Telescopes *(continued)*

Electromagnetic Radiation (p. 599)

1. What is electromagnetic radiation?

_____

_____

_____

2. The light you see with your eyes is called _____.
3. The distance between the crest of one wave and the crest of the next wave is called a(n) _____.
4. A range of light of different colors and different wavelengths is called a(n) _____.
5. What colors form the spectrum of visible light?

_____

_____

6. What wavelengths are included in the electromagnetic spectrum?

_____

_____

_____

_____

Types of Telescopes (pp. 600–601)

7. What do telescopes collect and focus?

_____

_____

_____

8. What is a convex lens?

_____

_____

_____

9. Complete the table to compare and contrast different types of telescopes.

Telescopes	
Type	**Description**
Refracting telescope	**a.**
Reflecting telescope	**b.**
Radio telescope	**c.**

d. How is a radio telescope different from both a refracting and a reflecting telescope?

_____

_____

e. How is a radio telescope similar to both a refracting and a reflecting telescope?

_____

_____

10. Which telescope uses convex lenses? _____

11. The largest visible light telescopes are now all _____.

Observatories (pp. 602–604)

12. A building that contains one or more telescopes is called a(n) _____.

13. Why have astronomers built the largest optical telescopes on the tops of mountains?

_____

_____

_____

14. Why have astronomers placed telescopes in space?

_____

_____

_____

15. Why can the Hubble Space Telescope make very detailed images in visible light?

_____

_____

_____

_____

1. Imaginary patterns of stars are called _____.

Classifying Stars (pp. 607–608)

2. What are five characteristics used to classify stars?

a. _____ b. _____

c. _____ d. _____

e. _____

Brightness of Stars (pp. 608–609)

10. The amount of light a star gives off is called its _____.

13. Complete the table about the measurement of a star's brightness.

Brightness of Stars	
Measurement of Brightness	**Definition**
Apparent brightness	**a.**
Absolute brightness	**b.**

17. What is a light-year?

_____

_____

_____

18. A light-year equals about _____ kilometers.

19. Is the following sentence true or false? The light-year is a unit of time.

_____

20. What is parallax?

_____

_____

_____

21. Astronomers use parallax to measure the distance to which of the following objects?

a. distant stars
b. the sun
c. the planets
d. nearby stars

Lives of Stars (pp. 616–620)

This section explains how the life of a star begins. It also explains what determines how long a star lives and what happens when a star runs out of fuel.

Use Target Reading Skills

As you read about the stages in the life of a star, make a flowchart that shows the stages in the life of a low-mass star like the sun. The first step is done for you.

Life Cycle of a Sun-Like Star

Protostar forms from a nebula.

↓

a.

↓

b.

↓

c.

The Lives of Stars (p. 617)

