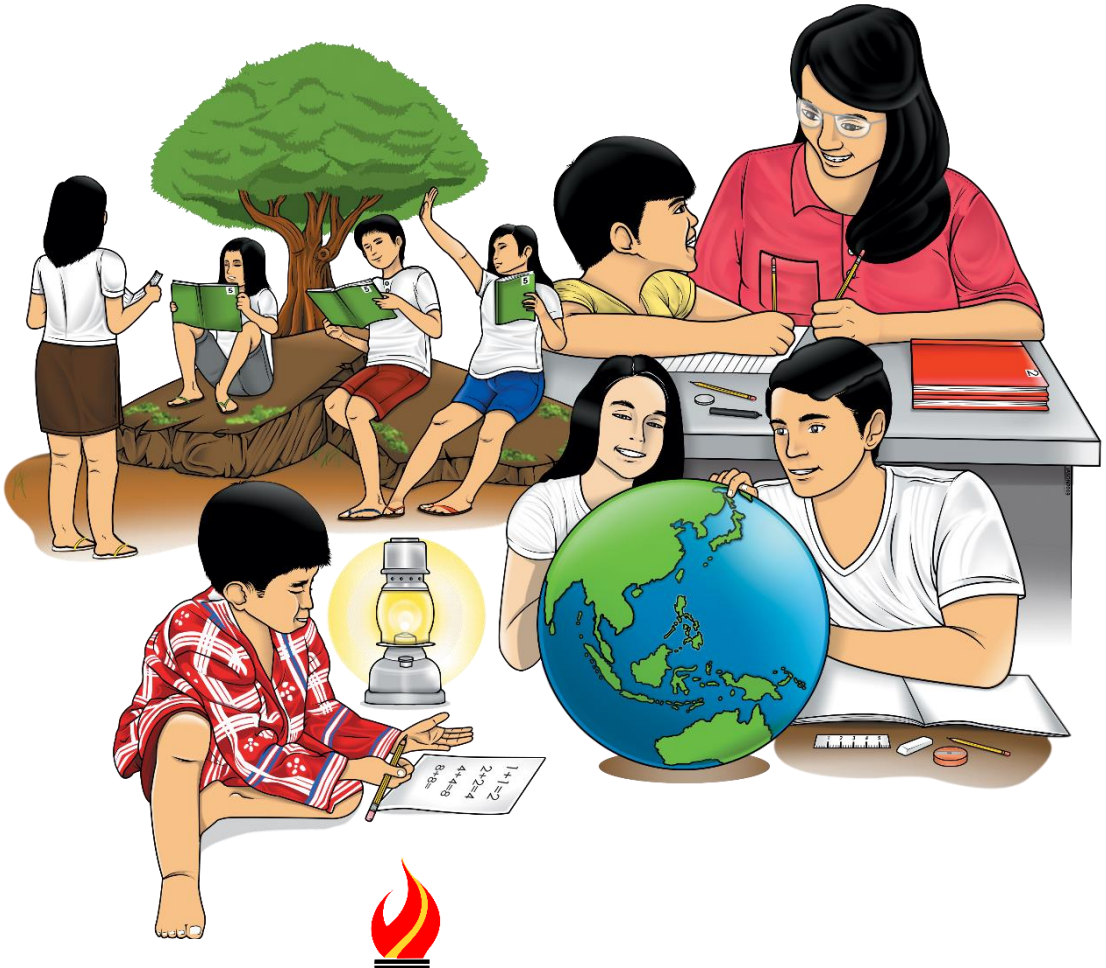
8

DepED
DEPARTMENT OF EDUCATION

Science

Quarter 1 – Module 5
Colors of Light



ALTERNATIVE DELIVERY MODE
ADM

Science – Grade 8
Alternative Delivery Mode
Quarter 1 – Module 5: Colors of Light
First Edition, 2020

Published by the Department of Education
Secretary: Leonor Magtolis Briones
Undersecretary: Diosdado M. San Antonio

Development Team of the Module

Writer: Jinemerie C. Atendido

Editor: Teresa May A. Mundiz, Nonita C. Patalinghug

Reviewers: Bernabe L. Linog, Relyn D. Raza, Jonas F. Saldia, Delia C. Pioco, Kevin Hope Z. Salvaña

Layout Evaluators: Celeste Faith R. Almanon, Jay S. Ayap

Management Team: Francis Cesar B. Bringas
Isidro M. Biol, Jr. PhD
Maripaz F. Magno
Josephine Chonie M. Obseñares
Gregoria T. Su, Ph.D
Marvilyn C. Francia
Jay S. Ayap
Nonita C. Patalinghug

Printed in the Philippines by _____

Department of Education – Caraga Region
Office Address: Teacher Development Center
J.P. Rosales Avenue, Butuan City, Philippines 8600
Telefax: (085) 342-8207/ (085) 342-5969
E-mail Address: caraga@deped.gov.ph

8

Science

Quarter 1 – Module 5:
Colors of Light

DepED
DEPARTMENT OF EDUCATION

Introductory Message

For the facilitator:

Welcome to the **Science 8** Alternative Delivery Mode (ADM) Module on **Colors of Light!**

This module was collaboratively designed, developed and reviewed by educators both from public and private institutions to assist you, the teacher or facilitator in helping the learners meet the standards set by the K to 12 Curriculum while overcoming their personal, social, and economic constraints in schooling.

This learning resource hopes to engage the learners into 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.

As a facilitator you are expected to orient the learners on how to use this module. You also need to keep track of the learners' progress while allowing them to manage their own learning. Furthermore, you are expected to encourage and assist the learners as they do the tasks included in the module.

For the learner:

Welcome to the **Science 8** Alternative Delivery Mode (ADM) Module on **Colors of Light!**

The hand is one of the most symbolized part of the human body. It is often used to depict skill, action and purpose. Through our hands we may learn, create and accomplish. Hence, the hand in this learning resource signifies that you as a learner is capable and empowered to successfully achieve the relevant competencies and skills at your own pace and time. Your academic success lies in your own hands!

This module was designed to provide you with fun and meaningful opportunities for guided and independent learning at your own pace and time. You will be enabled to process the contents of the learning resource while being an active learner.

This module has the following parts and corresponding icons:

What I Need to Know — This will give you an idea of the skills or competencies you are expected to learn in the module.

What I Know — This part includes an activity that aims to check what you already know about the lesson to take. If you get all the answers correct (100%), you may decide to skip this module.

What's In — This is a brief drill or review to help you link the current lesson with the previous one.

What's New — In this portion, the new lesson will be introduced to you in various ways such as a story, a song, a poem, a problem opener, an activity or a situation.

What is It — This section provides a brief discussion of the lesson. This aims to help you discover and understand new concepts and skills.

What's More — This comprises activities for independent practice to solidify your understanding and skills of the topic. You may check the answers to the exercises using the Answer Key at the end of the module.

