1. Write **T** if the statement is true; write **F** if the statement is false.

   - ____ Air can be compressed (pushed into a smaller space).
   - ____ Air has no mass.
   - ____ Air is made of particles too small to see.
   - ____ Air takes up space.
   - ____ Air is made of two gases: oxygen and carbon dioxide.
   - ____ Air is in many places, but not in closed containers such as jars.

2. Syringe A has air particles trapped inside of it.
   
a. Draw a model in syringe B to show what the air particles will look like when the plunger is pushed halfway down.

   b. In which syringe is the air more dense? __________

   c. In which syringe is there more air pressure? __________

   d. What happens if you release the plunger?

      *(Mark the one best answer.)*

      - □ **A** It stays right where it is.
      - □ **B** It moves back to where it started.
      - □ **C** It pushes the air into a smaller space.
      - □ **D** It pops out of the top end.
3. You build a pressure-indicator system like the one you see in the illustration at sea level. If you take the device to the top of a mountain 4,000 m high, what change in the system would you see (if you did NOT squeeze the jar on the outside).

(Mark the one best answer.)

- A The water goes down in the straw because there is more air pressure outside the jar.
- B The water will go up in the straw because there is less air pressure inside the jar.
- C The water in the bottle will compress because there is more air pressure inside the bottle.
- D The water in the straw will go down, the water in the bottle will go up and compress the air in the bottle.

4. You are an engineer who designed a new grocery bag that keeps frozen foods frozen on the trip home. Explain how the bag you designed minimizes thermal-energy transfer.

a. The insulation in the bag is made of ________________________.

b. Explain how the bag you designed minimized thermal-energy transfer.

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
5. Study the weather map above.

   a. If air pressure were the only factor that determined the direction that winds blow, which arrows correctly indicate which way and where the wind is blowing?

      _____ A _____ B _____ C _____ D

   b. What other factors can affect the direction in which prevailing winds blow?

      __________________________________________
      __________________________________________
      __________________________________________
      __________________________________________
      __________________________________________
      __________________________________________
6. Complete the model to show what happens.

Observation 1
The dropper was used to put cold water into room-temperature water.

Observation 2
A small bag of warm water was placed next to the vial.

Observation 3

How does this model help us understand how winds blow across Earth?

7. Complete the model to show what happens in the air when the Sun shines on land and water.

Explain why that happens.
8. Draw and describe a model to explain how energy transfers when water-vapor particles in the air come in contact with the leaf of a plant that is cooler than the air.

Draw your model here

9. Draw and describe a model to explain how energy transfers when water evaporates from a pond on a warm sunny day.
10. Use this picture to answer parts a and b of this item.

   a. Complete the model pictured here by adding labels to explain the general cycling of water through Earth’s systems driven by energy from the Sun and the force of gravity.

   b. What are the limitations of this model? (What is it missing?)

   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
11. Match these cause-and-effect relationships.

_____ The Sun’s energy heats liquid water particles.  

_____ Water vapor in the air transfers energy to condensation nuclei in the air.  

_____ Gravity pulls things toward Earth’s center.

X Water moves downhill and potentially into a large body of water.

Y Clouds form.

Z Evaporation and transpiration occur.

12. The diagram shows a typical model of Earth’s orbit around the Sun. The letters indicate four positions in Earth’s orbit.

Winter in the Southern Hemisphere would be in location _________.

Summer in the Southern Hemisphere would be in location _________.

13. A student is looking at a weather report that says this will be the coldest winter in several years. The student says, “I don’t understand, I thought we were in the middle of global warming?”

Explain why it is important to know the difference between weather and climate when discussing global warming.
14. In July, Barrow, Alaska (latitude 71.2° N), receives 24 hours of sunlight each day; Riverside, California (latitude 33.9° N), receives 14 hours of sunlight each day. The average high for Barrow in July is 8.3°C. The average high for Riverside in July is 34.2°C.

Explain this phenomenon. Why does a city that receives 10 hours more sunlight each day have colder average temperatures?

15. Use the data table below to answer the questions.

<table>
<thead>
<tr>
<th>City</th>
<th>Distance from ocean (km)</th>
<th>Latitude</th>
<th>Elevation (m)</th>
<th>Hours of daylight in July</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>45° N</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>300</td>
<td>47° N</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>405</td>
<td>48° N</td>
<td>44</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>395</td>
<td>9° N</td>
<td>48</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>804</td>
<td>25° N</td>
<td>3000</td>
<td>13</td>
</tr>
<tr>
<td>6</td>
<td>782</td>
<td>28° N</td>
<td>20</td>
<td>13</td>
</tr>
</tbody>
</table>

a. Which city, 1 or 2, would you expect to have a more moderate climate? _________
   Which data column did you use to decide? ○ A ○ B ○ C ○ D

b. Which city, 3 or 4, would you expect to have a warmer climate? _________
   Which data column did you use to decide? ○ A ○ B ○ C ○ D

c. Which city, 5 or 6, would you expect to have a warmer climate? _________
   Which data column did you use to decide? ○ A ○ B ○ C ○ D
16. The two maps above provide information about tornadoes in the United States.

   a. If you were considering taking a job in Chicago, Illinois, or in Atlanta, Georgia, which map would provide better information to make that decision if you were concerned about tornado activity? Explain why you chose that map.

   b. You are a member of the city council in a town that has experienced tornadoes in the past. Which of these recommendations would you try to convince people in your town to adopt? Write Y (yes) next to those to adopt; write N (no) next to those not to adopt.

      _____ Build a new mobile home park in the city.
      _____ Purchase a siren system for the town to use as an early warning system.
      _____ Have children in schools practice duck-and-cover drills.
      _____ New homes must include a basement in order to get a building permit.
17. A student makes a claim, starting a lively class debate. Here is the claim:

“It is more important to insulate your home if you live in Minnesota than in Arizona. In Minnesota, the winters are very cold and the summers are hot; in Arizona, the winters are mild, and the summers are very hot.”

What questions do you need to ask in order to take a side in this debate?

Write Y (yes) if that question should be asked; write N (no) if that question would not help you decide which side to take in the debate.

_____ How much electricity does an air conditioner use per hour at different temperatures?
_____ How is electricity generated for use in North Dakota and New Mexico?
_____ On average, how many homes run furnaces on natural gas and how many on electricity?
_____ How much does it cost to insulate the average home?
_____ How many months do people in each state use air conditioning and heating?

18. As countries develop over time, their populations grow and demand for electricity increases. People want cell phones, air conditioning or heating for their homes, more meat in their diets, automobiles, and so forth.

Write Y (yes) next to each statement that describes an action that could contribute to climate change; write N (no) next to each statement not likely to contribute to climate change.

_____ Burning more fossil fuels to create electricity for cell phones and other appliances
_____ Creating more pastures for cattle
_____ Developing solar power to produce more electricity
_____ Driving more cars
_____ Buying only foods produced in large quantities, grown in distant locations
_____ Using wind power to create electricity for cities