



# 9 SCIENCE

## QUARTER 1



**PIVOT 4A** LEARNER'S MATERIAL

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This module is a resource of information and guide in understanding the Most Essential Learning Competencies (MELCs). Understanding the target contents and skills can be further enriched thru the K to 12 Learning Materials and other supplementary materials such as worksheets/activity sheets provided by schools and/or Schools Division Offices and thru other learning delivery modalities including radio-based and TV-based instruction (RB/TVI).

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# Science

## Grade 9

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**Science Grade 9**  
**PIVOT IV-A Learner's Material**  
**Quarter 1**  
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## Guide in Using PIVOT Learner's Material

### For the Parents/Guardian

This module aims to assist you, dear parents, guardians, or siblings of the learners, to understand how materials and activities are used in the new normal. It is designed to provide the information, activities, and new learning that learners need to work on.

Activities presented in this module are based on the Most Essential Learning Competencies (MELCs) for Science as prescribed by the Department of Education.

Further, this learning resource hopes to engage the learners in guided and independent learning activities at their own pace and time. Furthermore, this also aims to help learners acquire the needed 21st century skills while taking into consideration their needs and circumstances.

You are expected to assist the child in the tasks and ensure the learner's mastery of the subject matter. Be reminded that **learners have to answer all the activities in their own notebook**.

### For the Learners

The module is designed to suit your needs and interests using the IDEA instructional process. This will help you attain the prescribed grade-level knowledge, skills, attitude, and values at your own pace outside the normal classroom setting.

The module is composed of different types of activities that are arranged according to graduated levels of difficulty—from simple to complex. You are expected to **answer all activities on separate sheets of paper** and submit the outputs to your respective teachers on the time and date agreed upon.

## PARTS OF PIVOT LEARNER'S MATERIAL

	Parts of the LM	Description
Introduction	What I need to know	The teacher utilizes appropriate strategies in presenting the MELC and desired learning outcomes for the day or week, purpose of the lesson, core content and relevant samples. This allows teachers to maximize learners awareness of their own knowledge as regards content and skills required for the lesson
	What is new	
Development	What I know	The teacher presents activities, tasks , contents of value and interest to the learners. This shall expose the learners on what he/she knew, what he /she does not know and what she/he wanted to know and learn. Most of the activities and tasks must simply and directly revolved around the concepts to develop and master the skills or the MELC.
	What is in	
	What is it	
Engagement	What is more	The teacher allows the learners to be engaged in various tasks and opportunities in building their KSA's to meaningfully connect their learnings after doing the tasks in the D. This part exposes the learner to real life situations /tasks that shall ignite his/her interests to meet the expectation, make their performance satisfactory or produce a product or performance which lead him/ her to understand fully the skills and concepts .
	What I can do	
	What else I can do	
Assimilation	What I have learned	The teacher brings the learners to a process where they shall demonstrate ideas, interpretation , mindset or values and create pieces of information that will form part of their knowledge in reflecting, relating or using it effectively in any situation or context. This part encourages learners in creating conceptual structures giving them the avenue to integrate new and old learnings.
	What I can achieve	

## Transport of Nutrients in the Respiratory and Circulatory System

### I

### Lesson

---

This lesson will provide you information on how respiratory and circulatory system work together in transporting nutrients, gases and other molecules to and from the different parts of the body.

For respiratory system, you will learn the parts of the human respiratory system, how gas exchange and transport of nutrients happen. You can match air flow and blood flow during ventilation and learn the securing and guarding in the respiratory tract.

Likewise in circulatory system, you will be familiarized with the parts of the circulatory system. You will also know more about the functions and mechanisms involve in it. This lesson is very important specially this time of pandemic because what is affected in our body are the main organs of respiratory system and circulatory system.

When you eat foods, you are actually using the chemical energy that fuels your body to do various activities. How are these nutrients, other fluids, gases and other molecules transported in your body? Can you enumerate the different organ systems in your body that work together to perform each functions to maintain homeostasis?

You can start by doing a simple exercise! Are you ready? Try to jump five times before you continue studying the lesson. Have you felt some changes in your body? Try to feel the left part of your chest. Do you feel an increased and faster heartbeat than when you are just sitting or doing a regular routine of being stationary in your place? Are you grasping for more air?

There are two organ systems that work together to allow the exchange of gases when you are doing strenuous activity like jumping. These are the respiratory system and the circulatory system.

Nowadays in the time of pandemic, if a person is experiencing symptoms like fever, colds and has a hard time breathing, there is a necessary measure to keep oneself away from the suspicion of having acquired the virus that weakens the respiratory system. This can be explained by the interaction of respiratory and circulatory system if the virus gets in the body. How is this possible?

You will learn all these in the succeeding lessons.

Let's start by studying the coordinated parts and functions of the organs in the respiratory and circulatory system that will aid in the transport of nutrients, gases, and other molecules to and from the different parts of the body.

In humans and other animals, the necessary nutrients, gases and liquids are transported in the body through the blood. Blood is carried through the body via blood vessels. There are three blood vessels in the human body. These are the vein, artery and capillary.

An artery is a blood vessel that carries blood away from the heart, where it branches into ever-smaller vessels. All arteries have relatively thick walls that can withstand the high pressure of blood ejected from the heart. Eventually, the smallest arteries, vessels called arterioles, further branch into tiny capillaries, where nutrients and wastes are exchanged, and then combine with other vessels that exit capillaries to form venules, small blood vessels that carry blood to a vein, a larger blood vessel that returns blood to the heart.

The respiratory system works directly with the circulatory system to provide oxygen to the body. This substance moves into the blood vessels that circulate the oxygen-rich blood to tissues and cells in the body. The chart below shows the comparison of the arteries and veins in human body.

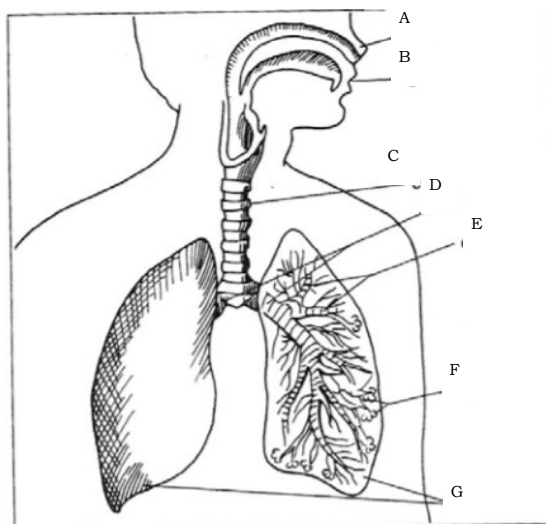
#### **Comparison of Arteries and Veins**

	<b>Arteries</b>	<b>Veins</b>
Direction of blood flow	Conducts blood away from the heart	Conducts blood toward the heart
General appearance	rounded	Irregular; often collapsed
pressure	high	low
Wall thickness	thick	thin
Relative oxygen concentration	Higher in systemic arteries; lower in pulmonary arteries	Lower in systemic veins; higher in pulmonary veins
valves	Not present	Present most commonly in limbs and veins inferior to the heart

Blood flow refers to the movement of blood through a vessel, tissue, or organ, and is usually expressed in terms of volume of blood per unit of time. It is initiated by the contraction of the ventricles of the heart. Ventricular contraction ejects blood into the major arteries, resulting in flow from regions of higher pressure to regions of lower pressure, as blood encounters smaller arteries and arterioles, then capillaries, then the venules and veins of the venous system.