 ***What I Have Learned***	This includes questions or blank sentence/paragraph to be filled in to process what you learned from the lesson.
 ***What I Can Do***	This section provides an activity which will help you transfer your new knowledge or skill into real life situations or concerns.
 ***Assessment***	This is a task which aims to evaluate your level of mastery in achieving the learning competency.
 ***Additional Activities***	In this portion, another activity will be given to you to enrich your knowledge or skill of the lesson learned. This also tends retention of learned concepts.
 ***Answer Key***	This contains answers to all activities in the module.

At the end of this module you will also find:

References	This is a list of all sources used in developing this module.

The following are some reminders in using this module:

1. Use the module with care. Do not put unnecessary mark/s on any part of the module. Use a separate sheet of paper in answering the exercises.
2. Don't forget to answer *What I Know* before moving on to the other activities included in the module.
3. Read the instruction carefully before doing each task.
4. Observe honesty and integrity in doing the tasks and checking your answers.
5. Finish the task at hand before proceeding to the next.
6. Return this module to your teacher/facilitator once you are through with it.

If you encounter any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator. Always bear in mind that you are not alone.

We hope that through this material, you will experience meaningful learning and gain deep understanding of the relevant competencies. You can do it!

What I Need to Know

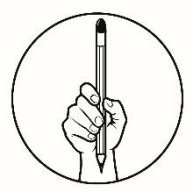
This module was designed and written with you in mind. It is here to help you master the Colors of Light. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

The module is divided into three lessons, namely:

- Lesson 1 – Colors of Light
- Lesson 2 – Hierarchy of Colors
- Lesson 3 – Bending of Colors

After going through this module, you are expected to:

1. Demonstrate the existence of the color components of visible light using a prism or diffraction grating; *(Week 4 S8FE-If-27)*
2. Explain hierarchy of colors in relation to energy; and
3. Explain that red is the least bent color and violet the most bent color according to their wavelengths and frequencies.



What I Know

Choose the letter of the correct answer. Write your answers on a separate sheet of paper.

1. Which has the greatest energy among the colors in a rainbow?
   A. green
   B. orange
   C. red
   D. violet

2. Among the following colors in a rainbow, which has the least energy?
   A. green
   B. red
   C. violet
   D. yellow

3. Which property of light enables the formation of a rainbow?
   I. color separation
   II. dispersion
   III. reflection
   IV. refraction

   A. I and III
   B. II, III, and IV
   C. I, III and IV
   D. I, II, III, IV

4. Red is the least bent among the seven colors because it has the _____.
   A. lowest frequency
   B. highest frequency
   C. longest wavelength
   D. shortest wavelength

5. What is the acronym used to remember visible light?
   A. DOGFOUND
   B. KTPERRY
   C. ROYGBIV
   D. ROMERO

6. What is called the separation of white light into different colors as it passes through prism?
   A. color separation
   B. dispersion
   C. reflection
   D. refraction

7. Which of the following orders of visible light colors shows increasing wavelength?
   A. red, orange, yellow, green, blue, indigo, violet
   B. red, yellow, green, orange, violet, blue, indigo
   C. violet, indigo, blue, green, yellow, orange, red
   D. violet, blue, green, orange, red, indigo, yellow

8. Why does white light separate into different colors as it passes through a prism?
   A. The colors are changed by addition.
   B. This is an example of color by subtraction.
   C. Different colored light has different wavelengths.
   D. The side part of a prism only let certain colors of light pass through.

9. A second prism will change a spectrum back into white light. What does it show?
   A. Prism distort image.
   B. Prisms are transparent.
   C. Light travels at a constant speed.
   D. White light is composed of colors.

10. Which of the following is true about the relationship between frequency and energy?
   A. The frequency of the color of light and energy are not related.
   B. As the frequency of the color of light increases, its energy decreases.
   C. As the frequency of the color of light decreases, the energy increases.
   D. As the frequency of the color of light increases, the energy also increases.

11. Which color has the shortest wavelength?
   A. green
   B. red
   C. yellow
   D. violet

12. Which of the following statements is incorrect?
   A. Short wavelength corresponds to low frequency.
   B. Frequency and wavelength are inversely related.
   C. High frequency light corresponds to short wavelength.
   D. Low frequency light corresponds to long wavelength.

13. Based on the colors of light, what color comes between blue and violet?
   A. indigo
   B. green
   C. orange
   D. violet

14. Which of the following colors of light bend the most?
   A. indigo
   B. green
   C. orange
   D. violet

15. White light separated through a prism is an example of _____.
   A. diffraction
   B. rarefaction
   C. reflection
   D. refraction

Lesson 1 Colors of Light

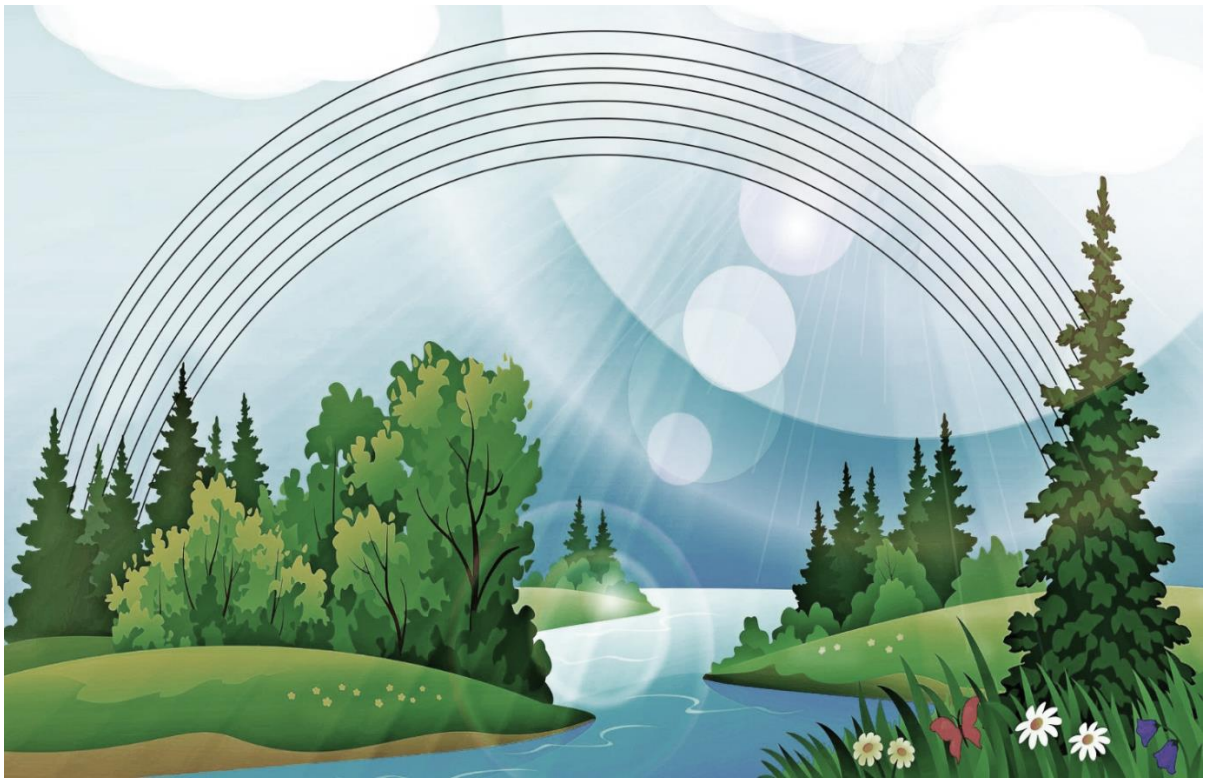
Have you ever wondered how a majestic rainbow is formed? Why do we see spectacular events in the sky like red sunset, blue sky, and rainbows? How is the arrangement of color determined by nature?