1. Is the following sentence true or false? All stars begin their lives as parts of nebulas. _____

2. A large amount of gas and dust spread out in an immense volume is called a(n) _____.

3. A contracting cloud of gas and dust with enough mass to form a star is called a(n) _____.

4. Describe how a star is born.

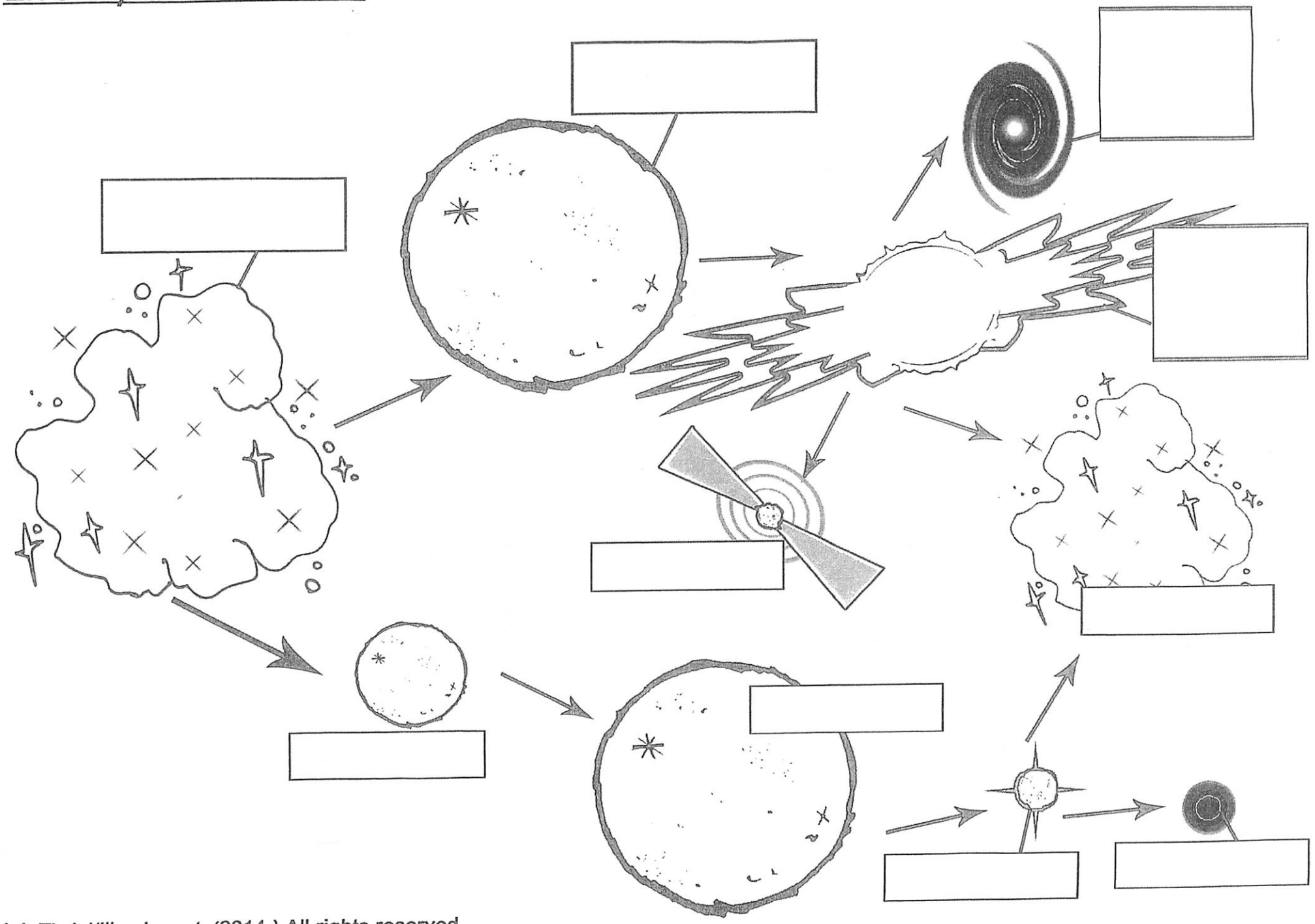
_____

_____

_____

Life Cycle of a Star

Name:_____ Date_____ Block_____



Lives of Stars *(continued)*

5. Circle the letter of the factor that determines how long a star lives.
   a. its mass
   b. its brightness
   c. its volume
   d. its temperature

6. Is the following sentence true or false? Stars with more mass last longer than stars with less mass. _____

Deaths of Stars (pp. 618–620)

Match each stage of a star with its definition.

Stage of a Star	Definition
____ 7. White dwarf	a. The small, dense remains of a high-mass star that is called a pulsar when it spins
____ 8. Planetary nebula	b. Explosion of a high-mass star
____ 9. Supernova	c. An object whose gravity is so strong nothing can escape
____ 10. Neutron star	d. A cloud of gas formed from the expanding outer layer of a red giant
____ 11. Black hole	e. The cooled core of a star that has run out of fuel

f. How do all stars begin?

_____

_____

Star Systems and Clusters (pp. 622–623)

1. What are star systems?

_____

_____

Galaxies (p. 624)

9. What is a galaxy?

_____

_____

Match the type of galaxy with its shape.

Type of Galaxy	Description of Shape
____ 10. Spiral galaxy	a. Bulge in middle and arms that spiral outward
____ 11. Elliptical galaxy	b. Does not have a regular shape
____ 12. Irregular galaxy	c. Looks like round or flattened ball

Star Systems and Galaxies *(continued)*

13. Circle the letter of each sentence that is true about galaxies.
    a. Elliptical galaxies contain only new stars.
    b. Irregular galaxies usually have many bright, young stars.
    c. In spiral galaxies, most new stars form in the spiral arms.
    d. Quasars have huge bar-shaped regions of stars that pass through their center.

14. A young galaxy with a giant black hole at the center is a(n) _____.

The Milky Way (p. 625)

15. The galaxy in which our solar system is located is called the _____.

16. What type of galaxy is the Milky Way?

_____

_____

_____

_____

The Scale of the Universe (pp. 626–627)

17. Why do astronomers often use scientific notation?

_____

_____

18. Suppose a star is about 38,000,000,000,000 kilometers away from Earth. How do you write this number in scientific notation?

_____

_____

19. What is the Local Group?

_____

_____

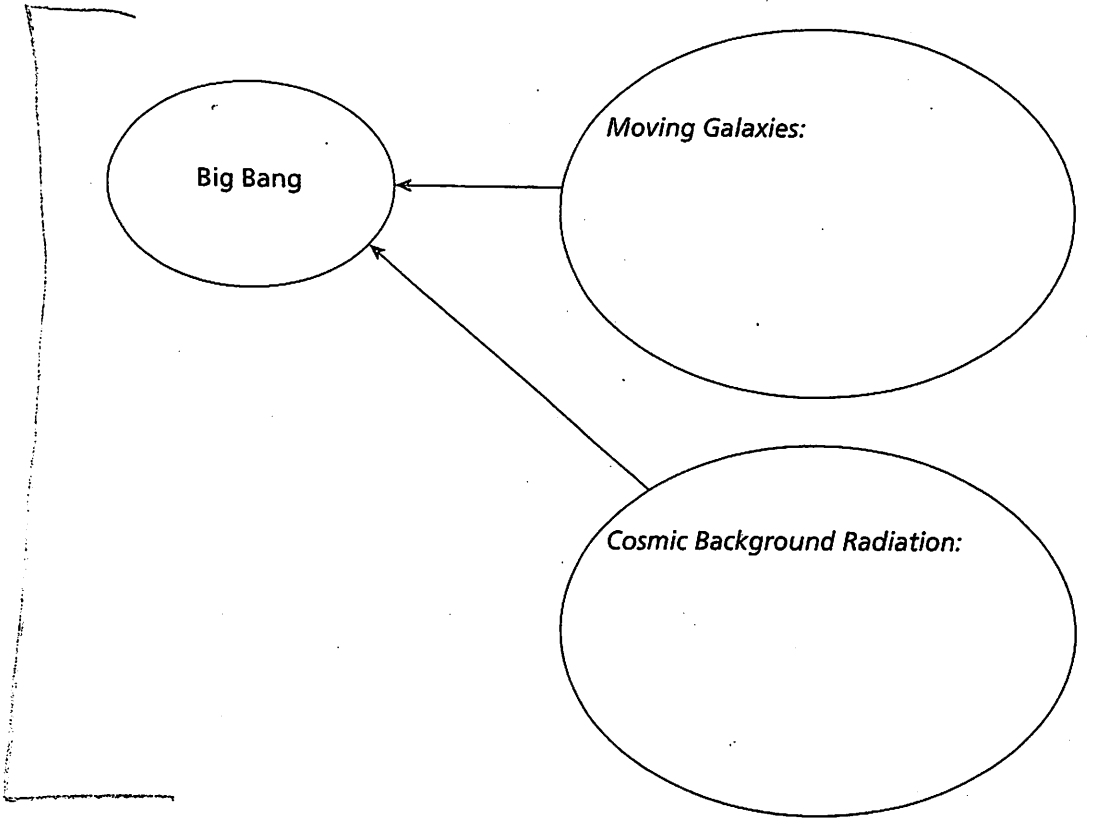
20. How large is the observable universe? _____

