.25 millibar.
- Temperature in troposphere decreases on getting higher, the rate of decrease is 6.5º C/1km.
- The ionosphere is surrounded by Van Allen Belts which are responsible for dissipating harmful cosmic rays away from the Earth.

For extra activity and practice,go to the MOE website

Lesson 2

Erosion of Ozone Layer and Global Warming

Lesson objectives :

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

1. Know the composition of Ozone gas.
2. Conclude the steps of ozone formation.
3. Appreciate the importance of Ozone Layer.
4. Describe the harmful effects of short- and medium-wave length ultraviolet radiation on the Ozone Layer.
5. Mention the pollutants of Ozone Layer.
6. Determine ways to protect Ozone Layer.
7. Describe the global warming phenomenon and the greenhouse effect.
8. Identify greenhouse gases.
9. Interpret the rising temperature of the earth's atmosphere.
10. Determine the negative effects resulted from the rising temperature of the earth's atmosphere.
11. Follow up the procedures and solutions to the problems of erosion of the ozone layer and global warming.

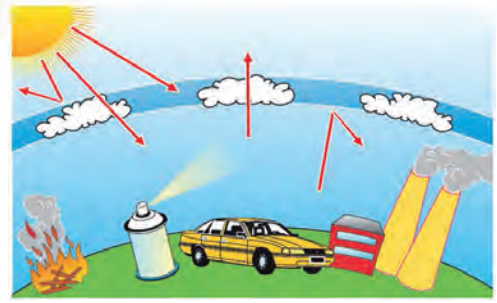
Main subjects :

1. Composition of Ozone gas.
2. Importance of Ozone Layer.
3. Erosion of the Ozone layer (ozone hole).
4. Pollutants of Ozone Layer and their effects.
5. Protecting the Ozone Layer.
6. Greenhouse effect and global warming phenomena.
7. Negative effects due to global warming.

Included cases :

1. Erosion of the Ozone Layer (ozone hole).
2. Impacts of science and technology on the society.
3. Greenhouse effect phenomenon.
4. World coalition.
5. Managing energy consumption.

- Since the mid 20th century, erosion of the Ozone Layer depletion and global warming phenomena have been the most serious threats.



The effects of pollutants on the atmosphere

Fig. (1)

First Erosion of the Ozone Layer phenomenon

Fig. (2)

Composition of ozone gas

- You may ask; why is Ozone layer formed in the stratosphere?

What is ozone gas? How is it formed?

Activity (1) Concluding how ozone gas forms

Observe and investigate with your classmates the following figures, then

Enter The MOE Website

1 From the following, select a suitable comment for each shape and write it down under it:

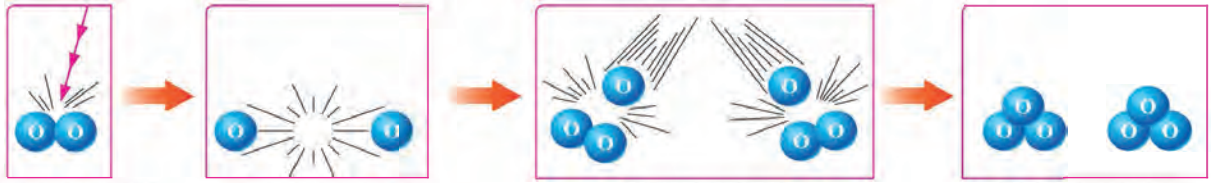


Fig. (3)

Based on the previous, ozone gas is formed in two steps:

- Breaking down the bond of the oxygen molecule O_2 when it absorbs the ultraviolet radiation (UV), producing two free active oxygen atoms 2O

$$O_2 \xrightarrow{UV} O + O$$

- Each free oxygen atom combines with an oxygen molecule to produce an ozone molecule (fig. 4)

$$O + O_2 \longrightarrow O_3$$

Ozone molecule O_3

Fig. (4)

Enrichment information and activity (1)

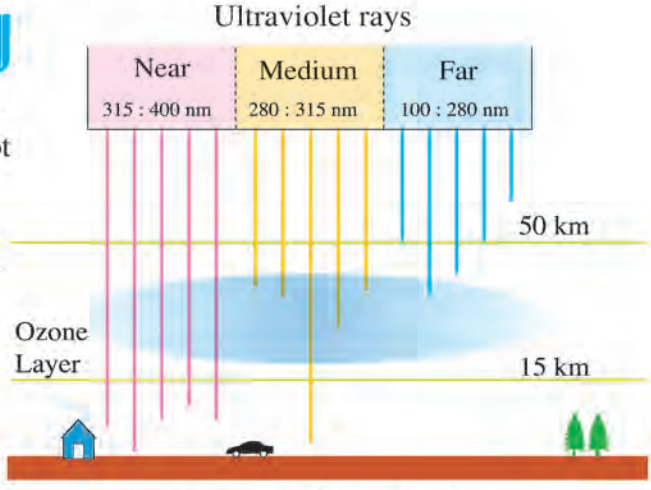
* Ozone gas has a faint blue color and of distinct smell. This can be observed near instruments that contain electric discharge pipes as in the cases of light photographic machines and TV sets.
* Mention instruments produce ozone gas when they are set to work. Enter MOE website

Ozone layer is formed in the stratosphere, and is located at a height between 20:40 km above sea level. Ozone layer is the first atmospheric layer that meets the ultraviolet radiation coming from the Sun. This layer contains a suitable amount of oxygen gas.

Importance of Ozone Layer

Investigate figure (5) and determine the type of ultraviolet radiation that does not penetrate Ozone Layer:

- with ratio 100% .....
- with ratio 95% .....



Importance of Ozone Layer

Fig. (5)

Nanometer = 1 x 10^{-9}meter

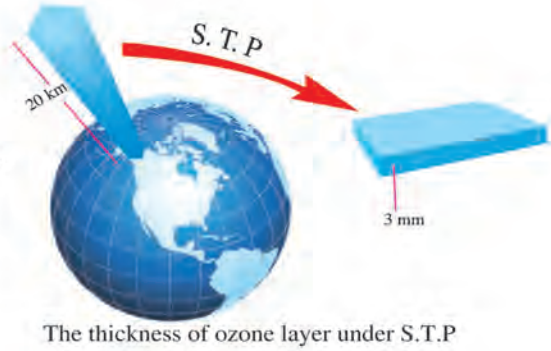
Ozone layer does not allow penetration of all far and most of medium ulraviolet radiations, which have very harmful effects. That is why Ozone is said to act as a protective shield for living organisms against the harmful chemical effects of the ultraviolet radiation.

Enrichment information (2)

Ultraviolet radiations, of wavelength close to the visible light penetrates the atmosphere and reaches the earth's surface, where it helps in producing Vitamin D in the bodies of the newly born babies.

Erosion of the Ozone layer

Temperature and atmospheric pressure at Ozone layer differ from those at earth's surface. The English Scientist Dobson postulated that the thickness of the Ozone Layer is 3 mm only if it were under the normal pressure and 0° C temperature; a condition known as STP or standard temperature and pressure (fig. 6) Accordingly, he assumed that the natural amount of ozone equals 300 Dobson units.



The thickness of ozone layer under S.T.P

Fig. (6)

Exercise (1)

Enter The MOE Website

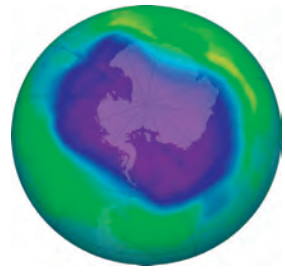
Since 1978, scientists have noticed that there was erosion of the Ozone layer above the South Pole; phenomenon known as Ozone Hole, that increases in September each year –Why? Its rate changes from year to year (fig. 7)

Enrichment information (3)

In fall, 2001 erosion of the Ozone layer reached 20×10^6 km^2, which equals twenty times the area of Egypt. In autumn, 2008 it reached 27×10^6 km^2; an area is larger than North America.

Exercise (2)

Use Dobson units at the base of figure(7) which represents the Ozone condition in fall. 2008:
to show what each of the following indicates:
Green color .....
violet color .....



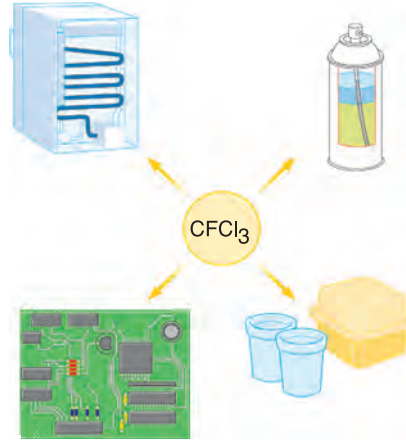
Deplction of Ozone Layer

Fig. (7)

Pollutants of Ozone Layer

The most dangrous pollutants are:

1. **Chlorofluorocarbon compounds (CFCs):** They are commercially known as Freon. which is used as a cooling material in air conditioning sets. as propellant in acrosols or as inflating material in making foam backing or as a solvent for cleaning electric circuits cards (Fig 8)
2. **Methyl bromide:** that is used as an insecticide to preserve stored agricultural crops.
3. **Halons:** that ar used in fire extinguishers.
4. **Nitrogen oxides :** that result from the burning fuel of ultrasound airplanes (Concord).



Uses of chlorofluorocarbon compounds

Fig. (8)

Research activity go the MOE website

Protecting the Ozone Layer

- Use of chlorofluorocarbon compounds must be reduced and find safer alternatives.
- Stop producing the ultrasound concord planes as their exhausts affect the Ozone.

Second Global Warming

Researches of the IPCC (The Intergovernmental Panel on Climate Change), that follow UN, showed that there is an increase in the average temperature of the Earth's near-surface air; a phenomenon known as Global warming which is caused by the greenhouse effect. What can you conclude from the figure below ?

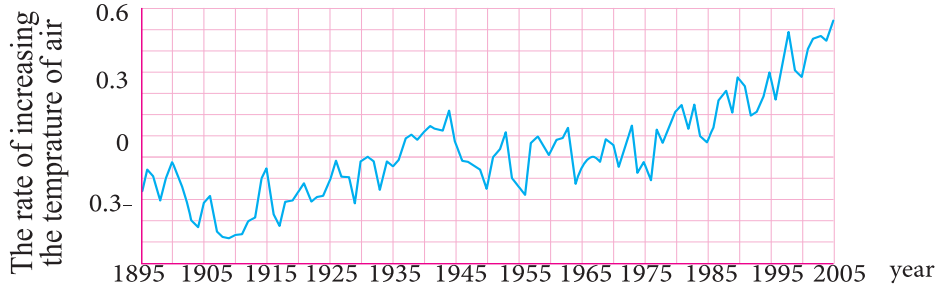


Figure (9) : Rising of planet Earth temperature

Greenhouse effect

Share your group in performing the following activity to know the greenhouse effect phenomenon.

Activity (2) Greenhouse effect

Tools :

- 2 empty soda bottles
- 2 thermometers
- Sodium bicarbonate powder
- Vinegar
- Water.

Figure (10)

Procedures:

1. Pour some water in the first bottle and a same amount of vinegar in the second.
2. Insert a thermometer in each bottle.
3. Put some sodium bicarbonate powder in one bottle and close it immediately to keep CO_2 gas trapped.
4. Put both bottles in a sunny place fig. (10)
5. Which bottle shows higher increase in temperature after 10 minutes?

Enter The MOE Website

Conclusion :

Increase of the concentration of CO_2 gas contributed to higher temperature.

- The same is happening as the temperature of planet Earth has been increasing since 1935 due to the greenhouse gases in the atmosphere. These gases are produced by fossil fuel burning fig. (1) , cutting trees and forest fire.

Products of burning fossil fuel

Figure (11)

The most important greenhouse gases

- Carbondioxidegas CO_2
- Chlorofluorocarbons CFCs compounds
- Methane gas CH_4
- Nitrous oxide N_2O
- Water vapour H_2O

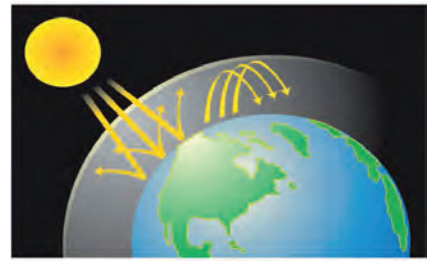
Enrichment information (7)

Greenhouse gases are considered a blessing which, can be changed into a catastrophe without those gases the temperature would have decreased to - 18°C. The increase of its Concentration in the atmosphere will lead to environmental disasters.