In this lesson, you will try to find through simple activities how light disperse to form the colors of light.

What's In

Activity 1

Draw and Color the rainbow on a separate sheet of paper using your coloring materials based on how well you remember how a rainbow looks like.



(https://pixabay.com/illustrations/mountain-river-landscape-rainbow-3995571/)

What's New

Activity 2

Perform the activity below and answer the questions on a separate sheet of paper.

Objective:

At the end of the activity, you will be able to infer that white light is made up of many different colors of light.

Materials:

Flashlight or any source of light

a big bowl

water

small mirror

paper

Procedure:

1. Fill the big bowl with water almost to its rim.
2. Place the mirror with its part partially submerged into the water.
3. Hold the paper above the bowl with one hand and use the other hand to turn on the flashlight or any source of light into the submerged part of the mirror.
4. Adjust the position of the mirror until you see color bands on the paper.
5. Record your observation.

Questions:

Q1. What happens when the light hits the mirror?

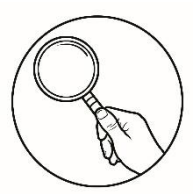
_____

_____

Q2: List and arrange the observed colors based on how they appear on the paper.

_____

_____



What is It

Color

Were you able to get good sets of data from the activity? Did you enjoy watching how the rainbow colors appear in the paper? Light is a kind of energy that can travel through space in a form of wave. Light from the sun or flashlights looks white, but it is really a mixture of many colors. The colors in white light are *red, orange, yellow, green, blue indigo and violet*. We highlight here the arrangement of colors of light as **ROYGBIV** when dispersion happens. **Dispersion** is a kind of refraction which provided us colors of light. This phenomenon is observed when white light passes through a prism.

A **prism** is a transparent optical element with flat and polished surfaces that disperses light. Usually a prism has a triangular base and rectangular sides. Prisms can be made from any transparent materials like glass, plastic or fluorite. Water in a glass can also acts as prism. It also breaks white light into constituent colors namely: red, orange, yellow, green, blue, indigo and violet **(ROYGVIB)**. You can see these colors when you look at a rainbow in our sky. A rainbow is caused by both the reflection and refraction of light in water droplets on the Earth's atmosphere. The water droplets serve as tiny prisms that refract, reflect, and disperse sunlight into spectrum of light appearing in the sky.

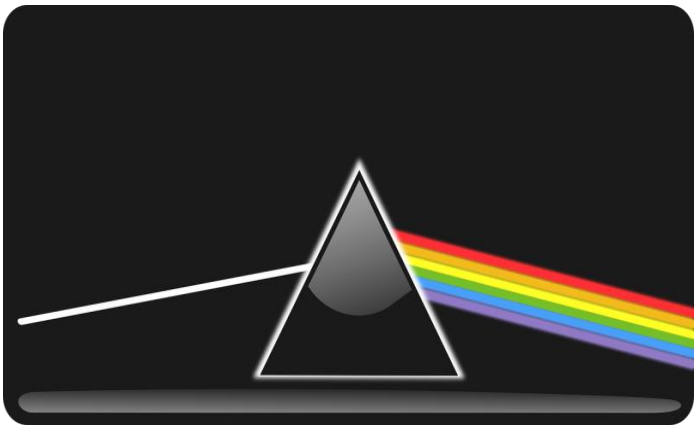
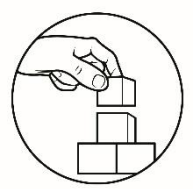


Figure 1. White Light through a Prism

https://pixabay.com/vectors/refraction-prism-optics-150853/



What's More

Activity 3

Use crayons or colored pencils to fill in the color spectrum below and label the dispersed colors on the blank provided. Choose your answers from the words in the box. Write your answers on a separate sheet of paper.

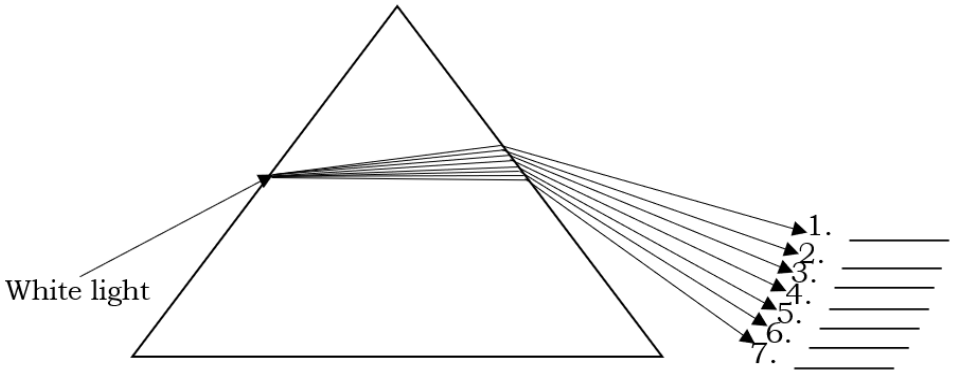


Figure 2. Dispersion of White Light

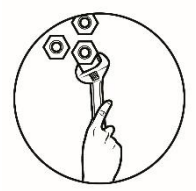
(Illustrated by: Jinemerie C. Atendido)

Blue		Red	Violet
Green	Orange	Indigo	Yellow

What I Have Learned

Fill in the blanks to complete the sentences. Write your answers on a separate sheet of paper.

1. _____is a kind of energy that can travel through space. It looks white, but it is really a combination of many colors.
2. The colors in ____ light are red, orange, yellow, green, blue, indigo, and violet.
3. When light appears white, it is made up of different colors just like the colors of the rainbow. The colors can be separated by shining light into ____.
4. _____ is the separation of white light into its component colors as it passes through a prism.
5. The main purpose of the prism is to separate visible light into constituent colors namely: ____, ____, _____, _____, _____, ____, and ____ (ROYGVIB).



