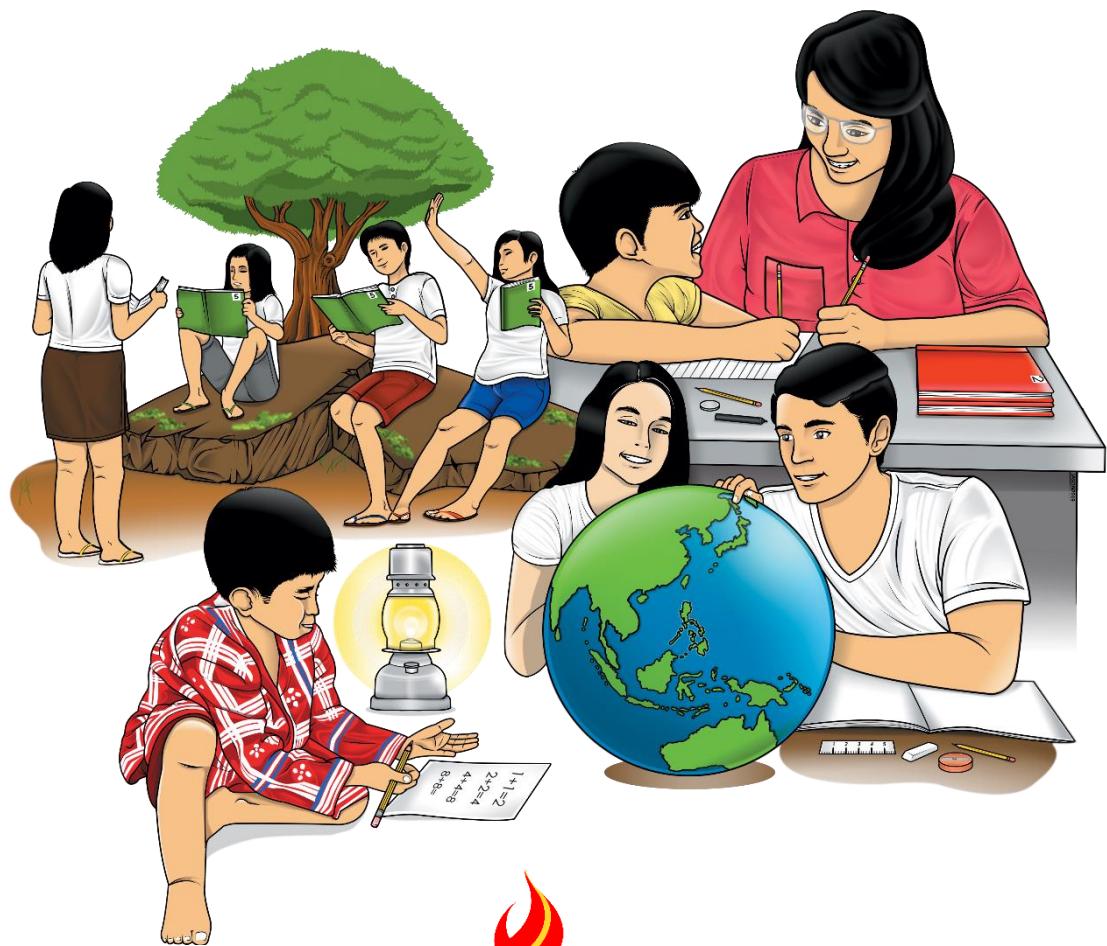


Science

Quarter 2 – Module 2: Life Through the Lens



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Science – Grade 7

Alternative Delivery Mode

Quarter 2 – Module: Life Through the Lens

First Edition, 2020

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

Lesson 1

Microscopy

Most Essential Learning Competency:

Focus specimens using the compound microscope.

This module is divided into two lessons:

Lesson 1 – Microscopy

Lesson 2 - The Magnification Process

After going through this module, you are expected to:

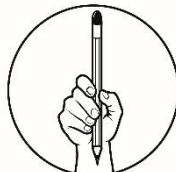
1. focus specimens using the compound microscope;
2. compute the magnification of the specimen; and
describe the proper ways of handling a microscope.



What I Need to Know

Hello! How are you? Have you ever wondered about the things that we cannot see? Take a look at your hands, it may look clean but if we look at it under a device that could magnify tremendously it actually contains a lot of microorganisms.

This module will open your eyes to the things that you could not ever imagine. Life is pretty interesting, and at the microscopic scale, it can also be beautiful, strange, intriguing, frightening and gross. Be a scientist yourself, let's work hand in hand as we find out the process on focusing and proper handling of microscope.



What I Know

Directions: Choose the best answer from the given choices Write the letter of your choice on a separate sheet of paper.

1. To focus on a specimen, it is best to start with which objective lens?
 - A. Middle Magnification
 - B. Lowest Magnification
 - C. Highest Magnification
 - D. Intermediate Magnification

2. Which one of the following instruments would you use to view an image of a plant cell?
 - A. Telescope
 - B. Periscope
 - C. Microscope
 - D. Kaleidoscope
3. On a typical microscope, there is a rotating part containing three different objective lenses. What is this part called?
 - A. Stage
 - B. Eyepiece
 - C. Nosepiece
 - D. Focus Knob
4. This is turned to bring the object being viewed closer.
 - A. cover slip
 - B. eyepiece lens
 - C. objective lens
 - D. fine adjustment
5. The lens that is within the eyepiece of the light microscope is called the _____.
 - A. ocular
 - B. scanning
 - C. low power
 - D. high power
6. When using the high-power objective, you should not adjust the _____.
 - A. diaphragm
 - B. stage clips
 - C. fine adjustment
 - D. coarse adjustment
7. The scanning, low, and high-power objectives are mounted on the _____.
 - A. stage
 - B. eyepiece
 - C. body tube
 - D. revolving nosepiece
8. Which part of the compound microscope helps in gathering and focusing light rays on the specimen to be viewed?
 - A. Eyepiece lens
 - B. Objective lens
 - C. Condenser lens
 - D. Magnifying lens
9. On the microscope stage, what is used to hold the glass slide in place and prevent it from moving?
 - A. Stage
 - B. Stage clip
 - C. Condenser
 - D. Fine adjustment knob

10. How does magnification affect the image of the objects?

- A. It increases the image size
- B. It decreases the image size
- C. It increases the field of view
- D. It decreases the field of view

11. After using the microscope, we need to clean it so that it will not get rust easily. Which is **NOT** an essential step in cleaning the microscope?