**Learning Task 1:** Study the diagram of the human respiratory system. Copy the diagram and label the parts correctly. Choose from the words listed below.

mouth  
nose  
bronchi  
air sacs  
lungs  
branching tubes  
trachea

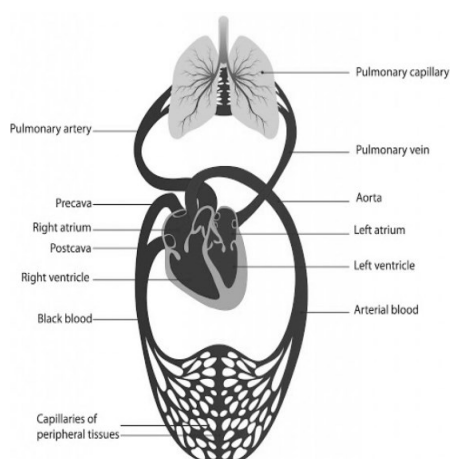


**D**

**Learning Task No. 2:** Copy and complete each statement. Choose from the words inside the box.

1. The main artery of the body, supplying oxygenated blood to the circulatory system. \_\_\_\_\_
2. The upper right chamber of the heart that receives oxygenated blood from the lungs. \_\_\_\_\_
3. The chamber within the heart that is responsible for pumping oxygen-depleted blood to the lungs. \_\_\_\_\_
4. The artery carrying blood from the right ventricle of the heart to the lungs for oxygenation. \_\_\_\_\_
5. Is the thickest of the heart's chambers and is responsible for pumping oxygenated blood to tissues all over the body. \_\_\_\_\_

Left atrium  
Aorta  
Pulmonary artery  
Right ventricle  
Left ventricle



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**Learning Task 3:** Read the instruction in each activity. Prepare and write your answers in your notebook.

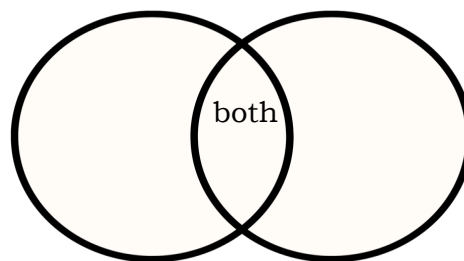
### A. Venn Diagram of Respiratory and Circulatory System

From the previous lesson you, became familiar with the respiratory system. But as you explore this module you will then realize that respiratory and circulatory system works together to perform their specific functions effectively. Below are the descriptions for the two body systems. Construct a Venn diagram to show their similarities and differences? Write the letter inside the corresponding space.

A-Arteries	F-Larynx	K-Pumps blood
B-Blood	G-Lungs	L-Trachea
C-Bronchioles	H-Nose	M-Uses oxygen
D-Gas exchange	I-Pharynx	N-Veins
E- Heart	J-Capillaries	O-Valve

Respiratory System

Circulatory System



### B. Inhale and Exhale

Each of the following goes with inhaling or exhaling. Place a checkmark in the box where you think each statement belongs.

	INHALING	EXHALING
1. air moves out of the lungs		
2. air moves into the lungs		
3. ribs move out		
4. ribs move in		
5. chest space becomes smaller		
6. chest space becomes larger		
7. diaphragm moves down		
8. Diaphragm moves up		



**Learning Task 4:** Read the handout about the heart and blood circulation. Prepare and write your answers in your notebook.

### **Handout: The Heart and Blood Circulation**

The human heart consists of *four chambers*: The left and right atrium which are the receiving chambers contracts to push blood into the lower chambers. The left and right ventricles which act as the pumping chambers propel blood to the lungs or to the rest of the human body.

There are two distinct but linked circuits in the human circulation called the **pulmonary and systemic circuits**. Both circuits transport blood and gases. The **pulmonary circuit** transports blood to and from the lungs, where it picks up oxygen and delivers carbon dioxide for exhalation. The **systemic circuit** transports oxygenated blood to virtually all of the tissues of the body and returns relatively deoxygenated blood and carbon dioxide to the heart to be sent back to the pulmonary circulation.

The right ventricle pumps deoxygenated blood into the pulmonary trunk, which leads toward the lungs and divides into two branches into the left and right pulmonary arteries. These vessels in turn branch many times before reaching the **pulmonary capillaries**, where gas exchange occurs. The *carbon dioxide* exits the blood and *oxygen* enters. The *pulmonary trunk arteries* and their branches are the only arteries in the post-natal body that carry relatively *deoxygenated blood*.

Highly oxygenated blood returning from the **pulmonary capillaries** in the lungs passes through a series of vessels that join together to form the pulmonary veins—the only post-natal veins in the body that carry *highly oxygenated blood*. The **pulmonary veins** conduct blood into the left atrium, which pumps the blood into the left ventricle, which in turn pumps *oxygenated blood* into the aorta and on to the many branches of the systemic circuit.

Eventually, these vessels will lead to the **systemic capillaries**, where exchange with the tissue fluid and cells of the body occurs. In this case, *oxygen and nutrients* exit the systemic capillaries to be used by the cells in their metabolic processes, and carbon dioxide and waste products will enter the blood.

The **blood exiting the systemic capillaries** is *lower in oxygen concentration* than when it entered. The capillaries will ultimately unite to form venules, joining to form ever-larger veins, eventually flowing into the two major systemic veins, the **superior vena cava and the inferior vena cava**, which return blood to the right atrium. The blood in the superior and inferior venae cavae flows into the **right atrium**, which pumps blood into the **right ventricle**. This process of blood circulation continues as long as the individual remains alive.

**Dual System** of the Human Blood Circulation Blood flows from the **right atrium** to the **right ventricle**, where it is pumped into the **pulmonary circuit**. The blood in the pulmonary artery branches is *low in oxygen* but relatively *high in carbon dioxide*. **Gas exchange** occurs in the **pulmonary capillaries** (oxygen into the blood, carbon dioxide out), and *blood high in oxygen* and *low in carbon dioxide* is returned to the **left atrium**. From here, blood enters the **left ventricle**, which pumps it into the *systemic circuit*. Following exchange in the systemic capillaries (oxygen and nutrients out of the capillaries and carbon dioxide and wastes in), blood returns to the **right atrium** and the cycle is repeated.

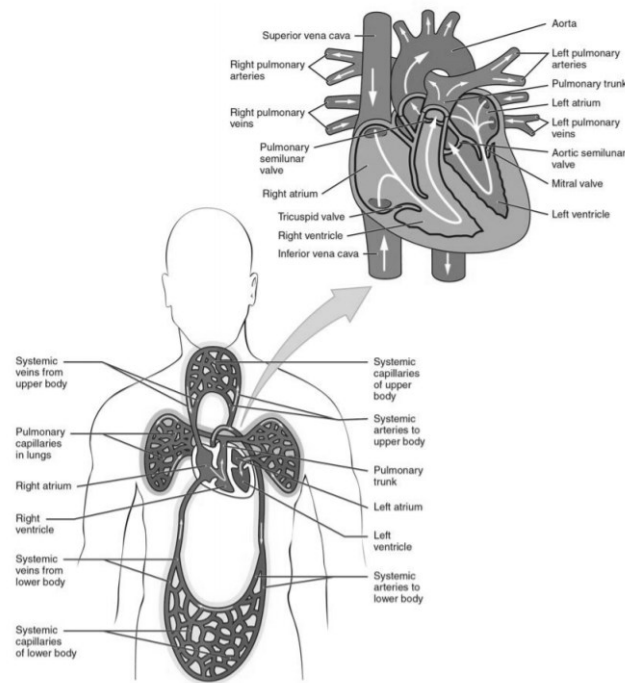


Diagram showing the dual blood circulation

### Guide Questions:

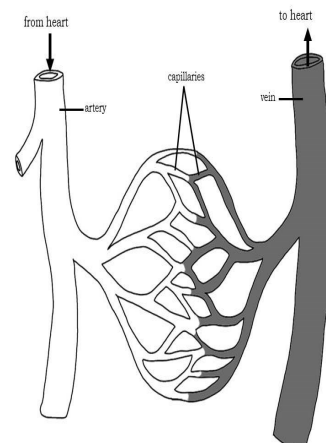
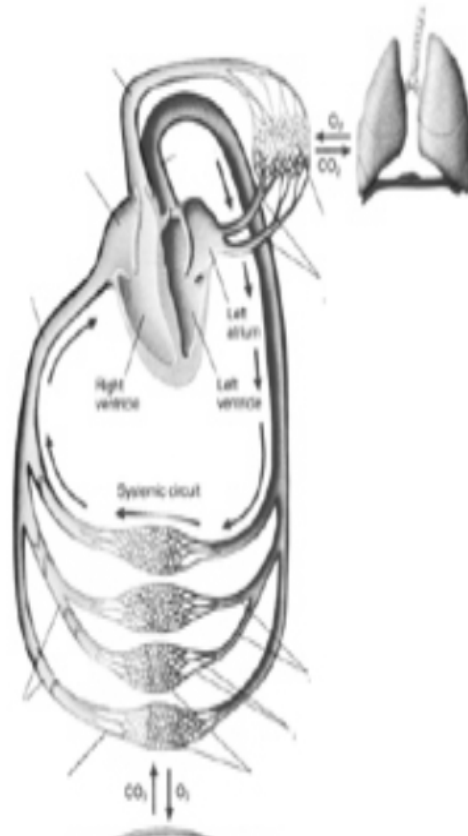
After reading the handout about the heart and blood circulation, answer the following questions.