Interpretation of the greenhouse phenomenon

When the concentration of greenhouse gases increases in the atmosphere, it plays the role of glass in the greenhouse (Fig. 12) as it permits the visible light and short-waved radiation from the Sun to pass and be absorbed by Earth and its components which reemit the radiation back in the form of infrared radiation. Infrared radiation cannot penetrate the atmosphere as it has a long wave-length. So it is kept trapped in the troposphere causing the rise of planet Earth temperature, a phenomenon known as greenhouse effect (Fig. 13).

Greenhouse
Figure (12)



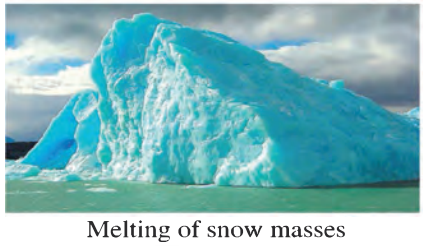
Greenhouse phenomenon
Figure (13)

The negative effects of Global Warming Phenomenon

One of the most dangerous effects is graded to the phenomenon of raising the temperature of the Earth planet.

1 Melting of the ice and snow of both South and North Poles:

Melting of polar ice would increase sea level in seas and oceans figure (14) which represents a threat of the disappearance of the coastal areas and that would lead to the extinction of some polar animals like the polar bear (Fig. 15) and seals (Fig. 16).



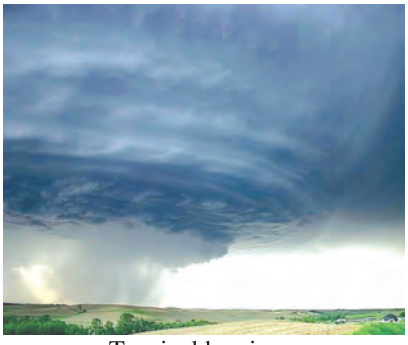
Melting of snow masses
Figure (14)

Polar bear
Figure (15)

Seals
Figure (16)

2 Severe climatic changes

Among these features is the repeated occurrence of tropical hurricanes (Fig. 17) such as hurricane Katrina in 2005, destroying floods (Fig. 18), drought waves (Fig. 19) and forest fires.

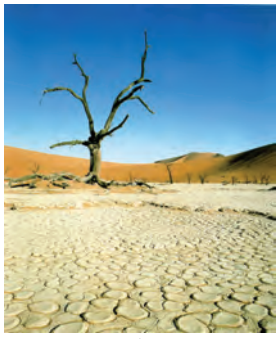


Tropical hurricane

Figure (17)

Flood

Figure (18)

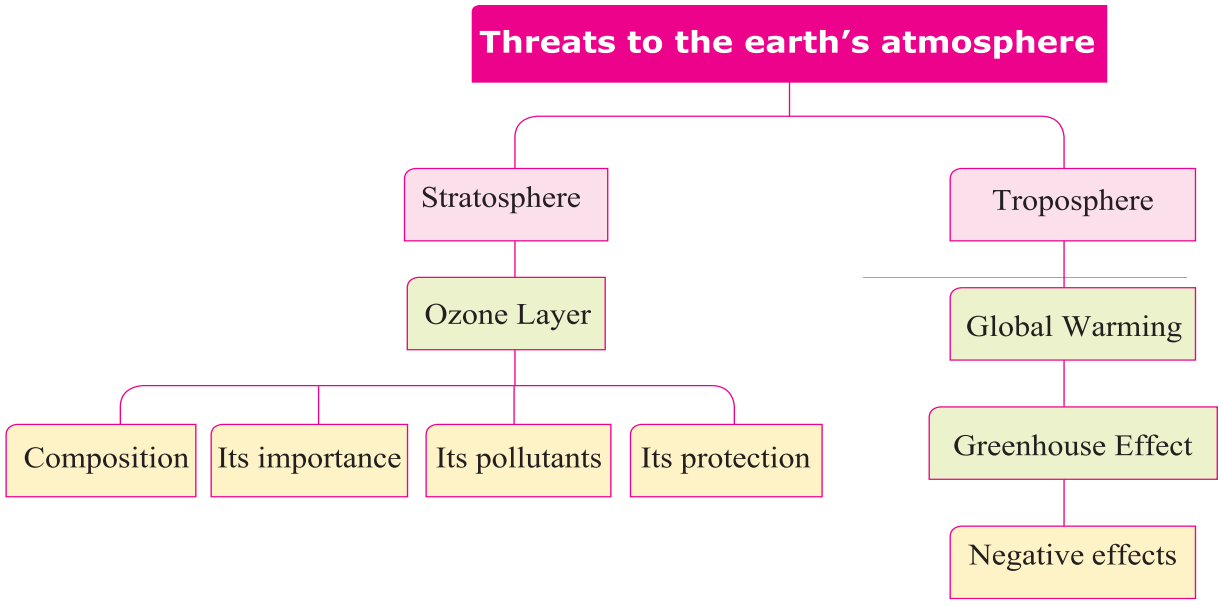


Drought wave

Figure (19)

Research activity go the MOE website

Lesson summary



- Ozone molecule O_3 is formed by combining one free oxygen atom with one oxygen molecule.
- Ultraviolet radiation, far and medium types have harmful effects on the life of living organisms.
- Chlorofluorocarbon compounds are the most dangerous Ozone Layer pollutants.
- Increasing CO_2 concentration in the atmosphere produces the global warming phenomenon.

For extra activity and practice,go to the MOE website

Unit 3

Fossils and Protecting Species from Extinction

Lessons of the unit

Lesson 1 : Fossils

Lesson 2 : Extinction

Sources of knowledge and learning

• Scientific books and encyclopedia

1 The Rocks - Nataly	Family library
2 Disasters - Nedhalay	Dar El Farouk
3 Guinnes Q & A (The world of dinosaurs)	Family library
4 Forests	Lebanon library publishers

Unit objectives

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

1. Recognize the concept of fossil.
2. Give different examples of fossils.
3. Infer the types of fossils.
4. Explain the ways of fossils formation.
5. Design a cast of a candle.
6. Design models of cast and mold.
7. Compare between types of fossils.
8. Mention the importance of studying fossils.
9. Calculate the age range of some fossils.
10. Appreciate the importance of the discovery of fossils in the service of man, environment and society.
11. Establish a vision to take responsibility and take personal decisions to protect fossils.
12. Collect data and information and expressed his opinion in the protection of fossils and their scientific and social importance.
13. Use research skills and inquiry in the study of fossils.
14. Define the concept of extinction.
15. Use fossils to indicate extinction of some types of organisms.
16. Conclude the factors that cause extinction of same types of living organisms.
17. Give examples of extinct and endangered species.
18. Understand the effect of extinction on ecological equilibrium.
19. Suggest new solutions to protect living organisms from extinction.
20. Deal gently with the organisms and in a civilized manner with the environment.
21. Act consciously with the environment and appreciate the importance of normal life.
22. Appreciate the role of scientists in protecting living organisms from extinction.
23. Use life skills in the study of extinction and protection of living organisms from extinction.
24. Write a scientific report on the causes of extinction of some organisms.
25. Continue and express their views and discuss with his colleagues and the teacher about ways to protect living organisms from extinction.
26. Appreciate the greatness of God in the creation of living organisms.

Lesson 1

Fossils

Lesson objectives:

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

1. Define the concept of fossils
2. Give different examples of fossils.
3. Show the types of fossils.
4. Determine the ways of fossils formation.
5. Design a cast of a candle.
6. Design models of cast and mold.
7. Compare between mold and trace.
8. Give examples of complete body fossils.
9. Conclude the concept of petrif ication and petrified fossils
10. Explain how the petrified woods are formed
11. Mention the importance of studying fossils.
12. Calculate the age range of some fossils.
13. Appreciate the importance of the discovery of fossils.
14. Take personal decisions to protect fossils.

Points of the lesson:

1. Concept of fossil.
2. Types of fossils and their formation.
3. Importance of fossils.

Included issues :

The scientific, technological and social importance of fossils

Fossils ... an exciting world ... a story told by sedemintary rocks .. tells us about the deep past , million years ago even before the creation of man on Earth.

Fossil concept :

Activity (1) **Determining the concept of fossil**

Organize a trip with your classmates to visit the Geological Museum at the River Nile bank in Zahraa El Maady and observe the fossils presnet in it :

Traces of worms' tunnels
Figure (2)

Dinosaur foot prin
Figure (1)

To complete the activity ,go to the MOE website

Remains of dinosaur's skull
Figure (4)

Remains of shark's teeth
Figure (3)

Conclusion :

Traces and remains of the old living organisms that are preserved in sedimentary rocks are known as fossils.

Types of fossils and ways of formation

Fossils differ according to the ways of formation.

First type : Fossil of a complete body

Complete body fossil was formed when the organism died and was buried fast in a medium that preserved it from decomposition as in the case of snow or amber. It keeps the whole shape and all the details of the body.

Enrichment information (1)

In Latin, the word fossil means something buried in Earth. The science that studies fossils is Paleontology.

Examples of a complete body fossil:

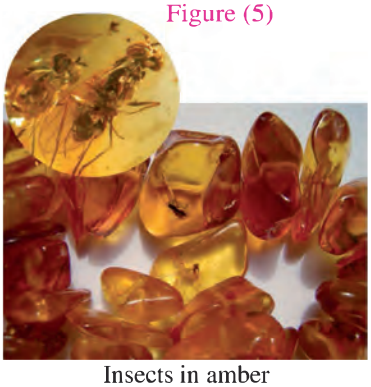
Mammoth (It is a type of extinct elephants)
Figure (5)

1 Mammoth fossil :

A snow avalanche occurred in Siberia 25000 years ago. It caused the death of mammoth animal, which were also buried immediately in the snow.
When the first mammoth fossil was discovered in the last century, it was complete as the whole shape, and all hair, flesh and food in its bowels are all still completely preserved.

2 Amber fossil :

During some old geologic al periods, there were common pine trees. These trees secreted resinous matter. This matter covered insects, After the resinous matter had been solidified it was changed into amber and preserved the bodies of these organisms buried inside it from decaying (Fig. 6).



Insects in amber
Figure (6)

Second type : mold

Participate with your group in doing the following activity.
Each student makes a different model.

Activity (2) Making model of a mold

Materials and tools :

- Plaster of paris.
- Plastic container.
- Water.
- Metal mold.
- Food oil.
- Rod for stirring.
- Brush.

Procedures :

Figure (7)

1. Use the brush to paint the internal surface of the mold with oil.
2. Mix plaster of paris with water and continue stirring to a suitable mixture.
3. Pour the mixture in the mold and wait until the plaster of paris solidifies (Fig. 7).
4. Separate the hard mixture from the mold (Fig. 8).

5 What do the details on the external surface of hard plaster show?

To complete the activity enter the MOE website

Figure (8)

Conclusion :

The hardened plaster of paris forms a solid mold of the metal mold.

Formation of a solid mold

1. When a snail (or clam) dies, it falls on the sea floor and is buried in sediments.
2. The sediments fill up the shell cavities and is solidified as the time passes.
3. The shell could decompose completely, leaving a rock mold carrying the internal details of the snail. (Fig. 9)

Ammonites fossil mold
Figure (9)

Real-life application **Candle mold**

Enter The MOE Website

Candle mold
Figure (10)

Third type : cast and print:

Activity (3) **Make a model of a cast**

Participate with your group in doing the following activity, each student makes a different model.

Materials and tools :

- Coloured clay.
- A shell of a clam.

Procedures :

1. Press on the clay by your hand to make a plane surface.
2. Put the shell on the surface of the clay and press it gently.
3. Remove the shell from the clay.
4. Whate do the details on the clay indicate?

Shell cast
Figure (11)

To complete the activity enter the MOE website

Conclusion :

A replica of the original outer shell shape is formed and it is known as cast.

- What a dead body of an organism leaves on sedimentary rocks is called cast (Fig.12)?
- What a living organism body leaves during its life is known as trace. (Fig.13)?

Dinosaur foot print
Figure (13)

Fish cast
Figure (12)

Exercise (1)

Enter The MOE Website

Fourth type : Petrified fossils

A type of fossils where the minerals can replace the organic matter of organism part by part without changing the shape, for examples:

Petrified Dinosaur's tooth
Figure (14)

Petrified Dinosaur's eggs
Figure (15)

Petrified wood
Figure (16)

Activity (4) Describing petrified wood

Visit with your classmates the petrified wood protectorate in Qattamiya and observe the petrified stems and trunks of trees that are more than 35 million years in age (Fig.16).

To complete the activity enter the MOE website

Conclusion :

1. Petrified woods look like rocks but they are fossils because they give us details about once living old plant.
2. Petrified wood was formed by replacing , part by part, of the original wood material by mineral replacement, silica, and this is known as "petrification"

Enrichment information and activity (2)

*An Egyptian dinosaur has been discovered in Bahariya Oasis, Giza Governorate, and parts of it are being displayed in the Egyptian Geological Museum.

