



Name: _____

Why is the Sun so important to us? What would we do without it? How long will it last? The Sun at the center of our solar system is an average star. It is located near the outer edges of a rather average-sized galaxy called the Milky Way. The diameter of the Sun measures about 875,000 miles. About 109 Earths would fit across the diameter of the Sun. The Sun could hold more than 1,300,000 planets the size of Earth. The Sun's surface area is almost 12,000 times the surface area of the Earth. The Sun contains 99.86% of all the mass in the entire solar system. This includes all of the planets, moons, and asteroids. The Sun takes approximately 225 million years to make one revolution around the Milky Way galaxy. It takes more than 25 Earth days to rotate once on its axis.

Some super-heated particles escape the Sun's gravity. These particles move at 300 miles per

second. They form a stream of particles, which scientists call the solar wind. Some of these solar particles are trapped in Earth's magnetic field at the North and South Poles. Here they mix with Earth's atmospheric gases. They create beautiful light displays called auroras.

Sunspots are areas on the surface of the Sun. They are thousands of degrees cooler than the surrounding gases. Therefore, they appear darker. A solar cycle occurs every 11 years when the Sun is most active. Sometimes more than 100 sunspots can be sighted on the Sun. However, when the Sun is at its least active, no sunspots may be seen at all. You should never stare directly at the Sun, especially with binoculars, a telescope, or a camera. It can destroy your eyesight.

What Did You Learn ?

1. How many planets the size of Earth would fit across the diameter of the Sun?
(A) 1,300,000 (B) 109 (C) 100 (D) 12,000
2. Where do solar particles get trapped?
(A) in space (C) in Earth's magnetic field
(B) on the moon (D) in a telescope
3. What are sunspots?
(A) hotter areas on the Sun (C) light spots on the Sun
(B) cooler areas on the Sun (D) solar wind
4. Which of the following should you use to stare at the Sun?
(A) telescope (C) binoculars
(B) unprotected eyes (D) none of the above

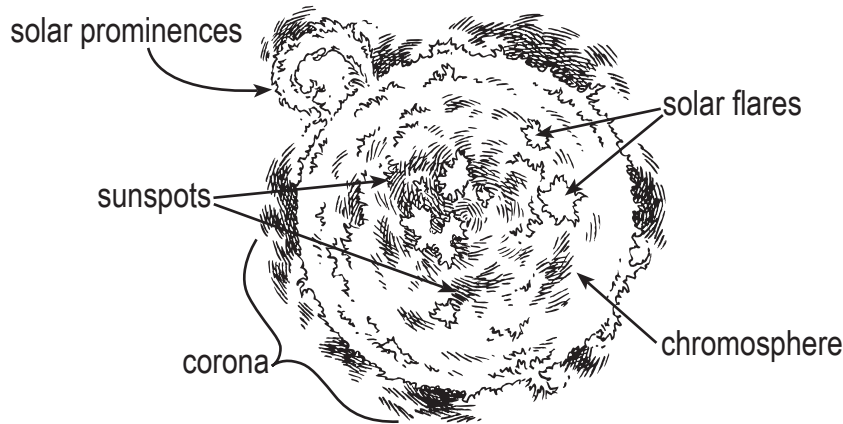
What Am I ?

I am a stream of super-heated particles that escape the Sun's gravity and travel 300 miles per second.

S _____



Name: _____



Directions: Read the Sun facts. Answer the questions below.

- The largest solar prominences can be over 310,000 miles long. They are longer than solar flares.
- Solar flares are massive explosions in the corona and chromosphere on the surface areas of the Sun.
- The corona is the outer atmosphere of the Sun. It extends millions of miles into space.
- The chromosphere extends about 1,500 miles deep into the surface of the sun.
- The photosphere is the visible surface of the Sun, which is the top 370 miles of the Sun's surface.
- The core of the Sun is about 174,000 miles across the center of the Sun.
- The diameter of the Sun is about 864,400 miles at the Sun's equator.
- The chemical makeup of the photosphere is about $\frac{3}{4}$ hydrogen and about $\frac{1}{4}$ helium.
- Sunspots are dark, visible patches on the photosphere. They are cooler than the other areas on the photosphere.
- Sunspots come in regular 11 year cycles. Sunspots only last about two weeks.

What Do You Know ?