- A. Blow away dust
- B. Wash the base and arm
- C. Clean off grease and spills
- D. Oil the mechanics and moving parts

12. Why is it important to use a staining element in viewing especially colorless specimen?

- A. To protect the specimen.
- B. To keep the specimen flat.
- C. To see clearly the specimen.
- D. To bring out the starch in the specimen.

13. When viewing a sample of cheek cells using a microscope, the student placed the cells on a slide and placed a coverslip over it. What is the purpose of the coverslip?

- A. To keep the cells flat.
- B. To protect the cheek cells.
- C. To get a better view of the cells.
- D. To let the cheek cells, stay on the slide and not fall of it.

14. Dan prepared a thin sheet of onion skin and study using the microscope but he cannot view clearly the specimen. Should Dan adjust the coarse adjustment knob first then followed by the fine adjustment knob?

- A. No, because the draw tube and the body tube should be adjusted for clearer view.
- B. No, because fine adjustment knob must be adjusted first then the coarse adjustment knob.
- C. Yes, because the coarse adjustment knob is for the tilting of the microscope and fine adjustment knob is for the rotation of the revolving nosepieces and its lenses.
- D. Yes, because coarse adjustment knob is for the fast movement of the body tube and fine adjustment knob is for the slow movement of the body tube.

15. Lily examine a specimen but there was no image being viewed because the field of view is dark. Should Lily adjust the objective lenses?

- A. Yes, Lily should adjust the objective lenses because it is responsible in providing light.
- B. Yes, Lily should adjust the objective lenses because she can choose between low power and high power.
- C. No, Lily should adjust the diaphragm and the mirror because these parts are responsible in providing of light.
- D. No, Lily should adjust the fine adjustment knob and coarse adjustment knob because these parts are for giving light.

Lesson

1

Microscopy



What's In

In the previous lesson, you already learned how to identify the parts of the microscope and their function. Each part of the microscope has its own function that is really important and essential to the microscope as a whole.

Scrambled Letters

Directions: Listed below are parts of the microscope that are scrambled. Mix the letters to come up with the right answer. Write your answer on a separate sheet of paper.

1. ETSAG = _____
2. IEECYEEP = _____
3. GMAAIDPHR = _____
4. YODB BTUE = _____
5. RMA = _____
6. EOSNEEIPC = _____
7. BSEA = _____

What Am I?

Directions: Identify the words being described. Choose the answer from the box below. Write your answer on a separate sheet of paper.

BASE	REVOLVING NOSEPIECE
STAGE	ARM

1. Supports the upper part of the microscope.
2. Located under the stage, controls the amount of light allowed to pass through the object.
3. Small platform where the specimen is placed for evaluation.
4. Holds objective lenses and can be rotated.
5. The bottom part of the microscope, supports the entire microscope.



What's New

Hello there! You are already familiar with the parts and functions of a microscope. Let's discover together how to focus specimen using the compound microscope. All we have to do is read and understand the context below to find these steps. Are you ready? Let's start!

Activity 1

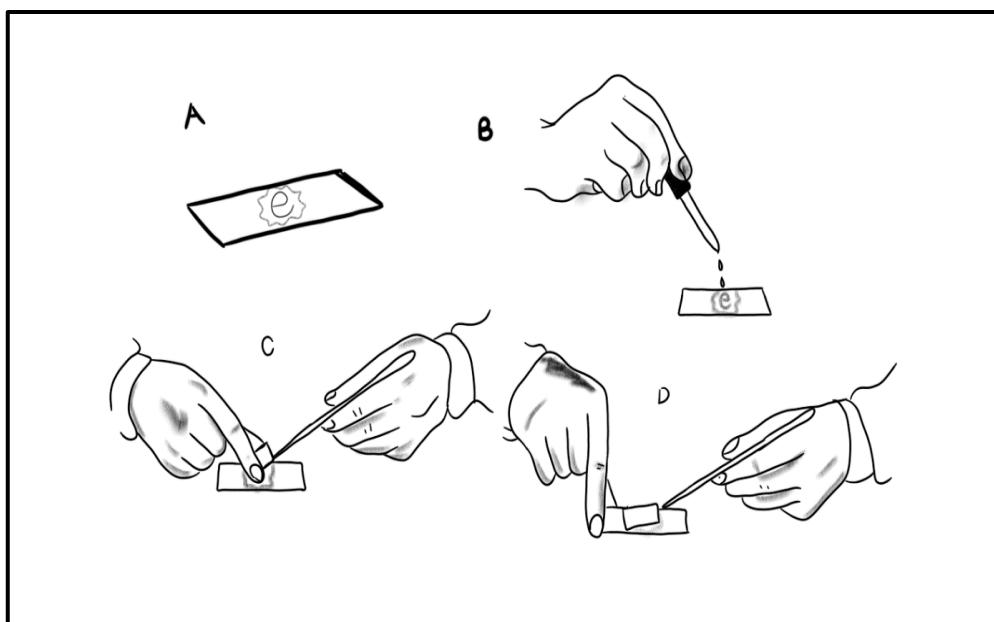
Newspaper Letter "e"

Materials needed:

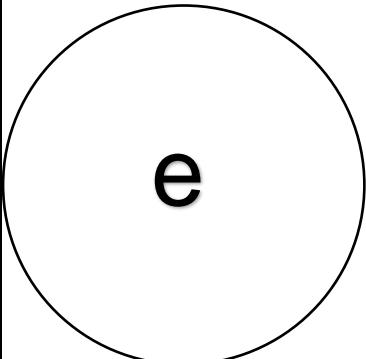
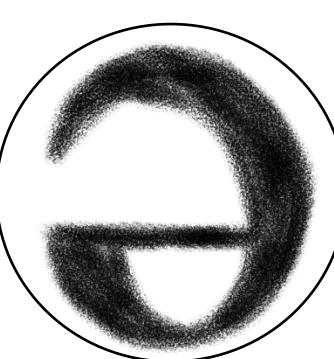
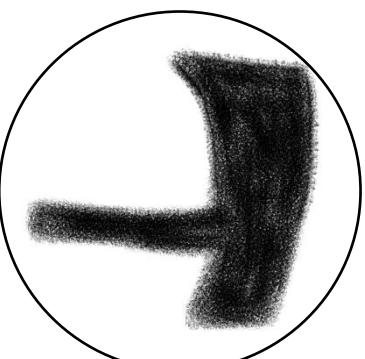
- Newspaper
- Scissors
- Pencil
- Glass slides
- Cover slides
- Water
- Dropper
- Microscope

Procedures:

- A. Cut out the letter "e" and place it on the slide face up.
- B. Add a drop of water to the slide.
- C. Place the cover slip over the "e" and water at a 45-degree angle.
- D. Lower slowly with a pencil to keep air bubbles out.