1. What are the two circuits by which the gases are circulated in and out of the lungs?
2. What tissues in the body transport the nutrients, gases and other substances in the human body?
3. Describe the transport of gases in a pulmonary circuit.
4. Describe the transport of gases in a systemic circuit.

**Learning Task No. 5:** Examine the diagram showing the pulmonary and systemic circuit. A blood that carries gases enters into the venules and gas exchange happens in the capillaries.

Write the number that corresponds to the correct order by tracing the blood flow in correct order. Some numbers are indicated already.

- 5 Tricuspid valve
- \_\_\_\_\_ Pulmonary veins
- \_\_\_\_\_ Left ventricle
- \_\_\_\_\_ Lungs
- \_\_\_\_\_ Mitral Valve
- 1 Venules
- 7 Pulmonary semilunar valve
- \_\_\_\_\_ Pulmonary arteries
- \_\_\_\_\_ Veins
- \_\_\_\_\_ Right atrium
- \_\_\_\_\_ Right ventricle
- \_\_\_\_\_ Capillaries
- 14 Aortic semilunar valve
- \_\_\_\_\_ Arteries
- \_\_\_\_\_ Inferior vena cava & superior vena cava
- \_\_\_\_\_ Left atrium
- \_\_\_\_\_ Arterioles
- \_\_\_\_\_ Aorta



*Jael Faith Ledesma\_illustrator*



**Learning Task 6:** Read and understand the procedures indicated in the activity. Perform them one by one. Make use of other materials available to you.

### Face Mask Design

In this activity, you will learn to make a face mask from used clothing available in your house. Look for three different textures of textile. Find out which is the best textile for face mask and what design is best to protect the user.

#### Materials:

Used clothing (3 different textures)  
Scissors  
Tape measure

#### Procedure:

1. Make patterns for the desired design of your face mask.
2. Using three different textures of textile, find out which texture of textile is the best cloth for face mask.
3. Fill in the template below

#### Project Description:

Type of Textile	Describe how you inhale and exhale using the face mask (test it by jumping as fast as you can in 3 minutes)	Describe the comfort of wearing the face mask like: sweat absorbing capacity, heat absorbing capacity and moist release when wearing eyeglasses)
A		
B		
C		

1. Design    2. Usability    3. Comfort

#### Guide Questions:

1. What is the economic implication of making your own washable face mask?
2. Why is it that wearing of face mask is mandatory in this time of pandemic caused by Covid 19?
3. How will you relate this activity in your lesson on respiratory and circulatory exchange of gases?

This lesson allows you to infer how one's lifestyle can affect the functioning of respiratory and circulatory system. Eating nutritious foods, doing regular exercise and gaining adequate sleep daily can keep your respiratory system, cardiovascular or circulatory system and immune system stronger. These activities will give your body enough knowledge, skills and attitudes towards a healthy lifestyle.

To have a healthy lifestyle, we must be conscious of what we are doing, like monitoring the amount of sleep we have daily, how we move in our position when doing something like working in front of the computer, eating the nutritious food and avoiding what is not necessary in our body. Science can reveal that healthy body, eating correct food for our age and body and having fitness routines can help prevent diseases like hypertension, stress, high cholesterol, diabetes, and even simple respiratory tract diseases like cough, colds, asthma, sinusitis and allergies. Also, preventing the corona virus to enter our systems can be learned.

In the succeeding activities, you will experience cardiovascular exercise that will help you to strengthen the heart muscles and make the respiratory tract clear and free from particulates in the environment. Doing the breathing exercise and stretching the muscles in our body can reverse our tendency to experience diseases.

You do not need to go to the gym or drink expensive medicines to make your body healthy, just monitor your attitude towards a healthy lifestyle. *"Having a healthy lifestyle making your body on style" - Vier Nama.*

*When you take care of your body, your mind  
and heart will be healthy.*

*Keep well and good!- May Natividad*

**Learning Task 1:** Read the instruction in doing the simple regular exercise at home. Choose any material available at home. Sign a pledge of commitment.

**Equipment:** any rubber shoes (sneakers), jump rope (available at home)

**Benefits:** Jumping rope helps develop better body awareness, hand-foot coordination, and agility.

**Safety:** Your jump rope should be adjusted for your height. Stand with both feet on the middle of the rope and extend the handles to your armpits. That's the height you're going for. If it's too long, cut or tie it to avoid tripping on the rope.

**Duration and frequency:** 15 to 25 minutes, 3 to 5 times per week

If you're a beginner:

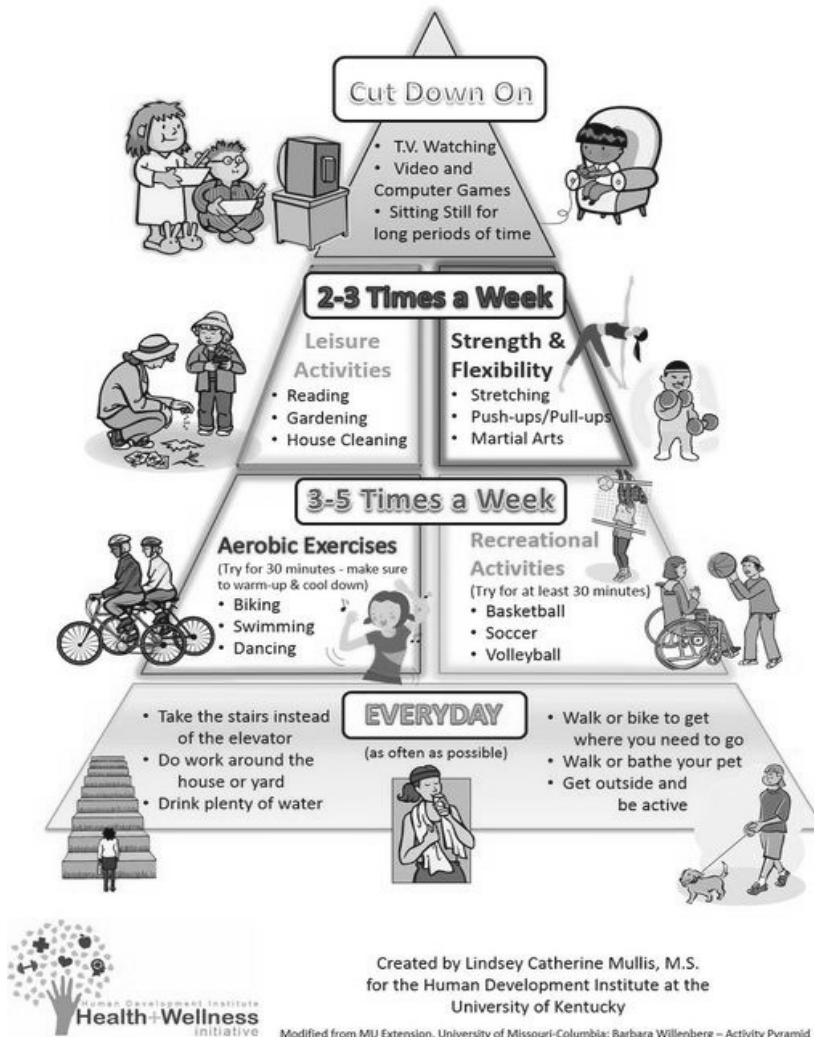
1. Start by jogging forward as you swing the jump rope over your head and under your feet. Do this move for 15 seconds.
2. Reverse your direction and jog backward as you continue to swing the jump rope.
3. Do step 2 for 15 seconds.
4. Finish your set by doing a hopscotch jump for 15 seconds.
5. To do this move, jump rope in place, and as you jump, alternate between jumping your feet out to the sides and then back to the center, similar to how you'd move them while doing jumping jacks.
6. Do step 5 for 15 seconds.
7. Rest for 15 seconds between sets.
8. Repeat 18 times.
1. If you're an intermediate exerciser, you can perform the moves for 30 seconds and rest for 30 seconds between sets.
2. The advanced circuit should be performed for 60 seconds at a time, followed by 60 seconds of rest
3. Sign the commitment form below.

