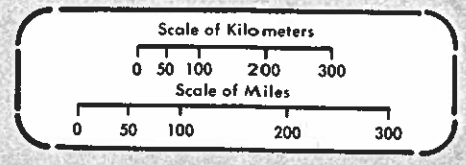
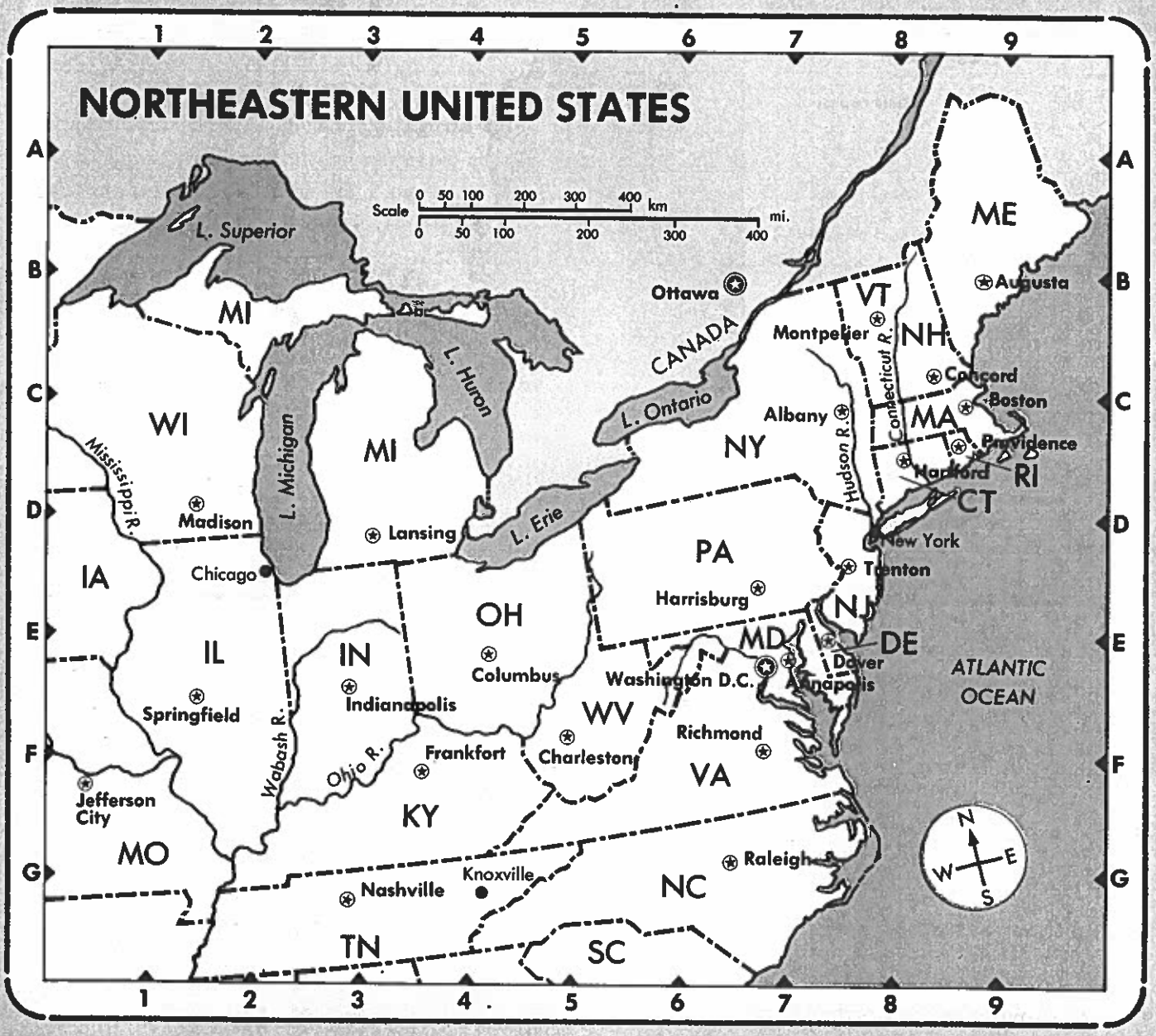
Scale and distance