The Expanding Universe (pp. 628–633)

This section explains how astronomers think the universe and the solar system formed.

Use Target Reading Skills

As you read about the evidence that supports the big bang theory, complete the graphic organizer.



How the Universe Formed (pp. 628–630)

1. The initial explosion that resulted in the formation and expansion of the universe is called the _____.

2. When did the big bang occur?

_____

3. Is the following sentence true or false? The farther away a galaxy is from us, the faster it is moving away from us. _____

4. How is the universe like rising raisin bread dough?

_____

_____

_____

_____

The Expanding Universe *(continued)*

5. Radiation left over from the big bang is called _____.

6. How can astronomers infer approximately how long the universe has been expanding?

_____

_____

Formation of the Solar System (p. 631)

7. About how long ago did our solar system form? _____

8. What events led to the birth of the sun?

_____

_____

_____

_____

_____

9. How did planetesimals form planets?

_____

_____

_____

The Future of the Universe (pp. 632–633)

10. Describe two possibilities of what will happen to the universe in the future.

a. _____

_____

_____

_____

b. _____

_____

_____

_____

_____

11. Which possibility in #10 is more likely? Explain why.

_____

_____

_____

Key Terms

Solve the clues by filling in the blanks with key terms from the chapter. Then write the numbered letters in the correct order to find the hidden message.

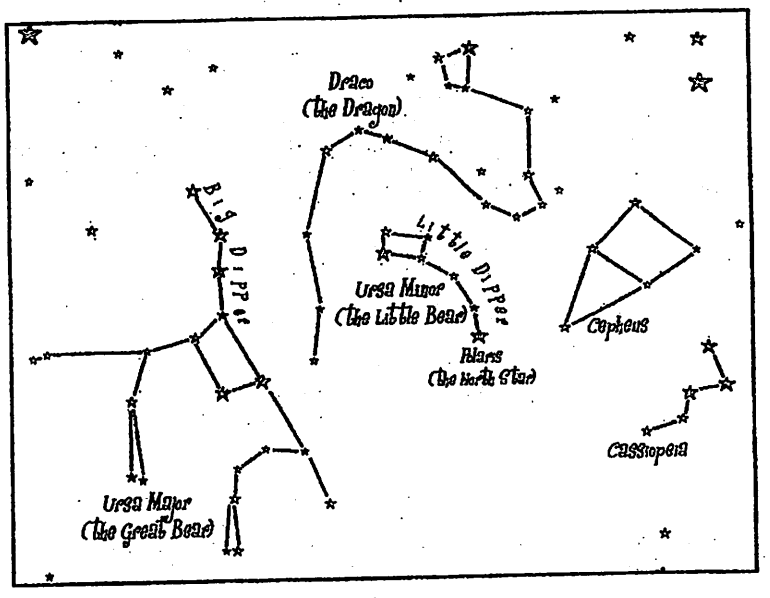
Clues	Key Terms
1. The earliest stage of a star's life	_ _ _ _ _ _ _ _ _ _ (1)
2. An object with gravity so strong nothing can escape	_ _ _ _ _ _ _ _ _ _ (2)
3. An instrument that breaks the light from an object into colors	_ _ _ _ _ _ _ _ _ _ _ _ _ (3)
4. All of space and everything in it	_ _ _ _ _ _ _ _ _ (4)
5. The small, dense remains of a high-mass star	_ _ _ _ _ _ _ _ _ _ _ (5)
6. The explosion that formed the universe	_ _ _ _ _ _ _ _ _ (6)
7. A pattern of stars in the sky	_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ (7)
8. The explosion of a dying giant or supergiant star	_ _ _ _ _ _ _ _ _ _ (8)
9. A galaxy that has a pinwheel shape	_ _ _ _ _ _ _ _ _ _ _ _ _ _ (9)
10. A building that contains one or more telescopes	_ _ _ _ _ _ _ _ _ _ _ _ (10)
11. A device used to detect radio waves from objects in space	_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ (11)
12. The apparent change in position of an object when you look at it from different places	_ _ _ _ _ _ _ _ _ (12)
13. A distant galaxy with a black hole at its center	_ _ _ _ _ _ _ (13)

Hidden Message

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _.

