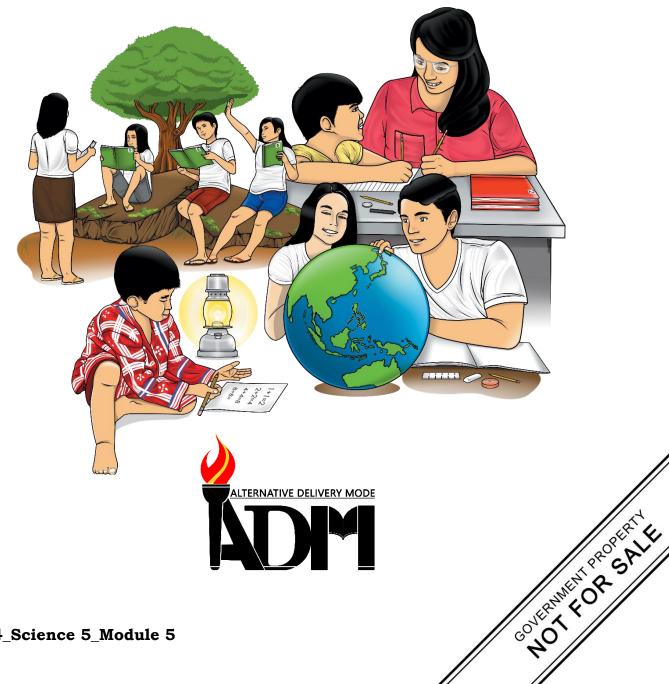




Science

Quarter 4 – Module 5: **The Stars and Constellations**



Science– Grade 5 Alternative Delivery Mode Quarter 4 – Module 5: The Stars and Constellations First Edition, 2020

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5

Science

Quarter 4 – Module 5: The Stars and Constellations



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.



What I Need to Know

This module was designed and written with you in mind. It is here to help you study the topic "The Stars and Constellations." 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.

This module will help you identify star patterns that can be seen at particular times of the year.

The module is divided into two lessons, namely:

- **Lesson 1** The Stars
- Lesson 2 The Constellation

After going through this module, you are expected to:

- 1. classify stars according to their size, brightness, color and temperature;
- 2. describe the different patterns formed by groups of stars; and
- 3. explain the stages of the life cycle of the stars.



What I Know

| Directions: | Read and understand the statements carefully. Fill in the blanks by |
|--------------------|------------------------------------------------------------------------|
| | choosing the letter of the correct answers. Write your answers in your |
| | science notebook. |

- A constellation is a group of visible _____ that form a pattern when viewed from Earth.
 A. lights B. patterns C. planets D. stars
- The color of the stars with the highest temperature is _____.
 A. blue B. orange C. red D. yellow
- 3. Which of the following constellation is most visible during October? A. Cancer B. Libra C. Orion D. Pegasus
- 4. The life cycle of a star is determined by its____.A. gasB. matterC. massD. weight
- 5. Which gas is the fuel for stars in producing their light?A. CarbonB. HeliumC. HydrogenD. Oxygen
- 6. It is difficult to see the stars and determine their size with our naked eyes because _____.
 - A. They are very far from Earth.
 - B. It is surrounded by many planets.
 - C. Their location cannot be determined.
 - D. Stars are very bright and have a hot temperature.
- 7. Which is a huge group of stars that are fairly close to each other in space?A. GalaxyB. ModelC. PlanetD. Universe
- 8. During each _____, different groups of constellations are noticeable.
 A. Christmas season C. Summer
 B. Season of the Year D. Winter
- 9. As the Earth rotates on its axis, the constellations and stars in them appear to

| A. disappear around each other | C. move around each other |
|--------------------------------|---------------------------|
| B. move across the sky | D. stand still in the sky |

10. Which is the most recognizable constellation of all?A. Big DipperB. LeoC. Little DipperD. Pegasus

CO_Q4_Science 5_ Module 5

Lesson

The Stars

Look at the night sky. What do you see? When we look at the night sky, many of us are amazed at the beauty of the tiny lights we see hanging in the dark. If the sky is clear, you will see hundreds of stars. Almost all of the stars you can see are part of the large system of stars called the *Milky Way galaxy*.