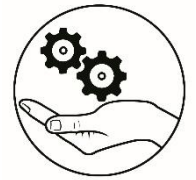
What I Can Do

Activity 4

Objective: At the end of the activity, you will be able to separate the colors of light passing through a casing of polygonal-shaped pen.

Materials: paper, pencil, casing of polygonal-shaped pen

Procedure: Make your own prism using a casing of a polygonal-shaped pen. Be patient and do the experiment until you get the angle just right. Draw what you observed on a separate sheet of paper.



Additional Activities

Activity 5

Perform the activity below and answer the questions on a separate sheet of paper.

Objective: At the end of the activity, you will be able to make your own rainbow using simple experiment.

Materials: water, sunlight, clear glass, small mirror

Procedures:
1. Fill the glass with water.
2. Put the mirror into the water inside the glass at a slant position so that it leans against the side of the glass.
3. Position the glass so that sunlight shines directly at the mirror. You may have to shift the mirror so that sunlight perfectly strikes on the mirror.
4. Look for a reflection on the wall. It would be easier to see if the room is dark.
5. Adjust the position of the mirror until you see a rainbow on the wall.

Questions:
Q1. What is the order of colors in the rainbow shown on the wall?

_____

Q2. How are rainbows formed in nature?

_____

Lesson 2 Hierarchy of Colors

In the previous lesson, we learned about the arrangement of colors of white light. But what does the arrangement of colors of light exhibit in terms of energy? Which color of light has the greatest energy? The next activity will provide you with answers to these questions. In this lesson, you will be able to relate the arrangement of colors and its corresponding energy.

What's In

Activity 6

Give what is asked. Write your answers on a separate sheet of paper.

1. Write the colors of the rainbow that each letter stands for:

R = _____
O = _____
Y = _____
G = _____
B = _____
I = _____
V = _____

2. Use crayons to draw what happens to the beam of light when it passes through the prism.

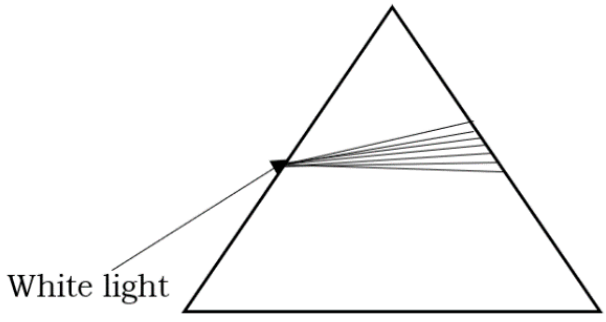


Figure 3. Dispersion of light

What's New

Activity 7

Objectives:

At the end of the activity, you will be able to infer that:

1. light is composed of colors of different frequencies and wavelengths;
2. frequencies of the colors of light are inversely proportional to the wavelength;
3. arrangement of colors of light shows the hierarchy of the colors with corresponding energy.

Study the table and answer the questions that follow on a separate sheet of paper.

Table 1. Range of Wavelength, Frequency and Energy of Light

Color	Wavelength (nm)	Frequency (THz)	Photon Energy (eV)
Violet	380-445	675-789	2.80-3.26
Indigo	445-450	668-675	2.75-2.80
Blue	450-495	606-668	2.50-2.75
Green	495-570	526-606	2.17-2.50
Yellow	570-590	508-526	2.10-2.17
Orange	590-620	484-508	2.00-2.10
Red	620-750	400-484	1.65-2.00

Legend: nm (nanometer: unit of wavelength)
THz (Terahertz: unit of frequency)
eV (electron volt: unit of energy)

Questions:

Q1. Which color has the highest frequency? the shortest wavelength?

_____

Q2. Which color has the lowest frequency? the longest wavelength?

_____

Q3. What did you observe about the wavelengths and frequencies of the different colors of light?

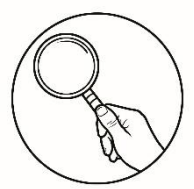
_____

Q4. Do the frequencies of colors of light increase from red to violet?

_____

Q5. What did you observe about the corresponding energies from red to violet?

_____



What is It

The frequency of light wave refers to the number of waves that move past a certain point in one second. **Frequency** is generally measured in **Hertz**, the units of cycles per second. Color has the frequency ranging from 430 trillion Hertz to 750 trillion Hertz. Waves can also go beyond and below those frequencies, but they are not visible to the human eye.

Wave frequency is related to wave energy. **The more energy in the wave, the higher its frequency. The lower the frequency is, the less energy in the wave.** When it comes to light waves, **violet** has the highest energy while **red** has the lowest energy. Related to energy and frequency is the wavelength, or the distance between corresponding points on subsequent waves. You can measure wavelength from peak to peak, trough to trough or between two consecutive corresponding points of waves.

Within the band of visible light, the different wavelengths are perceived by people as different colors. The shortest wavelength is violet, and the longest wavelength is red.

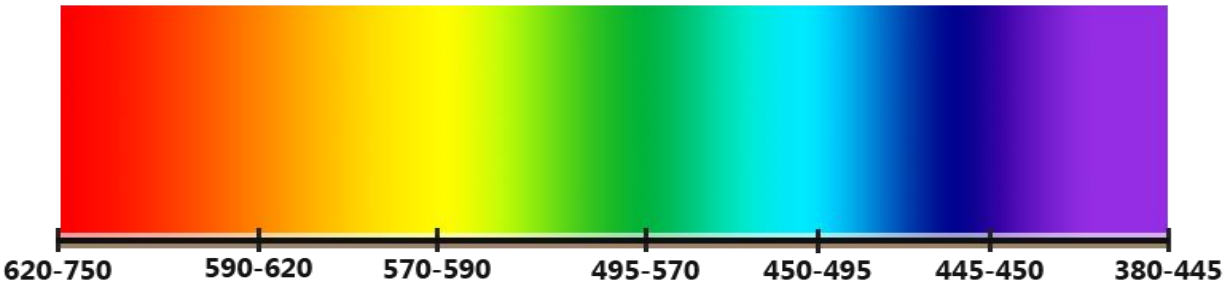
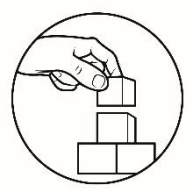


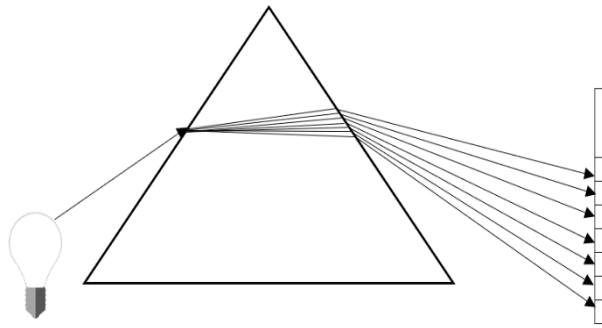
Figure 4. Wavelengths of Visible light (nanometers
(Illustrated by: Jinemerie C. Atendido)



What's More

Activity 8

Observe the illustration below and answer the questions by writing **Yes** if the statement is correct and **No** if the statement is incorrect. Write your answers on a separate sheet of paper.