*Search for the Egyptian Geological Museum in the internet and write a report about it.

Importance of fossils:

Fossils are important because they help in:

1. Age determination of sedimentary rocks

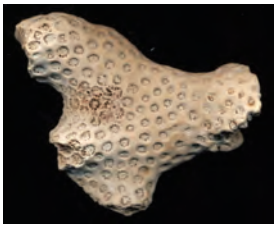
Fossils of the organisms that lived a short period of time in the past and wide geographical range and became extinct and they are known as index fossils. They indicate the age of sedimentary rocks, becaus the age of rocks is the same age of fossils existed in them.

2 Figuring out the paleoenvironment:

Fossils give an idea about the environment in which they lived during the old geological ages. Therefore, they could also indicate the climate of these ages as shown in the following examples:

Nummulites fossil
Figure (17)

Ferns fossil
Figure (18)



Coral fossil
Figure (19)

Nummulites fossils:

Figure (17) :

They are found in the limestone rocks Mokattam's mountain and indicate that there was a sea floor in this area more than 35 million years ago.

Ferns fossils:

Figure (18) :

They indicate that the environment where they lived was a hot and rainy tropical environment.

Coral fossils:

Figure (19) :

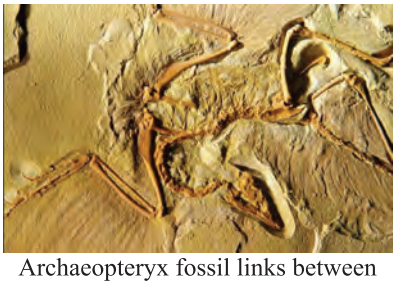
They indicate that the environment where they lived was clear, warm and shallow seas.

Exercise (2)

Enter The MOE Website

3 Studying life evolution :

Studying the fossil record showed that the life started first in sea, then established on land and organisms evolved always from simple to complicated higher forms. Algae preceded mosses and ferns. Gymnosperms appeared before Angiosperms. Invertebrates such as corals and mollusks with shells appeared before vertebrates. The first vertebrate to appear was the fish, followed by amphibians and reptiles and finally. Birds and mammals appeared together after the reptiles.



Archaeopteryx fossil links between reptiles and birds
Figure (20)

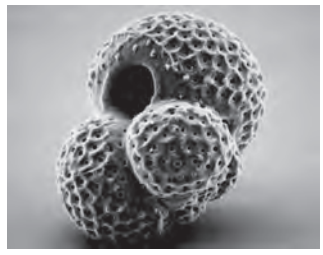
Exercise (3)

Go to The MOE Website

4 Petroleum exploration:

When searching for petroleum, geologists take samples from the rocks of the exploratory wells. These sample are studied microscopically. If they contain microfossils like foraminifera (Fig. 21) and radiolaria (Fig. 22), this could be a good indication of the age of the rocks from which they were taken. and the suitable conditions for petroleum formation.

Foraminifera
Figure (21)



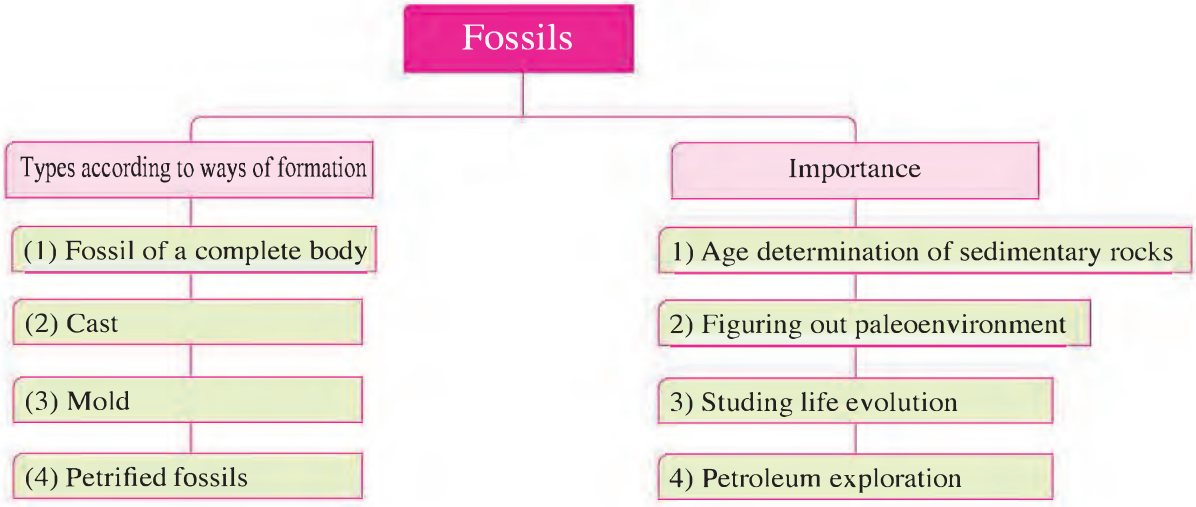
Radiolaria
Figure (22)

A case for discussion The geological heritage

To complete the activity enter the MOE website

Research activity: Nemolite fossils enter the MOE website

Lesson summary



- Fossils: Are remains or traces of organisms that lived in the past and were preserved in sedimentary rocks.
- Index fossils indicate the age of the sedimentary rocks in which they are found.
- Fish is first vertebrate to appear, followed by amphibians, then reptiles and finally birds and mammals appeared together.

For extra activity and practice,go to the MOE website

Lesson 2

Extinction

Second lesson :

Aims of the lesson

1. Identify the concept of extinction.
2. From the fossils in ference the extention of som living organisms.
3. Identify the factors which lead to the extenction of some living organisms.
4. Give examples for some extenced species and those are threatened with extenction.
5. Illustrates the effect of extenction on the ecological balance.
6. Mentain the living organisms threatened by extenction.
7. Deal in concieous with the environment according to his appreciation of the importance of natural life.
8. Appreciate the importance of the living organisms in biological balance.
9. Deal gentilly with living organisms.
10. Appreciate the effort of scientists in protection of living organisms.
11. Appreciate the effort of goverment in protection of living organisms.

Elements of the lesson

1. Concept of extinction.
2. Factors leads to the extinction of species.
3. Types of extinction and species threatemet extinction.
4. Effect of the extinction on the ecological balance.
5. Ways of protect living organisms.

Included cases

1. Extinction.
2. Environmental pollution.
3. Prevention of cruelty to animals.
4. Ecological equilibrium.

Extenction :

From your previous study, you know that the living organisms are always, in case of equilibrium. The number of certain kind of the organisms doesnot exceeds the number of another species. The continous decrease in number of other species without compensation of this decrease in number as a result the death of all indvidvals of this species which known as extinction.

Extenction : The continous decrease in the numbers of living organisms without ng this decrease death of all i , in each species.

Figure (1)
Fish's fossil

Figure (2)
Dinosaur's fossil

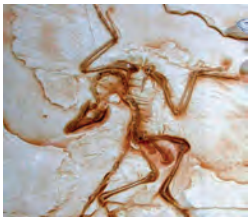


Figure (3)
Archaeopteryx fossil

Reasons of extinction :

- Many scientists attributed majro extinction which many living organisms lived on earth exposed to like extenction of dinasaures is due to occurance of big disasters like collesion of meteors with earth, violent earth movement, exposure of earth to long ice age, or as a result of toxic gases which evolved from volcanoes and many other factors.
- While other scientists attributed recent extinction due to human interference of human in environment like. destruction of the original habitate of the living organisms, overgrazing, pollution, climatic changes resulted from industrial activities of man and natural disasters (discuss with your teacher and colleagues how these factors leads to extinction of living organisms).

Extinct species and that threated with extinction :

- From the farmous extinct living organisms in ancient periods: dinasaures, Mamouth (the grand father of recent elephant) and recent extinct animals such as Dodo bird, Quagga, and others.

Activity (1)

Search in the web about living organisms which recently extincted and what have been extincted from egyptian habitates then discuss it with your teacher.

Figure (4)
Dinosaure

Figure (5)
Mamonth

Figure (6)
Dodo bird

Figure (7)
Quagga

There are more than five thousand kinds of living organisms threatend with extinction like Rhinosour, Panda bear, bald eagle, and from the egyptian environment :
Ibis bird , Barbary sheep(Arui) , and papyrus Plant

Figure (8)
Panda bear

Figure (9)
Rhinoceros

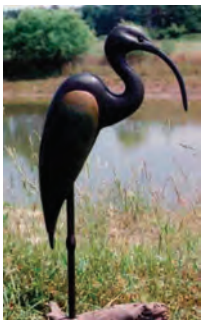


Figure (10)
Ibis bird

Figure (11)
Bald eagle

Figure (12)
Barbary sheep
(Arui)

Figure (13)
Papyrus plant

Effect of extinction on the ecological balance :

Activity (2)

Study the food chain in figure (14) and observe how the energy trans fere across this food chain and show the following statements.

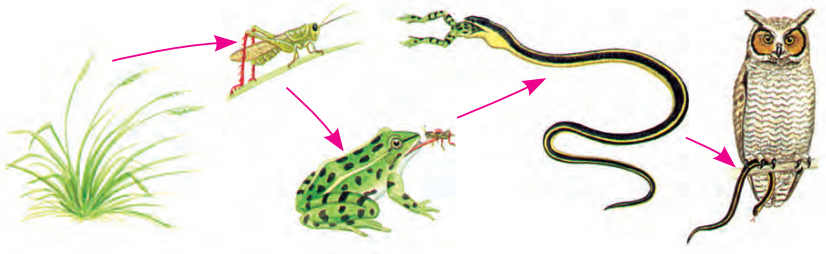


Figure (14) Food chain

To complete the activity enter the MOE website

- In the food chain, the energy transfere from producers to consumers.
- Each living organism has a role in transfere of energy in the pathway of the food chain.
- In case of absence of one of the living organisms, the role of this living organism stops, which affect on the other members of the food chain or on the food web (group of food chains connected with each other).
- At the extinction of one species or more from balanced ecosystem, some gaps occured in the pathway of energy inside this system which leads to a disturbance in the balanced ecosystem, and some times its distruction.
- The ecosystems are different from each other as a result of the effect of extinction on it : the simple ecosystem (less number of species) is affected strongly at the absence of one speices found in it due to absence of a substitute which compansate its absence and play its role as in the desert ecosystem [Figure (15)].
- While in the complex ecosystem (large number of species) it does not much affected by the absence of a species of a living organism found in it due to the presence of many substitution which can compansate its absence, as in the ecosystem of tropical ecosystem [Figure (16)].

Figure (15)
Desert ecosystem
ecosystem with less
number of species (less kinds)

Figure (16)
Tropical forest ecosystem
Complexs ecosystem (many kinds)

Ways of protection of living organisms from extinction

It was necessary for the scientists to think in ways of protection of species endangered by extinction to keep the ecological balance and so the ecological systems from distruction. From these methods :

1 Put laws which regulate the process of hunting of living organisms especialy the rare animals or that threated with extinction.

Figure (17)
Grey bear

2 Increase the ecological awarness of the importance of the preservation of the natural life which guarantee the continouity of human life.

3 Breeding and increasing the endangend species and re-habitation in its original environments.

4 Establishing genes banks for the endangered species.

5 Establishing of natural protectorates to preserve the endangered species with extinctian.

Natural protectorates

are safe places established to protect endangered species in their natural places where suitable conditions are available for their growth and reproduction away from their natural enimies. From these protectorates, yellow stone in united states of america, where the grey bear is are protected, and the Panda bear protectorate in northeast of china to protect the Panda bear.

In Egypt, Ras Mohamed protectorate had been established in 1983 in south Sina as the first protectorate in egypt to preserve some rare species of coral reefs and colored fish and Wadi El-Rayan protectorate in fayoum which contains Wadi El Hetan (Wheals valley) that contains skeletons of wheals fossils that are dated to be as old as 40 million years.

Figure (18)
Ras Mohamed protectorate
(shaped as a chin)

Figure (19)
Whale fossil

Enrichment information ( ) :
Number of natural protectorates that had been established according to the law (number 102 year 1983) about 30 natural protectorates till 2012 which found on a bout 15% of total area of egypt.

Summary of the lesson

Extinction

which mean

Continous decrease in the number of individuals of a certain species of living organisms

Extincted species example: Dinasaures, mamouth

Endangered species examples : Rhinocerose, Panda bear, bald eagle, Ibis bird Barbary sheep (Arui), Papyrus plant.

methods of protection of endangered species

from it

Establishing natural protecturales to pres erve the endangered species like Ras Mohamed protectorate in egypt.