*I \_\_\_\_\_ pledge to do this physical activities for the month of \_\_\_\_\_ .*

*Name Over Printed Signature/Date:\_\_\_\_\_*

# D

**Learning Task 2:** Take a look at the chart and the figure . Prepare a monthly health pledge using these two. Write your answer in your notebook.



Weeks of the Month	Cut Down On	2-3 Times a Week	3-5 Times a Week	Everyday
1st Week				
2nd Week				
3rd Week				
4th Week				
5th Week				

I \_\_\_\_\_ pledge to do this physical activities for the month of \_\_\_\_\_ .

Name Over Printed Signature/Date: \_\_\_\_\_



**Learning Task 3:** Do this activity with your family members. A family that plays together stays together. One way of improving mental health is doing group games like this. Read the instruction in the table below and begin. Answer the guide questions in your notebook.

### Play for a Healthy Lifestyle



Find your question by rolling your dice twice. The 1st roll determines the number on the top. The 2nd roll determines the number on the left. Talk for one/two minute(s) about that top. If you land on «Ask your classmate» you can ask any question according to the topic «Healthy Lifestyle» to anybody.

	1	2	3	4	5	6
1	Talk on what influences a person's health?	Ask your classmate!	What kinds of physical activities should we do to improve our health?	What do you prefer: fast food or homemade food and why?	Is it better to climb stairs instead of using a lift? Give your reasons.	What do we need to do to have good health?
2	Why do some people become addicted?	Doing something you love makes you happy and healthy. Is it true?	What kinds of food do you eat for dinner usually?	How to lose weight if it is necessary?	Ask your classmate!	If people eat junk food, they get overweight much easier. Do you agree and why?
3	Is it necessary to do gymnastics in the morning? Why?	Does your family follow healthy lifestyle and how?	Ask your classmate!	Name 5 steps to a healthy lifestyle.	How do you usually get to school?	Why do people who smoke look older than non-smokers?
4	What activities do you do after classes?	What health problems does fast food lead to?	It is important to drink water. Why?	Is smoking a healthy habit? Why?	What kind of addiction do you know?	Ask your classmate!
5	Ask your classmate!	What is the difference between physical and psychological addiction?	How can you prolong your life?	How long should a person sleep to feel well?	What kind of food should we eat to be healthy?	What happens to a person who doesn't sleep enough?
6	What ways of avoiding addiction do you	What would you like to change in your life to make yourself healthier?	How to make your sleep tight and healthy?	Ask your classmate!	Can a lack of sleep cause illness? What kind of?	How much time should we spend in front of TV or computer? Why?

ISLCollective

### Guide Questions:

1. What have you realized on the questions being asked to you?
2. What are the things that you will stop doing?
3. What are the things that you need to continue?

**Learning Task 4:** In this activity make a menu for the week using the table below. Make sure that you have a good combination of balance, healthy but not expensive food. Remember that your family will benefit from this menu. Prepare a table showing the nutritional contents and benefits of the itemized menu of the day as shown in the sample table on the next page.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Break-fast							
Lunch							
Dinner							
Describe the menu of the day. Why did you choose them?							

## A

**Learning Task 5:** This activity will find out the health status of your family. From the previous activity about maintaining a healthy lifestyle, Choose five (5) questions for you to analyze and identify the status of your family health. List down the answer of each of the family members. Write all their answers in your notebook.

### Healthy Lifestyle Case Study at Home

1. What influences a person's family health?
2. What would you change in your life to make yourself healthier?
3. How will you make your sleep tight and healthy?
4. Is smoking a healthy habit? Why?
5. What kind of physical activities should we do to improve our health?
6. How often an answer was mentioned by a family member?
7. What answers are the least mentioned? What are the most mentioned?
8. What can you infer from the responses in each question?
9. Give the summary of your findings and conclusions.

## Non-Mendelian Inheritance

### I

### Lesson

In this lesson, you will learn the different patterns of Non-Mendelian inheritance. This is a type of inheritance wherein the patterns of phenotypes does not coincide with those that was presented in the Mendelian Laws of inheritance. It also describes the inheritance of traits linked to a single gene in the chromosomes.

To better understand the patterns of non-Mendelian inheritance it is important to note the key terms like:

Term	Meaning
<b>Incomplete dominance</b>	Pattern of heredity in which one allele is not completely dominant over another
<b>Codominance</b>	Pattern of heredity in which both alleles are Simultaneously expressed in the heterozygote
<b>Multiple alleles</b>	A gene that is controlled by more than two alleles
<b>Pleiotropy</b>	When one gene affects multiple characteristics
<b>Lethal allele</b>	Allele that results in the death of an individual
<b>Polygenic trait</b>	Traits that are controlled by multiple genes

There are different activities that you can explore in this lesson. You will be able to analyze monohybrid crosses involving incomplete dominance, co-dominance and sex linkage. You will also describe the complex patterns of inheritance and analyze monohybrid crosses of blood types.

Some traits are controlled by sex-related inheritance. In humans, sex is determined by XX chromosomes for females and XY chromosomes for males. Sex-related inheritance can be categorized in three ways: (a) sex-linked traits which are determined by genes located on the sex chromosome, (b) sex-influenced traits which occur when phenotypes are different between males and females with the same genotype and (c) sex-limited traits are those traits that can only be expressed in one sex or the other.

Sex-limited traits are generally autosomal, which means that they are not found on the X and Y chromosomes. Sex-limited traits are those that are expressed exclusively in one sex however sex-influenced traits are expressed in both sexes but more frequently in one than in the other sex.

Several sex-linked genes were also discovered in human beings. An example is color blindness. The ability to discriminate between the colors red and green is controlled by the gene located in the X chromosome. Inability to distinguish between the two colors is due to a recessive allele of this gene. Sex - Linked traits are inherited through the sex chromosomes. Males have only one X chromosome. Thus, if they inherit the affected X, they will have the disorder. Females have two X chromosomes. Therefore, they can inherit or carry the trait without being affected if it acts in a recessive manner.

**Learning Task 1:** Examine the sample problem given below. Use the same genotypes to determine the offspring's of the crosses between  $X^bY$  male and female with  $X^BX^b$ . Find the genotypes, phenotypes, genotypic and phenotypic ratio of the offspring.

Male-pattern baldness is a recessive sex linked trait in which affected people become bald

Sample Test Cross: male with  $X^bY$  mated female with  $X^BX^b$  genotype

Genotypes:  $X^B$  = no baldness (dominant)

$X^b$ =male-pattern baldness (recessive)

Using Punnet Square:

	$X^b$	$Y$
$X^B$	$X^BX^b$	$X^BY$
$X^b$	$X^bX^b$	$X^bY$

Genotypes	Phenotypes
$X^BX^b$	Female normal
$X^bX^b$	Female bald
$X^BY$	Male normal
$X^bY$	Male bald

Genotypic ratio: 25%  $X^BX^b$  ; 25%  $X^bX^b$  ;  $X^BY$  and 25%  $X^bY$

Phenotypic Ratio: 25% female normal, 25% female bald; 25% male normal and 25% male bald

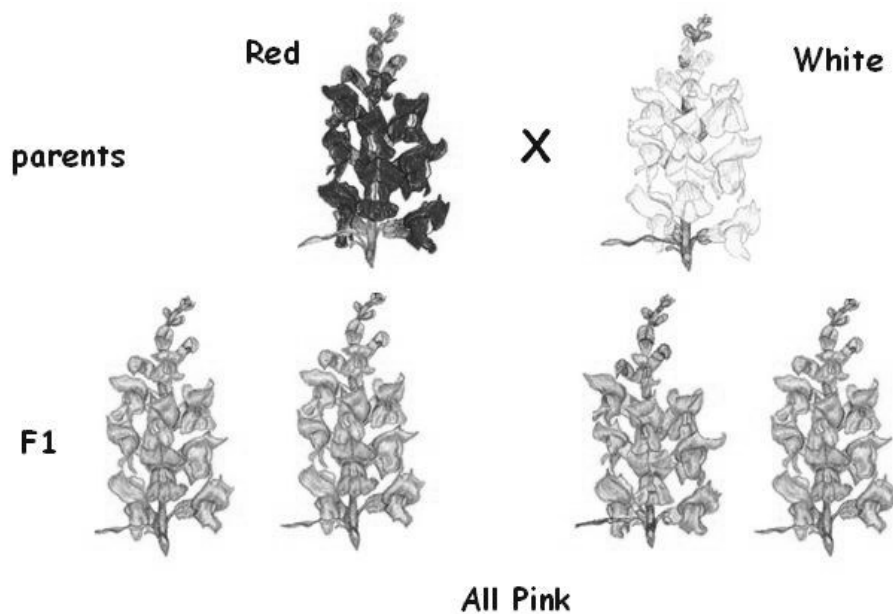
**Learning Task 2:** Read the handout about exploring snapdragon. Answer the guide questions in your notebook.

