Answers to Questions:

1) They must collide with each other. If two molecules are reacting then they must collide with enough energy (called the activation energy) to break their initial bonds so that new bonds can form.
2) Temperature, in general, increases the reaction rate because the reactants are moving faster, so they hit more often, having more collisions. Each time there is a collision, there is a chance that a reaction can occur, so more collisions means more reactions.
3) Higher concentration means there are more reactant molecules in a certain area, so there will be more collisions, so the reaction will go faster.
4) If there is more surface area then more of the solid's molecules are exposed to whatever molecules they may be reacting with. That means there will be more collisions, and a faster reaction.
5) The chemical reaction for the lantern is: fuel + oxygen --> combustion products (it doesn't matter what these are to answer this question). So, if the air is pressurized, then the concentration of oxygen will be greater. That means there will be more collisions between oxygen molecules and fuel molecules, so the reaction will go faster and the lanterns will burn much brighter.
6) The potential to form a bond. Unbonded things have the most chemical potential. Weakly bonded things can easily break those bonds and form stronger bonds, so they have less chemical potential. And strongly bonded things would have a hard time bonding with anything stronger, so they have the least chemical potential.
7) The chemical potential energy is converted to other forms of energy, so it can't build up in our bodies. The chemical potential energy is converted to heat energy (so we keep a constant temperature), kinetic energy (when we move any part of our body), gravitational potential energy (whenever we climb stairs or hills), and electrical energy (as small electrical currents are generated across the walls of our cells or sent through nerve cells to our brains).
8) Two separate atoms. When they bond they will be attracted to each other and rush toward each other, converting their chemical potential to kinetic/heat energy.
9) Two separate molecules for the same reason as in number 8. However, the bond formed between two separate molecules will always be a weak van der Waals bond. The bond between two atoms is almost always a strong covalent or ionic bond. So, two separate atoms have more chemical potential than two separate molecules.
10) A weak van der Waals bond.
11) The weaker bonded molecule has more chemical potential energy because those bonds can easily break, making it possible for the atoms in that molecule to bond more strongly with other atoms. Explosives work in this way. Atoms are weakly bonded in the explosive, but rearrange to form molecules with very strong bonds during the explosion. The formation of the strong bond converts an enormous amount of chemical potential energy to kinetic/heat energy.
12) Weak van der Waals bonds mostly occur between molecules, and strong covalent or ionic bonds occur between atoms.
13) Water is a liquid at room temperature because the water molecules are attracted to each other via van der Waals bonds, AND because the surrounding air pressure pushes them together.
14) Individual water molecules consist of two hydrogens covalently bonded to an oxygen. These water molecules are bonded to each other with van der Waals bonds. To get the water to boil the water molecules have to break the van der Waals bond (not the covalent bonds in the molecule) so they can separate from each other. Because the molecules are held close together from both the van der Waals bond and the surrounding air pressure you can boil water by lowering the air pressure, or heating the water. Lowering the air pressure works because the pushing force from the air no longer helps to hold the molecules together. Heat the water works because heating the molecules makes them bounce around more. Eventually, if they are heated enough they can break free of both the van der Waals bond AND the surrounding air pressure.
15) It is usually converted to heat and/or light energy.
16) All of the heat energy is converted to potential energy as the van der Waals bonds are broken between water molecules. As you add heat, it causes some water molecules to bounce around enough to break the van der Waals bond. Breaking of bonds converts heat to potential, so the heat goes down. The addition and conversion of heat energy is balanced so the temperature does not increase.
17) When condensation occurs, weak van der Waals bonds are forming. Because the bonds are weak, little chemical potential energy is converted to heat. Typically, during a chemical reaction, strong covalent and ionic bonds are forming, so more chemical potential energy is converted to heat energy.
18) Endothermic means a reaction converts heat to potential, so heat energy is absorbed and things cool down (or stay the same temperature as more heat is added). Exothermic means a reaction converts chemical potential to heat energy, so things warm up (or stay the same temperature if you continually cool the reaction).

19) A reaction reaches chemical equilibrium when the concentration of reactants (stuff on the left side of the arrows) and the concentration of the products (stuff on the right side of the arrows) remains constant. This is due to the fact the the reaction rate from left to right is the same as the rate from right to left.