Effects of extinction on the ecosystem

destroy the simple ecosystem

Little effect on the complicated ecosystem

For extra activity and practice,go to the MOE website

Science

Think and learn

2nd prep.

second term

Contents

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 theThe 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)

Activity (1) Defining the concept of oscillatory motion.

Materials and tools :

- a pencil.
- a 30 cm. long thread.
- Metalic 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)

To complete the activity enter the MOE website

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 (1)

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

Wonder

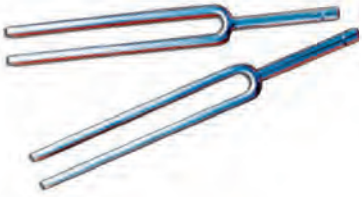
Have you asked yourself about the relation between the velocity of the pendulum and its kinetic energy?

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)

Enter The MOE Website



Tuning fork
Fig. (3)

Stretched string
Fig. (4)

Rotary bee
Fig. (5)

EKB

For more Knowlage about oscillatory motion Use EKB, then discuss with your teacher and Classmutes the Knowlage 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.
- Spring.
- Weight.
- 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.

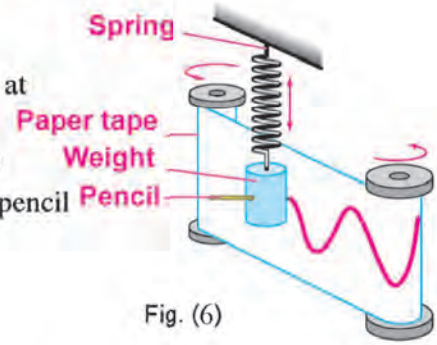


Fig. (6)

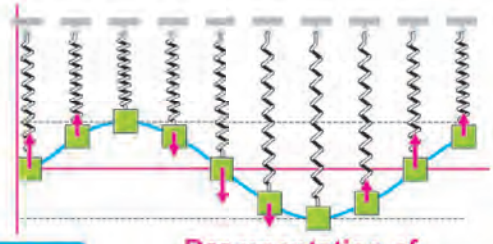
Don't forget to wind the paper roll regularly.

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 :

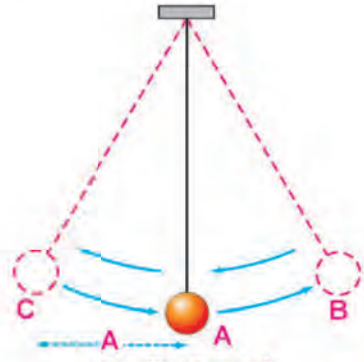
Observe the motion of the pendulum Fig. (8):

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)?

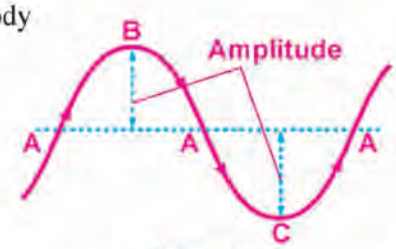
What is the relation between the values of displacements (AB) and (AC)?



Oscillation of pendulum
Fig. (8)

Enter The MOE Website

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)



Amplitude
Fig. (9)

2 Complete oscillation:

When the ball of the pendulum moves form (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).

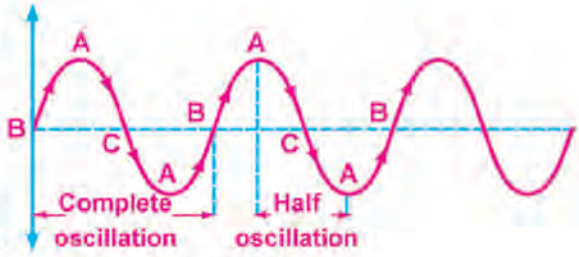


Fig. (10)

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

Exercise (2)

To complete the activity enter the MOE website

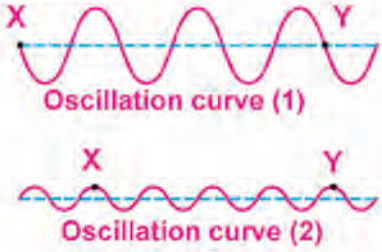


Fig. (11)

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:

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

Exercise (3)

To complete the activity enter the MOE website

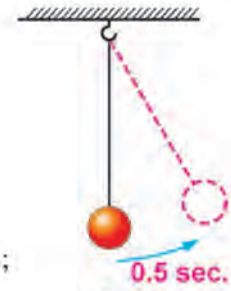


Fig. (12)

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?

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;

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

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 x 10^3 Hertz
Megahertz = 1 x 10^6 Hertz
Gigahertz = 1 x 10^9 Hertz

Fig. (13)

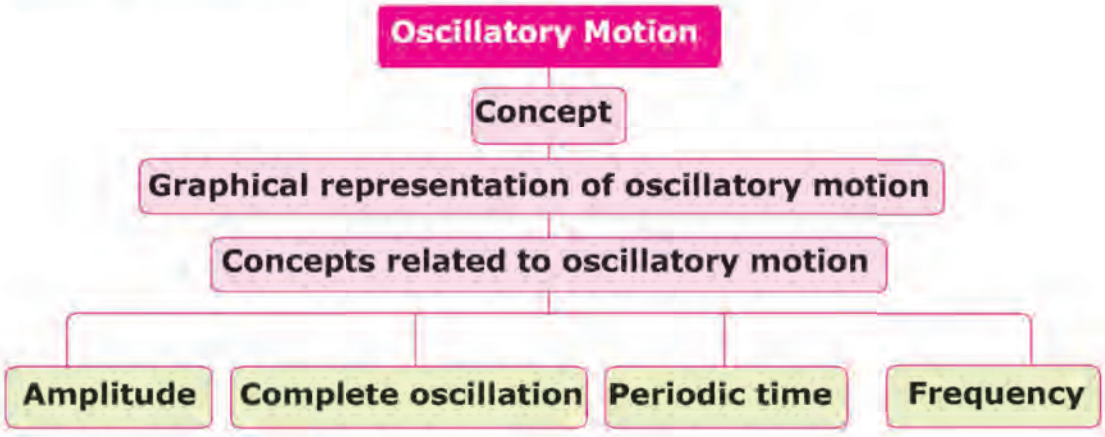
Exercise (4)

To complete the activity enter the MOE website

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.

For extra activity and practice,go to the MOE website

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. Recongize the Concopt 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?

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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)

Enter The MOE Website

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 burning scent stick.
- a candle.
- a tuning fork.

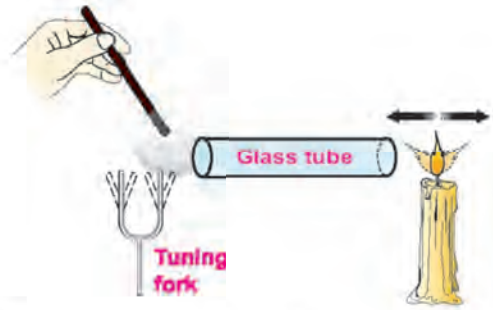

Fig. (3)

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

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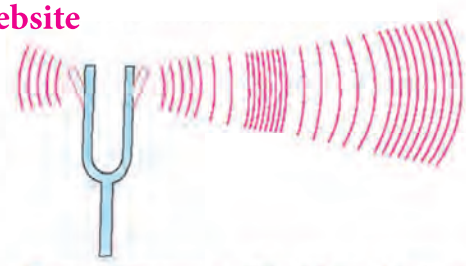
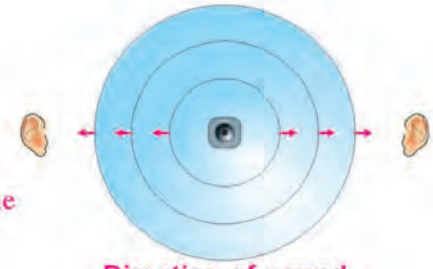
Explanation :

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 form their original places during transferring sound waves carrying energy to the candle flame.


Sound waves emitted by a tuning fork
Fig. (4)

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. (5)



Direction of sound wave propagation
Fig. (5)

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. (6)

1. Fix one end of the spring to a wall using the nail.
2. Tie the colored tape at the middle of the spring. Fig. (6)
3. 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. (7)

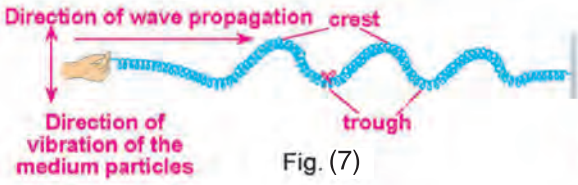


Fig. (7)

- **The second case**
when pushing and pulling the coil rings at the free end. Fig. (8)

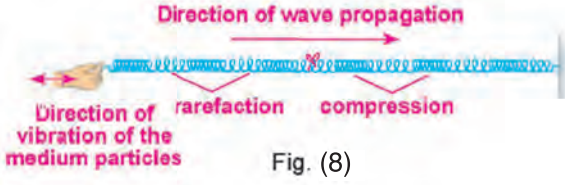


Fig. (8)

- Does the position of the rings change during wave propagation in any of the above cases?
- 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?

To complete the activity enter the MOE website

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. (9), 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. (10).
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. (11).
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.

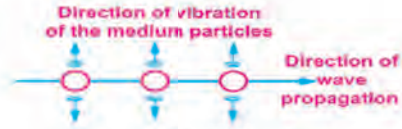


Fig. (9)

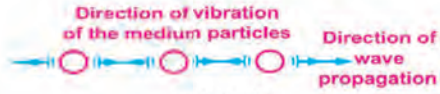


Fig. (10)

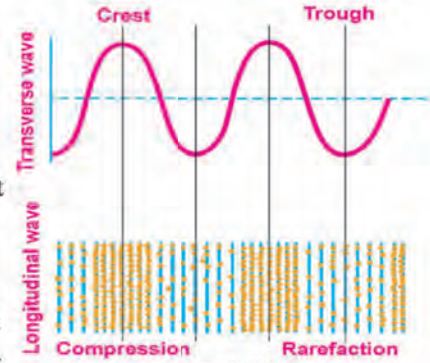


Fig. (11)

Exercise (2)

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Real life application | Physiotherapy tubs (Jacuzzi)

In most health clubs you can find these tubs known as Jacuzzi Fig. (12). 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. (12)

Communication

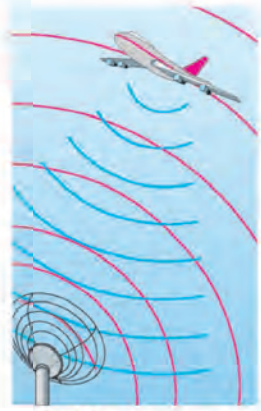
Discuss with your classmates under the supervision of your teacher, the reason behind hearing thunder after seeing lightening though they both do happen at the same time?

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. (12)

Sound Waves
Fig. (13)



Radio waves
Fig. (14)

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 3×10^8 m/s.

Exercise (3)

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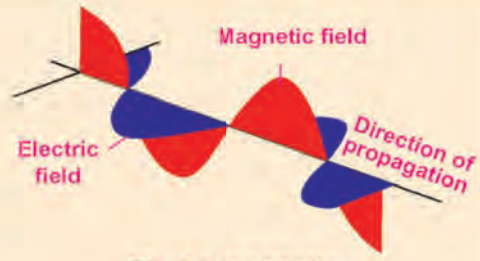
Enrichment information and activity (1)

- 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

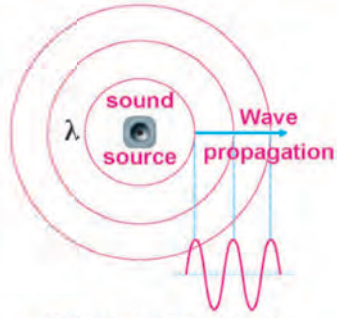


Electromagnetic
Fig. (16)

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. (17)
They are also similar according to some properties.
The following are some concepts that can express the properties of wave motion:

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



Representation of longitudinal wave
Fig. (17)

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. (18)?

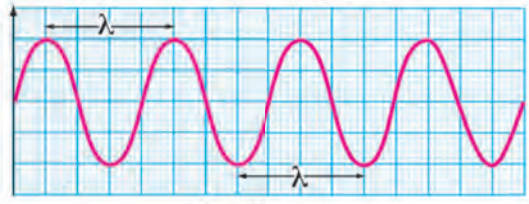


Fig. (18)

.....

Wavelength can be expressed by the symbol (λ).