1. Which two gases make up the Sun?

2. What is the scientific name for the visible surface of the Sun?

3. What feature of the Sun extends millions of miles into space?

4. Which feature of the Sun covers its surface for the top 1,500 miles?

5. How often do sunspots appear on the Sun? How long do they last?



Name: _____

Directions: Solve the following math problems. Write your answers in the ovals.

1. The diameter of the Sun at the Equator is 864,400 miles. The diameter of the Earth is 7,926 miles. How much larger is the diameter of the Sun?

2. The surface area of the Sun (the total surface of the Sun) is 2.3 trillion square miles, which is written 2,300,000,000,000 in numbers. The surface area of the earth is 196 million square miles. This is written 196,000,000. How much larger is the Sun?

3. The gravity of the Sun is 28 times the force of gravity on Earth. (If an object weighed 1 pound on Earth, it would weigh 28 pounds on the Sun.) How much would a person weighing 100 pounds on Earth weigh on the Sun?

4. It takes the Sun 225 million Earth years to orbit just once around the center of the Milky Way. How long would it take the Sun to orbit only 5 times around the center of the Milky Way galaxy?

5. The temperature of the Sun at the center is about 25,000,000°F. The surface temperature of the Sun is 9,941°F. What is the difference between the center and the surface of the Sun?

6. The average daytime temperature of Earth is 59°F. How many degrees less than the temperature of the surface of the Sun is Earth? (See problem #5.)

Stars: Red Giants and Supernovas



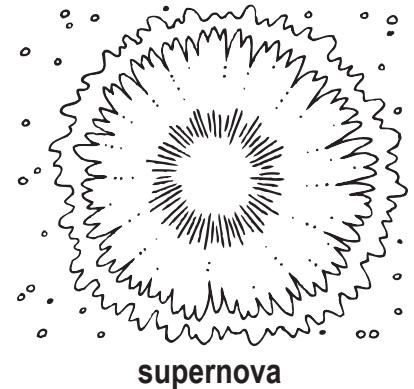
Name: _____

Our local star is the Sun. It appears to be rather small as stars go. Stars are fueled by hydrogen, and they exist until the last of their hydrogen fuel is used up. Our Sun will not run out of hydrogen for 5 billion years. Then our Sun will swell up and become a red giant. The core will continue to burn helium, the other main fuel in a star. A red giant can swell to a thousand times its previous size, although its core is still dense and no larger than Earth. Our own Sun is expected to swell to only 30 times its present diameter. It will look very large, nonetheless, in the sky. The red giant may throw off its outer shell and become a planetary nebula. The core becomes a white dwarf that will shine until its heat radiates away. It will eventually shrink to a dark cinder no longer capable of producing light. This will still take billions of years.

Unlike our Sun, giant stars contract or draw in upon themselves. They begin to absorb energy instead

of giving it off. As the energy is used up, the mass or size of the star increases. A giant star is pressured by gravity until it eventually explodes into a supernova. The first few seconds of a supernova produce 100 times all the energy our Sun will produce in 10 billion years. The supernova actually shines more brightly than all of the other stars in that galaxy. They are so bright that they can be seen from Earth. Astronomers have observed supernova explosions in 1054 CE, 1572 CE, and 1604 CE.

A more recent one was observed in 1987 and could be seen without a telescope in the Southern Hemisphere.



supernova

What Did You Learn ?

- Which of the following shines more brightly than any star in the night sky?
(A) nova (B) supernova (C) nebula (D) red giant
- What will our Sun become when it runs out of fuel?
(A) red giant (B) white dwarf (C) supernova (D) both A and B
- What gas provides fuel for the Sun to burn?
(A) nebula (B) hydrogen (C) helium (D) both B and C
- When a star comes to an end, what fuel has been used up?
(A) white giant (B) helium (C) hydrogen (D) both B and C

What Am I ?

I am a giant star pressured by gravity that explodes into an extremely bright light in a galaxy and can be seen at great distances.

S _____



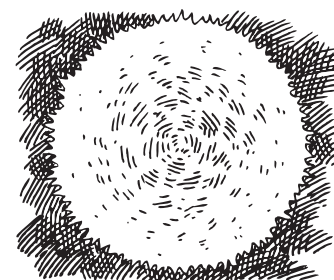
Name: _____

Directions: Study the chart. Answer the questions below.