During ancient times, people used the stars as their point of reference when travelling. It is because there are stars that appear to be fixed in position throughout the year. At present, stars play an important role in the field of astronomy. They are used as guides in determining the distance of planets and the locations of heavenly bodies.



Directions: Read and understand the sentences well. Draw a happy face (③) if the statement is correct and draw a sad face (④) if the statement is not correct. Write your answers in your science notebook.

- 1. The real color of the Sun is yellow.
- 2. The Sun is the nearest star to Earth.
- 3. The Sun is travelling at 520 km per second.
- 4. The Sun is the star at the center of the Solar System.
- 5. The Sun is a globe of hot gas, composed mainly of hydrogen, which is so large that 1,300,000 Earths would fit inside it.



What's New

Have you tried observing the sky during night time? What do you see? What do you call these little lights in the sky during the night?

As you gaze the sky tonight, make a portrait out of your observation of the night sky and compose a one stanza song about your portrait. You may portray it on the space provided below.



?) What is It

Stars are huge celestial bodies made of gases and can produce light and heat through nuclear fusion inside their cores. Stars are the building blocks of galaxies, of which there are billions in the universe. It is impossible to know how many stars exist, but astronomers estimate that in our Milky Way galaxy alone, there are about 300 billion.

Stars are so far away that distances between them are measured in lightyears. A *light-year* is the distance traveled by light in one year. A light-year is equal to 9.5 trillion kilometers. The Sun is the closest star to us.

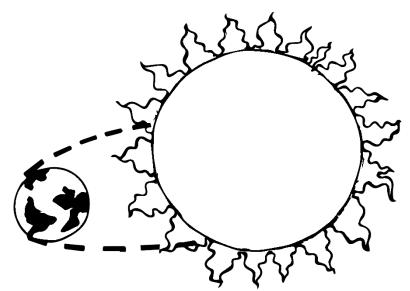


Figure 1: Comparison of the size of the Sun, the biggest star, from the Earth (Illustrated by Ryan A. Machate and Jose Marie E. Baculi)

The closest known star outside of our solar system is Alpha Centauri which is over four light-years away. Many stars that you see in the sky as mere points of light are millions of light-years away.

Stars may be blue, white, yellow, orange, or red. Stars differ in color because of their different temperatures. Like the flame, stars with high temperatures are blue or bluish-white. On the other hand, Red stars have lower temperatures. Yellow and orange stars have medium temperatures.

Stars have different sizes. They are measured in diameters. A **diameter** is a straight line that cuts a circle passing through the center point. The smallest known star has a diameter of about 20 kilometers. The Canis Major, one of the largest known stars, has a diameter of 1,975,000,000 kilometers. This is more than 100 times than the size of our Sun. Some stars are so large, yet the naked eye cannot see them because they are too far away.

The table below lists the names of some stars, their colors, and their surface temperatures.

| Table 1: Name, Color, and Temperature of Common Stars | | | | |
|-------------------------------------------------------|---------------------|------------------|--|--|
| Star | Color | Temperature (°C) | | |
| Rigel | Bluish-white | 12,000 | | |
| Sirius | White to blue-white | 10,500 | | |
| Sun | Yellow | 5,500 | | |
| Arctus | Orange | 4,200 | | |
| Antares | Red | 3,000 | | |

Magnitude, in astronomy, measures the brightness of a star or other celestial body. The brighter the object, the lower the number assigned as a **magnitude**. The magnitude of a star refers to how bright it looks to our eyes. The magnitude of a star is determined by its size, temperature, and distance from Earth.