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

Millimeter (mm) = 1×10^{-3} meter

Micrometer = 1×10^{-6} meter

Nanometer = 1×10^{-9} meter

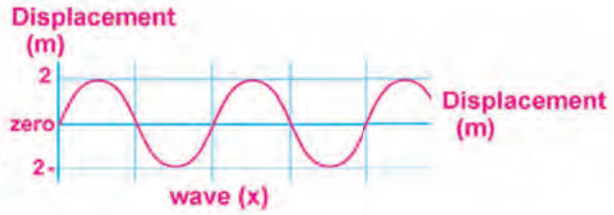
Enrichment information (2)

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

Visible light	380 : 700 Nanometer
Infrared rays	10^3 : 10^6 Nanometer
Microwave	10^6 : 10^9 Nanometer

2 Amplitude:

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



Exercise (4)

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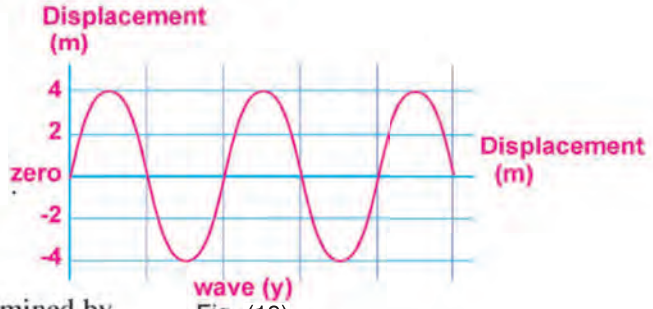

Fig. (19)

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?

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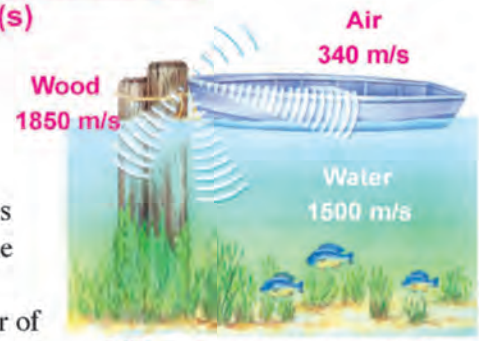
The velocity of a given wave is constant as it travels through the same medium. However, it differs as the nature of the medium changes Fig (20).

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



Different sound speeds in different media

Fig. (20)

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)?

To complete the activity enter the MOE website

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. (21)

The law of wave propagation:

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

Wave velocity (v) = frequency (F) x wavelength (λ)

This relation is known as the law of wave propagation and it can be applied to all kinds of waves. Fig (20).

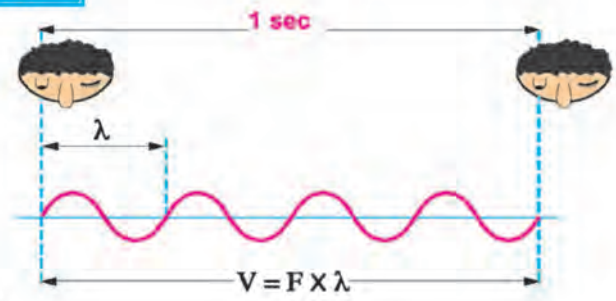


Fig. (20)

Exercise (5)

Enter The MOE Website

Exercise (6)

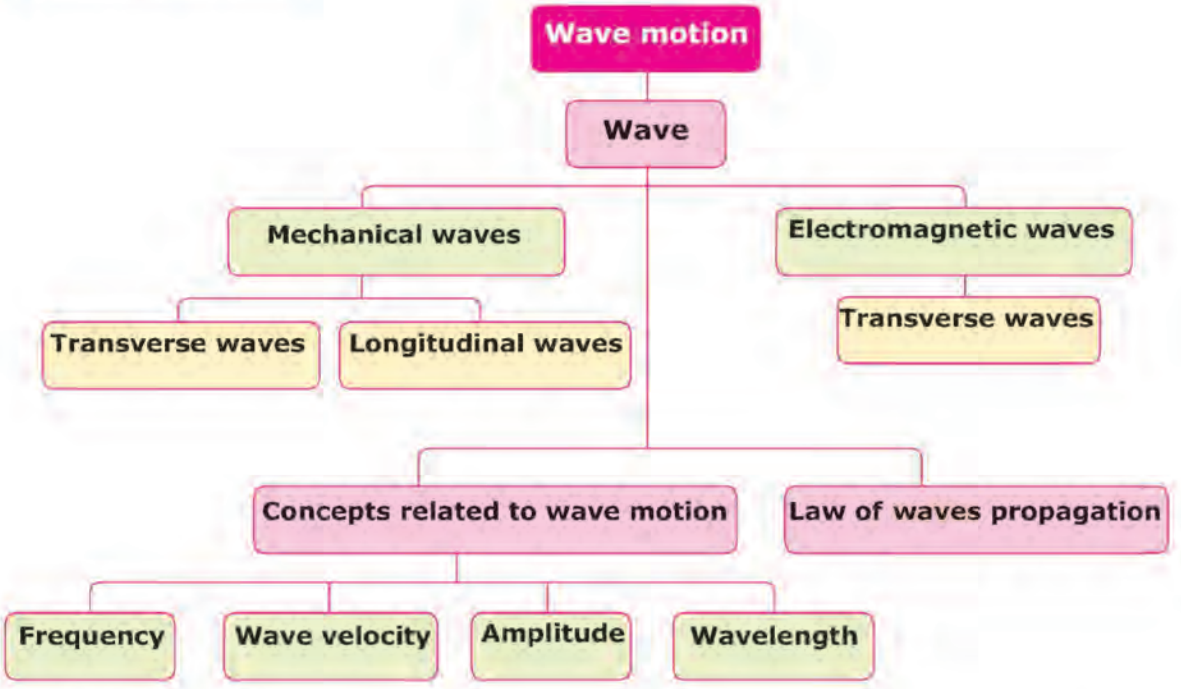
Enter The MOE Website

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.

For extra activities and practice , go to MOE website

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.

For extra activity and practice,go to the MOE website

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.

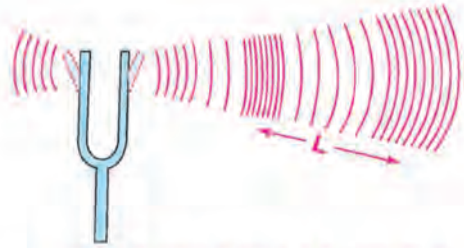
Involved Issues:

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 waves from a tuning fork
Fig. (1)

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

Exercise (1)

Enter The MOE Website

Exercise (2)

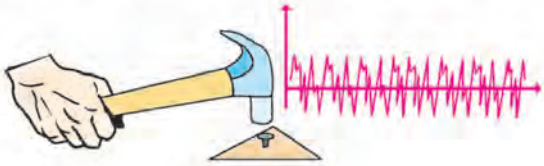
Enter The MOE Website

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 tunning 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. (3)
2. Noise of non-uniform frequency and is uncomfortable to be heard. Fig. (2)

Exercise (3)

Enter The MOE Website

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.

Violin
Fig. (4)

Drill
Fig. (5)

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.

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.

To complete the activity enter the MOE website

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)

Enter The MOE Website

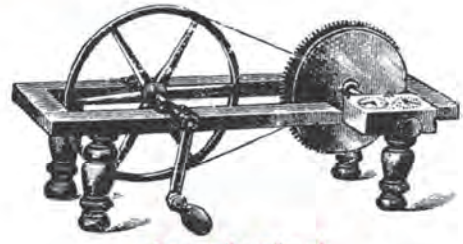
Enrichment Information (1)

- 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. (9)

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

Savart's wheel is used to determine the pitch (frequency) of an unknown tone. Fig. (10)
How can you perform that with your friends?



Savart's wheel
Fig. (10)

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)

Enter The MOE Website

2 Sound Intensity:

Assume that a play was performed in an open air theatre without using any sound amplifier Fig. (11).

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. (11)

Sound intensity is measured in Watt/meter^2

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^2)	Sound intensity (decibel)
- Quiet sounds like whispering and ruslting trees.	1×10^{-12}	zero
- Loud sounds like the sound of a motorbike.	1×10^{-6}	60
- Deafening sounds like that of jet planes.	1×10^{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.**

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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:**

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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) Enter The MOE Website

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:**

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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 :**

Enter The MOE Website

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. (12)

Tone produced from a violin
Fig. (13)

Tone produced from a piano
Fig. (14)

A pure and simple tone is produced from a vibrating tuning fork, and known as the fundamental tone Fig. (12)

On the other hand, the tones produced from a violin Fig. (13) and the piano Fig. (14), 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 :

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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.

.....

.....

Enrichment information (5)

- When the Ethiopian chickens that live in Africa Fig. (15) 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 chikens
Fig. (15)

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. (16)
  - It is also used to sterilize food, water and milk. Fig. (17) 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. (16)

Milk sterilizer
Fig. (17)

Enrichment information (6)

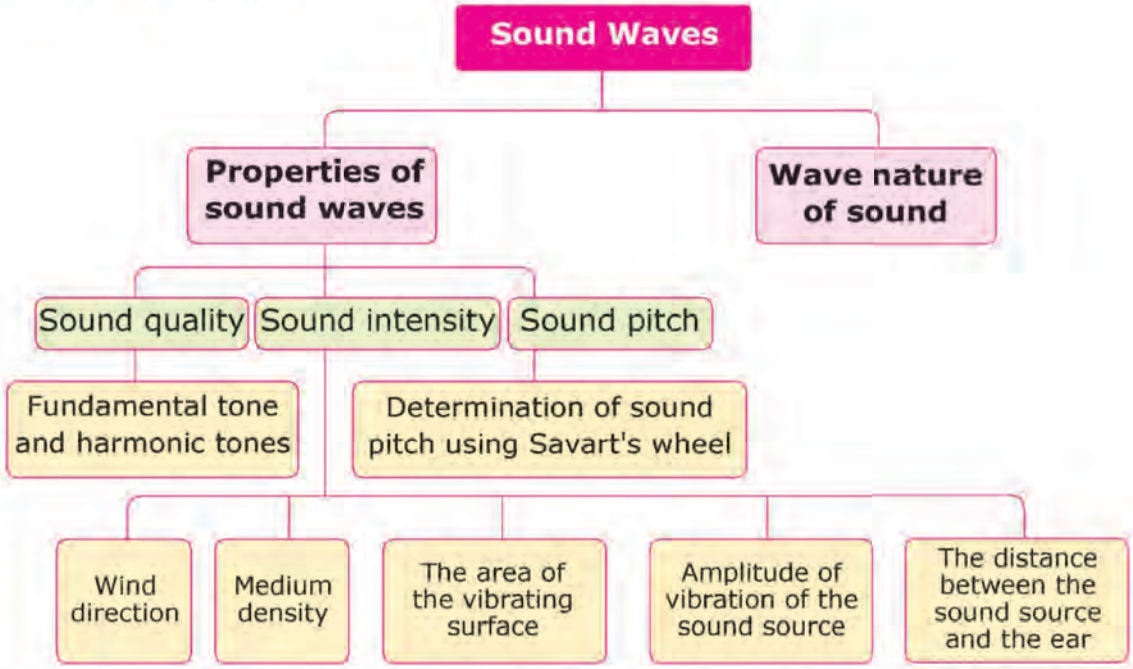
- When ultrasonic waves collide with land mines, they vibrate. And due to this vibration, it produces waves that travel through the earth's surface to be discovered by using a specialized laser device.

For extra activity and practice,go to the MOE website

EKB

it is noticed that some sound sources like musical tones have an intersting and comfortable effect on human ear while others like noise has uncomfortable effect on human ear.
search through EKB for the differenc between the noise and musical tones and the effect of noise on humman 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.

For extra activity and practice,go to the MOE website

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.

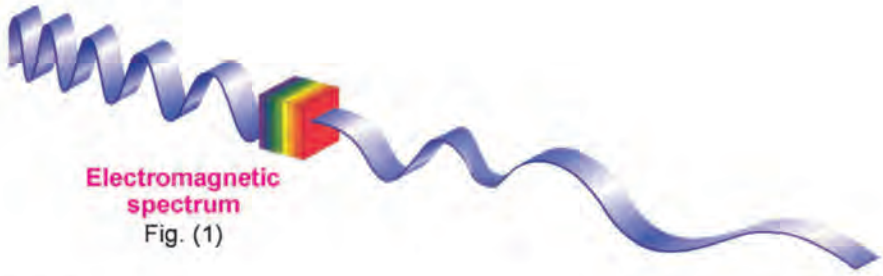
You have studied in unit one the different types of waves and learnt that the nature of light waves differ from those of sound waves.

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.