Red dwarf		Orange star		Yellow star	
M-type star Surface 5,400°F		K-type star 8,460°F		G-type star 10,800°F	
Yellow-white star		White star		Blue-white star	
F-type star Surface 13,500°F		A-type star Surface 18,000°F		B-type star Surface 36,000°F	
				Blue giant	
				O-type star Surface 63,000°F	

Facts to Know

A yellow star is called a G-type star. Our Sun is a star of this type. A G-type star has an average surface temperature of about 10,800°F. For example, the average surface temperature of our Sun is about 9,900°F. In general, blue stars are hotter than red stars. The hotter a star, the brighter it shines. The energy of a star is released at the surface as light and heat. Nuclear reactions occur at the center of a star. Most stars have two main gases: hydrogen and helium.



Questions

1. What is the coolest star mentioned above? What is its average surface temperature?

2. What is the hottest star mentioned above? What is its average surface temperature?

3. What color is our Sun? What is its average surface temperature?

4. Which star letter represents the hottest star?

5. What are the fuels burned in stars?

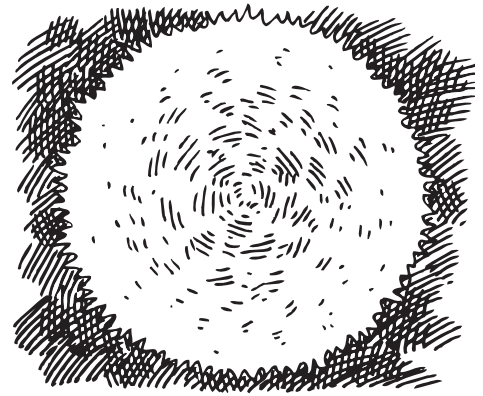
6. Which star letter represents the coolest star?



Name: _____

Directions: Use the star temperatures below and your math knowledge to answer the math questions.

Star	Average Surface Temperature
Red dwarf (M)	5,400°F
Orange (K)	8,460°F
Our Sun (G)	9,900°F
Yellow (G)	10,800°F
Yellow-white (F)	13,500°F
White (A)	18,000°F
Blue-white (B)	36,000°F
Blue giant (O)	63,000°F



- How much hotter is our Sun than a Red dwarf star?

- How much hotter is a Blue giant than our Sun?

- Which star is exactly twice as hot as a White star?

- What is the difference in temperature between an orange star and a yellow-white star?

- Which star is about six times as hot as our Sun?



Warm-Up 150

Word Study

Name: _____

Directions: Read and study the following vocabulary words and definitions. Then use each word in a sentence that relates to the information from this unit.

photosphere — the visible surface of the Sun

solar wind — particles streaming from the Sun in all directions

corona — outer atmosphere around the Sun

solar flares — explosions in the corona and chromosphere

chromosphere — area beneath the photosphere



Name: _____

What are constellations? Have you ever tried to form a picture using the stars in the sky?

Constellations are names given to groups of stars seen from Earth. These groups of stars appear to be close. However, the stars are really immense distances from us and from each other. The stars also vary in size, but they may appear to have the same brightness as seen from Earth.

The constellations were usually named by ancient peoples and given human stories based on the gods and myths of these people. Most of our names for constellations originally came from the Greeks and Romans. They saw patterns of stars in the heavens, and they built stories around them. The Native Americans of North and South America often saw the same pattern of stars. They created their own names and myths to accompany these patterns of stars.

Some of the 88 official constellations are well known. They include Orion (The Hunter), Leo

(The Lion), Gemini (The Twins), Pisces (The Fish), Sagittarius (The Archer), Scorpius (The Scorpion), Taurus (The Bull), Ursa Major (The Great Bear), Canis Major (The Great Dog), Pegasus (The Winged Horse), and Cancer (The Crab). Most, but not all, of these constellations can be seen from the Northern Hemisphere. Crux (The Southern Cross) is seen from the Southern Hemisphere. Aquarius (The Water-Bearer) is also best observed from that hemisphere. Capricornus (The Sea Goat) is seen from both hemispheres. This is true of several of these star clusters.

It is best to get away from man-made sources of light to look for these patterns of stars in the skies. Look first for simple patterns like Orion's belt of three stars in a row. Then gradually note other patterns. In time, you will want to use a field guide as you become familiar with the many stars and star pictures in the night sky.