There are two types of star magnitude, the apparent brightness or apparent magnitude and absolute brightness or absolute magnitude. The *apparent brightness or apparent magnitude* of stars is the brightness of stars that varies with their distance from the observer. Some stars with apparent magnitudes are the Sun = -26.7, Moon = -12.6, Venus = -4.4, Sirius = -1.4, Vega = 0.00, faintest naked eye star = +6.5, brightest quasar = +12.8, faintest object = +30 to +31.

No matter how near or far a star is from the observer, it has its own real or absolute brightness. *Absolute magnitude* is also known as a star's luminosity. Its luminosity measures the total amount of light energy emitted by a star. It is measured in watts or joules per second. Some visible stars have such low absolute magnitudes that they would appear bright enough to outshine the planets and cast shadows if they were 10 parsecs away from Earth. Rigel (7.0), Deneb (7.2), Naos (6.0), and Betelgeuse (5.6) are a few examples.

Stars are born, and as a result, they have a life cycle. Stars form in nebulae, which are clouds of gas and dust. Nuclear reactions in the center (or core) of stars generate enough energy to keep them shining brightly for many years. This is known as the **main sequence**. The exact lifetime of a star is highly dependent on its size. Large, massive stars burn their fuel much faster than smaller stars, and they may only live for a few hundred thousand years. Smaller stars, on the other hand, will last for billions of years because their fuel burns much more slowly.

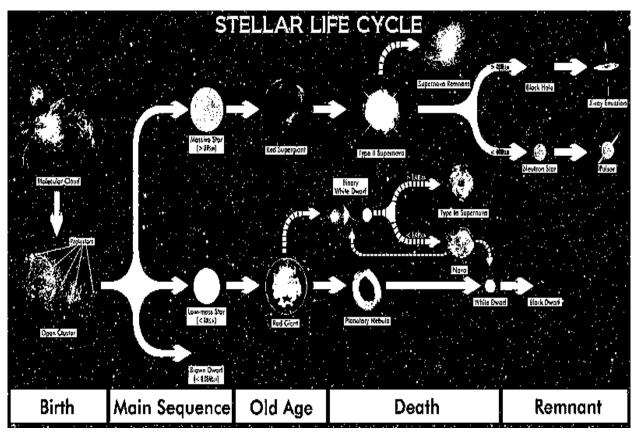


Figure 2: Life Cycle of the Star (Photo Source: R.N. Baily, 2017)

However, the hydrogen fuel that powers the nuclear reactions within stars will eventually run out, and the stars will enter the final phase of their lives. They will expand, cool, and change color over time to become **red giants**. The path they take after that is determined by the **mass** of the star.

Small stars, such as the **Sun**, will die in a relatively peaceful and beautiful manner, passing through a **planetary nebula** phase to become a **white dwarf**, which eventually cools down and stops glowing to become a "black dwarf."

Massive stars, on the other hand, will die in a most energetic and violent manner, with their remains scattered throughout the cosmos in an enormous explosion known as a **supernova**. When the dust settles, the only thing left is a very dense star known as a **neutron star**. These are known as **pulsars** because they are frequently rapidly spinning. If the exploding star is massive enough, it may even form a **black hole**.



Activity: Hide and Seek

You Will Need:

- Piece of red, orange, yellow, white, blue cloth or curtain
- flashlight
- door/window

What to Do:

- Close the door and window. Use a red cloth to block the light. Switch on a flashlight and observe the light coming from it. (Do the same activity with the other colors of cloth or curtain.)
- > Observe the brightness of the light transmitted from the flashlight.
- Compare the brightness of the transmitted light when using different colored cloths or curtains.
- Now, open the door and window. Use a red cloth to block the light. Switch the flashlight again. (Do the same activity with the other colors of cloth or curtain.) Observe and compare the brightness of the light transmitted.