Color	Wavelength (nm)	Frequency (THz)	Photon Energy (eV)	Speed in vacuum (m/s)
Red	620-750	400-484	1.65-2.00	3×10^8
Orange	590-620	484-508	2.00-2.10	3×10^8
Yellow	570-590	508-526	2.10-2.17	3×10^8
Green	495-570	526-606	2.17-2.50	3×10^8
Blue	450-495	606-668	2.50-2.75	3×10^8
Indigo	445-450	668-675	2.75-2.80	3×10^8
Violet	380-445	675-789	2.80-3.26	3×10^8

Figure 5. Refraction of Colors
(bulb: https://pixabay.com/vectors/bulb-light-electric-energy-power-307687/)

1. Does white light split into different colors? _____
2. Do all colors of light travel at the same speed in a vacuum? _____
3. Do all colors of light have the same energy? _____
4. Does blue have the shortest wavelength? _____
5. Does red have the longest wavelength? _____

What I Have Learned

Fill in the blanks to complete the sentences. Write your answers on a separate sheet of paper.

1. The color of white light ranges from _____, 430 trillion Hertz, to ____, 750 trillion Hertz.
2. The more energy in a wave, the ____ its frequency. The lower the frequency is, the ____ energy in the wave.
3. _____ has the highest energy color while ____ has the lowest energy.
4. The shortest wavelength is _____, and the longest wavelength is ____.
5. The ____ energy of the wave, the faster it moves from one medium to another. On the other hand, the ____ energy of the wave, the slower it travels from one medium to another.

What I Can Do

Activity 9

Give what is asked. Write your answers on a separate sheet of paper.

1. List the colors of white light in order of decreasing wavelength.

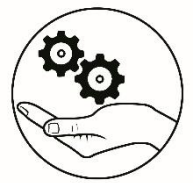
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

2. List the colors of white light in the order of decreasing energy.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

3. State the relationship among frequency, energy and wavelength of colors.

_____
_____



Additional Activities

Activity 10

Give what is asked. Write your answers on a separate sheet of paper.

Q1. The figure below shows the visible spectrum with their wavelengths. Identify the color that is asked using the given wavelengths.

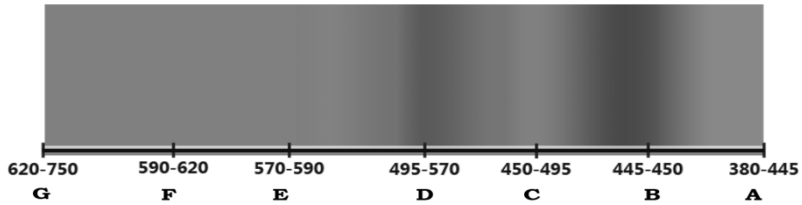


Figure 6. Wavelengths of Visible light (nanometers)
(Illustrated by: Jinemerie Atendido)

A. _____ D. _____ G. _____
B._____ E. _____
C._____ F. _____

Q2. Which of the colors has the highest frequency and energy?

_____

Q3. Which of the colors has the longest wavelength? the shortest wavelength?

_____

Lesson 3 Bending of Colors

Rainbows are created just like the colors of light appeared in previous activity. A prism separates the white light into the different colors of light. With the different refractive indices of the colors of light, bending is also different for each of the colors of light. In this lesson, you will know which color bend the most and which color bend the least.

What's In

Activity 11

Directions: Fill in the blanks with the correct answers found in the box below. Write your answers on a separate sheet of paper.

Using a **1.** _____, you can split up white light to form a spectrum. It is a block of glass with a triangular cross-section. The light waves are **2.** _____ as they enter and leave the prism. The shorter the wavelength of light, the **3.** ____ its frequency and the longer the wavelength, the **4.** _____its frequency. The colors are arranged in the order from longest wavelength: **5.** _____, **6.** _____, **7.** _____, **8.** _____, **9.** _____ indigo and violet. Thus, when it comes to light waves, **10.** _____has the highest energy color while red has the lowest energy color.

red	**prism**	**orange**	**yellow**	**violet**
refracted	**higher**	**lower**	**blue**	**green**

What's New

Activity 12

Use the table below as your guide in answering the questions below.

Table 2. Colors of light and variation of refractive index

Color	Wavelength (nm)	Index of Refraction in Crown Glass
Red	620-750	1.512
Orange	590-620	1.514
Yellow	570-590	1.518
Green	495-570	1.519
Blue	450-495	1.524
Indigo	445-450	1.526
Violet	380-445	1.530

Arranged from least bent to most bent

Legend: nm (nanometer: unit of wavelength)

Modified True or False

Write **TRUE** if the statement is correct but if it is false, change the underlined word to make the whole statement correct. Write your answers on separate sheet of paper.

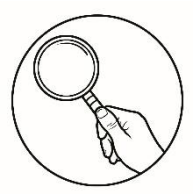
_____1. **Red** has the greatest refractive index among the seven colors.

_____2. Violet has the **lowest** refractive index among them.

_____3. Red is the **least** bent color among them.

_____4. **Violet** is the most bent color among them.

_____5. The greater the refractive index of the color of light, the **more** bending is observed.



What is It

Light exhibits the characteristics of a wave. It moves in its maximum speed in vacuum but this speed decreases as it moves along different media. **Refraction** is the bending of light when it travels from one medium to another. **When light crosses the boundary of two media of different optical density, a change in speed takes place.** The optical density is the measurement of a component's ability to slow the transmission of light. This change in speed is manifested by the bending of the light ray. A known indicator of the optical density of a material is the index of refraction of the material (n). **The index of refraction of a material** is a quantity that compares the speed of light in a material to its speed in a vacuum.