What Did You Learn ?

1. What term is applied to patterns of stars in the night sky?
 (A) hemisphere (B) clusters (C) constellations (D) pictures
2. Which constellation looks like a hunter with a belt of stars at his waist?
 (A) Pisces (B) Orion (C) Aquarius (D) Taurus
3. Most of our present constellation names come from what cultures?
 (A) African (B) Native American (C) Greek and Roman (D) Egyptian
4. Which constellation name means the "Twins"?
 (A) Gemini (B) Leo (C) Sagittarius (D) Canis Major

Who Am I ?

I am one of the easiest constellations to recognize in the sky with three bright stars in row and a huge bow.

O _____



Warm-Up 152

Constellation Names: English and Latin

Name: _____

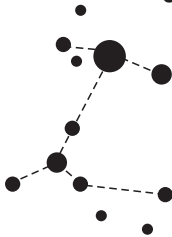
Most constellations have a scientific/Latin name and an English term that is also used.

Directions: Match the Latin name and the description with the English name.

- _____ 1. Cancer (small star cluster between two of the three crab legs)
- _____ 2. Ursa Major (has the big dipper in this animal constellation)
- _____ 3. Ursa Minor (looks like a large spoon)
- _____ 4. Cygnus (this bird has a cross shape and two very bright stars at top and bottom)
- _____ 5. Andromeda (a V-shaped constellation said to represent a woman chained to a rock)
- _____ 6. Cepheus (this king looks like a child's outline of a house)
- _____ 7. Orion (looks like a person raising his arms)
- _____ 8. Corona Borealis (looks like the headpiece of a king or queen)
- _____ 9. Canis Major (has Sirius, the Dog Star, the brightest star in the sky)

English Term/Picture Bank

a. The Great Dog



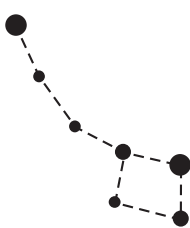
b. The Crown



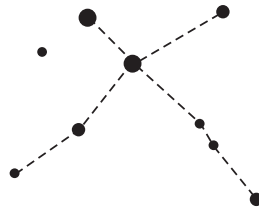
c. The Hunter



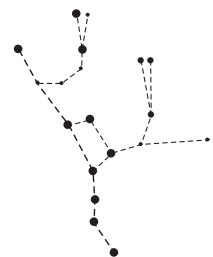
d. The Little bear



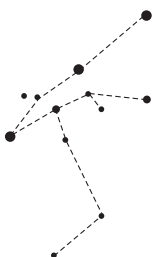
e. The Swan



f. The Great Bear



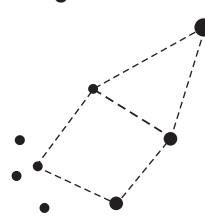
g. Princess



h. The Crab



i. King


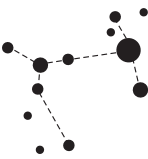
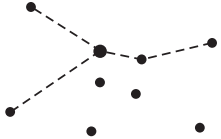
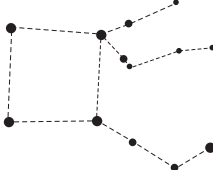
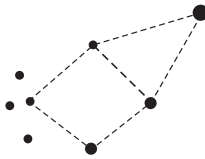
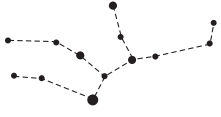
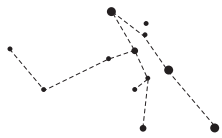

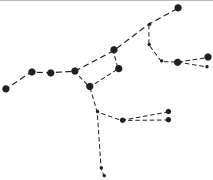
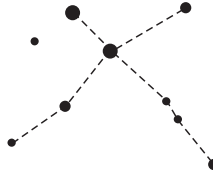





Thinking About Constellations



Name: _____

Directions: Read the description of each constellation. Respond to the questions below.

1. Orion <i>hunter</i> 	2. Canis Major <i>great dog</i> 	3. Cancer <i>crab</i> 
4. Pegasus <i>winged horse</i> 	5. Cepheus <i>king, looks like a house</i> 	6. Virgo <i>goddess of fertility and harvest</i> 
7. Andromeda <i>rescued princess</i> 	8. Corona Borealis <i>crown</i> 	9. Ursa Major <i>great bear</i> 
10. Cygnus <i>swan</i> 	11. Draco <i>serpent/dragon</i> 	12. Perseus <i>warrior hero</i> 
13. Ursa Minor <i>little bear</i> 		

What Do You Think ?