Electromagnetic spectrum
Fig. (1)

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

Enter The MOE Website

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. (2)

- A glass triangular prism is used to analyze white light into the seven colors of spectrum. Fig. (2)
  - 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 ∝ 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) Enter The MOE Website

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. 3)

Fig. (3)

Activity (2) Light Behavior in Different Media:

Enter The MOE Website

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) Enter The MOE Website

Traveling of light in straight lines:

Light propagates through transparent media in straight lines Fig. (4). The thickness of these lines can be controlled. You can participate with your classmates to carry out the following activity:

Fig. (4)

Activity (3) Demonstrate the propagation of light in straight lines

Enter The MOE Website

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

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:

Activity (4) Illustrating the concept of light intensity.

Enter The MOE Website

Explanation :

Light emitted form 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.

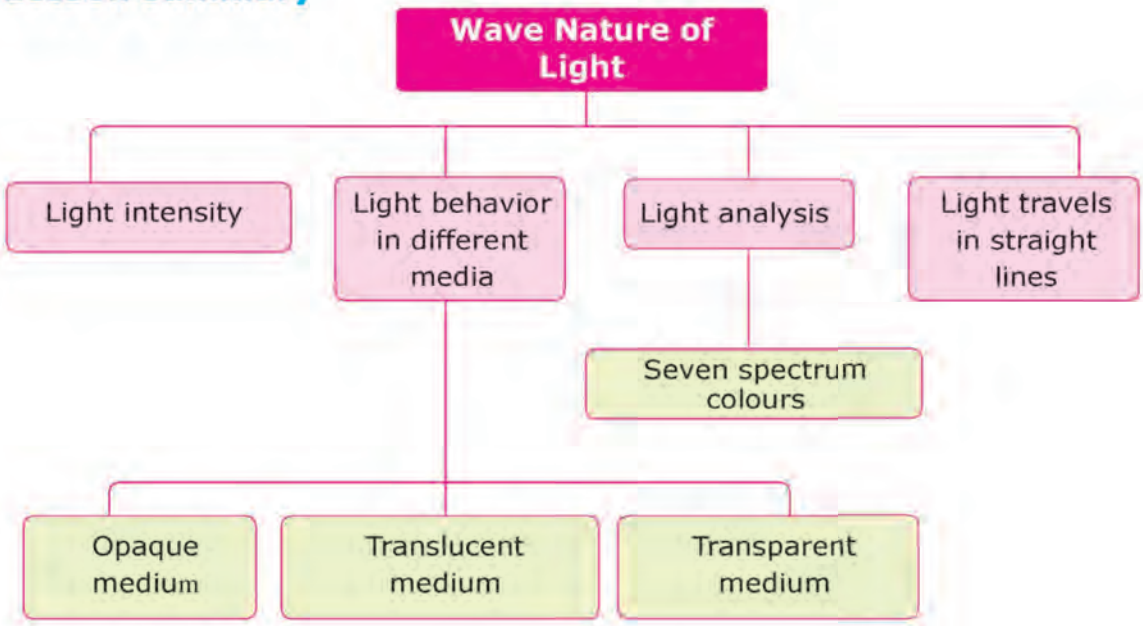
Conclusion :

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.

For extra activity and practice,go to the MOE website

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.

For extra activity and practice,go to the MOE website

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. Identity 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:

Devloping 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:

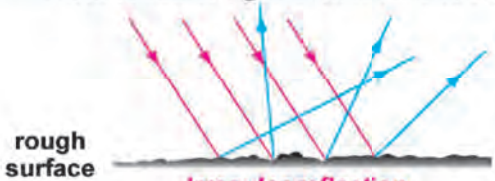


Fig. (4)

Fig. (3)

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)

Enter The MOE Website

Laws of Light Reflection :

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

Activity (1) Identification of the laws of light reflection

Enter The MOE Website

Conclusion :

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

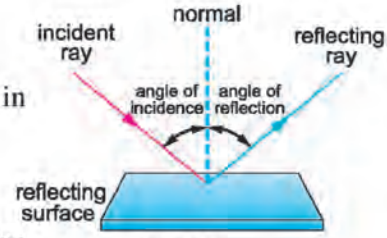


Fig. (7)

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)

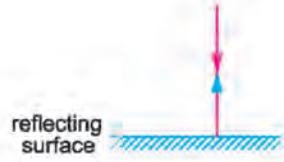


Fig. (8)

Refraction of Light

How can you explain the changing path of a barrel pushed from asphalt to sand, then back again to asphalt? Fig. (7)

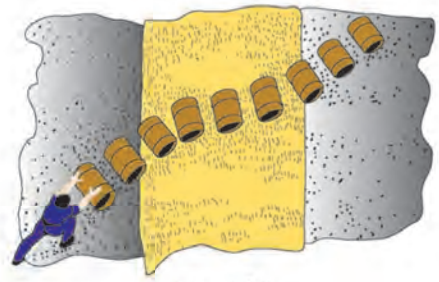


Fig. (7)

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. (8)
- 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 :

Refrection of light
Fig. (8)

Activity (2) **Demonstration of light refraction and some related concepts**

Enter The MOE Website

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.

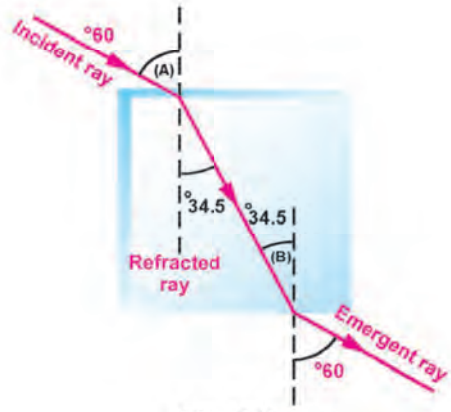


Fig. (9)

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 Fig. (10)
  Which is greater angle of incidence or angel of refraction?
  .....

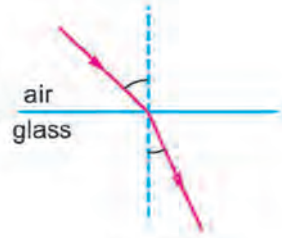


Fig. (10)

- 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. (11)

Fig. (11)

Exercise (2)

Enter The MOE Website

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 vise versa.

Enrichment information (3)

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

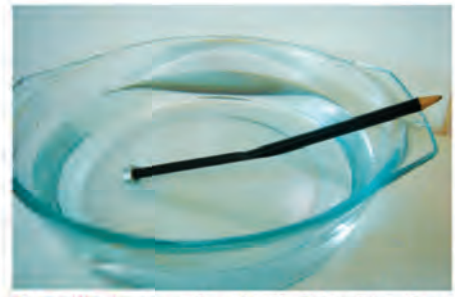
Exercise (3)

Enter The MOE Website

Natural phenomena related to Reflection and Refraction of light

1 Apparent shapes of objects

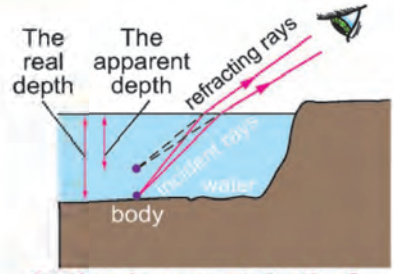
A pencil partially immersed in water appears as being broken . Fig. (12) that is due to the refraction of light rays coming from the immersed part in water .



Pencil's image due to light refraction
Fig. (12)

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. (13) 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. (13)

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. (14)

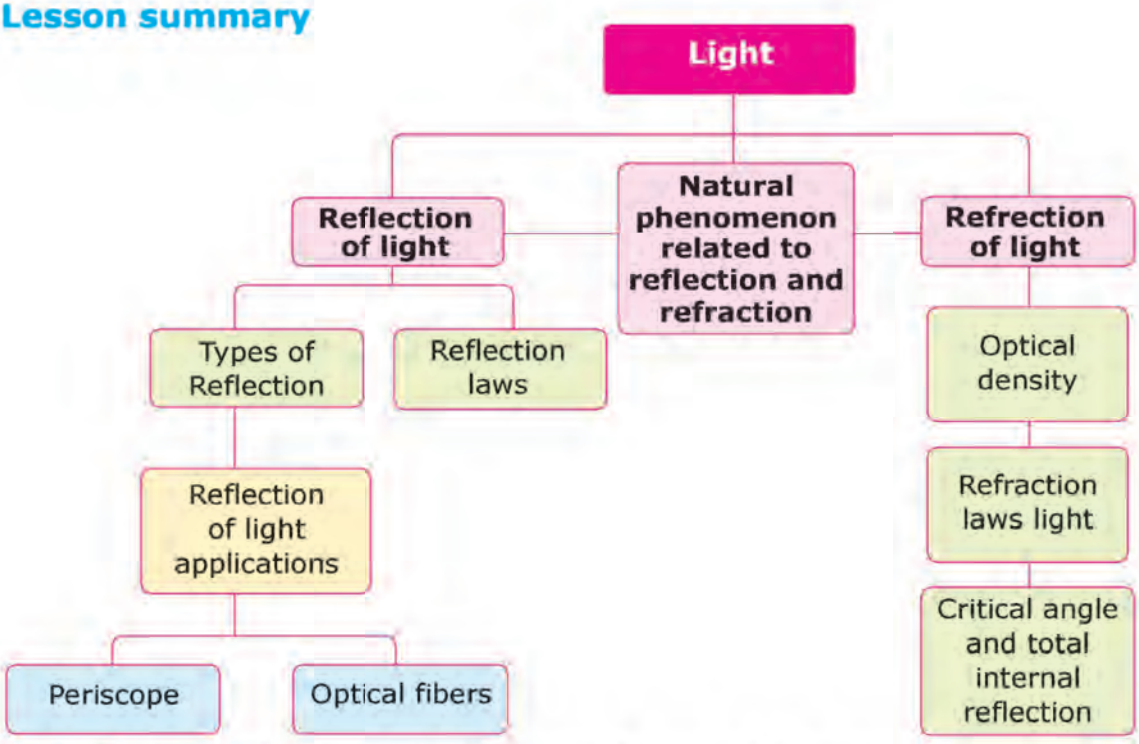
For extra activity and practice,go to the MOE website

Mirage on road
Fig. (15)

EKB

search in the EKB for an explaination of the Mirage phenomenon including some photos and videos.
then demonstrate waht 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 bath 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.

For extra activity and practice,go to the MOE website

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 ,androceium 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:

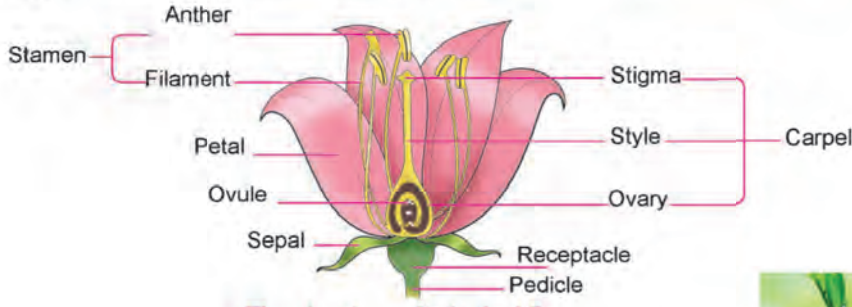
Inflorescence
Fig. (2)

Activity (1) **Identify the structure of a typical flower:**

Enter The MOE Website

Fig. (3)

From activity (1), you can recognize that a typical flower, Fig. (4), 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. (4)

1 The calyx:

The outer whorl of floral leaves is known as the calyx and its leaves are called sepals. Fig. (5), 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. (5)

2 The corolla

The whorl following the calyx, its leaves are called petals, Fig. (6) 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. (6)

Exercise (1)

Enter The MOE Website

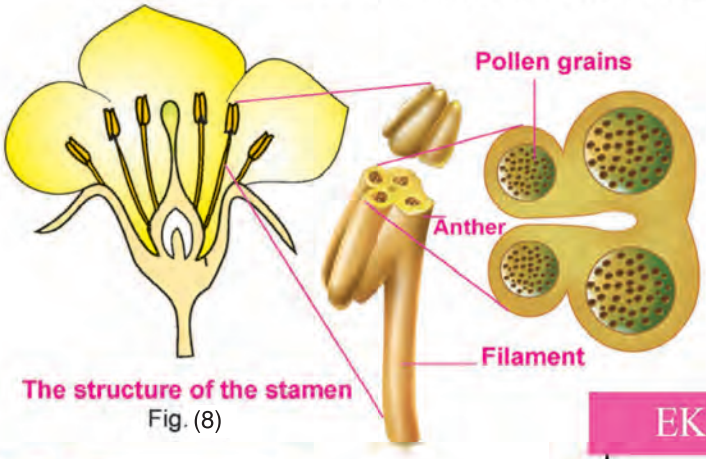
Enrichment information (1)

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. (7).
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. (8).