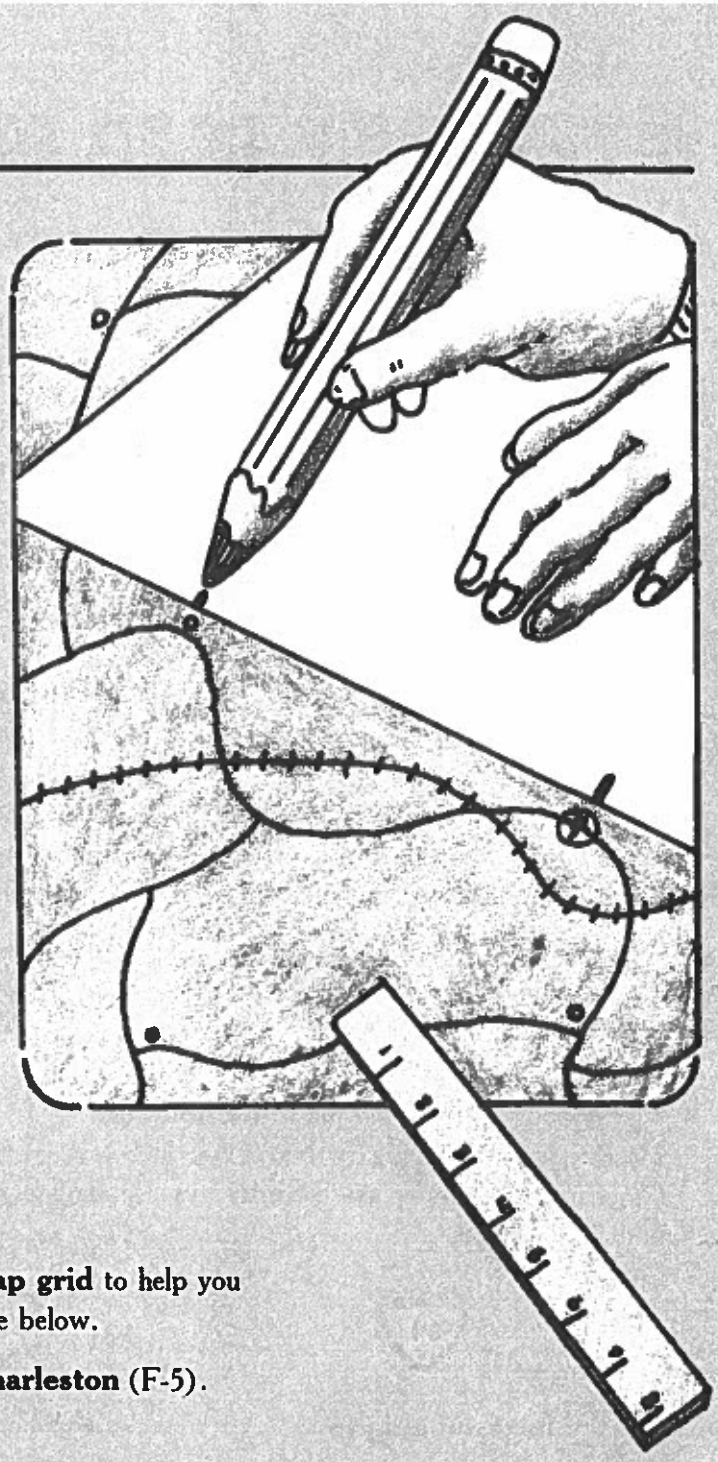
The **scale** of a map shows how much of the **earth's surface** is **represented** by a given **measurement** on the **map**. You will find the scale near the map legend.

- Sometimes a scale is written: **1 inch = 250 miles**.
  1 inch on the **map** represents **250 miles** on **earth**.
- Most map scales look like the ones at the right. They are called **graphic scales**. Each scale is marked off like a ruler. The distance between marks stands for distance on earth.





Suppose you plan a trip from **Springfield, Illinois,** to **Nashville, Tennessee.** About how many **miles** will you travel? Use the scale in the map on **page 10** to find out.



- Place a piece of paper on the map so that the edge of it touches the symbol for both cities **(E/F-1, G-3)**. Put a pencil **dot** on the **paper** where the symbols for **Springfield** and **Nashville** touch the edge.

- Now place the **edge** of your measuring **paper** along the **scale of miles** at the top of the map. One dot should be on **0**. The other dot will be at the **300** mile mark. This means that **Springfield** is about **300 miles** from **Nashville.**

- Now use the scale of **kilometers**. About how many kilometers is **Springfield** from **Nashville?**

_____

Use the **scales** in the map on **page 10**. Use your **map grid** to help you locate places and underline the answer for each sentence below.