1. Place the slide on the stage and view in low power. Center the "e" in the field of view. Carefully and slowly move the coarse adjustment knob until the image appears clear. Draw what you see. Move the slide to the left. What happens? Move the slide to the right. What happens? Move also the slide up and down and observe what happens to the image.
2. View the specimen in high power. Use the fine adjustment only to focus (this will keep the glass slides from breaking and the objective lens from scratching).
3. These are the images before and after examining under a microscope.

Naked Eye	Low Power	High Power
		

This is the actual letter 'e' before putting it under the microscope.

This is an illustration of a letter 'e' shown using low power objective. This slide was set up with the letter in the correct orientation. Notice that it appears upside down when viewed under the microscope.

This is an illustration of the letter 'e' shown using high power objective. Notice, that as you increase the power of the lens, your field of view gets smaller. Same with its orientation, if you move the slide to the left, the image goes right and vice versa.

Guide Questions:

- Did the letter appear in the same orientation when viewed through the microscope?
- When you move the slide to the right what direction does it appear to move under the microscope?
- What happened to the image when you switched objectives?

Activity 2

Onion Cells Under the Microscope

Materials needed:

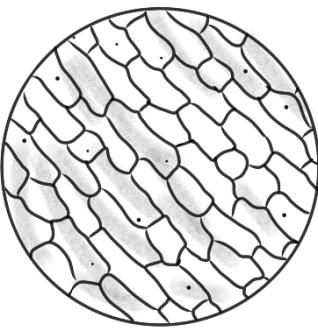
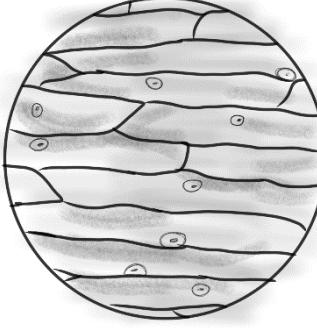
- Onion
- Knife
- Forceps
- Glass slides
- Cover slides
- Iodine solution
- Dropper
- Microscope
- Paper towels

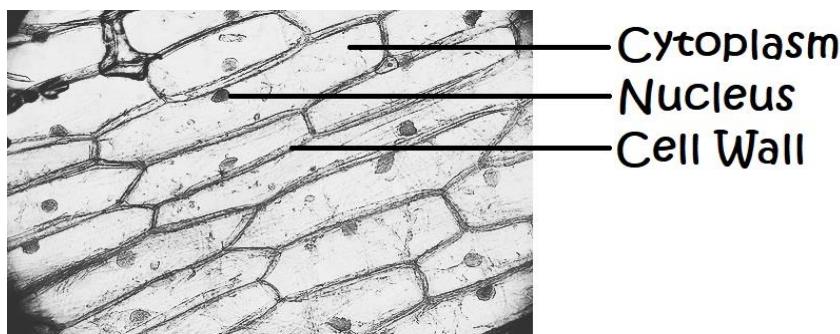
Procedures:

- Set aside a clean microscope slide.
- Carefully cut away a small, single layered piece of onion (1-2 cm wide).
- Peel the thin layer of skin (membrane) from the inside surface of your piece of onion. Forceps may help with this. The membrane looks a bit like soft Scotch tape and should separate relatively easily from the inside surface of the onion slice.
- Place section of membrane carefully on the microscope slide, trying to keep it as flat as possible.

5. Apply a couple of drops of iodine solution to the section. Wait 2 minutes for the stain to develop before positioning a cover slip over the section.

6. Place the slide first under scanning objective, then low power objective and finally under high power objective and observe the onion cells. *note: Be careful, when focusing the microscope, not to break the glass slide with the microscope lens.

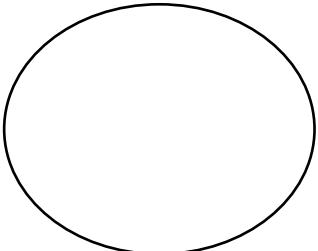
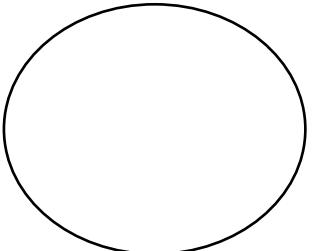
Low Power	High Power
 <p>This is an illustration of an onion skin shown using low power objective. Notice that it is composed of rectangle like shapes with dots on some of it. These rectangle shapes are plant cells and the small dots are nucleus. Plants cells are usually rectangular and animal cells are circular. Plant and Animal Cells will be discussed further on the next module.</p>	 <p>This is an illustration of an onion skin shown using high power objective. The same with letter "e" activity that as you increase the power of the lens, your field of view gets smaller. The nucleus becomes more visible. By adding the stain or iodine solution the image is clearer and more visible than without.</p>



These are the parts of onion (plant) cells that are visible under the microscope.

- Cytoplasm- jelly like substance inside a cell where organelles are embedded.
- Cell wall- a rigid wall that surround and supports the cell.
- Nucleus- the central part of most cells that contains genetic material.

Directions: Draw and label the images of onion skin that you see on the microscope under low power objective and high-power objective. Compare the difference in both images. Write your answer on a separate sheet of paper.

Low Power	High Power
	
Comparison:	



What is It

How to Focus a Microscope

A microscope can help you observe things that you can't see with the naked eye, such as bacteria. However, if you do not know how to focus your microscope correctly, you will be unable to view these objects. Getting the best focus on your microscope requires setting it up properly, focusing on your sample, and magnifying the sample so that you can see it.