Directions: Based on the given activity, use a table describing and comparing the different appearance of light blocked with different colored cloth or curtain.

| Color of Cloth / Curtain | Appearance (Brightness) of light with closed door and window | Appearance (Brightness) of light with opened door and window |
|-----------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|
| Red | | |
| Orange | | |
| Yellow | | |
| White | | |
| Blue | | |

Guide Questions:

- 1. Which color of the cloth/curtain transmits the brightest light?
- 2. Does the brightness of the DIY star change when the room door/window is closed and opened?

Lesson

2

The Constellations

People are always fascinated by the night sky and the stars. People in ancient times noticed how stars appear to form patterns in the sky. These star patterns are known as *constellations*.

The ancient people first observed these groups of stars as outlines of animals, mythological heroes, gods, and other objects. They found it easier to locate and remember constellations when they try to find a distinct and particular pattern how a group of stars are arranged.



Activity 1

Directions: Copy the puzzle below in your Science notebook. Find the five (5) names of constellations by connecting the letters to find the word on the puzzle.

| U | S | Κ | U | Т | В | S |
|---|---|---|---|---|---|---|
| R | R | D | R | А | С | 0 |
| S | Р | А | S | D | E | Т |
| А | 0 | J | А | Z | Р | А |
| М | Η | Ι | Μ | D | Η | U |
| А | Y | Р | Ι | R | E | Ι |
| J | D | G | Ν | U | U | 0 |
| 0 | R | Ι | 0 | N | S | М |
| R | А | F | R | 0 | Т | W |

Example: DRACO

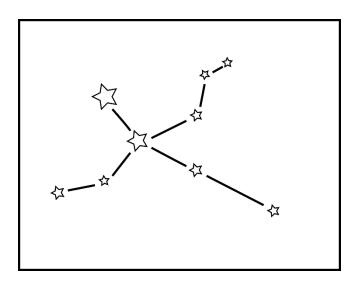
- 1. URSA MINOR
- 2. ORION
- 3. CEPHEUS

- 4. URSA MAJOR
- 5. HYDRA

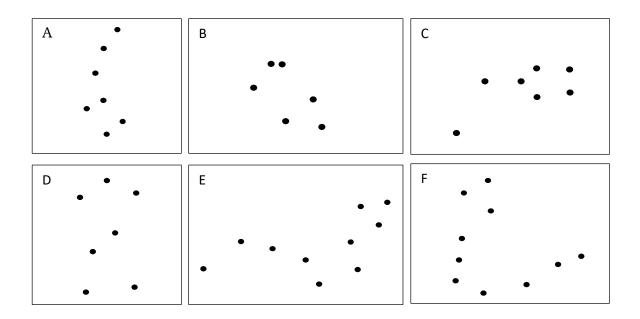
Activity 2.

Directions: Copy the boxes and blank spaces as shown below in your Science notebook. Connect the dots to form a certain pattern of a constellation.

Example:



(Illustrated by Ryan A. Machate)





What's New

Have you tried star gazing at night? What do you observe with the stars? Do the stars show different patterns? These are called constellations. A constellation is a group of stars that appears to form a pattern or picture.

Directions: Make your star pattern. You can use any kind of material you like. This may be a simple wallet, a T-shirt, or a drinking cup/mug. On this stuff, make your star template. What would the name of the star pattern you create be?



Figure 3: Sample illustration of a mug with star design (Illustrated by Ryan A. Machate and Jose Marie E. Baculi)



Constellations can be seen through astronomical instruments used by different astronomers.

Constellations are groups of stars that appear to form different shapes or patterns in the sky. The word "constellation" comes from the Latin term "*constellation*", which can be translated as "*set of stars*".

We use constellations to divide up the sky. Groups of stars that are not constellations but belong to a constellation are called *asterisms*. **Asterisms** are also naked-eye star patterns, but they do not form constellations on their own. An example is the Big Dipper, which is part of Ursa Major.

The Big Dipper is a group of seven bright stars. Three stars form the handle and four stars form the bowl. Another is the Little Dipper but in an opposite form.