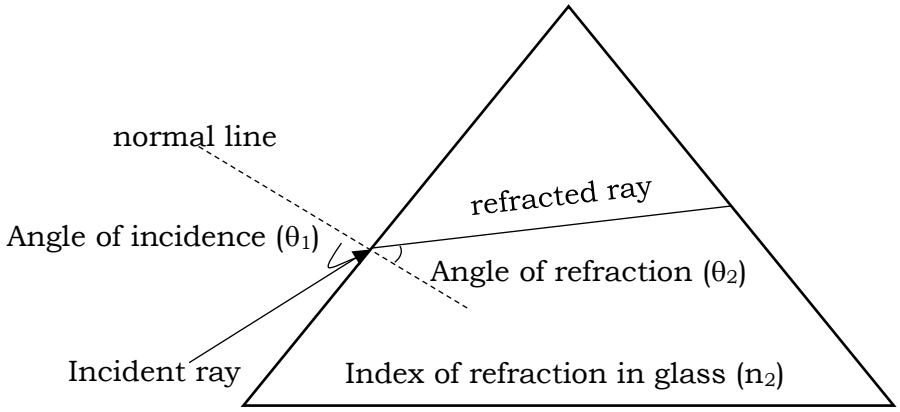


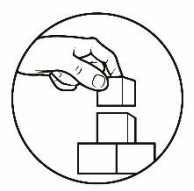
Figure 7. Refraction of Light in a Prism

In figure 7, light travels from air to the prism. When the light enters the glass, which is denser than air, it slows down and is bent. You observe that the angle of incidence (θ_1) is greater than the angle of refraction (θ_2). You can see that the light ray refracts or bends towards the normal. Thus, light bends towards the normal when travelling from a less dense medium to a higher density medium and light bends away from the normal when travelling from denser to less dense medium like when light ray leaves the prism.

The incoming ray is called the *incident ray* from medium 1 and the outgoing ray is the *refracted ray* in medium 2, and the associated angles are the *angle of incidence* and the *angle of refraction*.

When white light enters a prism, separation into seven different colors is observed. The refractive indices of the different colors of light indicate that it travels at different speeds in the prism which accounts for the different degrees of bending.

In terms of frequency and energy of colors, **blue**, **indigo** and **violet** are the ones with the highest frequency and energy. These colors are the ones that are bent the most. At the end of the spectrum, **red** is the one with the lowest frequency and energy. It is the color that is bent the least and violet is the most bent.



What's More

Activity 13

Observe the illustration and answer the questions after. Write your answers on a separate sheet of paper.

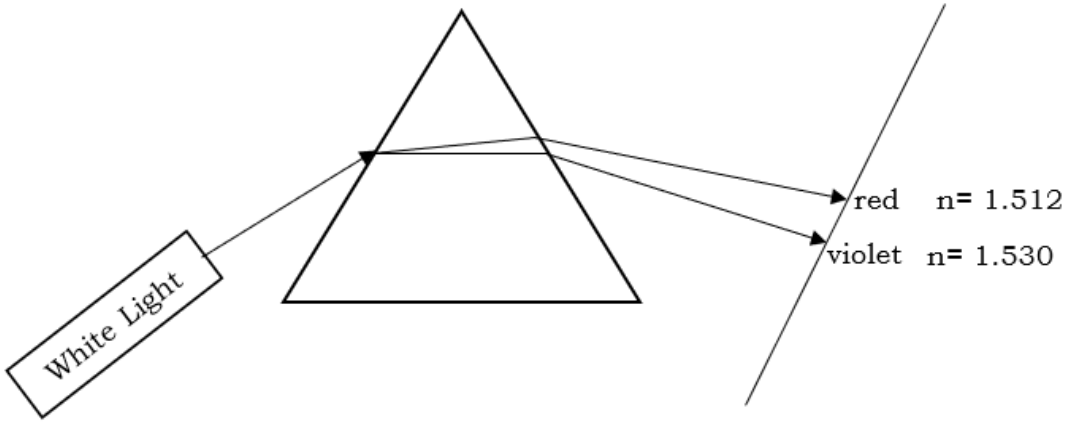


Figure 8: Bending of white light

(Illustrated by: Jinemerie C. Atendido)

1. Which color has the higher index of refraction (n)? Lower index of refraction (n)?

_____

2. Based from the illustration, which color is the most bent? Least bent?

_____

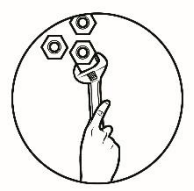
3. What is the relationship between the bending of colors to its index of refraction?

_____

What I Have Learned

Fill in the blanks to complete the idea of the sentences. Write your answers on a separate sheet of paper.

1. _____ is the bending of light as it passes from one medium to another of different optical densities.
2. The _____ of a material is a quantity that compares the speed of light in that material to its speed in a vacuum.
3. When light moves from one medium to another of different _____, the speed changes, bringing changes in the direction of the refracted ray with respect to the normal line.
4. The component colors of white light arranged from the ____bent to the ___bent are as follows: Red, Orange, Yellow, Green, Blue, Indigo and Violet.



What I Can Do

Activity 14

Objective: At the end of the activity, you will be able to give scientific explanations of certain superstitious beliefs related to observable phenomena in the sky.

Materials: Paper and Pen

Procedure:
You are to give the scientific explanation to clarify the beliefs of the people in your locality on phenomena.

1. Red sky in the afternoon (Sunset)

_____
_____

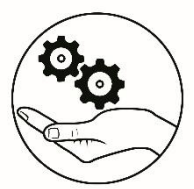
2. Rainbows only appear after the rain

_____
_____

3. There's a pot of gold at the end of the rainbow.

_____
_____

Scoring Rubrics
3: Discussions did not have misconceptions with complete scientific evidence.
2: Discussions did not completely show scientific evidence.
1: Discussions did not show complete scientific evidence with misconceptions.
0: There was no discussions shown.