### **Handout: Exploring Snapdragons**

In this activity you will investigate the genetic trait of a flower color in snapdragons which does not follow Mendel's Law of Dominance

Recalling Mendel's Law of Dominance, one allele can mask the expression of another allele when they are joint together. Therefore, if a person has a heterozygous genotype (i.e. one dominant allele and one recessive allele), he/she will show the dominant phenotype (i.e. physical trait).

In snapdragons, there are two alleles for flower color - one coding for red color and one coding for white color. When purebred red plants and purebred white plants are crossed, the resulting offspring (i.e. the F1 generation) are all pink. When the pink offspring are crossed to create a third generation (i.e. the F2 generation), 25% of the offspring are red, 50% are pink, and 25% are white. These results are summarized in the next page.



### **Guide Questions :**

1. State Non-Mendellian's Law of Inheritance.
2. What are the two alleles for flower color in snapdragon?

**Learning Task 3:** Given the genotypes and phenotypes of flower color for P and F<sub>1</sub>, solve for the genotypes and phenotypes of F<sub>2</sub> generation .

### Exploring Snapdragons

Prove how the following flower color was produced in the F<sup>1</sup> and F<sup>2</sup> generation.


Generation	Flower Color
P (parent)	Red x White
F <sub>1</sub>	100% Pink
F <sub>2</sub>	25% Red 50% Pink

#### Legend:

Red flower - F<sup>R</sup>

White flower - F<sup>w</sup>

Pink flower - F<sup>R</sup>F<sup>w</sup>

	F <sup>R</sup>		
F <sup>w</sup>	F <sup>R</sup> F <sup>w</sup>	F <sup>R</sup> F <sup>w</sup>	 100% F <sup>R</sup> F <sup>w</sup> Pink flower
F <sup>w</sup>	F <sup>R</sup> F <sup>w</sup>	F <sup>R</sup> F <sup>w</sup>	

**F<sup>1</sup>** (example)

**Offspring with corresponding %**

**F<sup>2</sup> Offspring with corresponding %**



**Learning Task 4:** Answer the following questions. Write your answer in your notebook.

### Guide Questions





1. Based on the results of the genetic crosses , why do you think the red and white flower alleles can “interact with one another? Explain both the F<sup>1</sup> and F<sup>2</sup> generations.
2. How are the results of the crosses differ if the red allele was dominant over the white allele? Explain both the F<sup>1</sup> and F<sup>2</sup> generations.

## E

**Learning Task 5:** Read and understand the pattern of inheritance in multiple alleles. Answer the guide question in your notebook.

### Multiple Alleles

Mendel studied just two alleles of his pea genes, but real populations often have multiple alleles of a given gene. In this activity you will learn how to cross the gene for coat color in rabbits (the C gene) which comes in four color alleles (C, C<sup>ch</sup>, C<sup>h</sup>, c) as shown by the figure below.

Genotype			
CC	C <sup>ch</sup> C <sup>ch</sup>	C <sup>h</sup> C <sup>h</sup>	cc
Phenotype			
BLACK	CHINCHILLA	HIMALAYAN	ALBINO
			

Using the given genotypes, find the F<sup>1</sup> and F<sup>2</sup> generation of the cross between black rabbit and chinchilla, the cross of himalayan and albino. Use the Punnett squares below to guide you.

#### A. Black (CC) x Chinchilla (C<sup>ch</sup>C<sup>ch</sup>)







**F<sup>1</sup> Offspring with corresponding %**

**F<sup>2</sup> Offspring with corresponding %**

### Guide Question

- Based on the results of the genetic crosses you have shown, how do you think the red and white flower alleles can “interact with one another? Explain both the F<sup>1</sup> and F<sup>2</sup> generations.
- How are the results of the crosses different if the red allele was dominant over the white allele? Explain both the F<sup>1</sup> and F<sup>2</sup> generations.

## A

**Learning Task 6:** Create a family tree showing the F<sup>1</sup> and F<sup>2</sup> generations of your mother and father side. Describe the dominant traits that appear in both families. Illustrate your answer in your notebook.

# Species Extinction and Adaptation

## Lesson

This lesson will relate species extinction to the failure of populations or organisms to adapt to abrupt changes in the environment.

Extinction happens when the last member of the species dies. A species becomes extinct if it can no longer adapt to changes in the environment and consistently compete with other organisms in its environment.

From the research entitled “Cause and Consequences of Species Extinctions” the authors Sodhi, Brook and Bradshaw (2014) concluded that, although extinctions are a normal part of evolution, human modifications to the planet in the last few centuries, and perhaps even millennia, have greatly accelerated the rate at which extinctions occur. Habitat loss remains the main driver of extinctions, but it may act synergistically with other drivers such as overharvesting and pollution, and, in the future, climate change. Large-bodied species, rare species, and habitat specialists are particularly prone to extinction as a result of rapid human modifications of the planet. Extinctions can disrupt vital ecological processes such as pollination and seed dispersal, leading to cascading losses, ecosystem collapse, and a higher extinction rate overall.

We are living in a dynamic changing environment and most species are dependent on it. There are organisms that can easily adapt to the changing environment depending on the resistant into it. There are organism that can adapt easily but others are not.

Now is the time to embrace change, because even in the pandemic, we are experiencing perhaps disappearance of living organisms that even human beings can not adapt . But creative innovations are everywhere, discover new approaches instead of just waiting for solutions and blaming others for mistakes. The only way to succeed over time is to exceed the effort of making the environment safe for everyone.

**Learning Task 1:** Write a simple paragraph about the changing environment in this time of pandemic. Cite at least three changes that you need to adapt in order to survive in the New Normal. Complete the paragraph below.

### Adapting in the New Normal Life

There are three changes that I need to adapt in order to survive in the new normal.

These are \_\_\_\_\_

---

---

---





**Learning Task 2:** Complete the table to be familiarized with the extinct animals of the Philippines. Identify their common names. Use the pool of words below.

**Extinct Animals in the Philippines common name / scientific**

Description	Common name / scientific name	Period
1. Introduced in the 13th-16th? century from Sabah in the reign of the Sultanate of Sulu, and became extinct on Maguindanao or were transported back to Sabah. Bone fragments are the only proof left behind of their existence		
2. Once roamed in the plains of Luzon, Mindanao entire Philippine Archipelago. Unfavorable geographical conditions and human exploitation caused their extinction.		
3. Discovered in Palawan in 2011. The fossil has not yet been extracted from the rocks in fear of destroying the natural heritage caves of Palawan. Future technology in fossil extraction is the only way to get and identify the fossil.		
4. Excavations in Callao Cave, in the lowland (c. 85 m elevation) Cagayan River Valley of northeastern Luzon, Philippines, have produced the first fossils of any endemic genera of Philippine murinae rodents.		

