

**Basic
Science Concepts**

Unit 1
Digestive System p. 10

Unit 2
Skeletal System p. 16

Unit 3
Respiratory System p. 22

Unit 4
Circulatory System p. 28

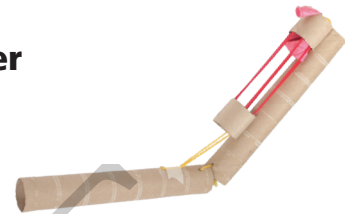
Unit 5
Nervous System p. 34

Unit 6
Human Health and Diseases p. 40

**STEM
Experiments**

Experiment 1:
Muscle Power

p. 46



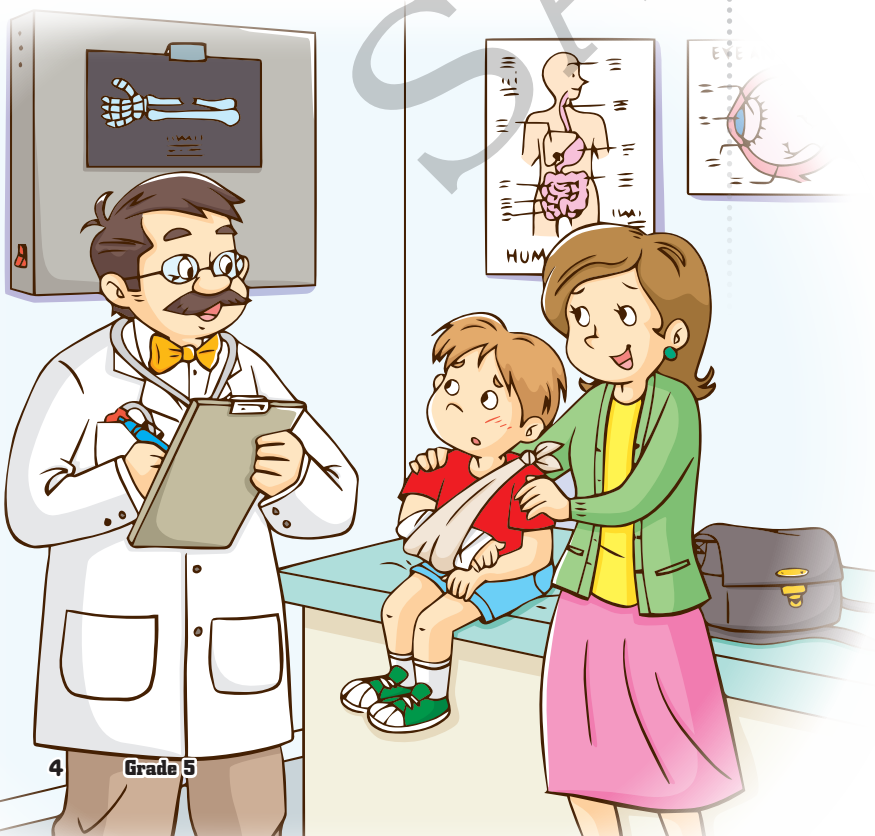
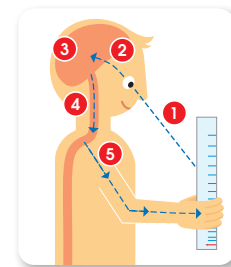
Experiment 2:
Beating Hearts

p. 50



Experiment 3:
Catch It!

p. 54



Section 2: Structures and Mechanisms

Basic Science Concepts

Unit 1 Effects of Natural Forces	p. 60
Unit 2 Impacts on Structures	p. 66
Unit 3 External and Internal Forces	p. 72
Unit 4 Bridges and Forces	p. 78
Unit 5 Mechanical Systems	p. 84
Unit 6 Protective Equipment	p. 90

STEM Experiments

Experiment 1:
Force vs. Distance
p. 96



Experiment 2:
Reinforced Sand
p. 100



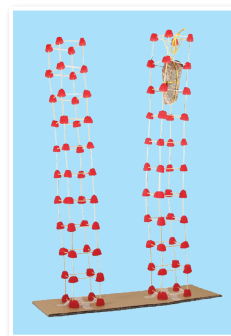
Experiment 3:
The Weakness of Concrete
p. 104