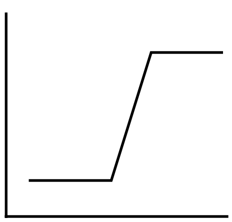
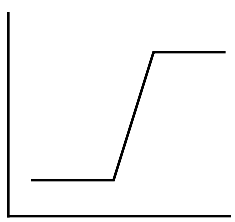
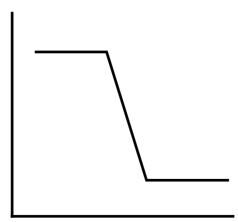
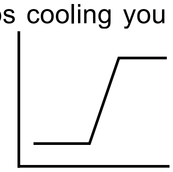
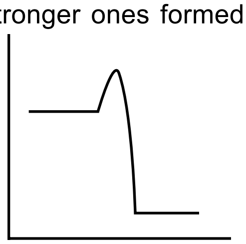
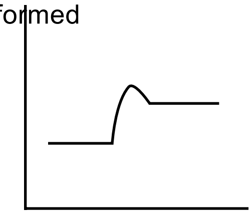
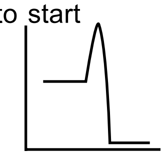
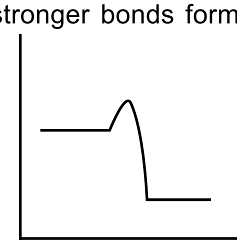
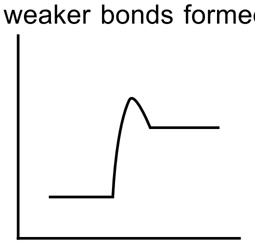
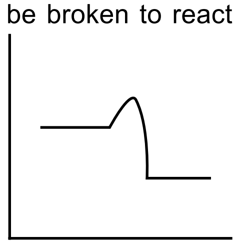
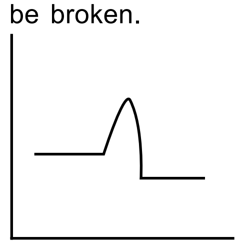
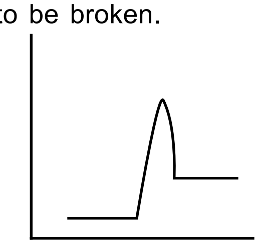
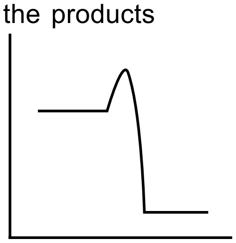
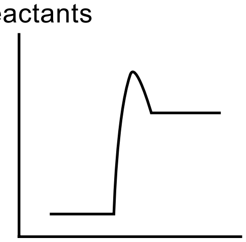
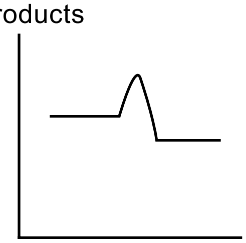
20) a: They will be constant.

b: It will respond to reduce “A” by running the reaction from left to right (forming “AB”) . This happens because the addition of “A” causes a sudden increase in the concentration of “A”, causing more collisions between “A” and “B”. This increases the rate of reaction between “A” and “B”, so the reaction goes from left to right more quickly. Eventually, when the amount of “A” is reduced and the amount of “AB” is increased, equilibrium will be reached again.

c: Cooling it means you are reducing the heat energy, so the reaction will go in a way that will produce more heat energy. The formation of “AB” is exothermic which converts potential to heat energy, so the reaction will go from left to right, forming more “AB” and producing more heat, eventually reaching equilibrium once again.

d: Increasing the pressure will cause the equilibrium to react in such a way as to reduce the pressure. If you look at the equation you can see that if ALL the “A” and “B” combined to form “AB” then there would be half as many molecules than if all the “AB” broke apart into “A” and “B”. Having less molecules bouncing around would reduce the pressure, so the reaction will go in the direction to produce “AB” which takes two separate molecules and makes one molecule. Eventually, the equilibrium will be reached again.

Potential Energy Diagrams:

1) bonds broken 	2) bonds broken 	3) bonds formed 	4) bonds broken - heat energy converted to potential so temperature drops cooling you off 
5) bonds broken and stronger ones formed 	6) stronger bonds broken and weaker bonds formed 	7) bonds broken and much stronger bonds formed, but the reaction requires a lot of energy to start 	8) weaker bonds broken - stronger bonds formed 
9) stronger bonds broken - weaker bonds formed 	10a) single bond needs to be broken to react 	10b) Double bond needs to be broken. 	10c) Triple bond needs to be broken. 
11a) more stable bonds in the products 	11b) more stable reactants 	11c) slightly more stable products 	11d) slightly more stable reactants