Common name/scientific name	Period
<div>Asian elephant <i>Elephas maximus</i></div> <div>Fossil marines</div> <div>Cebu tamaraw <i>Bubalus cebuensis</i></div> <div><u><i>Stegodon luzonensis</i></u></div>	Pleistocene  Holocene  Miocene
<div>Palawan fossil <i>Sirenia</i> <i>Dugong sp.</i></div> <div>Tiger <i>Panthera tigris sp.</i></div> <div>Philippine rhinoceros <i>Rhinoceros philippinensis</i></div>	

### Extinct Animals in the Philippines common name / scientific

Description	Common name / scientific name	Period
5. Two articulated phalanx bones and another phalanx piece were found amidst an assemblage of other animal bones and stone tools in Ille Cave near the village of New Ibajay. From the stone tools, besides the evidence for cuts on the bones, and the use of fire, it would appear that early humans had accumulated the bones.		
6. Due to the lack of a complete skeleton, it lived during the Pleistocene era (2.588 million – 11,700 years ago) and that it was essentially the larger version of its modern cousin.		
7. Lived on the island of Cebu before becoming extinct in modern times, primarily due to habitat destruction and human exploitation. The subspecies was declared extinct in 2000, however, other warty pig subspecies still survive on other Philippine islands.		
8. Stood only 75 cm (2 ft 6 in) and weighed about 150 to 160 kg (330 to 350 lb). The species was smaller than the modern Mindoro tamaraw.		

Common name/scientific name	Period
<div>Asian elephant <i>Elephas maximus</i></div> <div>Fossil marines</div> <div>Cebu tamaraw <i>Bubalus cebuensis</i></div> <div><u><i>Stegodon luzonensis</i></u></div>	Pleistocene
<div>Palawan fossil <i>Sirenia</i> <i>Dugong sp.</i></div> <div>Tiger <i>Panthera tigris sp.</i></div> <div><u>Philippine rhinoceros</u> <i>Rhinoceros philippinensis</i></div>	Holocene
<div><u>Philippine rhinoceros</u> <i>Rhinoceros philippinensis</i></div>	Miocene



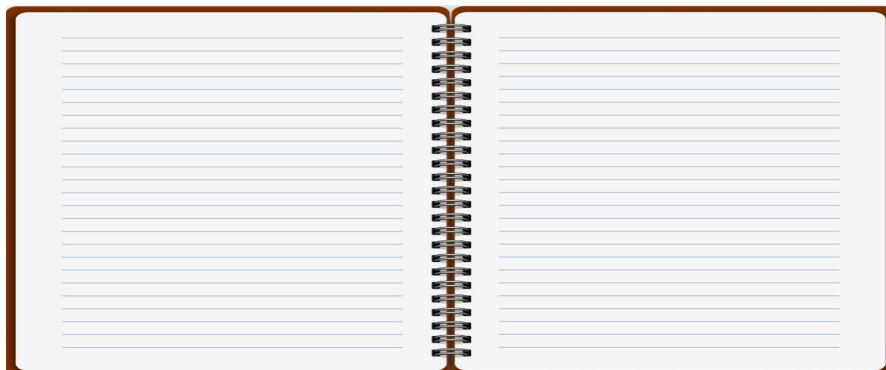
**Learning Task 3:** Read the words in both columns. Match column A with column B. Write your answer in your notebook.

**A. Causes of Extinction of Species**

Column A	Column B
A. Climatic Heating and Cooling	1. From John W. Williams' research, their findings indicated that "By the end of the 21st century, large portions of the Earth's surface may experience climates not found at present and some 21st century climates may disappear.
B. Changes in Sea Levels or Currents	2. Habitat loss and degradation affect 86% of all threatened birds, 86% of mammals and 88% of threatened amphibians.
C. Asteroids / Cosmic Radiation	3. Increase in population, destruction/fragmentation of habitat, pollution and climate change/global warming
D. Acid Rain	4. They use resources that the other species depend on. Once competition gets too great, the survival of the fittest plan will begin, and one of the species, usually the natural one, will die off.
E. Disease / Epidemic	5. This forms when sulfur dioxide and / or nitrogen oxides are put into the atmosphere. Increases the acidity of the soil which affects plant life. It can also disturb rivers and lakes to a possibly lethal level.
F. Spread of Invasive Species	6. Each species has defense mechanisms like immunities and the ability to fight disease. With the changing climate and landscape certain species are losing their ability to fend off disease. They are becoming more susceptible to disease and epidemics, which can lead to their eventual extinction.
G. Human Causes of Extinction	7. The biodiversity Earth can't keep up with the rapid changes in temperature and climate. The species are not used to severe weather conditions and long seasons.
H. Habitat Degradation	8. This is the result of melting freshwater. The denser, saltier water sinks and forms the currents that marine life depends on. Ocean floor spreading and rising also affects sea level.
I. Climate Change and Global Warming	9. The reverberations of their impact to Earth can be felt around the world. The impact site is completely destroyed. Radiation is being emitted from outer space and the sun. A supernova remnant is one source of cosmic radiation.

## B. My Advocacy Board

You have learned from the previous activity that one of the causes of extinction of species is disease or epidemics. Relating it to our present situation do you think someday human beings will become extinct also because of diseases and pandemics? What program or projects you would like to propose to avoid the extinction of human beings to happen? Write your advocacy program or projects in your notebook.



## A

**Learning Task 4 :** Answer the following questions. Prepare a simple proposal to show your thoughts on the issue.

### Adaptation to Changing Environment

This activity increases your awareness and interest to do something for the changing environment. Below is the research entitled “The Conflict Between Adaptation and Dispersal in Maintaining Biodiversity in Changing Environments”. Make an analysis of the abstract of this research by identifying the objectives or purpose of the research, methodology or design, and findings.

**Objective / Purpose**

**Methodology / Design**

## Findings

# The conflict between adaptation and dispersal for maintaining biodiversity in changing environments

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Edited by Alan Hastings, University of California, Davis, CA, and approved September 9, 2019 (received for review July 11, 2019)

Dispersal and adaptation both allow species to persist in changing environments. Yet, we have limited understanding of how these processes interact to affect species persistence, especially in diverse communities where biotic interactions greatly complicate responses to environmental change. Here we use a stochastic metacommunity model to demonstrate how dispersal and adaptation to environmental change independently and interactively contribute to biodiversity maintenance. Dispersal provides spatial insurance, whereby species persist on the landscape by shifting their distributions to track favorable conditions. In contrast, adaptation allows species to persist by allowing for evolutionary rescue. But, when species both adapt and disperse, dispersal and adaptation do not combine positively to affect biodiversity maintenance, even if they do increase the persistence of individual species. This occurs because faster adapting species evolve to hold onto their initial ranges (i.e., monopolization effects), thus impeding slower adapting species from shifting their ranges and thereby causing extinctions. Importantly, these differences in adaptation speed emerge as the result of competition, which alters population sizes and colonization success. By demonstrating how dispersal and adaptation each independently and interactively contribute to the maintenance of biodiversity, we provide a framework that links the theories of spatial insurance, evolutionary rescue, and monopolization. This highlights the expectation that the maintenance of biodiversity in changing environments depends jointly on rates of dispersal and adaptation, and, critically, the interaction between these processes.

environmental change (11). In contrast, when local adaptation is fast compared to dispersal, evolutionarily mediated priority effects can emerge. Also known as monopolization effects, these occur when early-arriving species adapt to the local conditions enough to prevent preadapted but later-arriving species from colonizing (12, 13). Such monopolization effects have been demonstrated to be strong drivers of community dynamics in simulated metacommunities experiencing environmental fluctuations and disturbances (14–17). Evidence of monopolization effects has also been found in a number of empirical studies (18–20). Urban et al. (10) applied this idea to changing climate by hypothesizing that monopolization effects could prevent species from tracking their climate niches. But they did not formalize this hypothesis, so it is unclear how strong this effect would be and how it should depend on rates of evolution and dispersal.

Our best expectations for how dispersal and evolution interact to affect the persistence of multispecies communities under climate change come from a model by Norberg et al. (21). These authors found that evolution minimized extinction risk and that this was greatest when dispersal rates were low. In contrast with predictions from the spatial insurance hypothesis (3, 23), they found that dispersal did not reduce extinction risk because it allowed competitively superior species to expand their ranges to the detriment of other species. Thus, reconciling these conflicting predictions is a priority for advancing our understanding of how dispersal and evolution contribute to the maintenance of biodiversity in changing conditions.

What is your realization on the results of the research?

Do you think we can adapt to abrupt changes in the environment?