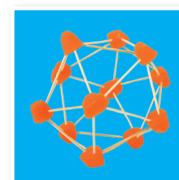
Experiment 4:
Egg Protectors
p. 108



Experiment 5:
Earthquake-proof Buildings
p. 112



Experiment 6:
Gumdrop Domes
p. 116



Section 3: Matter and Energy

Basic Science Concepts

Unit 1 Matter and Energy	p. 122
Unit 2 States of Matter	p. 126
Unit 3 Changes in States of Matter	p. 130
Unit 4 Measuring Matter	p. 134
Unit 5 Physical and Chemical Changes	p. 138
Unit 6 Environmental Impacts	p. 142

STEM Experiments

Experiment 1:
Changing States

p. 146



Experiment 2:
Physical Changes

p. 150

Experiment 3:
Formation of New Substances

p. 154



Experiment 4:
Magical Purple

p. 158

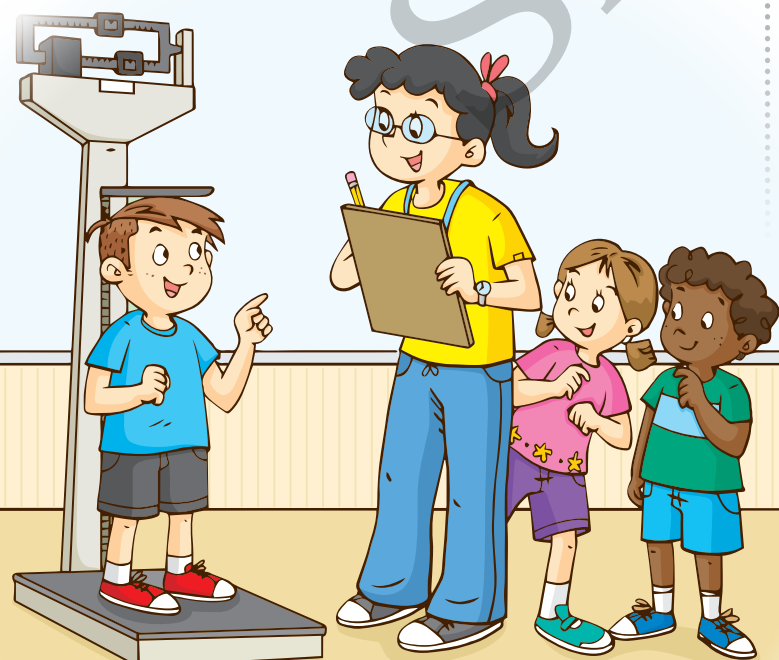
Experiment 5:
Self-inflating Balloons

p. 162



Experiment 6:
Turning Milk into Plastic

p. 166



Section 4: Earth and Space Systems

Basic Science Concepts

Unit 1
Forms of Energy p. 172

Unit 2
Energy Sources p. 176

Unit 3
Renewable and Nonrenewable Sources of Energy p. 180

Unit 4
Storing and Transforming Energy p. 184

Unit 5
Impacts of Human Energy Use p. 188

Unit 6
Energy Conservation p. 192

Answers p. 218

STEM Experiments

Experiment 1:
Transforming Energy

p. 196



Experiment 2:
Storing Energy

p. 200



Experiment 3:
Air – A Heat Insulator

p. 204



Experiment 4:
Hydro Power

p. 208



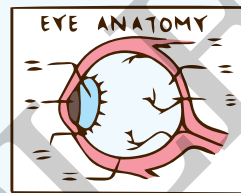
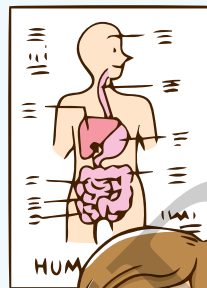
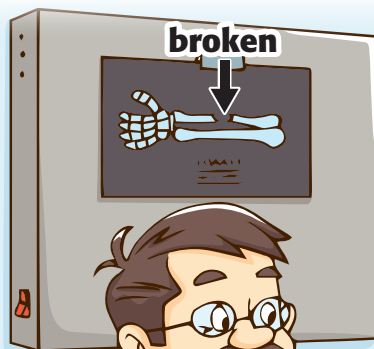
Experiment 5:
Let's Swing!