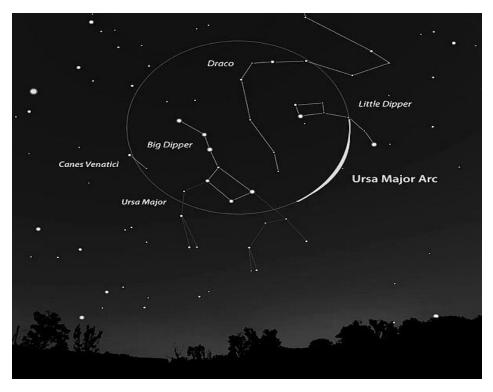


Figure 4: Big Dipper Map (Photo Source: Benjamin, 2020)

Some constellations appear all year round (circumpolar), and some appear only on certain months of the year. Those constellations that we can see year-round are called circumpolar. These constellations all circle the North Star, and because we live in the Northern Hemisphere, we see them all year round. These constellations are **Ursa Major**, **Cassiopeia**, **Ursa Minor**, and **Cygnus the Swan**.



Figure 5: Ursa Major position of the stars (Photo Source: Michal Kryński, 2017)

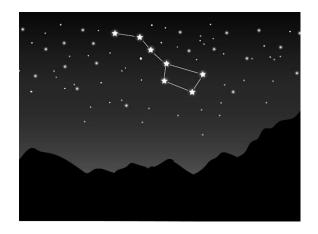


Figure 6: Ursa Major pattern (Illustrated by Reyson Joe Cañedo)

Ursa Major, also known as the Great Bear, is a northern sky constellation with a mythology that dates back to prehistory. Its Latin name means "greater (or larger) she-bear," referring to and contrasted with **Ursa Minor**, the lesser bear, which

is located nearby. It was one of the 48 original constellations listed by Ptolemy in the 2nd century AD. It is currently the third largest of the 88 modern constellations.

Ursa Major is known primarily for the asterism of its main seven stars, which has been variously referred to as the "Big Dipper," "the Wagon," "Charles' Wain," or "the Plough." The stellar configuration of the Big Dipper, in particular, resembles the shape of the "Little Dipper." Two of its stars, Dubhe and Merak, can be used to navigate to the current northern pole star, Polaris in Ursa Minor.

Ursa Major and the asterisms that incorporate or comprise it are significant to several world cultures, most notably as a symbol of the north. Its representation on the flag of Alaska is a modern example of such symbolism.

Ursa Major is visible throughout the year from most of the northern hemisphere and appears circumpolar above the mid-northern latitudes. The main asterism is invisible from southern temperate latitudes, but the southern parts of the constellation can still be viewed.



Figure 7: Cassiopeia position of the stars (Photo Source: 4shadoww, 2020)



Figure 8: Cassiopeia pattern (Photo Source: Till Credner 2003)

Cassiopeia is a constellation in the northern sky, named after the vain queen Cassiopeia in Greek mythology, who boasted about her unrivalled beauty. Cassiopeia is located in the northern sky, and from latitudes above 34°N, it is visible year-round. The (sub) tropics can be seen at its clearest from September to early November, and at low southern, tropical latitudes of less than 25°S, it can be seen, seasonally, low in the North.



Figure 9: Position and pattern of Ursa Minor (Photo Source: Orensila, 2020)

Ursa Minor (Latin: "Lesser Bear", contrasting with Ursa Major), also known as the **Little Bear**, is a constellation in the Northern Sky. Like the Great Bear, the tail of the Little Bear may also be seen as the handle of a ladle, hence the North American name, **Little Dipper**: seven stars with four in its bowl-like its partner, the Big Dipper. It was one of the 48 constellations listed by the 2nd-century astronomer Ptolemy and remained one of the 88 modern constellations. Ursa Minor has traditionally been important for navigation, particularly by mariners, because Polaris is the North Pole star.