1 2 3 4 5 6 7 8 9 10 11 12 13

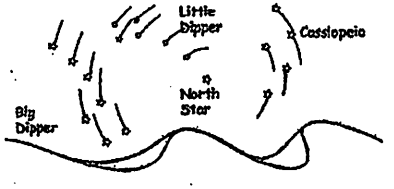
Northern Circumpolar Constellations



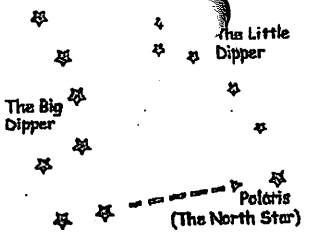
Northern Circumpolar Constellations

Depending on where you live, some constellations are visible all year round and some constellations are seasonal. If you live in the Northern Hemisphere, the constellations that circle around the North Star are visible all year. They are called circumpolar constellation because they travel in circles around the North Star. Because the circumpolar constellations are easily recognized and visible all year, they are a good place to start learning about the night sky. The main circumpolar constellations are Ursa Major, the Great Bear; Ursa Minor, the Little Bear; Draco, the Dragon; Cepheus, the King; and Cassiopeia, the Queen.

The circumpolar constellations travel in circles around the North Star, Polaris. If you take long exposure photographs of the North sky, you can see these 'star swirls'.

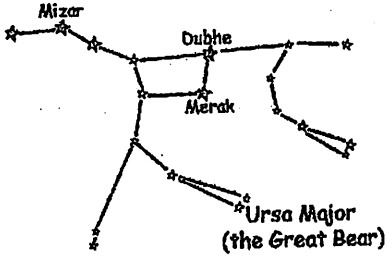


The Big Dipper



The Big Dipper is by far the easiest grouping of stars to recognize because five of the seven stars are very bright and can even be seen by people living in cities. However, the Big Dipper is not a true constellation. It is part of a larger constellation called Ursa Major, the Great Bear. The Big Dipper can be used as a quick guide for locating the North Star. The two stars at the end of the spoon are called the pointer stars and if you follow a straight line through the two pointer stars upward, the next bright star you come across will be the North Star. The distance that you have to go is about five times the distance between the two pointer stars. Using the North Star, you can get your bearings on Earth.

Ursa Major, The Great Bear



Artemis, the moon goddess and goddess of the hunt, always had hunting companions with her when she went on the hunt. One such companion was Callisto, a beautiful young maiden.

One day Zeus passed by a woodland cove and spied the sleeping Callisto. Zeus disguised himself as Apollo and made Callisto his lover. They had a child named Arcas. Of course Zeus knew that both Hera, his wife, and Artemis would be angry with Callisto so to protect her he turned her into a bear to keep her hidden from Artemis and Hera.

One day, Arcas was hunting and he came across a great bear. He was just about to shoot his arrow when Zeus intervened and changed him into a little bear so that Arcas could know who the great bear really was. Zeus then transported the two bears to the heavens so that they would be protected from the wrath of the angry goddesses.

However, Hera was unhappy that Callisto and her son were shining so brightly in the heavens so she asked the ocean god to prevent them from ever bathing in the ocean waters. And so, according to this story, that is why the two bears are forced to circle the heavens while the other constellations are allowed to dip below the horizon and bathe in the immortal waters every night.

Three important stars in Ursa Major are Mizar, Dubhe and Merak. Dubhe and Merak are also known as the pointer stars because they point to the North Star. Mizar was the first binary star that was ever discovered. A binary star is a star that orbits another star. In 1650, an Italian astronomer named Riccioli using a simple telescope discovered that there were indeed two stars orbiting each other, a fact which could not be seen by the naked eye. Since then many binary stars have been discovered.

Ursa Minor, the Little Bear

Ursa Minor is much harder to find than Ursa Major. Usually, it's easier to find Ursa major first and follow the pointer stars to Polaris and then find the other stars of Ursa Minor.

One important star is Polaris, the Pole Star or the North Star. It is an important star for navigators because it stays relatively fixed in the heavens while all of the other stars move in circular arcs throughout the night. In the past, it has been called 'the ship star', 'the leading star', 'star of the sea' and the 'steering star'.

Draco, the Dragon

The titans were giants with serpentine feet. They were almost invincible. When they revolted against the gods, they caused great destruction. During the battle, Athena grabbed the feet of one of these dragon-like giants and flung it into the heavens where it got tangled among the stars.

One interesting star is Thuban. Around 2700 BC, at the height of the ancient Egyptian civilizations, Thuban, not Polaris, was at the celestial north pole and was therefore the pole star. The pole star changes slowly because the Earth's rotational axis wobbles (spins around like a top).

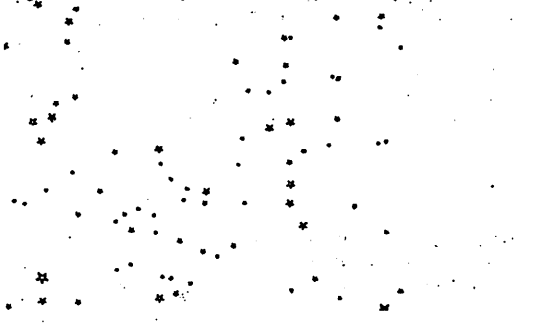
The King and Queen, Cepheus and Cassiope.