p. 212



2 Skeletal System

Under our skin, along with organs and muscles, we have bones. These bones form the skeletal system. In this unit, you will look at what a bone is made up of. You will also learn about the role of the skeletal system and identify the parts.



Like your skin, your bone will heal itself. Meanwhile, wear this cast for extra protection.

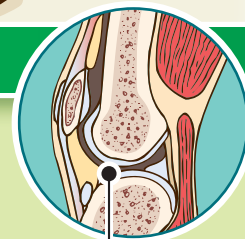
After completing this unit, you will

- know the functions of the skeletal system.
- know the structure of bones.
- be able to identify some bones in the skeletal system.

Vocabulary

cartilage: a flexible tissue that can be found in joints

joint: the place where two bones meet



cartilage



Extension

You know that your ears are soft and flexible. However, have you ever wondered what your ears have that gives them their shape and structure? It is cartilage. Cartilage is a flexible tissue which is lighter than bone but can still provide structural support. This is why your ears can hold their shape and stay flexible at the same time. In fact, you had more cartilage than bones when you were in your mother's womb. By the time you are about 25, most of this cartilage will become bone.

Can you name another body part that also has cartilage?

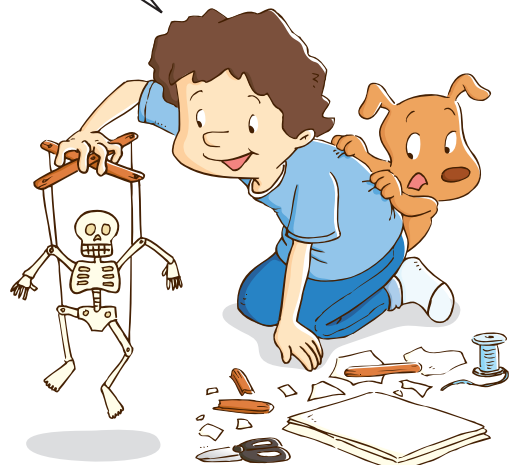


A. Check the correct functions of bones.

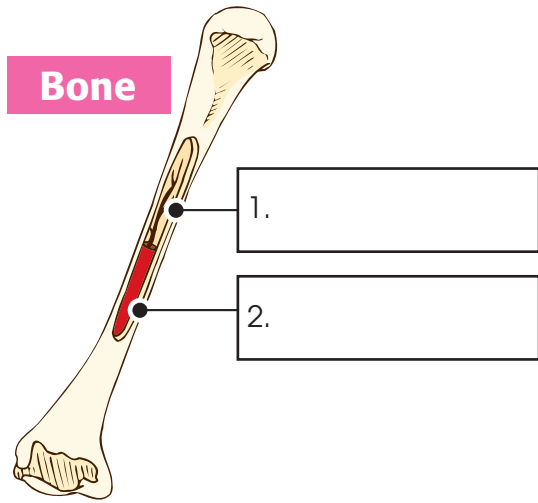
Functions of the Skeletal System

- A provides body structure
- B adds weight to your body
- C protects organs
- D protects skin
- E creates nutrients
- F makes new blood cells
- G allows for body movement along with muscles

You have four functions.