## Photosynthesis and Respiration

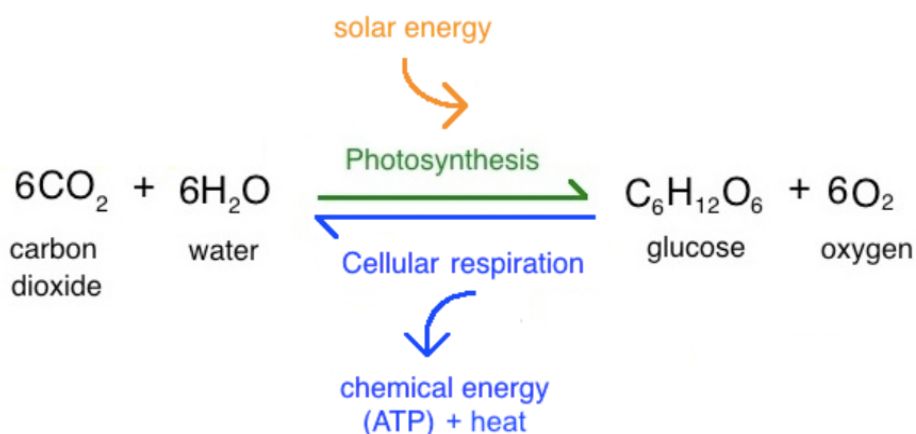
### I

This lesson will lead you to differentiate basic features and importance of photosynthesis and respiration. Try to read and understand some concepts in some activities to know more on these.

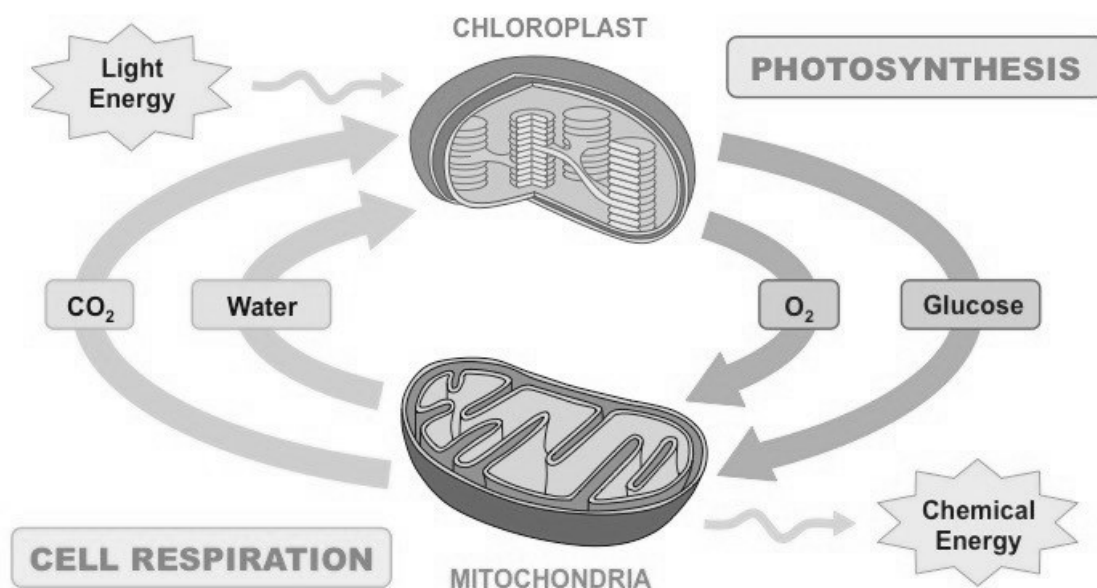
The bi-product of photosynthesis is oxygen being release by plants. Breathing in oxygen is necessary so that our cells can carry out cellular respiration and generate ATP.

The two biological reactions that complement each other in the environment are photosynthesis and respiration that occur in a reverse manner. In the process of respiration, oxygen and glucose yield water and carbon dioxide, while carbon dioxide and water yields glucose and oxygen in photosynthesis. Both photosynthesis and respiration can function enough as living organisms provide carbon dioxide for plants that undergo photosynthesis and produces glucose. Bacteria and plants release oxygen that is required for all living organisms for respiration.

The equation of cellular respiration and photosynthesis are almost opposite processes, meaning the interchange of oxygen and carbon dioxide by cellular respiration and photosynthesis helps in maintaining both atmospheric oxygen and carbon dioxide and differ in the form of energy that is being absorbed or released as shown by the figure below:



**Learning Task 1:** Observe the diagram showing the exchange of materials during photosynthesis and cellular respiration. Answer the guide question based on the diagram.



**Guide Question:**

1. In which part of the cell does photosynthesis happen?
2. In which part of the cell does respiration happen?
3. What energy is needed by photosynthetic organisms during the process of photosynthesis?
4. What energy is needed by organisms during cell respiration?
5. What are the materials needed during photosynthesis?
6. What are the materials produced after the process of photosynthesis?
7. What are the materials needed during cell respiration?
8. What are the materials produced after the process of cell respiration?
9. Describe the materials needed during photosynthesis, where does they come from?
10. Describe the materials needed during cell respiration, where does they come from?

## D

**Learning Task 2:** Read the paragraph below. Perform the task in each part. Write your answer in your notebook.

### PHOTOSYNTHESIS EQUATION

This activity will help you explore the photosynthesis equation.

Photosynthesis is the process used by plants and some bacteria to create energy from sunlight. Chlorophyll is the green pigment in plants that is responsible for this conversion process. During photosynthesis, photoautotrophs use energy from the sun, along with carbon dioxide and water, to form glucose and oxygen.

1. **Illustrate the photosynthesis equation and label properly.**





2. Fill in the table below to describe the stages of photosynthesis. There are two stages of photosynthesis, the light-dependent reactions and the Calvin cycle.

STAGE	LOCATION	EVENTS	REQUIRES SUN-LIGHT?

3. Draw a sample plant and animal. Illustrate how photosynthesis and respiration exist between these two organisms. Write a simple story about photosynthesis and respiration.

My Plant and Animal:

The story of photosynthesis and respiration .

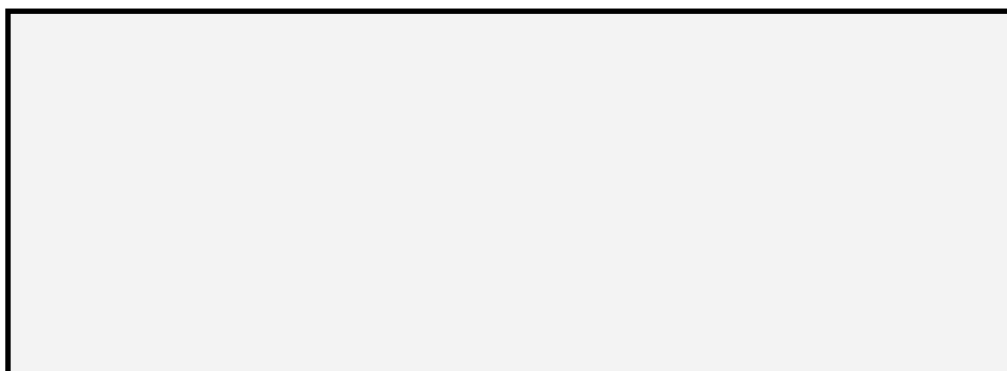
**Learning Task 3:** Read the paragraph below. Perform the task in each part. Write your answer in your notebook.

### RESPIRATION PROCESS AND EQUATION

Respiration is the process of taking oxygen from the air and cycling it through the lungs, which then gives oxygen to blood to be used in the body. The carbon dioxide waste is expelled out of the lungs. Cellular respiration uses glucose, or sugars, from food molecules and turns them into carbon dioxide, water, and ATP a nucleotide essential to the body.

Cellular respiration can occur both aerobically (using oxygen), or anaerobically (without oxygen). During aerobic cellular respiration, glucose reacts with oxygen, forming ATP that can be used by the cell. Carbon dioxide and water are created as byproducts

**A. Illustrate the cellular respiration equation and label properly.**



TERM	MEANING
1.	The process happening inside the cells of organisms
2.	The primary energy carrier in living things
3.	It is where cellular respiration occurs
4.	The jelly-like substance that fills the space between
5.	Process that requires oxygen
6.	Process that does not require oxygen
7.	An anaerobic pathway for breaking down glucose

WORD POOL		
<b>Aerobic</b>	<b>Mitochondria</b>	<b>Cytoplasm</b>
<b>Adenosine triphosphate</b>	<b>Fermentation</b>	<b>Cellular respiration</b>
	<b>Anaerobic</b>	

**Learning Task 4:** Answer the following questions after performing the activity. Write your answers in your notebook.

### PLANTITO AND PLANTITA

In this activity, you prove the effect of photosynthesis in plants. Get the needed materials as listed below and follow the steps on how to prepare the experiment.