Cepheus and Cassiopeia were the king and queen of Joppa, a city in the land of Ethiopia. They had many children including a daughter named Andromeda. Andromeda was very beautiful and when the sea nymphs overheard Cassiopeia boasting about her beauty, they complained to Poseidon.

Poseidon got angry and sent a sea monster[1] to destroy the city. When the monster was coming, Cepheus consulted an oracle. The oracle gave Cepheus a choice: Sacrifice his daughter Andromeda, or face the destruction of the monster. Cepheus agreed to sacrifice his daughter to save the people of his kingdom and so he chained Andromeda to a cliff.

As it happened, Perseus was flying past on his flying horse Pegasus. Perseus agreed to save the daughter in return for her hand in marriage. Perseus and Andromeda lived a long life. When they died they were transformed into the stars as constellations along with the King and Queen, Cepheus and Cassiopeia. Cassiopeia is sitting in her throne and Cepheus has his arms stretched out. However, as punishment, Poseidon made sure that Cassiopeia's throne was dumped upside down every night (when the constellation forms and 'M' instead of a 'W'.

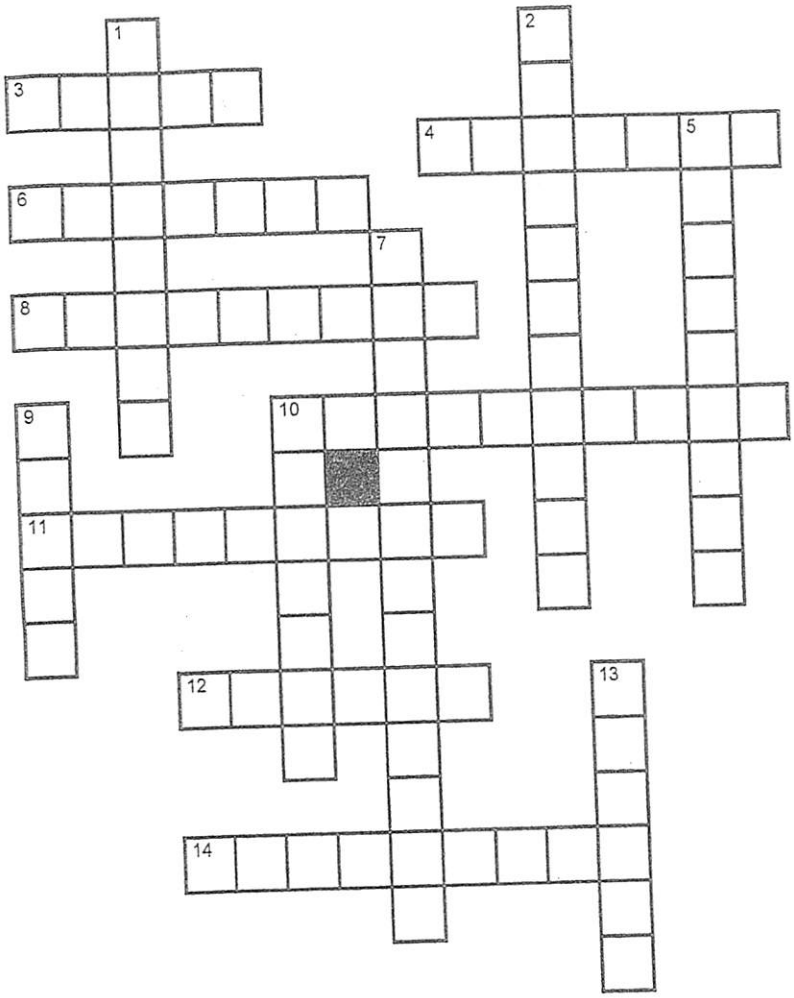
Without looking at the first page, can you draw the five circumpolar constellations?

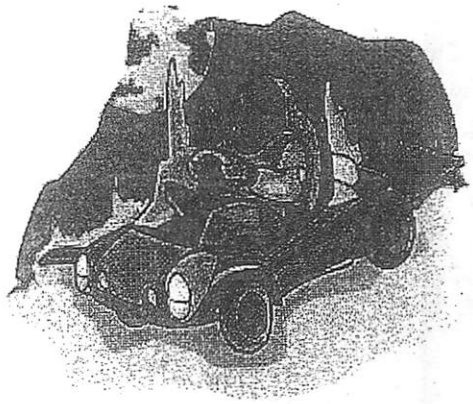


[1] In some myths the monster is a squid-like creature called the Kraken and in other myths it is a giant whale named Cetus. In versions of the myth where Cetus is the monster, the story goes that Cetus was placed in the stars below Andromeda to chase her perpetually around the heavens.