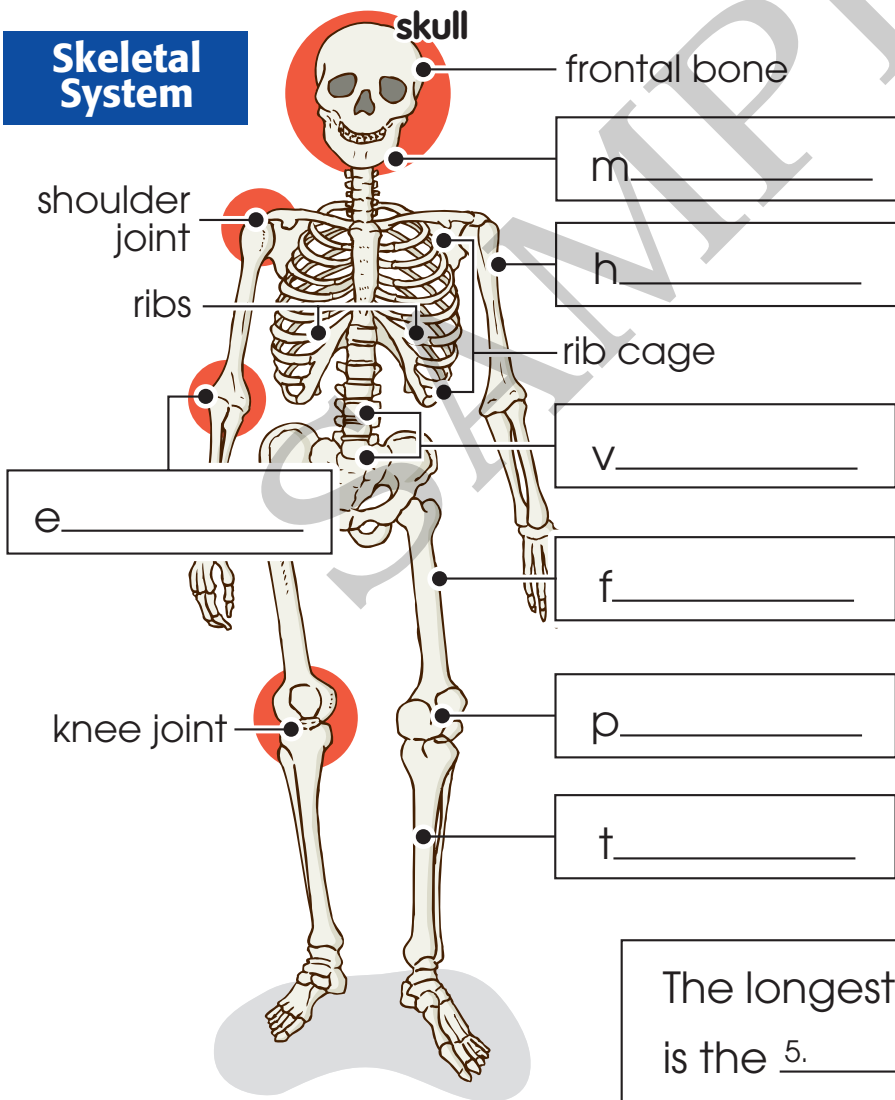
B. Label the diagrams to show the inside of a bone and the skeletal system. Then fill in the blanks.



Bone

hollow blood vessel
marrow blood cells

Most bones have a 3. center that holds marrow. This material is constantly making new 4. to keep you healthy.



Skeletal System

vertebrae
mandible
elbow joint
patella
humerus
tibia
femur



The longest bone in your body is the 5.