Figure 10: Cygnus position of the stars (Photo Source: Hans Braxmeier, 2016)

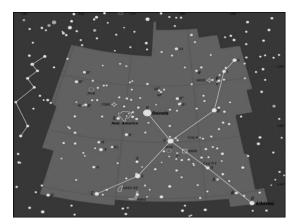


Figure 11: Constellacion Cygnus (Photo Source: Eynaud, 2017)

Cygnus is a northern constellation lying on the plane of the Milky Way. Its name is derived from the Latinized Greek word for swan. Cygnus is one of the most recognizable constellations of the northern summer and autumn. It features a prominent asterism known as the Northern Cross (in contrast to the Southern Cross).

Why do we see different constellations during the year? If observed through the year, the constellations shift gradually to the west. Earth's orbit causes this around the Sun. In the summer, viewers look from a different direction in space at night than during the winter.

People used the stars to navigate before the invention of the compass, primarily when sailing across the ocean. They used the Ursa Minor constellation to identify the location of Polaris, also known as the North Star.

Constellations are useful because they help astronomers and stargazers in identifying specific stars in the night sky. Constellations are less important today than they were in ancient times. In ancient times, constellations were used to create and track the calendar, allowing farmers to know when to plant and harvest crops.



What's More

Directions: Perform the activity carefully, with the supervision of your parent or guardian. Write your answers to the guide questions in your science notebook.

Activity: See Me How

Note: Learners will provide the materials below. Search on the internet or draw your favorite constellations as your template.

You Will Need:

- Constellation templates
- Cardboard tubes (empty tube of tissue paper or any empty container)
- Glue
- scissors
- black construction paper (4.5 x 4.5")
- push pin / any sharp tip pen

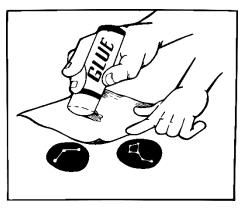


(Photo by Adelei Kristine F. Mañoso)

What to Do:

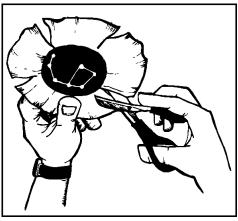
Note: Be careful in using the glue gun/hot objects.

1. Cut and glue the constellation template in the middle of the black construction paper.



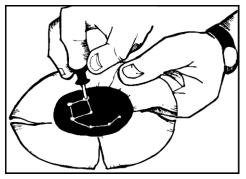
(Illustrated by Ryan A. Machate) 15

2. Make some diagonal cuts from the outer edge of the construction paper to the center. Do not cut into the constellation pattern. (Hint: Cut it into 8 wedges).



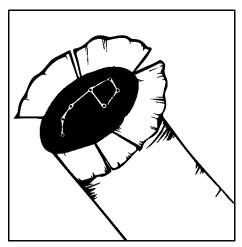
(Illustrated by Ryan A. Machate)

3. Using the pushpin or any sharp tip pen, punch the holes where the dots/ stars are located.



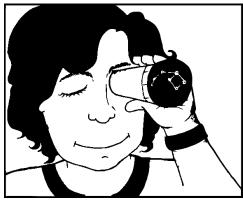
(Illustrated by Ryan A. Machate)

4. Glue the constellation template on the top of the cardboard tube. Tape each wedge down to secure it in place.



(Illustrated by Ryan A. Machate)

5. Close an eye and look into the other end of the cardboard tube.



(Illustrated by Ryan A. Machate)

Guide Questions:

- a. What can you see from your model?
- b. What constellations have you formed?
- c. How will you describe the stars as you saw them with your naked eye?
- d. How will you describe the stars as you saw them through your improvised telescope?



What I Have Learned

Directions: Complete the paragraph below by filling in the blanks. Choose your answer from inside the box. Write your answers in your science notebook.

| Latin | star | astronomical | Ursa Major |
|-----------|----------------|--------------|------------|
| patterns | Constellations | seven | Ursa Minor |
| Asterisms | Little Dipper | Big Dipper | |

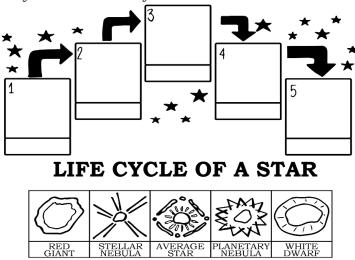
Different astronomers use different (1) ______ instruments to see constellations. (2) ______ are groups of stars that appear to form different shapes or patterns in the sky. The word "constellation" comes from the (3) _____ term "constellation", which can be translated as "set of stars".