Name: _____

CIRCUMPOLAR CONSTELLATIONS





Across

3 The Dragon. (5)

4 The man who rescued Cepheus's daughter. (7)

6 The North Star. (7)

8 The Great Bear. (4,5)

10 The Queen sitting in her throne. (10)

11 A grouping of stars that is part of Ursa Major. (3,6)

12 The pole star in the age of the pharaohs. (6)

14 Cepheus's daughter. (9)

Down

1 The woman who became the great bear. (8)

2 A constellation near the North Star. (11)

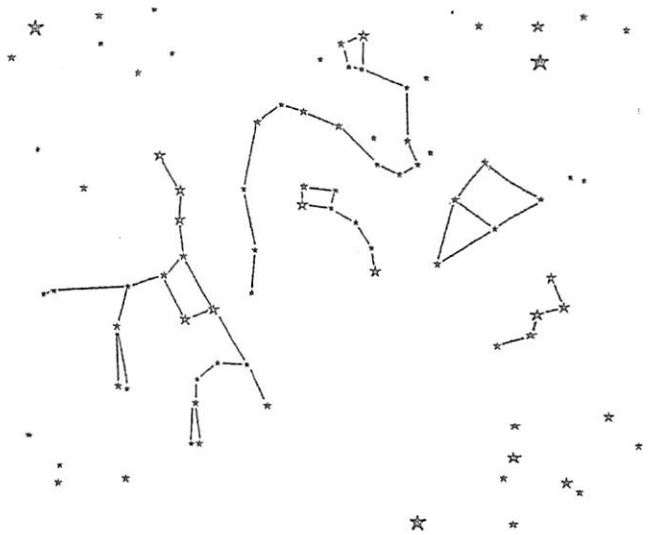
5 The Little Bear. (4,5)

7 A group of stars. (13)

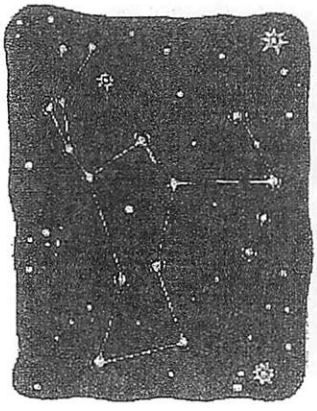
9 One of the pointer stars. (5)

10 Cassiopeia's husband. (7)

13 A star that orbits another star. (6)



CONSTELLATIONS

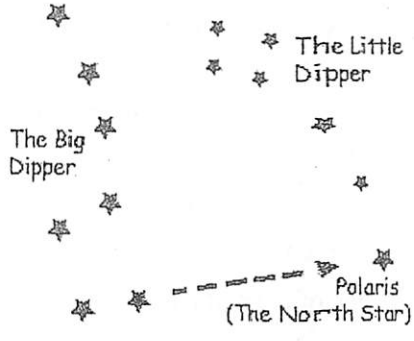


Orion the Hunter: This constellation is a winter constellation, meaning it can only be seen in the winter months. Some constellations can be seen all year round and some constellations are seasonal. As well, some constellations can only be seen from the Northern Hemisphere and some can only be seen from the Southern Hemisphere

Z	O	X	S	G	E	M	I	N	I	S	C	I	L	U
W	W	L	P	C	Y	W	E	S	U	V	A	S	I	C
O	G	S	I	G	O	V	I	R	G	O	S	B	B	A
R	W	T	O	T	F	R	U	J	T	T	S	I	R	N
I	A	Y	A	U	T	A	P	E	B	I	I	G	A	C
O	Q	C	V	C	T	L	D	I	E	A	O	D	I	E
N	U	J	Z	N	A	H	E	S	U	S	P	I	D	R
D	A	I	E	Z	O	P	E	D	U	S	E	P	A	P
Z	R	C	N	E	C	C	R	R	I	A	I	P	R	S
W	I	A	L	D	S	Y	U	I	N	P	A	E	I	Z
U	U	O	C	I	U	A	G	L	C	C	P	R	E	E
D	S	W	P	O	T	S	S	N	U	O	R	E	S	S
P	L	E	I	A	D	E	S	X	U	P	R	O	R	F
O	O	C	T	A	N	S	C	J	K	S	U	N	S	Q
I	S	A	G	I	T	T	A	R	I	U	S	S	O	S

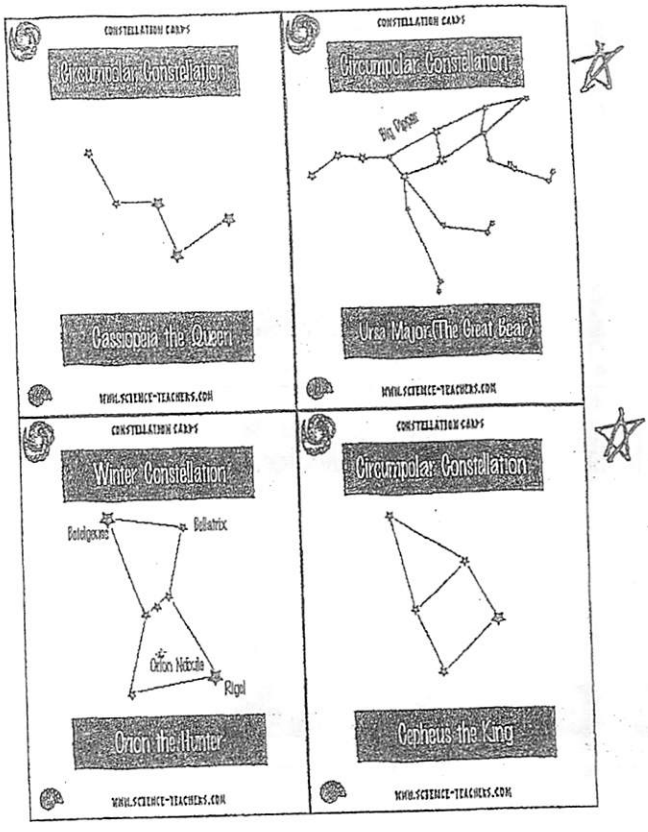
Find these constellations:

Aquarius
Aries
Big Dipper
Cancer
Cassiopeia
Centaurus
Cygnus
Draco
Gemini
Indus
Leo
Libra
Little Dipper
Lupus
Octans
Orion
Pisces
Pleiades
Sagittarius
Scorpius
Southern Cross
Taurus
Virgo



You can find the North Star by using the two pointer stars of the Big Dipper.

