1. Evaporation is the change of
   A) a solid into the liquid phase.
   B) a gas into the solid phase.
   C) a liquid into the gas phase.
   D) a gas into the liquid phase.

2. Evaporation of a liquid is a cooling process:
   A) the lower energy liquid molecules collide with and stick to a cooler surface, and cool that surface.
   B) the lower energy molecules sink, and the higher energy molecules spread out and cool down.
   C) the higher energy liquid molecules escape, leaving the lower energy molecules behind.
   D) the higher energy molecules give their energy to the lower energy molecules, lowering the average energy and thus the temperature of the liquid.

3. Wetting the cloth cover of your canteen on a hot day is
   A) a bad idea; it will cause the water inside to get hotter as the wet cover absorbs more heat.
   B) a good idea; the evaporating water cools the cloth, the canteen, and the water inside it.
   C) useless. This has no effect on the temperature of the water inside.
   D) just plain weird. Who thinks up this stuff anyway?

4. It is not possible for a solid substance to change directly to the gas phase.
   A) True; it must go through a liquid phase first.
   B) False; the process is called sublimation, and can be seen when dry ice “smokes” as it evaporates.
   C) False; the process is possible, but only for water and only under extreme circumstances.
   D) Mostly true. Only one known substance can do it: dumbledorium.

5. Regelation occurs when a
   A) liquid freezes into the solid phase.
   B) gas cools into the liquid phase.
   C) solid melts under pressure, then refreezes.
   D) liquid evaporates into a gas.

6. Condensation is a warming process:
   A) the lower energy gas molecules escape, leaving the higher energy molecules behind.
   B) the higher energy molecules give their energy to the lower energy molecules, increasing the average energy and thus the temperature of the gas.
   C) the higher energy gas molecules collide with and stick to a warmer surface, warming it up further.
   D) the lower energy gas molecules collide with and stick to a cooler surface. The gas molecules left behind have a higher average energy and temperature.

7. When a water droplet condenses on the side of your Coke can,
   A) it takes energy away from the can and cools it down.
   B) it takes energy away from the can and warms it up.
   C) it adds energy to the can, warming it up.
   D) it adds energy to the can, cooling it down.

8. As you continuously add heat to a pan of water on the stove, the water temperature
   A) continues to rise as long as more heat energy is added.
   B) rises to 100°C. Any additional heat will cause the water to boil, as the energy is used to change the phase, not raise the temperature.
   C) decreases, because boiling is actually a cooling process.

9. A pan of water in Flagstaff, Arizona (at 7800 ft above sea level) boils
   A) at a higher temperature than a pan of water in Ocean Shores, Washington (at sea level).
   B) at a lower temperature than a pan of water in Ocean Shores.
   C) at the same temperature as a pan of water in Ocean Shores.
   D) as soon as you quit watching it, regardless of its temperature.

10. Energy is absorbed by a substance when the phase changes
    A) from liquid to solid or from liquid to gas.
    B) from gas to liquid or from liquid to solid.
    C) from solid to liquid or from liquid to gas.
    D) from gas to solid or from solid to gas.
11. Energy is given up or released by a substance when the phase changes
   A) from liquid to solid or from liquid to gas.
   B) from gas to liquid or from liquid to solid.
   C) from solid to liquid or from liquid to gas.
   D) from gas to solid or from solid to gas.

12. As energy is added to a solid block of ice,
   A) it will melt completely before its temperature can begin to rise.
   B) its temperature will start to rise before any of the ice starts to melt.
   C) the ice starts to melt and the temperature starts to rise simultaneously.
   D) either could happen first; it's totally random.

13. Why is the latent heat of vaporization for water (540 cal/g) so much larger than the latent heat of fusion for water (80 cal/g)?
   A) Because the hot water that is getting ready to boil already has more energy than the cold water that is getting ready to freeze.
   B) To change from the liquid to gas phase, energy is required to break the bonds between water molecules. Then more energy is required to overcome surface tension as the water molecules jump off the surface.
   C) To change phase from the liquid to solid, bonds are formed between water molecules. From liquid to gas, bonds are broken. It always takes more energy to break bonds than make bonds.
   D) It isn't; 540 cal/g is not correct. The latent heats are the same for either fusion of vaporization, because it does not matter which direction the phase change happens: solid to liquid or liquid to gas, the same amount of energy is required to break the bonds between the molecules.

14. Latent heat of fusion is the amount of energy required
   A) to completely change the phase of 1g of a substance from liquid to solid.
   B) to completely change the phase of 1g of a substance from solid to liquid.
   C) to completely change the phase of 1g of a substance from liquid to gas.
   D) either A or B is correct; the phase change can be in either direction.

15. Latent heat of vaporization is the amount of energy required
   A) to completely change the phase of 1g of a substance from liquid to solid.
   B) to completely change the phase of 1g of a substance from solid to liquid.
   C) to completely change the phase of 1g of a substance from liquid to gas.
   D) either A or B is correct; the phase change can be in either direction.

16. More energy is required to solidify 1g of liquid water than to vaporize it.
   A) True; it requires 80 calories to vaporize the liquid.
   B) True; it takes 540 calories to solidify the liquid.
   C) False; it takes 540 calories to vaporize the water, vs. 80 calories to solidify it.
   D) False; it takes exactly 100 calories of energy to make either phase transition.

17. Adding 100 calories of heat to 1g of solid ice at 0°C results in
   A) liquid water at 100°C.
   B) liquid water at 80°C.
   C) liquid water at 20°C.
   D) solid ice at 0°C.

18. How much total heat is necessary to completely vaporize 1g of ice initially at 0°C?
   A) 80 calories.
   B) 100 calories.
   C) 540 calories.
   D) 720 calories.