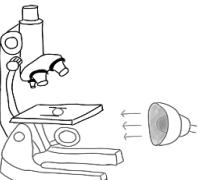
Procedures:

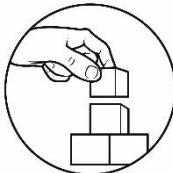
1. Uncover the microscope, unwrap the cord, and plug it in or face the mirror in an area with enough light source.
2. Clean all glass surfaces with lens paper. Start with the eyepiece, then do the objectives, the substage mirror or illuminator, and end with the stage window.
3. Turn on the light (or adjust the mirror so that the light shines through the stage window). Adjust the diaphragm under the stage so that a medium amount of light gets through. Adjust the fine focus knob to a middle position.
4. Place the slide on the stage, with a slide clip holding down each side of the slide. Center the specimen on the slide over the stage window.
5. Using the low power objective, focus with coarse adjustment. Start with the objective as close to the slide as possible and focus away from the slide.
6. Before turning to a higher power, make sure there is something worthwhile to look at and center the specimen in the middle of the field
7. Without changing the focus adjustment, change to the next highest objective (the centered specimen should be in view and should be almost in focus). Now focus with the fine adjustment knob. Repeat Steps 6 and 7 up to the highest power.
8. Clean up! Return to low power objective before taking off the slide. Clean and dry the stage and objectives, turn off the light, and wrap the cord neatly around the base of the microscope. Replace the cover.

Guide Questions:

1. When the specimen is out of focus, which part of the microscope should you turn to obtain a clearer image?
2. After switching from low power to high power, what happens to the field of view?
3. Why is it important to start viewing from low power to high power objectives?

How to Use A Microscope to Observe A Specimen?

1		Put a table lamp in front of the microscope or adjust the mirror so that natural light is reflected through the stage window.
2		Put a low-power eyepiece into the microscope.
3		Rotate a low-power objective into position.
4		Look through the eyepiece. Adjust the mirror until you see a bright circle of light.
5		Place a slide on the stage, and fix it with the clips. The specimen on the slide should be right above the hole of the stage.
6		Look at the microscope from the side. Turn the coarse adjustment knob carefully to lower the objective until it is very close to the slide.
7		Look through the eyepiece. Turn the coarse adjustment knob to raise the objective slowly until you can see an image of the specimen
8		Turn the fine adjustment knob to get a sharper image. The image is now in focus.



What's More

Wet Mounting a Specimen

In a wet mount, the specimen is placed in a drop of water or other liquid held between the slide and the cover slip by surface tension. This method is commonly used, for example, to view microscopic organisms that grow in pond water or other liquid media, especially when studying their movement and behavior.

Materials: Slide, Cover slip, Water, Dropper, Tweezers and Specimen.

Procedures:

1. Place a drop of water on the center of a clean dry slide
2. Using the tweezers, place the specimen in the middle of the drop.
3. While holding the cover slip upright, carefully place one edge of the cover slip next to the water.
4. Slowly lower the upper edge of the cover slip onto the water. The objective is to minimize or eliminate air bubbles under the cover slip. You might find it helpful to use one toothpick to hold the lower edge in place, while using another to carefully lower the slip into place.
5. An absorbent towel can be placed at the edge of the cover slip to draw out some of the water, further flattening the wet mount slide.

Guide Question:

Why would you want to wet mount a specimen?



What I Have Learned

Directions: Read the paragraph carefully and identify the correct words that fit in the given sentences in the box below. Write your answer on a separate sheet of paper.

Diaphragm

Objectives

Low Power

High Power

Lens Paper

Stage

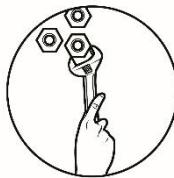
Uncover the microscope, unwrap the cord, and plug it in or face the mirror in an area with enough light source. Clean all glass surfaces with (1) _____. Start with the eyepiece, then do the (2) _____, the substage mirror or illuminator, and end with the stage window. Turn on the light (or adjust the mirror so that the light shines through the stage window).

Adjust the (3) _____ under the stage so that a medium amount of light gets through. Adjust the fine focus knob to a middle position. Place the slide on the (4) _____, with a slide clip holding down each side of the slide. Center the specimen on the slide over the stage window.

Using the low power objective first, focus with coarse adjustment. Start with the objective as close to the slide as possible and focus away from the slide. Before turning to a (5) _____ objective, make sure there is something worthwhile to look at and center the specimen in the middle of the field.

Without changing the focus adjustment, change to the next highest objective (the centered specimen should be in view and should be almost in focus). Now focus with the fine adjustment knob.

Clean up! Return to (6) _____ objective before taking off the slide. Clean and dry the stage and objectives, turn off the light, and wrap the cord neatly around the base of the microscope. Replace the cover.



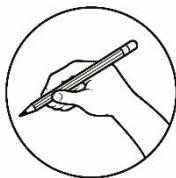
What I Can Do

Microscope is one of the most important inventions in the history of science. Without this instrument, we would not be able to see and identify very small organisms even though they are just around us.

Directions: In dedication for our front liners especially to hospital employees, write a thank you message for all of their hard works and sacrifices made in this global health crisis, COVID 19 Pandemic. Write your message on a separate sheet of paper.

Your output will be graded using the rubric below.

Area	10 Points	7 Points	5 Points	3 Points
Content and Focus on Topic	Includes detailed information about the topic.	Includes information about the topic.	There is some information about the topic.	There is a little information about the topic
Grammar and Spelling	All spelling and grammar are correct.	Most of the words and grammar are spelled correctly.	Some of the words are spelled correctly and some grammar are correct.	Spelling and grammar errors are frequent.



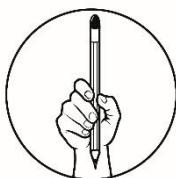
Assessment

Directions: Choose the best answer from the given choices. Write the letter of your choice on a separate sheet of paper.

1. Which focusing knob can be used with low power?
 - A. Diaphragm
 - B. Inclination Knob
 - C. High power objective
 - D. Coarse adjustment knob
2. How many objective lenses are there in a compound microscope?
 - A. 1
 - B. 3
 - C. 6
 - D. 12
3. Where should a specimen be positioned under a microscope under low power to view it correctly?
 - A. Middle
 - B. Bottom
 - C. Left side
 - D. Right side

4. To focus a specimen, it is best to start with which objective:
 - A. Ocular
 - B. Scanning
 - C. Low power
 - D. High power
5. Which part of the microscope is used to sharpen the focus of the specimen?
 - A. Fine adjustment knob
 - B. Coarse adjustment knob
 - C. Low power objective lens
 - D. High power objective lens
6. Which part of the compound microscope helps in gathering and focusing light rays on the specimen to be viewed?
 - A. Eyepiece lens
 - B. Objective lens
 - C. Condenser lens
 - D. Magnifying lens
7. The object to be studied and placed on the stage of the microscope is described as the _____.
 - A. clip
 - B. slide
 - C. image
 - D. specimen
8. Another term for the eyepiece is _____.
 - A. mirror
 - B. ocular
 - C. cover slip
 - D. objective lens
9. The area that can be seen through the eyepiece of a microscope is the _____.
 - A. Image
 - B. Specimen
 - C. Field of view
 - D. Magnification
10. When preparing a wet mount for a study under the microscope, what will you do to ensure that the liquid portion of the specimen will not spill on it.
 - A. Cover slip is placed over the specimen.
 - B. Low power lens is above the object on the stage
 - C. Drop of methylene blue is added to the specimen
 - D. Drop of water is added to the specimen on the slide
11. The student placed the cells on a slide and placed a cover slip over it. The purpose why the student covers the specimen is _____.
 - A. protect the onion
 - B. keep the cells flat
 - C. get a better view of the cells
 - D. onion cells will not fall off the slide