Materials:

2 garden pots or any empty container of the same size

Garden soil to fill your pots or container

10 pcs mongo seeds

Procedure:

1. Prepare garden pots / container.
2. Fill the garden pots / container with same amount of soil.
3. Water the soil, then put 5 mongo seeds in each pot / container.
4. Put one pot / container outside the house where sunlight is available and the other pot inside the house where there is no sunlight.
5. Water the

#### OUTSIDE

#### INSIDE

	Day 5	Day 8	Day 10	Day 15	Day 5	Day 8	Day 10	Day 15
Number of seeds grown								
Color of stem and leaves								
Length of stem and leaves								

plants daily. Observe the growth of seeds.

6. Fill in the table below for your observation.

Guide Questions:

1. Which location can the plants grow faster? Why?
2. Which leaves and stems are greener in color? Why?
3. What contributes in the difference in the appearance of plants?



**Learning Task 5 :** Study the table before answering the question below. Write your answer in your notebook.

### **Differentiating Cellular Respiration and Photosynthesis**

The table below are the comparison between cellular respiration and photosynthesis. Fill in the number in each space to differentiate the two.

<b>Cellular Respiration</b>	<b>Photosynthesis</b>
1. _____	Occurs only in all green plants, algae, and in some bacteria.
The entire process occurs in Mitochondria.	2. _____
3. _____	Carbon dioxide, water, and light energy are the reactants of this process.
Carbon dioxide, water, and energy (ATP) are the products.	4. _____
5. _____	Undergoes Anabolic Process.
Oxygen is taken in and carbon dioxide is liberated out.	6. _____
7. _____	In this process, food is synthesis by capturing the energy.
It is an exergonic reaction as energy is released.	8. _____
9. _____	This process requires sunlight since photosynthesis occurs only in the presence of sunlight.
The chemical reaction of cellular Respiration is $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$	10. _____

1. How will your describe cellular respiration in your own words? What about photosynthesis?



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## Answer Key

### Weeks 1-2

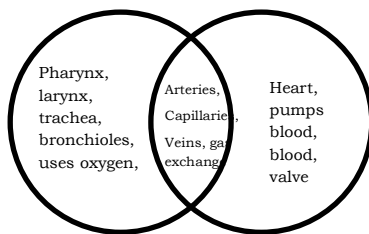
#### Lecture Task No. 1:

- nose
- Mouth
- Trachea
- Bronchi
- Branching tubes
- Air sacs
- Lungs

#### Lecture Task No. 2:

- aorta
- Right atrium
- Right ventricle
- Pulmonary artery
- Left ventricle
- 

#### Lecture Task No. 3. A:



#### Learning Task No. 3B.

INHALING	EXHALING
/	/
/	/
/	/
/	/
/	/
/	/

#### Learning Task No. 4

- pulmonary and systemic circuit
- Blood
- The **pulmonary circuit** transports blood to and from the lungs, where it picks up oxygen and delivers carbon by circulation dioxide for exhalation.

4.The **systemic circuit** transports oxygenated blood to virtually all of the tissues of the body and returns relatively deoxygenated blood and carbon dioxide to the heart to be sent back to the pulmonary circulation.

5. Carbon dioxide exits the blood and oxygen enters in pulmonary capillaries

#### Learning Task No. 5:

- |                             |   |
|-----------------------------|---|
| 5 Tricuspid valve           | 4 Right atrium                            |
| 10 Pulmonary veins          | 6 Right ventricle                         |
| 13 Left ventricle           | 18 Capillaries                            |
| 9 Lungs                     | 14 Aortic semilunar valve                 |
| 12 Mitral Valve             | 16 Arteries                               |
| 1 Venules                   | 3 Inferior vena cava & superior vena cava |
| 7 Pulmonary semilunar valve | 11 Left atrium                            |
| 8 Pulmonary arteries        | 17 Arterioles                             |
| 2 Veins                     | 15 Aorta                                  |

#### Learning Task No. 6:

Answers in the guide questions

- varies according to your personal lifestyle and other factors
- To avoid being infected by Covid-19
- Wearing of face mask will filter the entry of virus and unwanted foreign materials in the mouth that will affect the blood circulation and the coordinated function of the respiratory and circulatory system.

### Week 3

#### Learning Task No. 1:

- Signature of the parent with date

**Learning Task No. 2:** Answers will vary

**Learning Task No. 3:** Answers will vary but must include concepts in keeping a healthy lifestyle.

**Learning Task No. 4:** Answers will vary

**Learning Task No. 5:** Answers will vary based on your lifestyle

## Weeks 4-5

### Learning Task No.1:

1.

	$X^b$	$Y$
$X^b$	$X^bX^b$	$X^bY$
$X^b$	$X^bX^b$	$X^bY$

**Genotypes:**  $X^bX^b$ , and  $X^bY$

**Phenotypes:** female bald, male bald

**Genotypic ratio:** 50%  $X^bX^b$ , and 50%  $X^bY$

**Phenotypic ratio:** 50% female bald and 50% male bald

### Learning Task No. 2:

1. A pattern of inheritance in which traits do not segregate in accordance to Mendel's laws.
2. R and W

### Learning Task No. 3:

$F^{RR}$  - 25% - red

$F^{RW}$  - 50% - pink

$F^{WW}$  - 25% - white

Because the alleles of the two different colors of genes can be segregated to interact with one another.

	$F^R$	$F^W$
$F^R$	$F^{RR}$	$F^{RW}$
$F^W$	$F^{RW}$	$F^{WW}$

## Week 6

### Learning Task No.1.

Answer vary depending on your own personal experience of changes in the new normal. This may include wearing of face mask, PPE, sanitizing with alcohol, studying at home, and many others.

### Learning Task No.2

1. Asian elephant/*Elephas maximus*-Holocene
2. *Stegodon luzonensis* /Pleistocene
3. Palawan fossil sirenian-Miocene
4. Fossil marines- Pleistocene
5. Tiger-Panthera tigris sp
6. Philippine Rhinoceros-Pleistocene
7. Cebu Warty Pig- Holocene
8. Cebu Tamaraw- Pleistocene or Holocene

## Week 6

### Learning Task No. 3

1. A
2. H
3. G
4. F
5. D
6. E
7. I
8. B
9. C

### Learning Task No. 4

Answers may vary

## Week 7-8

### Learning Task No. 1:

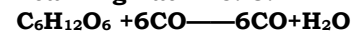
1. chloroplast
2. Mitochondria
3. Light energy
4. Chemical energy
5.  $CO_2$ ,  $H_2O$
6.  $O_2$ , glucose
7.  $O_2$ , , glucose
8.  $CO_2$ ,  $H_2O$
9. The materials needed are products of cellular respiration,  **$CO_2$ ,  $H_2O$**
10. The materials needed are products of photosynthesis

### Learning Task No. 2:

Light Dependent-thylakoid-uses light energy—ATP and NADPH

Light Independent or Dark Reaction- stroma- fixation, reduction—no sunlight needed  
Concepts include Photosynthesis and respiration

### Learning Task No. 3:



1. cellular respiration
2. Adenosine Triphosphate
3. Mitochondria
4. Cytoplasm
5. Aerobic
6. Anaerobic
7. fermentation

### Learning Task No. 4.

1. outside w/ light
2. Outside
3. Presence of sunlight

### Learning Task No. 5.

1. all organisms
2. Grana
3.  $O_2$ , , glucose
4.  $O_2$ , , glucose
5. Catabolic process
6.  $CO_2$  taken in and  $O_2$  released
7. Releases energy
8. Endergonic
9. Proceed w/o sunlight
- 10..  $6CO + H_2O \rightarrow C_6H_{12}O_6 + 6CO$

GOVERNMENT PROPERTY  
**NOT FOR SALE**

**Para sa mga katanungan o puna, sumulat o tumawag sa:**

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