Additional Activities

Activity 15

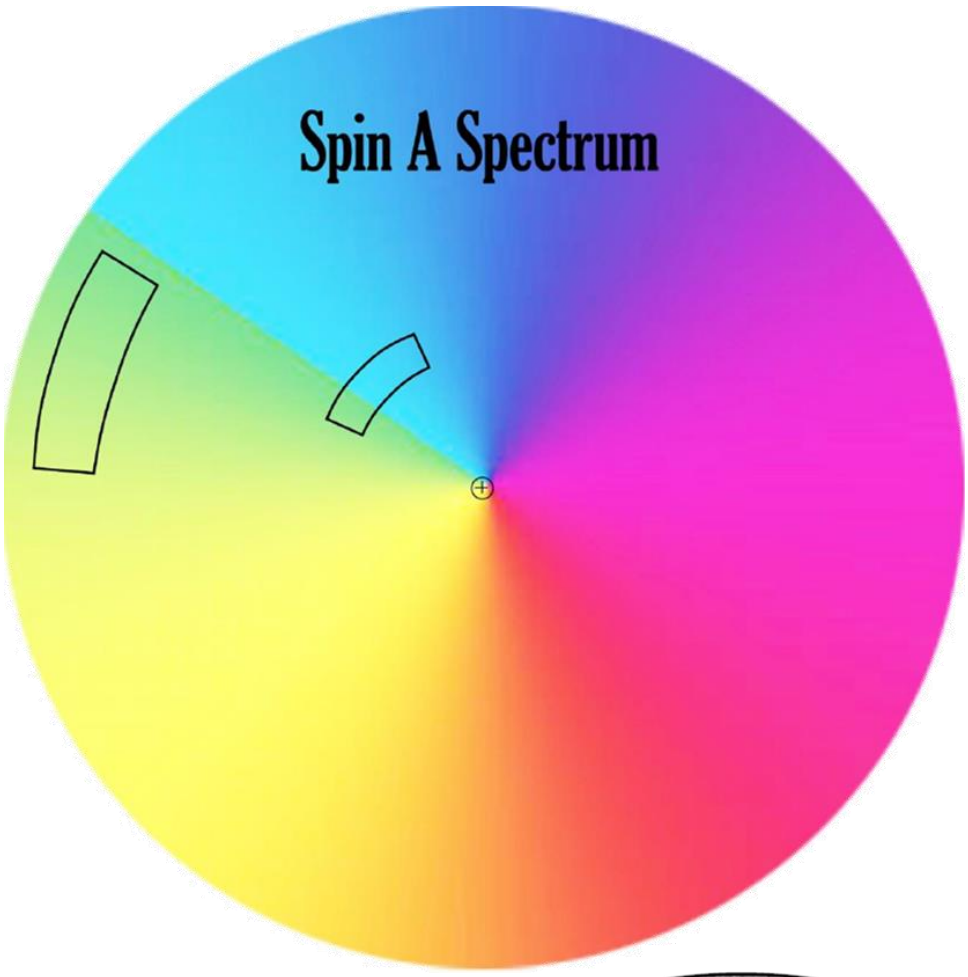
Objective: At the end of the activity, you will be able to make a color wheel showing the wavelengths, frequencies and energies of the colors of light.

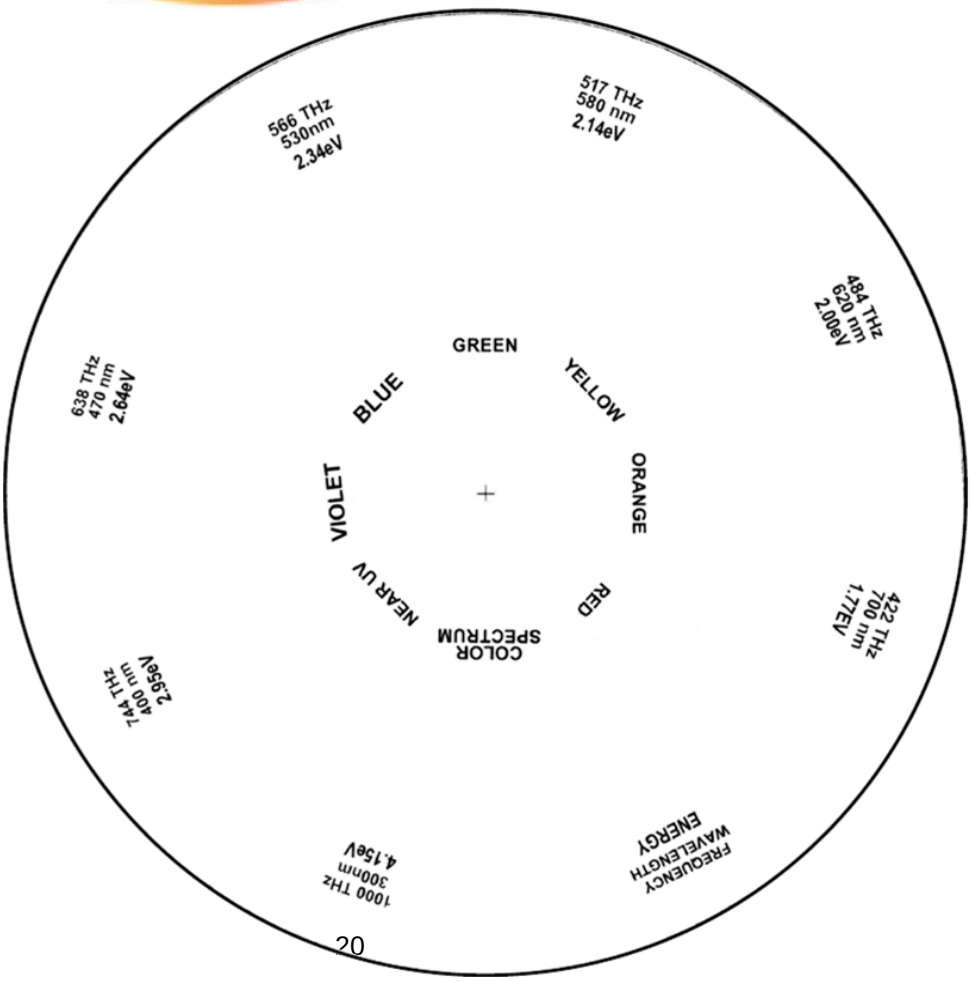
Materials:

Color wheel pattern
Folder/Any paper
Cutter/Scissors
Glue/Paste
Split Pin/button fastener/coconut broomstick

Procedures:

1. Cut the color wheel patterns (already distributed by the teacher) that make up the wheel found in the next page.
2. To make it thicker, put the color wheel patterns on a folder or any paper and cut it out.
3. Cut the shapes drawn on the top wheel. The shapes which will be the small window located near the center of the wheel should be completely cut out and removed.
4. Punch a hole at the center of the two wheels. You may use split pin/ button fastener/coconut broomstick to secure the two wheels together one on top of the other, but both should be free to rotate relative to each other.
5. When you see a region of the color spectrum that shows up in the open window and the wavelength, frequency, and energy that corresponds to the region then you know that you have done it correctly.


Spin A Spectrum


566 THz
530nm
2.34eV
517 THz
580 nm
2.14eV
484 THz
620 nm
2.00eV
638 THz
470 nm
2.64eV
GREEN
YELLOW
ORANGE
RED
BLUE
VIOLET
NEAR UV
COLOR
SPECTRUM
422 THz
700 nm
1.77EV
714 THz
400 nm
2.95ev
1000 THz
300nm
4.15ev
FREQUENCY
WAVELENGTH
ENERGY

Assessment

Choose the letter of the correct answer. Write your answers on a separate sheet of paper.

1. Which has the least energy among the colors of a rainbow?
   A. green
   B. orange
   C. red
   D. violet

2. Violet is bent most among the seven colors because it has the _____.
   A. highest frequency
   B. lowest frequency
   C. longest wavelength
   D. shortest wavelength

3. Which of the following can separate white light into seven colors?
   A. box
   B. cellphone
   C. paper
   D. prism

4. Nina sent an arrow beam of white light through a prism. As a result, she observed the light dispersing into ___.
   A. four colors
   B. three colors
   C. five colors
   D. seven colors

5. Rainbows are formed through _____.
   I. dispersion
   II. reflection
   III. refraction

   A. I only
   B. I and II
   C. III only
   D. I, II and III

6. What can prisms do?
   A. Change sunlight into a single color.
   B. Invert a light ray's frequency and wavelength.
   C. Separate the incoming light into its constituent colors.
   D. Slow down light to few meters per second, when used back to back.