The stamens of the androecium
Fig. (7)



The structure of the stamen
Fig. (8)

4 Gynoecium:

The fourth and innermost whorl of the flower. Its leaves are called crapels, which resembles the flask in shape and is formed of a bulge known as the ovary, Fig. (9), 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 inflamation of the mucus membrane of the nose causing continous sneezing use EKB to make a research about the discovery of this disease, and ways of protection of patients.

Exercise (2)

Enter The MOE Website

The sex of the flower:

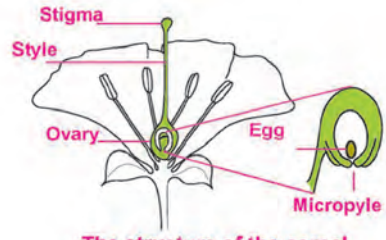
To identify the sex of the flower, participate with your classmates in the co-operative group, to perform the following activity:

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. (10), unlike the female flower which contains only the gynoecium and its symbol is ♀, Fig. (11). The fore-mentioned flowers are known as unisexual flowers, like palms, maize and pumpkins.



The structure of the carpel
Fig. (9)

Palm tree with a male flower
Fig. (10)

Palm tree with a female flowers
Fig. (11)

Exercise (3)

Enter The MOE Website

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?

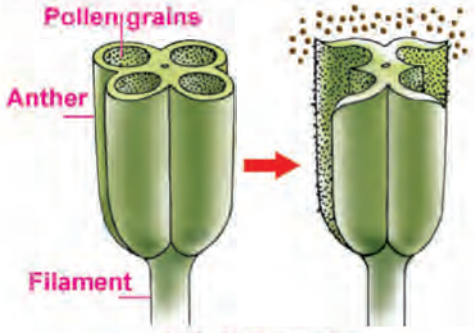
The flower is a short stem where the leaves have been modified to form the genital (reproductive) organs ,which in turn form seeds inside fruits.

- Name the reproductive organ in flowering plants?

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

1 Pollination:

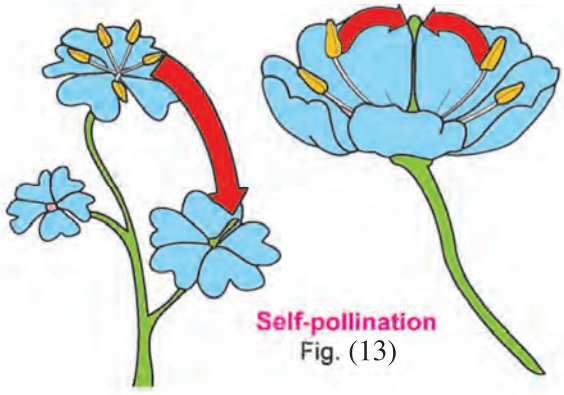
When pollen grains mature and become well developed, the anther splits up longitudinally, releasing pollen grains in the air, Fig. (12). The process of the transfer of pollen grains from anthers of a flower to the stigma is called pollination.



L.S. In the anther
Fig. (12)

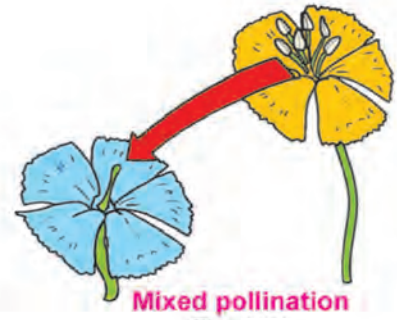
Types of pollination:

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. (13).



Self-pollination
Fig. (13)

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. (14).



Mixed pollination
Fig. (14)

Exercise (4)

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The methods of cross pollination:

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

1 pollination by air:

Observe Fig. (15) 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. (15)

Fig. (15)

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

Enrichment information

Maize plant produces about 50 millions of pollen grains.

2 Pollination by insects:

Observe Fig. (16) 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. (16)

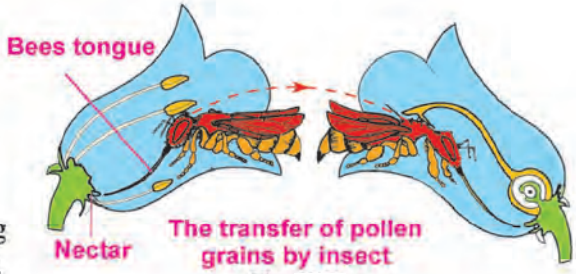

Fig. (16)

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:

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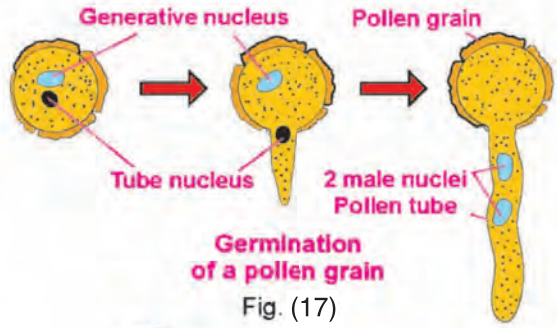
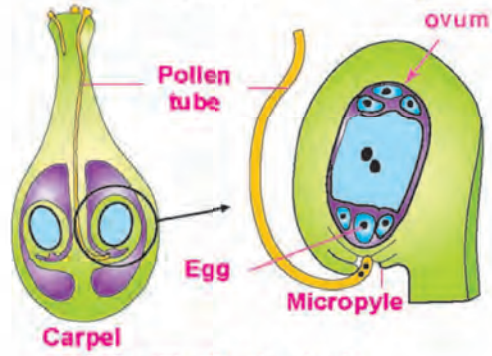
- After pollination, the pollen grain stick to the stigma, this secretes a sugary solution. The pollen grain then begins to germinate forming a **pollen tube** containing two male nuclei Fig. (17).



Germination of a pollen grain
Fig. (17)

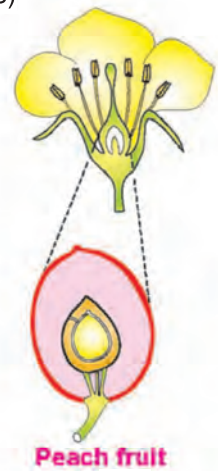
- The pollen tube extends through the style and reaches the ovum by the micropyle opening in the ovary Fig. (18). The tip of the pollen tube degenerates in order that one of the two male nuclei fuses with the egg to form a fertilized ovum which is known as **the zygote**. The zygote in turn undergoes 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**.



Fertilization in plants
Fig. (18)

- 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. (19)
- However, an ovary with many ova, gives rise to a fruit with many seeds inside it, like beans and peas. Fig. (20)

Pea fruit
Fig. (20)



Peach fruit
Fig. (19)

Exercise (5)

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Second: Asexual reproduction in plants

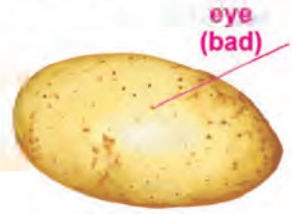
- Can plants reproduce without the presence of flowers?
Some plants can reproduce without the presence of flowers by means of parts of the roots, stems, leaves or buds, which is known as vegetative reproduction.
Vegetative reproduction may be natural or artificial.

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. (21).



Potato tube
Fig. (21)

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

Activity (4) Identify reproduction by tubers

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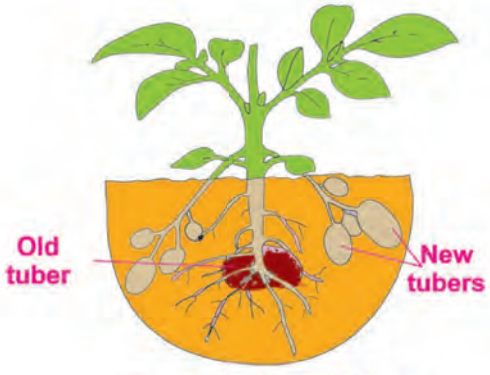
Some buds grow forming a root system, and a shoot system, and after a while new tubers grow. Fig. (22)



Reproduction by tubers
Fig. (22)

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. (23)

Participate with your classmates in the following activity:

A cut
Fig. (23)

Activity (5) **Identify reproduction by cutting**

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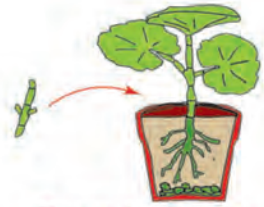
- The buds buried inside the soil, grow to form roots, while the buds above the surface of the soil grow to form the shoot system of the plant. Fig.(24). These shrubs are then transferred to the soil to grow more efficiently.



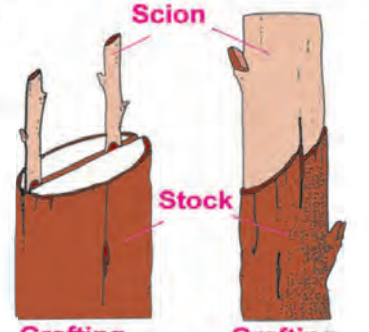
Reproduction by cutting
Fig. (24)

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. (25) 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. (26) as it occurs in large trees.



Grafting by wedge
Fig. (26)

Grafting by attachment
Fig. (25)

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.

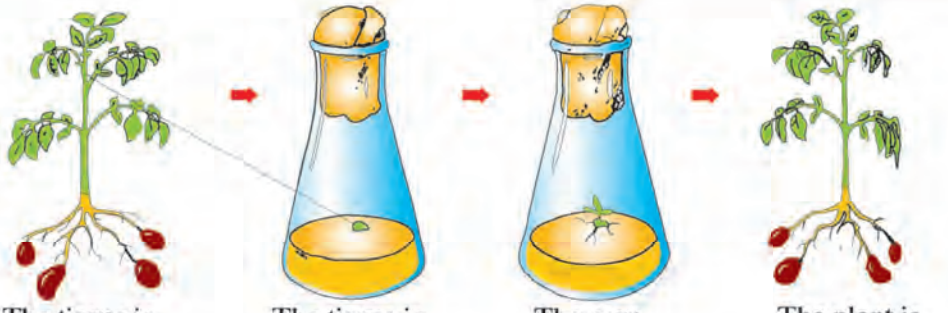
EKB

Glueing Stem is a Disease Which, Infect Bitter Orange Tree,Which Doesn't Infect Naring. Thats 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

3 Tissue culture:

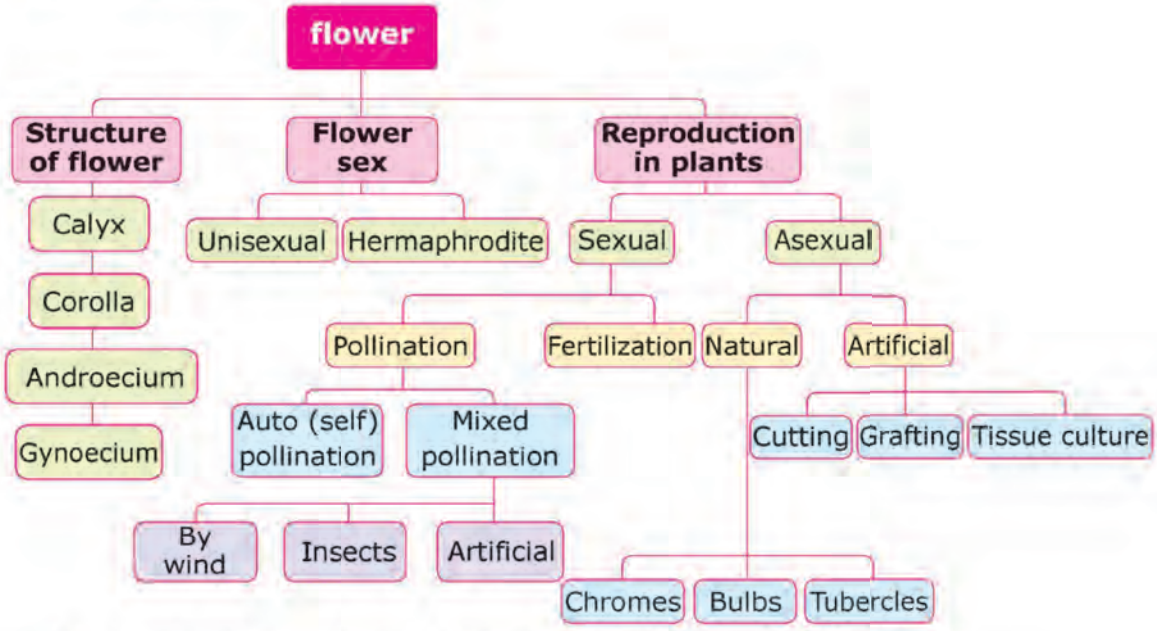
The scientists have developed a process of multiplying a small part of a plant to get many identical parts. This process is known as tissue culture. Fig. (27)



Tissue culture from potato stem
Fig. (27)

For extra activity and practice,go to the MOE website

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 becomes 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.

