Answer the following according to the graph below.

1. At what temperature does water boil?

2. Why is the temperature not rising between points B and C even though heat is still being added?

3. What is happening between points D and E?

4. How much energy is required between points D and E? Is it being added or released?

5. What type of change is occurring between points E and D?

6. How much energy is required between E and D? Is it being released or added?

7. Does the temperature of liquid water ever rise above 100°C?

8. Between which points is Latent heat occurring?

9. What is happening to the liquid water between points D and C?

10. What type of phase change is occurring between C and D?

11. During freezing and condensation, is energy being added or released?

12. How many joules are released during condensation?

13. How many joules are added during vaporization?

14. How many joules are added during melting?

15. __________ many ____________ are ________________ during ________________?
1. As heat energy is added to an open container of boiling water, the temperature of the boiling water will
   A) decrease  B) increase  C) remain the same
2. Which substance has the highest specific heat?
   A) iron  B) water  C) lead  D) granite
3. If equal masses of water in various phases (states) are compared, which phase will contain the greatest amount of stored energy (latent heat)?
   A) solid ice  B) liquid water  C) water vapor
4. Water loses energy when it changes phase from
   A) gas to liquid  B) solid to liquid  C) solid to gas  D) liquid to gas
5. Which material requires the least amount of energy to change its temperature 1°C per gram?
   A) iron  B) ice  C) water  D) lead
6. Equal masses of basalt, copper, granite, and iron that are at room temperature are placed in boiling water. Which sample would reach the same temperature as the boiling water first?
   A) basalt  B) copper  C) granite  D) iron
7. At which temperature will ice melt under normal conditions?
   A) 0 K  B) 32 K  C) 212 K  D) 273 K
8. A large amount of latent heat is absorbed by water during
   A) evaporation  B) freezing  C) condensation  D) precipitation
9. What is the total number of energy required to melt 1 gram of ice at 0°C to liquid water at 0°C?
   A) 1 J  B) 334 J  C) 3340 J  D) 2260 J
10. Which factor has the greatest influence on the number of daylight hours that a particular Earth surface location receives?
    A) longitude  B) latitude  C) diameter of Earth  D) distance from the Sun
11. Increasing the amount of carbon dioxide in Earth’s atmosphere increases atmospheric temperature because the carbon dioxide absorbs
    A) incoming solar gamma ray radiation  B) incoming solar visible light radiation  C) outgoing terrestrial ultraviolet radiation  D) outgoing terrestrial infrared radiation
12. Base your answer to the following question on the graph below, which shows the temperature increase of samples of water, granite, iron, and lead. Each sample has a mass of 100 grams. Each sample was placed an equal distance from a light bulb and heated for a 10-minute period. This investigation was performed at room temperature under ordinary classroom conditions.

Which sample would decrease in temperature at the greatest rate after the heat source is removed?
   A) iron  B) lead  C) granite  D) water
Base your answers to questions 13 and 14 on the diagram below. Soil and water were heated for 10 minutes from a starting temperature of 20°C.

13. After the heat lamp is turned off and removed from the area, how will the cooling rates of the soil and water compare?
   A) The soil will cool faster because it is a good reflector.
   B) The soil will cool faster because it has a lower specific heat.
   C) The water will cool faster because it is a good absorber.
   D) The water will cool faster because it has a higher specific heat.

14. What were the rates of heating for the soil and water?
   A) soil: 1.8° C/min; water: 0.4° C/min
   B) soil: 9° C/min; water: 2° C/min
   C) soil: 20° C/min; water: 20° C/min
   D) soil: 38° C/min; water: 24° C/min

15. Base your answer to the following question on the diagram below. The diagram shows a classroom demonstration. Two identical flashlights were placed in the positions shown and they illuminated areas of varying size, A and B, on a classroom globe. Thermometers were then placed at the center of each illuminated area to measure the rate of temperature increase. Readings were taken over a period of 30 minutes.

   Students most likely observed that the temperature of area A increased at a
   A) slower rate than the temperature of area B because area A received rays that were less concentrated
   B) slower rate than the temperature of area B because area A received rays that were more slanted
   C) faster rate than the temperature of area B because area A received rays that were more perpendicular to the surface
   D) faster rate than the temperature of area B because area A received rays with less total energy

Base your answers to questions 16 and 17 on the diagram below, which represents a cross section of the shoreline of Lake Erie.

16. Compared with the change in temperature of the water surface, the change in temperature of the land surface will be
   A) faster, because the land has a lower specific heat
   B) faster, because the land has a higher specific heat
   C) slower, because the land has a lower specific heat
   D) slower, because the land has a higher specific heat

17. Which characteristics of the land surface have the greatest effect on the amount of insolation the land surface absorbs?
   A) hardness and age
   B) density and hardness
   C) age and roughness
   D) roughness and color

Base your answer to the following question on the diagram below, which shows incoming solar radiation passing through the glass of a greenhouse and then striking the floor.

18. Describe one way the glass in the greenhouse acts like the greenhouse gases in Earth's atmosphere.

19. Some of the incoming solar radiation is absorbed by the floor. Identify the type of electromagnetic energy rerradiated by the floor.
20. Base your answer to the following question on the diagram below, which represents four stations, A, B, C, and D, in a laboratory investigation in which equal volumes of sand at the same starting temperature were heated by identical light sources. The light sources were the same distance from each station, but at different angles to the surfaces. Two thermometers were used at each station, one just above the surface and the other just below the surface. The lights were turned on for 30 minutes and then removed for the next 30 minutes. Temperatures were recorded each minute for the 60 minutes.

(Not drawn to scale)

Which type of sand surface would most likely absorb the most radiation?

A) dark-colored smooth surface
B) dark-colored rough surface
C) light-colored smooth surface
D) light-colored rough surface

Base your answers to questions 21 and 22 on the passage below.

**Ozone in Earth’s Atmosphere**

Ozone is a special form of oxygen. Unlike the oxygen we breathe, which is composed of two atoms of oxygen, ozone is composed of three atoms of oxygen. A concentrated ozone layer between 10 and 30 miles above Earth’s surface absorbs some of the harmful ultraviolet radiation coming from the Sun. The amount of ultraviolet light reaching Earth’s surface is directly related to the angle of incoming solar radiation. The greater the Sun’s angle of insolation, the greater the amount of ultraviolet light that reaches Earth’s surface. If the ozone layer were completely destroyed, the ultraviolet light reaching Earth’s surface would most likely increase human health problems, such as skin cancer and eye damage.

21. Explain how the concentrated ozone layer above Earth’s surface is beneficial to humans.

22. State the name of the temperature zone of Earth’s atmosphere where the concentrated layer of ozone gas exists.