7. For visible light, which property changes with color?

   I. frequency
   II. period
   III. wavelength

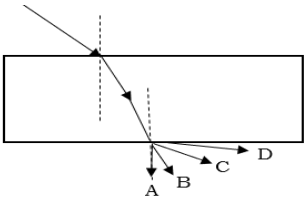
   A. III only
   B. I and II
   C. I and III
   D. I, II, and III

8. Which of the following colors has the highest energy?
   A. orange
   B. red
   C. violet
   D. yellow

9. What refers to the bending of light as it passes from one medium into another?
   A. frequency
   B. reflection
   C. refraction
   D. wavelength

10. Which of the following arrangements of visible light colors shows decreasing wavelength?
   A. red, orange, yellow, green, blue, indigo, violet
   B. red, yellow, green, orange, violet, blue, indigo
   C. violet, blue, green, orange, red, indigo, yellow
   D. violet, indigo, blue, green, orange, yellow, red

11. A ray of light passes through a glass block. When it passes through the glass, it changes direction. Which of the refracted rays A, B, C or D is most likely to leave the glass block?

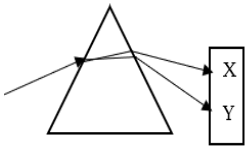


   A. A
   B. B
   C. C
   D. D

12. What refers to the splitting of white light into seven different colors?
   A. dispersion
   B. refractive index
   C. reflection
   D. refraction

13. Refractive Index is a ratio between the speed of light in vacuum and ____.
   A. speed of light in vacuum
   B. speed of sound in vacuum
   C. speed of light in a medium
   D. speed of sound in a medium

14. The diagram shows a ray of white light passing through a prism and emerges as a band of colored light which strikes a screen. What is the color of X and Y?



   A. X=Blue, Y=Red
   B. X=Red, Y=Violet
   C. X=Green, Y=Red
   D. X=Green, Y=Blue

15. Based on the colors of light, what color comes between red and yellow?
   A. indigo
   B. green
   C. orange
   D. violet

Answer Key

What I Know

1. D
2. B
3. B
4. C
5. C
6. B
7. C
8. C
9. D
10. D
11. D
12. A
13. A
14. D
15. D

Lesson1: Colors of Light

What's New

Q1. RED, ORANGE, YELLOW, GREEN, BLUE, VIOLET

Q2. From Top to Bottom: Red, Orange, yellow, Green, Blue, Violet

Q3. The refractive index of prism varies with the wavelength or color of the light used. This causes the different colors of light to be refracted differently. Then leave the prism at different angles, creating an effect similar to a rainbow

Q4. Some colors visible in the prism were not observed in the water

What's more: 1. red 2. orange 3. yellow 4. green 5. blue 6. indigo 7. Violet

What I have Learned :

1. Light 2. white 3. prism 4. Dispersion 5. red, orange, yellow, green, blue, indigo, violet

Additional Activities:

1. Red, orange, yellow, green, blue, indigo, violet

2. It is caused by dispersion of white light in water droplets.

Lesson 2: Hierarchy of Colors

What's In

1. R=ed
O=range
Y=ellow
G=reen
B-lue
I=ndigo
V=iolet

2.

What's New:

Q1. VIOLET, VIOLET

Q2. RED, RED

Q3. The wavelengths and frequencies of the colors of light vary. The wavelength decreases from red to violet while the frequency increases from red to violet.

Q4. YES

Q5. As the frequency of the color of light increase, the energy also increases. Red has the least frequency with the least energy and Violet has the highest frequency and the highest energy.

What's More

1. Yes 2. Yes 3. NO 4. No 5. Yes

What I have learned

1. Red, violet 2. higher, less 3. Violet, red 4. Violet, red 5. higher, less

What Can I do?

1. Red, Orange, Yellow, Green, Blue, Indigo, Violet
2. Violet, Indigo, Blue, Green, Yellow, Orange, Yellow
3. The energy of a wave is directly proportional to its frequency, but inversely proportional to its wavelength. The greater the energy, the larger the frequency and the shorter (smaller) the wavelength.

Additional Activities:

Q1. A. Violet B. Indigo C. Blue D. Green E. Yellow F. Orange G. Red Q2. violet Q3. red, violet

Lesson 3: Bending of Light

What's in: #3

1. Prism 2. refracted 3. higher 4. lower 5. red 6. orange 7. yellow 8. green 9. blue 10. violet

What's New: Activity 3

1. VIOLET 2. GREATER 3. TRUE 4. TRUE 5. TRUE

What's More

1. higher=violet; lower= red
2. most bent=violet; least bent=red
3. The higher the index of refraction means the greater its bend.

What I have learned

1. Refraction 2. index of refraction 3. optical density 4. least, most

What Can I do?

1. When the sunlight travels a long path through atmosphere to reach our eyes, the blue light has been mostly removed, leaving mostly red and yellow light remains since red light waves are scattered the least by atmospheric gas molecules.
2. Rainbows can also be formed when its misty outside or when there is overspray. You only need water that can act as prism and light to shine to create a rainbow.
3. Having a rainbow is caused by dispersion of light in water droplets which is why they occur when sun comes out after rain. Having gold at the end of rainbow is just a myth since you can never reach the end of the rainbow.

Assessment

1. C
2. D
3. D
4. C
5. D
6. C
7. C
8. C
9. C
10. A
11. B
12. A
13. C
14. B
15. C

References

Book:

Campo, Pia C., et.al. *Science 8 Learner's Module*. Pasig: Vibal Publishing House, Inc.,2013.

Online Article

Pariona, Amber. "How Is a Rainbow Formed?" *WorldAtlas* 1016 2017. Accessed May 11, 2020. https://www.worldatlas.com/articles/how-is-a-rainbow-formed.html.

Websites

Sciencing. "How Do Prisms Work?" Accessed May 11, 2020. https://www.worldatlas.com/articles/how-is-a-rainbow-formed.html.

How Stuff Works. "How are frequency and wavelength of light related?" Accessed May 11, 2020. https://science.howstuffworks.com/dictionary/physics-terms/frequency-wavelength-light.htm.

For inquiries or feedback, please write or call:

Department of Education - Bureau of Learning Resources (DepEd-BLR)

Ground Floor, Bonifacio Bldg., DepEd Complex
Meralco Avenue, Pasig City, Philippines 1600

Telefax: (632) 8634-1072; 8634-1054; 8631-4985

Email Address: blr.lrqad@deped.gov.ph * blr.lrpd@deped.gov.ph