1. Which of the constellations are supposed to resemble animals?

2. Which of the constellations are intended to resemble queens, princesses, or goddesses?

3. Which is your favorite constellation? Do you prefer the star pattern or the description associated with the constellation?



Warm-Up 154

Recognizing Constellations

Name: _____

Directions: Place the correct name below each of the common constellations shown below. (You could use information from pages 158 and 159 to help you.)

Word Bank

Pegasus

Orion

Draco

Andromeda

Perseus

Cepheus

Virgo

Cygnus

1. Serpent

D _ _ _ _ _

2. Fertility Goddess

V _ _ _ _ _

3. The Winged Horse

P _ _ _ _ _

4. King

C _ _ _ _ _

5. The Hunter

O _ _ _ _ _

6. Rescued Princess

A _ _ _ _ _

7. Warrior Hero

P _ _ _ _ _

8. The Swan

C _ _ _ _ _

What Do You Think



Which of the constellations looks most like its name? Explain your choice.

Which of the constellations above have you actually seen in the night sky? When?



Name: _____

Directions: Read and study the following vocabulary words and definitions. Then use each word in a sentence that relates to the information from this unit.

constellation — group of unrelated stars that appear to form a picture as seen from Earth

Orion — a constellation known as the Hunter; found at the location of stars that appear to form a belt and bow

Taurus — a constellation that seems to resemble a bull

Leo — a constellation that seems to resemble a lion in the night sky

Cancer — a constellation that seems to resemble a crab



Page 136 Cloud Math

- | | | |
|---------------|---------------|--------------|
| 1. 14,000 ft. | 4. 18,400 ft. | 7. 4,900 ft. |
| 2. 63,000 ft. | 5. 16,500 ft. | |
| 3. 63,400 ft. | 6. 43,500 ft. | |

Page 137 Name That Cloud

- | | | |
|------------|------------------|------------------|
| 1. cirrus | 5. cirrocumulus | 9. cirrostratus |
| 2. cumulus | 6. stratocumulus | 10. nimbostratus |
| 3. nimbus | 7. cumulonimbus | |
| 4. stratus | 8. altocumulus | |

Page 138 Cloud Word Study

Answers will vary.

Unit 24

Page 139 What Are Ocean Zones?

- | | | | |
|------|------|------|------|
| 1. B | 2. C | 3. B | 4. A |
|------|------|------|------|

What Am I? Black Smoker

Page 140 Animals of the Ocean Zones

Sunlit Zone

- | | | |
|--------------|-----------|----------|
| octopus | manta ray | coral |
| sperm whale | turtle | blowfish |
| jellyfish | lobster | oyster |
| sea cucumber | dolphin | |

Twilight Zone

- | | | |
|--------------|-------------|------------|
| octopus | tube worm | viperfish |
| sperm whale | cuttlefish | gulper eel |
| jellyfish | hatchetfish | |
| sea cucumber | lanternfish | |

Midnight Zone

- | | | |
|---------------|-------------|-------------|
| sea cucumber | snipe eel | lanternfish |
| sea spider | tripod fish | hatchetfish |
| angler fish | viperfish | |
| vampire squid | gulper eel | |

Question: Answers will vary.

Page 141 Creatures of the Twilight Zone

- fang tooth, lanternfish, angler fish, viperfish, eelpout
- hydrozoans, squid, tube worms
- eelpout
- squid
- lanternfish, angler fish

Page 142 Ocean Depths Math

- | | | |
|---------------|--------------|------------|
| 1. 2,850 ft. | 4. 792 in. | 7. 672 in. |
| 2. 16,500 ft. | 5. 1,176 in. | |
| 3. 12,700 ft. | 6. 120 in. | |

Page 143 Ocean Zones Word Study

Answers will vary.

Unit 25

Page 144 How Can You Save the Environment?

- | | | | |
|------|------|------|------|
| 1. A | 2. D | 3. D | 4. A |
|------|------|------|------|

What Am I? Compost Pile

Page 145 Environmental Math

- 1 billion trees
- 650 million phones
- 416 billion bags
- a. 600 lbs.
b. 460 lbs.
c. 200 lbs.
d. 180 lbs.