12. How would you use stage clip when studying a specimen under the microscope?
- A. Clip under the base for tilting.
 - B. Clip beside the arm for better grasp.
 - C. Clip over the slide so it will not fall off.
 - D. Clip onto the diaphragm in order light will pass through.
13. Anna is studying a new strain of bacteria. What must Anna do to carry the task properly and securely.
- I. Focus the specimen using the coarse and fine adjustment knob.
 - II. Get the microscope and placed it in a flat surface.
 - III. Wear proper attire like mask, gloves and lab gowns.
 - IV. Prepare the specimen in a glass slide and place the cover slip.
 - V. She discovered that the bacteria can multiply rapidly.
- A. I, II, III, IV, V
 - B. III, II, IV, I, V
 - C. V, IV, III, II, I
 - D. IV, III, I, II, V
14. When viewing a sample of onion cells using a microscope, a drop of iodine solution is placed on the onion cells. Is it important to put a staining element like iodine solution in viewing cells?
- A. No, because it smells bad.
 - B. No, because it contains starch.
 - C. Yes, because it protects the cells.
 - D. Yes, because it helps to see the cells clearly.
15. Sarah prepares glass slide, cover slip and specimen for her biology class. She placed the specimen on center of the glass slide, a small drop of staining element is put on the specimen. Is it necessary to place the cover slip at the top of the specimen with staining element?
- A. Yes, because it keeps the specimen in placed.
 - B. Yes, because it looks more cooler with cover slip on it.
 - C. No, because it will just case the staining element to spill.
 - D. No, because it blurs the view of the specimen under the microscope.



What I Know

Directions: Choose the best answer from the given choices. Write the letter of your choice on a separate sheet of paper.

1. A student wants to view cells under the compound microscope at a total magnification of 400X. If the eyepiece is 10X, which of the following objective lenses should be used?
 - A. 5X
 - B. 10X
 - C. 40X
 - D. 80X

2. If the eyepiece of a microscope magnifies by 10, and the objective lens magnifies by 4, what is the total magnification of the microscope?
 - A. 0.4
 - B. 2.5
 - C. 14
 - D. 40

3. If the eyepiece magnification on light microscope is 10x and the objective is 40x, what is the overall magnification?
 - A. 4x
 - B. 10x
 - C. 40x
 - D. 400x

4. What is the total magnification of a microscope with two lenses when one lens has a magnification of 15x and the other lens has a magnification of 30x?
 - A. 15x
 - B. 30x
 - C. 45x
 - D. 450x

5. When observing cells, which of the following optical tools is most appropriate?
 - A. Telescope
 - B. Petri dish
 - C. Hand lens
 - D. Microscope

6. Which part of the microscope is responsible for gathering diffuse rays from the microscope light source and illuminating the specimen with a small cone of bright light?
 - A. Ocular lens
 - B. Objective lens
 - C. Focusing knob
 - D. Condenser lens

7. What part will you adjust if you need to tilt the microscope?
 - A. Arm
 - B. Base
 - C. Diaphragm
 - D. Inclination Joint

8. Which two parts of the light microscope magnify the image of an object?
- A. Eyepiece and mirror
 - B. Objective and mirror
 - C. Objectives and diagram
 - D. Eyepiece and objectives
9. Moves the stage slightly to sharpen the image is called _____.
- A. aperture
 - B. body tube
 - C. fine focus knob
 - D. coarse focus knob
10. Which should be used to observed bacteria?
- A. 43x objective and 10x eyepiece
 - B. 60x objective and 15x eyepiece
 - C. 97x oil immersion objective and 5x eyepiece
 - D. 60x oil immersion objective and 10x eyepiece
11. Which of the following statement is true?
- A. All living things are made of cells.
 - B. Bacteria are cells that have bad effects.
 - C. New cells are created when old cells die.
 - D. A hen's egg is an example of many millions of cells.
12. What do you think is the reason why a scratch on microscope lenses happened?
- A. Washing the entire microscope.
 - B. Providing too much light when viewing.
 - C. Using rough cloth in cleaning the lenses.
 - D. Keeping the microscope in a cabinet full of dust.
13. How are you going to handle a microscope when transferring from one location to another?
- A. Hold the microscope on the stage with both hands.
 - B. Hold on the arm and swing it as you walk to keep in balance.
 - C. Hold it in the inclination joint with one hand and other hand to its base.
 - D. Hold one hand on the arm of the microscope and other hand on the base of the microscope.
14. The glass slide has a rectangular shape, it is where the specimen should be placed. A student knows that after using the materials in their experiment he should clean them before keeping it. He decided to put the specimen at the edge of the glass slide so that cleaning of it afterwards can be easily done. Did the student do the right thing?
- A. No, because he should place it at the tip of the glass slide.
 - B. Yes, because it will be easy in cleaning the materials afterwards.
 - C. No, because a specimen should be placed on the center of the slide.
 - D. Yes, because it will still look the same whether it is placed on the center or the edge.

15. A student is task to solve the magnification of the microscope lenses that he has used. Should he multiply the value of ocular lens and the value of objective lenses?

- A. No, because he should add the value of ocular lens and the value of objective lenses.
- B. No, because he should divide the value of ocular lens and the value of objective lenses.
- C. Yes, because the sum of the ocular lens and objective lenses are equals to the total magnification.
- D. Yes, because the product of the ocular lens and objective lenses are equals to the total magnification.

Lesson 2

The Magnification Process



What's In

In the previous lesson, you already learned how to focus specimen using a compound microscope. You learned that each part of the microscope has its own role in focusing the specimen.

Mix and Match

Directions: Listed below are parts of the microscope that are scrambled. Mix the letters in the column B to come up with the right answer and match it to column A which is their function. Write the letter only on a separate sheet of paper.