We use constellations to divide up the sky. Groups of (4) ______ that are not constellations but belong to a constellation are called *asterisms*. (5) ______ are also naked-eye star (6) ______, but they do not form constellations on their own. An example is the (7) ______ which is part of (8) _____. Big dipper is a group of (9) _____ bright stars. Three stars form the handle, and four stars form the bowl, also with the (10) _____ but in the opposite form.



What I Can Do

A. Directions: Arrange the following according to the stages of the life cycle of the stars. Draw them and write their labels on the space provided. Write your answers in your science notebook.



⁽Illustrated by Ryan A. Machate)

B. Directions: Take a look at the night sky. Look for a location where you can see the stars. Use Polaris as a starting point to connect the other stars you've seen to form your constellation. Draw and name your constellation. Make a story of at least 50 words explaining how it came to be. Write your output in your science notebook.

| Top Point | Excellent (4) | Good (3) | Fair (2) | Poor (1) |
|--------------|--------------------|------------------|--------------------|--------------------|
| Topic | The Main Idea is | The main Idea is | There is an | The main idea is |
| Sentence | clear restating of | present and | attempt of getting | not present and |
| | the prompt. | clearly written. | the main idea but | not clearly |
| | | | not clearly | written. |
| | | | written. | |
| Illustration | The illustration | Most of the | The writer | The supporting |
| | is developed in a | illustration is | attempts to | details within the |
| | logical order | presented | develop the | illustration as a |
| | appropriate to | logically, and | illustration | whole are not |
| | the writer's | readers have | logically, but | developed in a |
| | purpose and | little trouble | some of the | logical order. |
| | reader's needs. | following the | illustrations | |
| | | supporting | presented are | |
| | | details. | confusing to the | |
| | | | target readers. | |

Performance Task Rubrics:

| Top Point | Excellent (4) | Good (3) | Fair (2) | Poor (1) |
|------------|----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Conclusion | The conclusions do an excellent job of summing up or restating the topic and tying the details together. | The conclusion sums up the topic by restating it, but it does not tie the details together. | There is an attempt at a conclusion, but it does not restate the topic or tie the details together. | There is no conclusion. The essay just ends without summing up or restating the topic. It does not tie the details |
| | | | | together. |



Assessment

- **Directions:** Read and understand each statement well. Choose the letters of the correct answers. Write your answers in your science notebook.
- 1. Which are groups of stars that appear to form different shapes or patterns in the sky.

| A. Big Bang | C. Milky Way |
|-------------------|--------------|
| B. constellations | D. stars |

2. Which color of the star has the highest temperature?

| A. blue | C. blue red |
|----------|-------------|
| B. green | D. White |

3. In what form of matter do stars begin their life cycle with?

| A. a rock | C. a ball of gas |
|------------|------------------|
| B. a stone | D. a light |

4. The ______ of a star is determined by the amount of matter that is available in its nebula, the giant cloud of gas and dust from which it was born.

| A. | gas | C. | mass |
|----|-------|----|--------|
| В. | light | D. | Matter |

5. Which are groups of stars that are not constellations but belong to a constellation?

| A. asterisms | C. Nebula |
|-------------------|-------------------|
| B. constellations | D. shooting stars |

6. Which is a group of seven bright stars whose three stars form the handle and four stars form the bowl?

| A. Big Dipper | C. Little Dipper |
|---------------|------------------|
| B. Hydra | D. Orion |