CONSTELLATION FLASH CARDS



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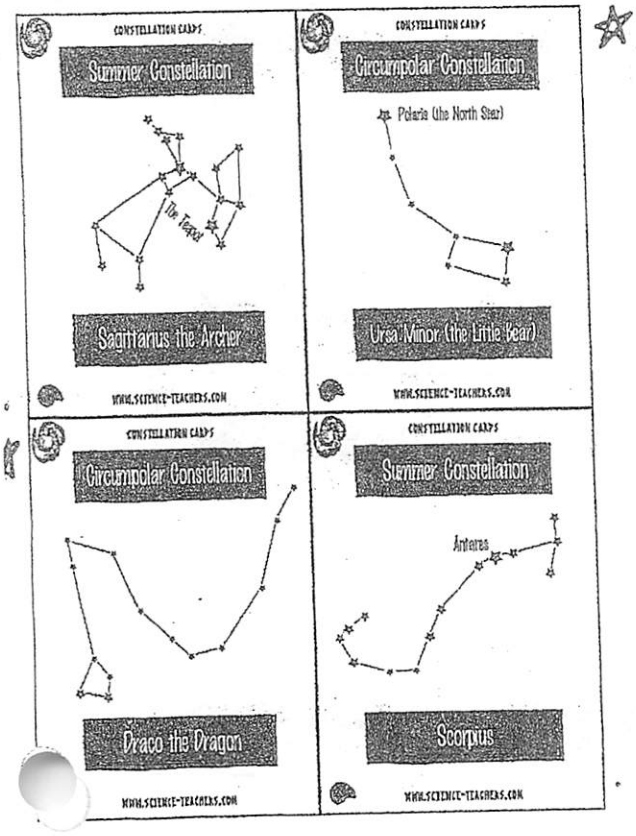

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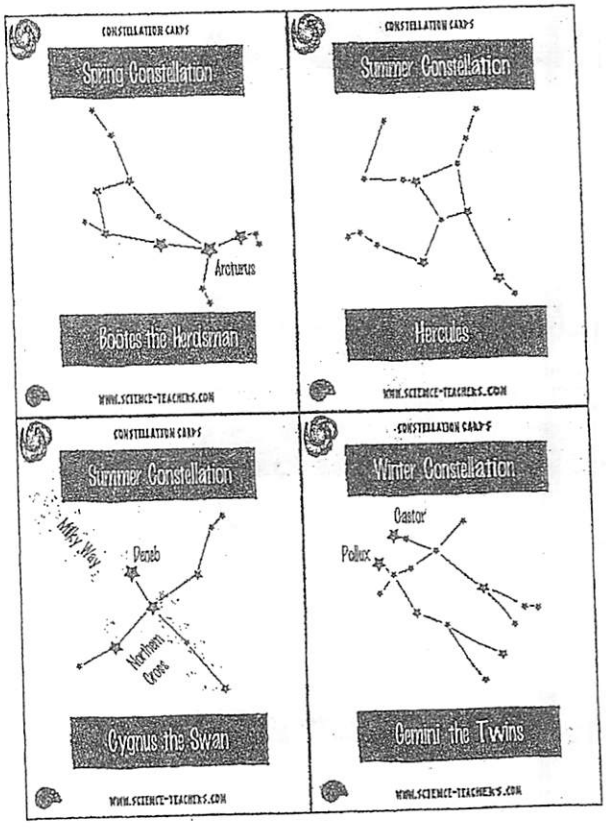

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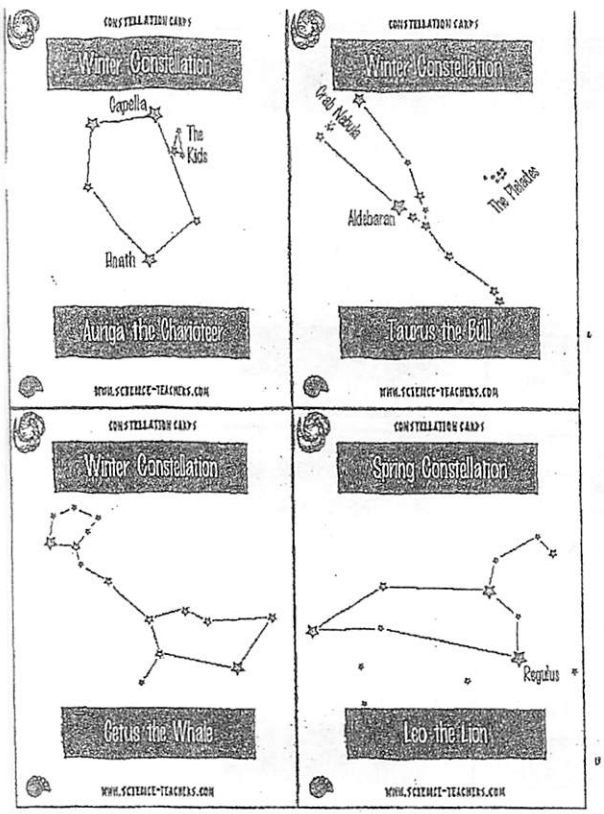