Column A	Column B
1. Support the upper part of the microscope and used to carry it.	A. RRIORM
2. Holds the eyepiece in place	B. MRA
3. Provides light for viewing the image	C. ETSAG
4. Holds the objective lenses	D. WRDA BTUE
5. Platform where specimen is placed.	E. EOSNEEIPC

Directions: Write TRUE if the statement is correct and FALSE if the statement is wrong. Write your answer on a separate sheet of paper.

1. When you move the slide to the right the image moves to the left.
2. When you move the slide inward, the image will move away from you.
3. Use the low power objective before using the high-power objective.
4. Clean all glass surfaces with tissue paper.
5. Adjust the diaphragm under the stage so that a medium amount of light gets through.



What's New

Hello there! You are already learned how to focus specimen using a microscope. Now let's discover together how to compute the magnification of the specimen and know the proper ways of handling the microscope. All we have to do is read and understand the context below to find these. Are you ready? Let's start!

Activity 1

Magnification is the measure of the ability of lens to produce a bigger image of an object. A good image is obtained when the amount of specimen detail is also increased.

To determine the total magnification, multiply the magnification of eyepiece by the objective lens.

Total Magnification

Directions: Fill in the charts below. Calculate the total magnifications for the examples given, then calculate the total magnification using each of the objective lenses on microscope scenario. Write your answer on a separate sheet of paper.

***Eyepiece lens magnification x objective lens magnification = Total Magnification**

SAMPLES		
Eyepiece Lens Magnification	Objective Lens Magnification	Total Magnification
5x	50x	1.
5x	100x	2.
10x	50x	3.
20x	20x	4.

Microscope Scenario:

The microscope has an eyepiece magnification of 10x and has 3 objective lenses namely scanning, low power and high power. Scanning objective lens has a magnification of 4x, low power objective lens has a magnification of 10x and high-power objective lens has a magnification of 40x.

Directions: Fill the magnification of eyepiece and objective lenses base on the scenario and compute for the total magnification. Write your answer on a separate sheet of paper.

YOUR MICROSCOPE			
Eyepiece Lens Magnification	Objective Lens Name	Objective Lens Magnification	Total Magnification
5.	Scanning	8.	11.
6.	Low Power	9.	12.
7.	High Power	10.	13.

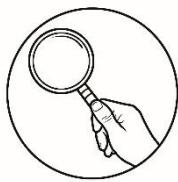
Activity 2

The microscope is a highly important instrument with a wide range of applications. It allows scientists and students to study a range of microorganisms, cells and structures, playing an integral role in both research and diagnostics. To lengthen its life, you need to know the proper care and maintenance of the microscope.

Proper Care and Maintenance

Directions: Tick (✓) if the statement signifies proper care and maintenance and cross (X) if it isn't. Write your answer on a separate sheet of paper.

1. When carrying your microscope, hold it by the base and the stage.	5. Always ensure the objectives are cleaned immediately after use.
2. On an annual basis moving parts on the microscope should be cleaned and lubricated.	6. Never use sharp instruments or anything abrasive on the microscope lenses.
3. Make sure you store your microscope in an area that has corrosive chemical fumes	7. Always keep your microscope covered when not in use even if the microscope is stored in a cabinet.
4. Touch the lenses of the microscope to ensure their safety of lenses.	8. You should never allow the lens to touch the slide you are looking at.



What is It

Magnification

The two lenses that determine the magnification of the microscope are the eyepiece lens and the objective lens. Each has a number on it that signifies its magnification.

OCULAR LENS (eyepiece) – Your microscope will have either one (monocular) or two (binocular) ocular lenses.

These are the lenses you will look through when examining a specimen with the microscope. Take a look at the side of your ocular lens and you will notice a label of “10X”. This indicates that each ocular lens magnifies the image by a factor of 10 or 10X.

OBJECTIVE LENSES – Notice the set of objective lenses on the revolving nosepiece. These lenses allow you to change the degree of magnification. Some of our microscopes have four objective lenses while others have only three. The degree of magnification for each objective lens is indicated on its side. Let’s take a look at each progressing from the shortest to longest objective lenses, being sure to rotate the revolving nosepiece to click each objective lens into position above the stage before examining it:

- 4X – This objective magnifies the image by a factor of 4. It is referred to as the “scanning objective” since it is used to scan the slide to locate the specimen before viewing it at higher magnification.
- 10X – This objective magnifies the image by a factor of 10 and is referred to as the “low power” objective.
- 40X – This objective magnifies the image by a factor of 40 and is referred to as the “high power” objective.

Total Magnification

The total magnification of an image is quite simple – it is the product of the ocular lens magnification times the magnification of the objective lens you are using:

$$\text{Magnification of Ocular} \times \text{Magnification of Objective} = \text{Total Magnification}$$

For example, if the ocular lens magnifies the image by a factor of 10 (10X), and the objective lens magnifies the image by a factor of 50 (50X), the total magnification of the image is 500X:

$$10X \times 50X = 500X$$

Many students make the mistake of adding the two magnifications, so remember that total magnification is the product (multiplication) of the ocular and objective lens magnifications.

Proper Handling of Microscope

Microscopes are instruments used to magnify small objects, allowing them to be seen by the naked eye. Most microscopes have several different powerful lenses attached to them, allowing the viewers to inspect the content at more than 100 times its actual size.

These are the tips that will help you in proper care and maintenance of the microscope.

Tip 1: Handle with care

Most microscope problems occur as a result of improper handling. When carrying your microscope, hold it by the base and the metal support arm. Do not pick it up by the stage, as this can cause misalignment.

Tip 2: Keep lenses clear of slides

When using your microscope and adjusting the focus you will need to lower the objective lens down as far as it will go. However, you should never allow the lens to touch the slide you are looking at. Dirty lenses can be difficult to clean.

Tip 3: Clean after using

Always ensure the objectives are cleaned immediately after use. Objective, eyepieces, and condenser may be removed for cleaning. Use only lens paper and lens cleaner. Do not use solvents.

Tip 4: Cover when not in use

All microscopes are sold with dust covers. Always keep your microscope covered when not in use even if the microscope is stored in a cabinet. Eye tubes also need to be kept free of dust so do not store a microscope without the eyepieces. If the microscope eyepieces must be removed, cover the tubes with caps or a plastic bag with a rubber band around the eye tube.

Tip 5: Look after the bulb

After using the microscope, turn off the illuminator and wait for it to cool for several minutes before putting it away. By allowing the bulb to cool you will extend its life. When turning the microscope on and off, use the switch not the power point.