1. **Washington** (E-7) is about ____ **miles** from **Charleston** (F-5).
   150 **250** **425**
2. **Raleigh** (G-6/7) is about ____ **kilometers** from **Nashville** (G-3).
   300 **450** **700**
3. **Lansing** (D-3) is about ____ **kilometers** from **Indianapolis** (E-3).
   400 **300** **200**
4. If you start at **Knoxville** (G-4) and drive **400 miles northeast,** at which **city** do you arrive? _____
5. If you start at **Ottawa** (B-6/7) and fly **southwest** for **850 kilometers,** at which city do you arrive? _____

Lesson 2.2 The Conservation of Matter

matter: something that takes up space and has mass

states: stages or conditions of matter, especially solid, liquid, and gas

molecule: the smallest piece of something before it's broken into individual atoms

atoms: smallest pieces of matter; they can exist alone or combine to form molecules

chemical: referring to the structure or makeup of matter and substances

The best-known states of matter are solid, liquid, and gas. Others have been discovered, though. Plasmas are similar to gases, but the atoms have more energy. When gas inside a fluorescent light is charged with electricity, it becomes plasma. The Northern Lights and neon signs are plasmas, also.

Another state of matter was first discovered in 1995. It's called the *Bose-Einstein condensate*. This state of matter occurs when certain elements become so cold, their atoms almost stop moving.

When you burn a log, where does it go?

Flour, sugar, eggs, milk, baking powder, salt, and vanilla. Mix them all together in a bowl, put the mixture in a pan, and bake it. When the ingredients come out of the oven, they've become a cake. It doesn't look anything like eggs, milk, or sugar anymore. Where did the ingredients go? They haven't gone anywhere—they've just changed shape.

In a similar way, **matter** often appears to change forms or even disappear altogether. Think of a puddle of water on the sidewalk. After a few hours in the hot sun, it disappears. The water didn't really disappear, though. It changed **states**, turning from a liquid into a gas and floating away. *Conservation of matter* means that the amount of matter does increase or decrease, it just changes.

Water in the air is a gas, but it's made of the same matter that filled the puddle. Whether ice, liquid, or steam, each **molecule** has two hydrogen **atoms** and one oxygen atom. Water is always H_2O, no matter what state it's in.

Three states of matter are solid, liquid, and gas. Heat or pressure can change matter from one state to another. These are only physical changes, though. Ice cubes look nothing like steam, but they are both made of the same molecules—H_2O. A **chemical** change is different. It's when one kind of matter becomes another kind because its molecules change. They break apart, losing some of their atoms and taking on new ones.

When you burn a piece of wood, it goes through a chemical change. Like the cake, a piece of wood contains many different ingredients, or matter. The wood is made of lots of different atoms and molecules.

Atoms are extremely small, but they still have mass. When you weigh something, you are really weighing all of its atoms and molecules. After you burn a piece of wood, you end up with a pile of ash. The mass of the ash is much less than that of the wood. Where did the rest of it go?

When wood burns, chemical changes take place. The matter in the wood becomes different matter. It doesn't just change states. Most of the solid matter in the wood changes into gases and smoke. If you could capture the smoke and gases and weigh them along with the ash, it all would weigh the same amount as the original piece of wood. Matter is never destroyed, it just changes form.

NAME _____

Circle the letter of the best answer to each question below.

1. What are three states of matter?

   a. ice, water, and steam

   b. hot, warm, and cold

   c. atoms, molecules, and matter

   d. solid, liquid, and gas

2. When boiling water turns to steam, the water has

   a. gone through a chemical change.

   b. gone through a physical change.

   c. melted.

   d. All of the above

3. Two apples are placed on a balance, one on each side. Each apple is sealed inside a jar. The balance reads level, so you know that the mass of each apple and its jar is equal to the other. A flame is placed underneath the apple on the left. Soon, it becomes shriveled and much smaller than the apple on the right. How does the balance read now?

   a. The right side is heavier.

   b. The left side is heavier.

   c. The balance is still level.

   d. Not enough information is given.

Write your answers on the lines below.

4. Explain why you chose your answer to question 3.

   _____

   _____

5. List two things that can cause matter to change states.

   _____ _____

6. When an oxygen atom is added to H_2O, or water, you get H_2O_2, or hydrogen peroxide.

   This is an example of a _____ change.