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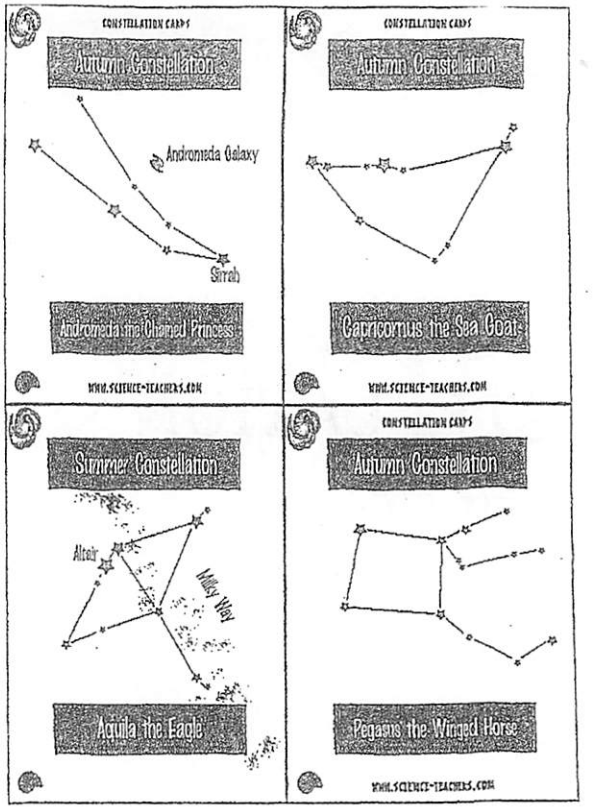

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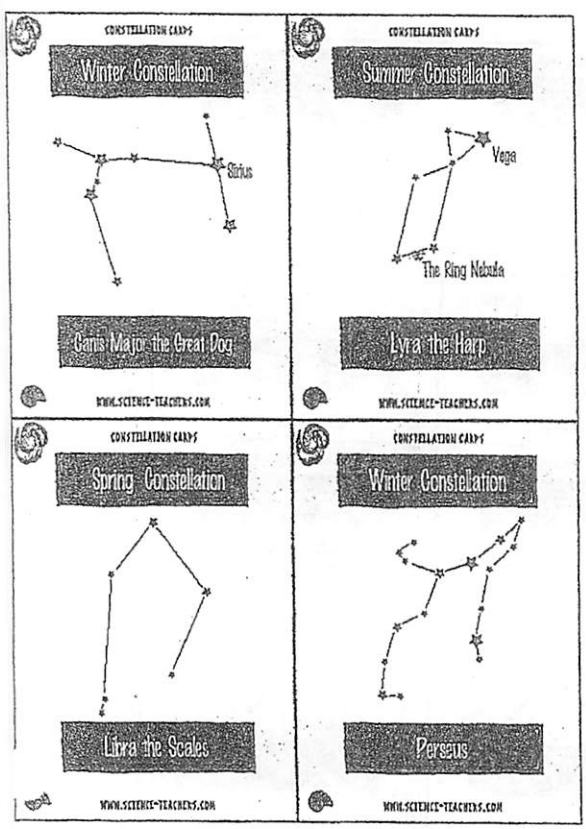

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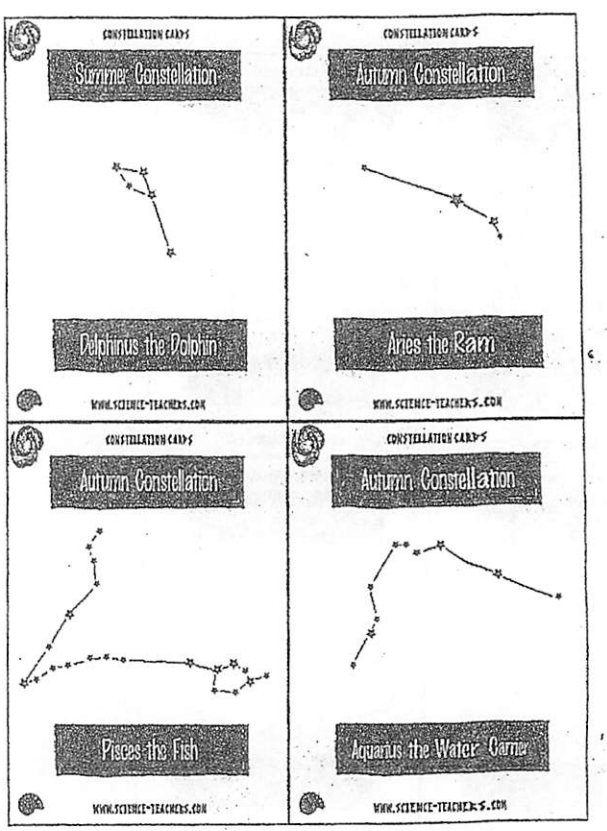

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