Tip 6: Store in a clean, dry place

Make sure you do not store your microscope in an area that has corrosive chemical fumes that can destroy lenses or metal parts or beside solutions that may leak. Salt air and pervasive damp can also cause damage over time. Make sure your cabinet is ventilated.

Tip 7: Only use special lens paper or wipes for cleaning the lenses

Microscope lenses can easily be scratched and should be treated with great care. Use an aspirator to remove dust. Sticky residue can be removed with lens paper moistened with distilled water or lens cleaning solution and rubbed gently using a circular motion. Never use sharp instruments or anything abrasive on the microscope lenses.

Tip 8: Keep your User's Manual and wrenches in a safe place

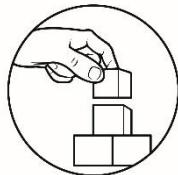
Each microscope should come with a user's manual and specialist wrenches as required. Always consult the User's Manual before making any adjustments to your microscope and use the wrenches provided. Never over-tighten or use force when performing any maintenance on your microscope, or use inappropriate tools. This can damage the parts.

Tip 9: Perform an annual maintenance check

On an annual basis moving parts on the microscope should be cleaned and lubricated. Clean grease and dirt from sliding surfaces using a clean cloth. Do not grease the teeth of the rack and pinion gears. Inspect the power cords and plugs for safety and stock up on a supply of replacement bulbs.

Tip 10: Have your microscope serviced professionally

A rule of thumb for frequency of servicing is every 200 hours of use or every 3 years, whichever comes first.



What's More

Magnification

Directions: Fill the blanks by solving the missing numbers. Write your answer on a separate sheet of paper.

Eyepiece Lens	Objective Lens	Total Magnification
5x	(1)	20x
5x	40x	(2)
(3)	10x	100x
10x	40x	(4)



What I Have Learned

Directions: Read the paragraph carefully and identify the correct words that fit in the given sentences in the box below. Write your answer on a separate sheet of paper.

small base	arm lenses	dust cover glass
lens paper		lowest

Microscopes are devices used to magnify (1) _____ objects, allowing them to be seen by the naked eye. Most microscopes have several different powerful lenses attached to them, allowing the viewer to inspect the content at more than 100 times its actual size.

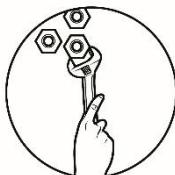
Hold the microscope with one hand around the (2) _____ of the device, and the other hand under the (3) _____. This is the most secure way to hold and walk with the microscope.

Avoid touching the (4) _____ of the microscope. The oil and dirt on your fingers can scratch the (5) _____.

Clean smudges on the microscope glass with a piece of (6) _____. Any other material, such as tissues or even cotton, can scratch the glass of the microscope.

Rotate the nosepiece of the microscope all the way down to its (7) _____ level when you have finished using the microscope. If you leave the nosepiece up while storing it, the gears on the device can wear out. If this happens, the nosepiece may not be able to lift and hold its position.

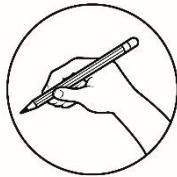
Cover the microscope with the (8) _____ to protect it from dirt and other debris.



What I Can Do

Directions: Write 3 DO's and 3 DON'Ts in Handling a Microscope. Write your answer on a separate sheet of paper.

DO's	DON'Ts
1. 2. 3.	1. 2. 3.



Assessment

Directions: Choose the best answer from the given choices. Write the letter of your choice on a separate sheet of paper.

1. To obtain total magnification, you should _____ the magnification of the eyepiece to the objective lens power.
 - A. add
 - B. divide
 - C. multiply
 - D. subtract
2. What two parts do you place your hands while carrying a microscope?
 - A. Arm and Base
 - B. Arm and Ocular
 - C. Base and Nosepiece
 - D. Base and High-Power Objective
3. What do you use to clean the microscope lenses?
 - A. Cotton
 - B. Wet Wipes
 - C. Lens Paper
 - D. Tissue Paper
4. If the eyepiece magnification on light microscope is 10x and the objective is 40x, what is the overall magnification?
 - A. 4x
 - B. 10x
 - C. 40x
 - D. 400x
5. The magnification of a microscope with a 10x eyepiece and a 10x objective will be 1000x.
 - A. True
 - B. False
 - C. Maybe
 - D. Unnecessary
6. Find the magnification: Eyepiece= 10x Objective lens= 55x
 - A. 10x
 - B. 55x
 - C. 65x
 - D. 550x

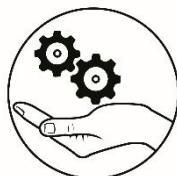
7. Find the magnification: Eyepiece= 20x Objective lens= 20x
- A. 20x
 - B. 40x
 - C. 200x
 - D. 400x
8. The higher the magnification, the _____ you see of specimen.
- A. less
 - B. more
 - C. lower
 - D. higher
9. An increase in magnification causes _____.
- A. a decrease in the field of view
 - B. an increase in the working time
 - C. a decrease in the working distance
 - D. an increase in the working distance
10. Which of the following should you **NOT** do while using the microscope?
- A. Use low power objectives lens first.
 - B. Use stage clips to hold the slide in place.
 - C. Use direct sunlight when mirror is the light source.
 - D. Use fine adjustment only under the high-power objective.
11. Which of the following is **NOT** a proper method for handling microscopes?
- A. Carry the microscope with one hand.
 - B. Always use fine adjustment when using high power.
 - C. Remove the slide before putting the microscope away.
 - D. Never clean the objectives with anything but lens paper.
12. What would be the result if the power of ocular lens is 10x and objective lens is 20x?
- A. 20 times
 - B. 30 times
 - C. 200 times
 - D. 2000 times
13. You are looking at an object under the microscope. What is proper sequence in focusing the microscope?
- I. Use the fine adjustment knob when using the high-power objective.
 - II. Use the coarse adjustment knob in moving down the body tube.
 - III. Set the mirror to get proper amount of light.
 - IV. Adjust the microscope's diaphragm.
 - V. Tilt the inclination joint.
- A. V, III, IV, II, I
 - B. I, II, III, IV, V
 - C. II, V, IV, I, III
 - D. I, III, II, V, IV

14. Andy is using a compound microscope which has three objective lenses and has coarse adjustment knob and fine adjustment knob. Is it correct to use the coarse adjustment knob when changing objectives lenses?