Page 146 Do's and Don'ts for Saving the Environment

Answers will vary.

Page 147 Do Something!

Answers will vary.

Page 148 Reduce, Reuse, Recycle

Answers will vary because families are very different.

Glass is the only item listed where reduce is the best answer.

Reuse items might include:

- | | |
|-------------------|-----------------------|
| old books | outgrown baby clothes |
| outgrown clothes | baby bottles |
| outgrown bicycles | old eyeglasses |
| outgrown toys | old sheets/blankets |

leftover art supplies

All of the rest, and some of the above, could be recycled.

Page 149 Saving the Environment Word Study

Answers will vary.

Unit 26

Page 150 Our Sun

- | | | | |
|------|------|------|------|
| 1. B | 2. C | 3. B | 4. D |
|------|------|------|------|

What Am I? Solar Wind

Page 151 Fun Sun Facts

- hydrogen and helium
- photosphere
- corona
- chromosphere
- every 11 years for 2 weeks

Page 152 Sun Math

- 856,474 miles
- 2,299,804,000,000 mi²
- 2,800 pounds
- 1,125,000,000 years
- 24,990,059°F
- 9,882°F

Page 153 Stars: Red Giants and Supernovas

- | | | | |
|------|------|------|------|
| 1. B | 2. D | 3. D | 4. D |
|------|------|------|------|

What Am I? Supernova

Page 154 Types of Stars

- | | |
|--------------------------|------------------------|
| 1. red dwarf — 5,400°F | 4. O |
| 2. blue giant — 63,000°F | 5. hydrogen and helium |
| 3. yellow — 9,900°F | 6. M |



Page 155 Star Math

1. 4,500°F
2. 53,100°F
3. Blue-white
4. 5,040°F
5. Blue giant

Page 156 The Sun & Stars Word Study

Answers will vary.

Unit 27

Page 157 What Are Constellations?

1. C
2. B
3. C
4. A

Who Am I? Orion the Hunter

Page 158 Constellations Names: English and Latin

1. h
2. f
3. d
4. e
5. g
6. i
7. c
8. b
9. a

Page 159 Thinking About Constellations

1. Canis Major, Cancer, Pegasus, Ursa Major, Cygnus, Draco, Ursa Minor
2. Virgo and Andromeda
3. Answers will vary.

Page 160 Recognizing Constellations

1. Draco
2. Virgo
3. Pegasus
4. Cepheus
5. Orion
6. Andromeda
7. Perseus
8. Cygnus

What Do You Think? Answers will vary.

Page 161 Constellations Word Study

Answers will vary.

Unit 28

Page 162 What Are Ice Ages?

1. A
2. D
3. D
4. C
5. Answers will vary.

Page 163 Meet the Ice-Age Mammals

- | | |
|-------------------|---------------------------|
| A. dire wolf | E. giant panda |
| B. woolly mammoth | F. giant ground sloth |
| C. western horse | G. giant short-faced bear |
| D. smilodon | H. yesterday's camel |

Questions

1. short-faced bear, smilodon, dire wolf
2. woolly mammoth, western horse, giant panda, giant ground sloth, yesterday's camel

Page 164 Prehistoric Mammals

- | | |
|----------------------|-----------------------|
| 1. woolly mammoth | 6. giant ape |
| 2. prehistoric camel | 7. smilodon |
| 3. dire wolf | 8. giant ground sloth |
| 4. western horse | 9. American lion |
| 5. scimitar cat | 10. giant panda |

Carnivores

dire wolf scimitar cat smilodon American lion

Herbivores

western horse giant panda prehistoric camel
giant ape woolly mammoth giant ground sloth

Question:

Any of the larger carnivores would have been dangerous to man.

Page 165 Understanding Ice-Age Terms

- | | |
|------------|----------------------|
| 1. hooves | 5. canines |
| 2. tusks | 6. retractable claws |
| 3. fossils | 7. scavenger |
| 4. mammals | |

Questions

Accept all reasonable answers.

1. Canines (dogs), felines (cats), bears, humans
2. horses, cows, goats
3. felines (cats)

Page 166 Ice Age Word Study

Answers will vary.