- 7. Our nearest star neighbor in space, Alpha Centauri, is four light-years away from Earth. Why will it be difficult, if not impossible, to visit it?
 - A. It is very far away.
 - B. It is very bright and hot.
 - C. There may be no planets near it.
 - D. We are not sure exactly where it is.
- 8. Which is the most recognizable constellation of all?
 - A. Big Dipper C. Leo
 - B. Little Dipper D. Orion
- 9. What do you call the constellation named after the winged white horse of Poseidon in Greek mythology?

| A. Athena | C. Unicorn |
|------------|------------|
| B. Pegasus | D. Venus |

- 10. Which is a group of seven bright stars that form a constellation?
 - A. AquariusC. Big DipperB. Big DipperD. Sirius



Activity: Man-Made Constellation

Directions: Make a man-made constellation using the following materials and procedures. You can also create your pattern dot designs and make a short story about your picked design. (*The following photos used in this activity were taken by Ms. Adelei Kristine F. Mañoso*)

You Will Need:

- flashlight
- black construction paper
- pencil
- scissors
- awl/needle



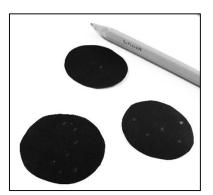


1. Take off the top part of the flashlight and trace onto the black construction paper the size you want the discs to fit in.

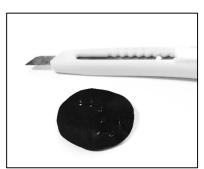
2. Remove the shiny silver part inside the flashlight to ensure that the discs will work.



3. Get a pair of scissors and carefully cut the discs as close to the tracings you made.



4. Select your favorite constellations and mark the dots onto the circled black construction papers.



5. Insert the awl/needle in each marked dot to make a hole.

(Photos by Adelei Kristine F. Mañoso)

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6. Put together your new flashlight and attach the discs with the constellations.

Now, you've made your constellations!

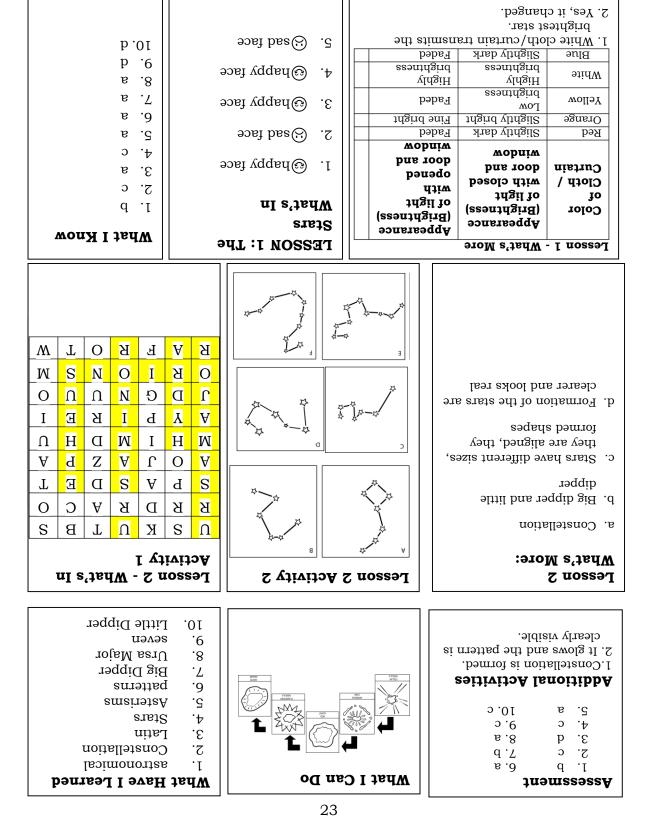


(Photo by Adelei Kristine F. Mañoso)

This is an enjoyable activity that brings the imagination while learning about our night sky.

Guide Questions:

- 1. What is formed when the pattern of dots was lighted using the flashlight?
- 2. What have you observed with the constellations using the flashlight as your source of light?





Answer Key

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