- A. Yes, because it helps you to work faster.
- B. No, because coarse adjustment knob is for the tilting of the microscope.
- C. Yes, because coarse adjustment knob is responsible in changing the lenses.
- D. No, because coarse adjustment knob is for the fast movement of the body tube and it might damage the glass slide.

15. Jose just finished using the microscope after his science class. He cleans the materials he used. In cleaning the slides, is it advisable to use rough fabric?

- A. No, because it can create a scratch on the glass slide.
- B. No, because it can spread the color of the fabric to the glass slide.
- C. Yes, because if you only use a soft fabric it cannot get the stain from the glass slide.
- D. Yes, because rough fabrics are made for cleaning the stains and maintaining the shape of the glass slides.



Additional Activities

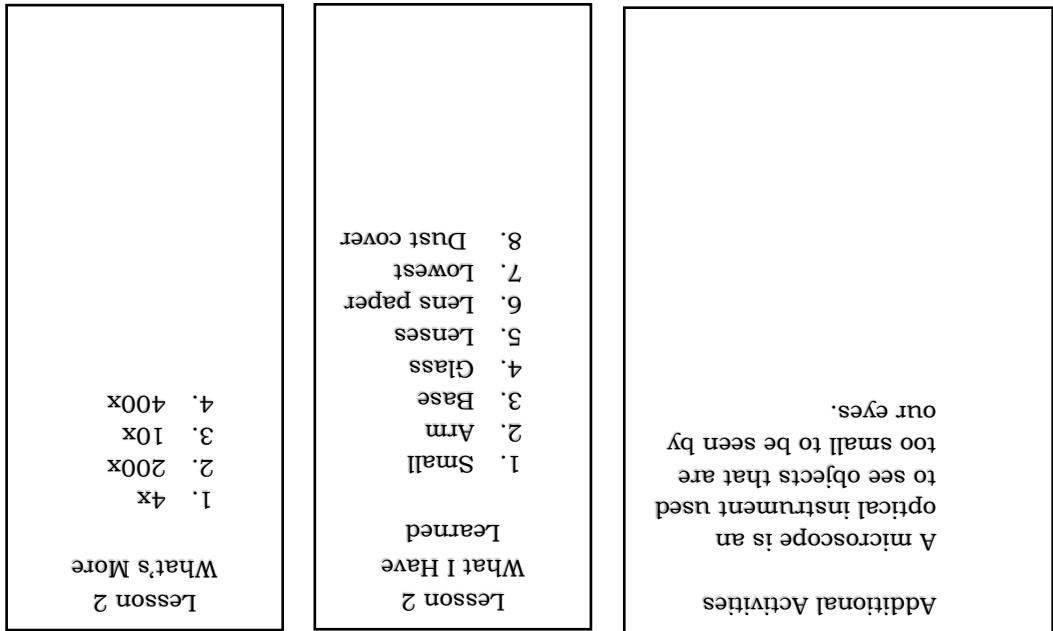
Directions: Make a sentence that best describes a microscope from the words given in the box. Write your answer on a separate sheet of paper.

instrument	to	that	seen	used	is
A		small	see	an	
optical		by	to	microscope	
	eyes		our	be	
too		objects		are	



Answer Key

Lesson 1		Lesson 2		Lesson 1		Lesson 2	
What's In	What's In	What I Have	What I Know	Assessment	Assessment	What I Know	Assessment
1. 250x	Activity 1	Activity 1	Activity 1	1. B. Arm	1. Lens paper	1. D. Draw tube	1. A. Mirror
2. 500x	Activity 1	Activity 1	Activity 1	2. Stage	2. Objectives	2. Eye piece	2. D. Draw tube
3. 500x	Activity 1	Activity 1	Activity 1	3. Diaphragm	3. Diaphragm	3. Diaphragm	3. A. Mirror
4. 400x	Activity 1	Activity 1	Activity 1	4. Stage	4. Stage	4. Body tube	4. E. Nosepiece
5. 10x	Activity 1	Activity 1	Activity 1	5. High power	5. High power	5. Body tube	5. C. Stage
6. 10x	Activity 1	Activity 1	Activity 1	6. Low power	6. Low power	6. Stage	6. D. Draw tube
7. 10x	Activity 1	Activity 1	Activity 1	7. Base	7. Base	7. Activity 2	7. A. Stage
8. 4x	Activity 1	Activity 1	Activity 1	8. Base	8. Base	8. Activity 2	8. B. Stage
9. 10	Activity 1	Activity 1	Activity 1	9. Activity 2	9. Activity 2	9. Activity 2	9. C. Stage
10. 40	Activity 1	Activity 1	Activity 1	10. Base	10. Base	10. Activity 2	10. D. Stage
11. 40x	Activity 1	Activity 1	Activity 1	11. Stage	11. Stage	11. Activity 2	11. E. Stage
12. 100x	Activity 1	Activity 1	Activity 1	12. Arm	12. Arm	12. Activity 2	12. F. Stage
13. 400x	Activity 1	Activity 1	Activity 1	13. Nosepiece	13. Nosepiece	13. Activity 2	13. G. Stage
14. 1000x	Activity 1	Activity 1	Activity 1	14. Base	14. Base	14. Activity 2	14. H. Stage
15. 4000x	Activity 1	Activity 1	Activity 1	15. Stage	15. Stage	15. Activity 2	15. I. Stage
1. C	1. C	1. C	1. C	1. C	1. C	1. A	1. A
2. A	2. D	2. B	2. D	2. D	2. D	10. A	11. A
3. A	3. C	3. D	3. C	3. D	3. A	10. D	10. C
4. D	4. D	4. B	4. D	4. B	4. D	9. C	9. B
5. A	5. A	5. D	5. A	5. D	5. A	8. C	8. B
6. D	6. D	6. C	6. D	6. C	6. D	7. D	7. D
7. D	7. D	7. D	7. D	7. D	7. D	6. C	6. C
8. C	8. C	8. B	8. C	8. B	8. C	5. A	5. A
9. B	9. B	9. A	9. B	9. A	9. B	4. B	4. D
10. A	10. A	10. D	10. A	10. D	10. D	3. A	3. C
11. B	11. B	11. A	11. A	11. A	11. A	2. D	2. D
12. C	12. C	12. C	12. C	12. C	12. C	1. D	1. D
13. D	13. D	13. D	13. D	13. D	13. D	10. A	10. A
14. D	14. D	14. C	14. D	14. C	14. D	9. C	9. A
15. C	15. C	15. A	15. C	15. A	15. C	8. A	8. A



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