C. Look at the diagrams on the previous page. Answer the questions.

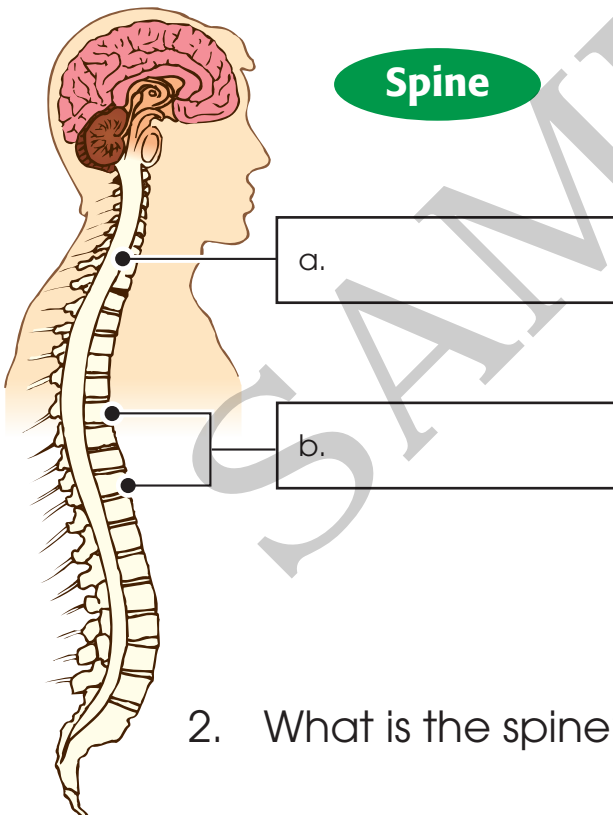
1. What protects your brain and gives your face its shape? _____

2. What protects your heart and lungs? _____

3. Name two joints in your body.

D. Complete the diagram with the words in bold. Then answer the questions.

1.



The spine is a column of bones that runs down your back. The bones in the spine are called **vertebrae**. Your spine helps hold up your body and protects a bundle of nerves called the **spinal cord**.

2. What is the spine?

3. What are the functions of the spine?



Have you ever watched a piece of firewood burning in a campfire? When firewood is burned, it changes by releasing carbon dioxide and leaving a residue of ash. These new substances – carbon dioxide and ash – are the result of the chemical change of burning firewood.

Since the ash and carbon dioxide cannot be changed back to the firewood, burning firewood is an irreversible chemical change. Try this experiment to learn about another common chemical change in our daily lives – rusting.

FORMATION OF NEW SUBSTANCES

understanding what a
chemical change is

What you need:



Difficulty:



Time needed:

1 day

In this experiment, you will learn about chemical changes through rusting.

You may put the steel wool back into the vinegar and leave it for another week to observe.



What to do:

- 1 Place the steel wool in the jar.
- 2 Pour vinegar into the jar until the steel wool is fully submerged.
- 3 Touch the jar and observe the steel wool for five minutes. Did you notice any changes?
- 4 Let the jar sit overnight.
- 5 Take out the steel wool with your gloves on and put it on the plate. Did the steel wool look different?



STEM Note

Steel is an alloy of iron and carbon. The carbon in steel makes it harder than wrought iron but not as brittle as cast iron. Steel has a unique balance of hardness, flexibility, and tensile strength.



WHAT *just* happened?

When the steel wool came into contact with the vinegar, the vinegar removed the steel wool's protective coating. This made the iron in the steel wool expose to the oxygen in the air and a chemical reaction occurred as a result. You should have noticed that the steel wool's color changed to reddish brown. The reddish-brown substance is what we call rust, which is a combination of iron and oxygen through a chemical process. This new substance showed you that the steel wool underwent a chemical change.

Furthermore, during this chemical reaction, heat was produced. That is why the jar felt warm when touched.



Rusting



in the presence of water



- Can you give more examples of chemical changes at home and in nature? How do they affect our lives and the environment?
- If you combine vinegar and baking soda, a chemical change will occur. What are the characteristics of this chemical change?
- Is rusting a reversible or irreversible chemical change?
- What problems can rusting cause to our lives? How can we avoid it?



- Food goes through chemical changes in human bodies. Research online with the permission from an adult to learn how human bodies turn food into energy for daily activities and functions.
- Research online with an adult to learn what chemical changes undergo in batteries to create electricity.



- In the experiment, the chemical change destroyed the structure of the steel wool and changed its properties. How do engineers protect steel structures, such as bridges and railways, from damaging?



- Use a thermometer to measure the temperature change of the liquid in the steel wool jar during the experiment. How much did the temperature change?



Rusty Stain

Did you know that the solution you made in the experiment by soaking steel wool in vinegar can be used as a wood stain? Carpenters sometimes stain wood with this mixture to give the wood a reddish-brown color. Now, that is making good use of a chemical change!