For extra activity and practice,go to the MOE website

Lesson 2

Reproduction in Humans

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 preservention 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. Veneral 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

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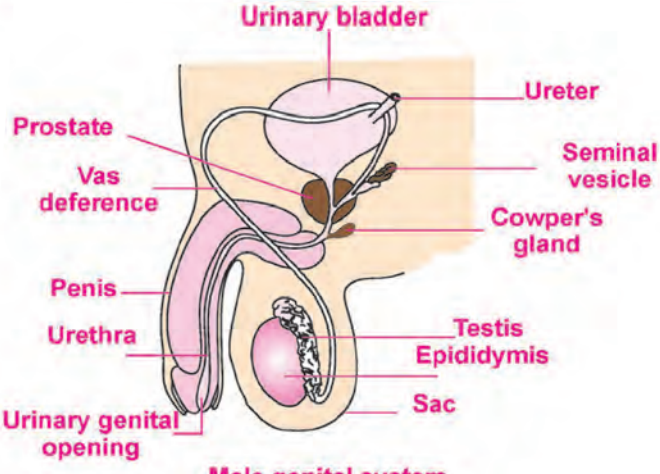

Male genital system
Fig. (1)

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.

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

.....

Some of the puberty sings
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 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)

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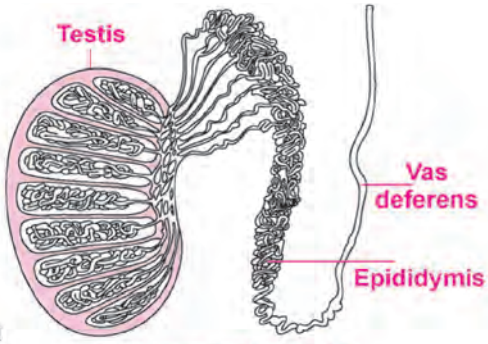
2 Vas deferens :

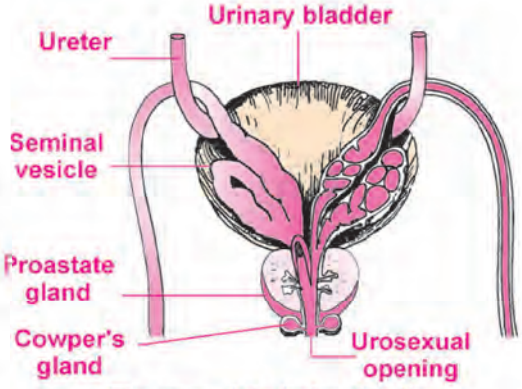
Attached to each testicle is a group of fine highly looped tubes known as the epididimis, where the sperms continue the final stages of growth and development and storage. The epididimis continues in the form of a long single tube known as the vas deferens. This tube helps transfer the sperms from the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

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

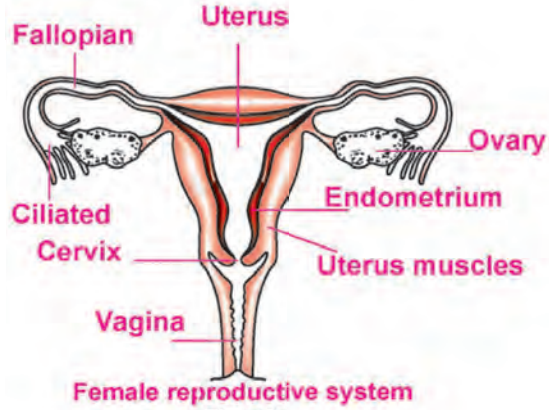
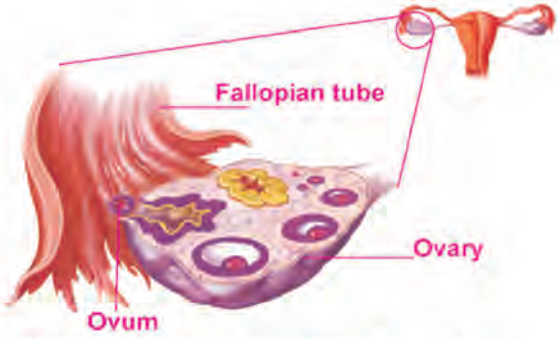


Fig. (5)

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)

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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 reprodution occur in man and how fertile occur ?

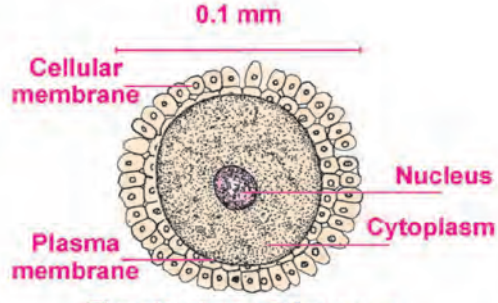
Communication

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 is 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.

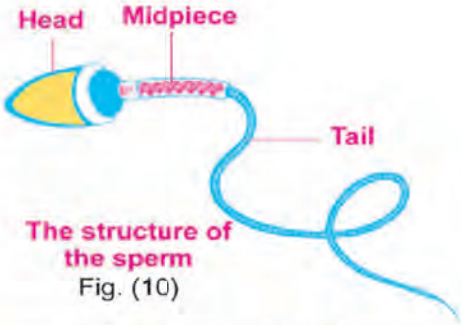


The structure of the ovum
Fig. (9)

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.



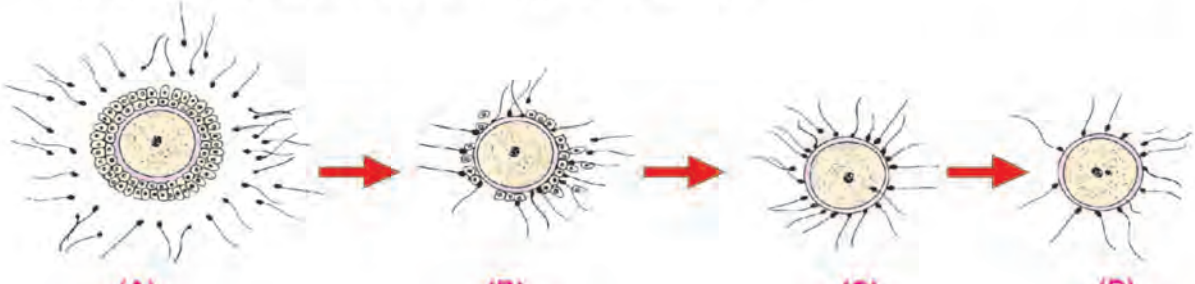
The structure of the sperm
Fig. (10)

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.



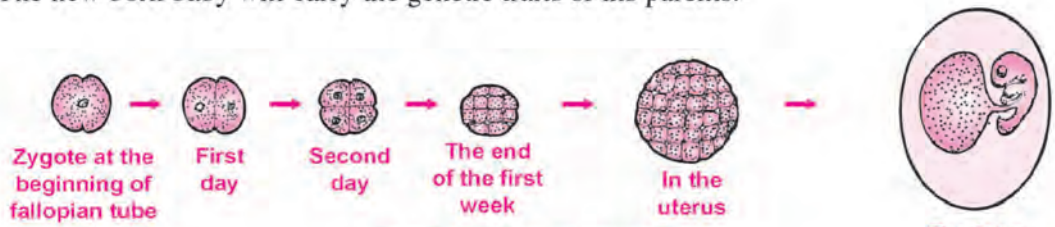
Steps of fertilization
Fig. (11)

- 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 14th 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)

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- 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.

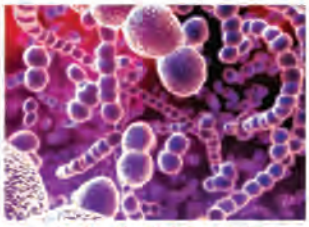
Diseases of the genital system :

- 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.



Spherical bacteria
Fig. (14)

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

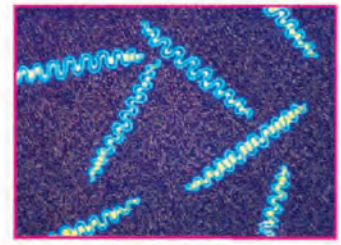
Enrichment information (5)

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 umblical Cord and during delivery Fig. (15)
Incubation period two to three weeks
Symptoms:



Spiral bacteria
Fig. (15)

- 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)

The hand of patient of syphilis
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 hormane in woman.

2 - Lead to the death of the embryos and recent born babies.

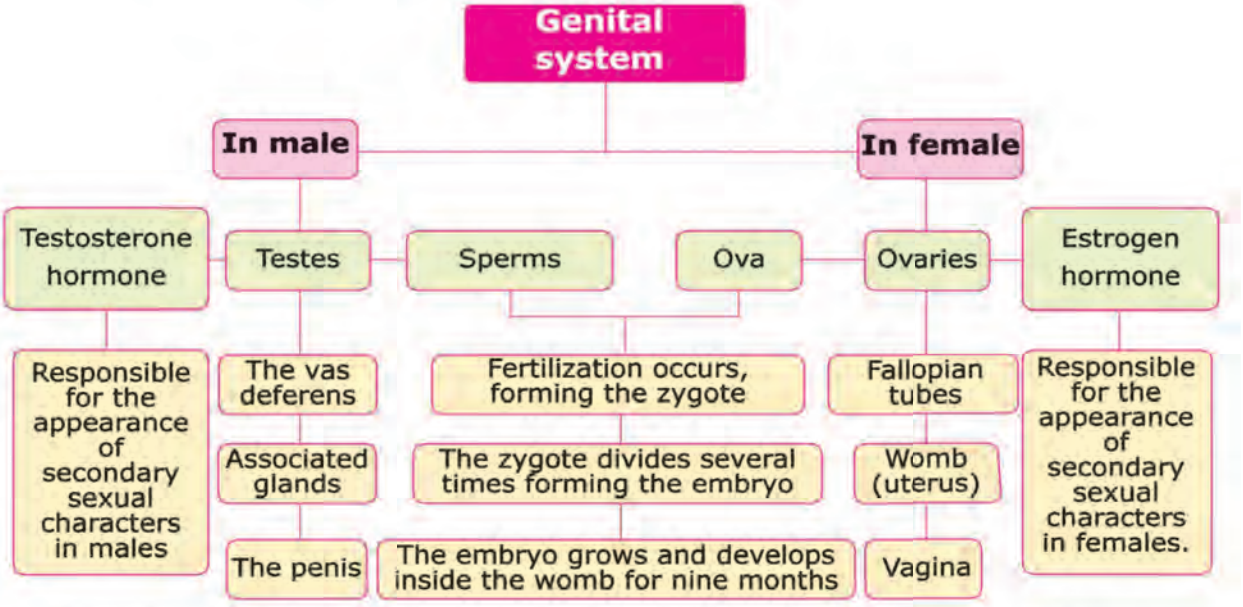
3 - the intake of drugs by pregnant mother lead to the increase of deformation rate is the embryos.

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.

For extra activity and practice,go to the MOE website

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.

For extra activity and practice,go to the MOE website

قائمة المراجع المستخدمة فى تأليف الكتاب

المراجع العربية

(١) موسوعة المشاهدة العيانية (الكيمياء) - أحمد شفيق الخطيب - مكتبة لبنان ناشرون

(٢) القانون العظيم فى الكيمياء - د. تريفونوف - دار مير للطباعة والنشر

(٣) الموسوعة العلمية المعاصرة - أحمد شفيق الخطيب - دار مير للطباعة والنشر

(٤) الأرض تدافع عن نفسها (الماء) - باميلا جرانت - مكتبة الأسرة

(٥) دليل استخدام معامل العلوم المتطورة للمرحلة الإعدادية - وزارة التربية والتعليم

(٦) الكيمياء فى خدمة الإنسان - رولاند چاكسون - الهيئة المصرية العامة للكتاب

(٧) التلوث البيئى وأثره على صحة الإنسان - د. محمد السيد أرناؤوط - مكتبة الأسرة

(٨) قصص وطرائف عن الفلزات - ترجمة عيسى مسوح - دار مير للطباعة والنشر

(٩) سلسلة ألفا العلمية (الأعاصير والعواصف) - نيكولا باربر - مكتبة العبيكان

(١٠) بيئتنا مستقبلنا (أزمة المناخ) - أكاديميا

(١١) المناخ والطقس - إبراهيم حلمى - دار الشرق العربى

(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

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