a) at 0 º Celsius, ice melts and becomes liquid water. then the temperature increases and at 100 º Celsius, the liquid water becomes gaseous.

b) if the water vapor was caught in a sealed container, you will get the same amount of liquid water or ice as before (only the state of matter changes, due to change in the relation between the molecules and not the molecules themselves)

c) first, it becomes liquid, it melts, but immediately after it turns brown. the sugar molecules fall apart, the energy of the heat breaks the molecule apart, afterwards it might even "burn", react with oxygen... it is thermally instable.

d) the temperature of this brown substance changes but nothing else. you won't get the original sugar back.

e) carbon atoms

f) as you heat up water or sugar they get more ready to react with oxygen of the air. water won't react, but changes it's state of matter, sugar molecules however will fall apart or react before they can change their state of matter.

g) because water and iron both contain movable particles. in water the molecules can move around freely, and in a piece of metal there are free electrons which move around. the molecules in sugar and salt however are fixed in position in a lattice, they can not move the heat energy increases the speed of the molecules and they bump into each other and pass the vibration on that way.

h) the vibration or speed of the molecules is what we measure as temperature

i) water and alcohol are both very small molecules and kerosene and oil are much bigger. and they also have a long chain of C-C-H bonds which have different properties than the O-H bonds.

j) they have a different boiling point, so you can separate using this property, it is called distillation

k) in the periodic table the atoms are ordered according to the numbers of protons inside the nucleus, this is the atomic number

l) the atomic weight is basically the sum of protons and neutrons in the nucleus, the number which is listed on the periodic table is an average weight of the respective atom (in nature you always find atoms with different numbers of neutrons)
e.g. most carbon atoms have 6 neutrons in the nucleus, a few however have 7 and some have 8. that's why the average is 12.011

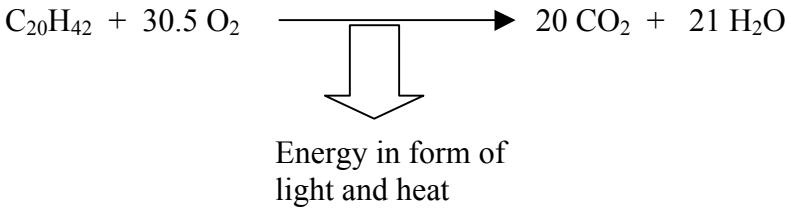
m) pure substance: consists only of the same kind of particle, can be molecule (water), ions (salt), we can not separate this substance any further with physical methods like filtration, distillation etc.) for metal we mostly mean: consists of one kind of metal atom (pure gold)

element: in the periodic table all the elements are listed. an element is a substance which contains only one sort of atoms, all the atoms of an element contain the same amount of protons in the nucleus. it can not be further dissected into a simpler substance.

ionic compound: a substance formed by the combination of elements, ions are attracted to each other and held firmly in position inside a lattice

covalent compound: a substance formed by the combination of elements, the atoms involved are sharing electrons and therefore build stable particles called molecules.

n) wax or paraffin reacts with oxygen from the air and builds carbon dioxide and water.



1. at the beginning, the carbon atom is part of a paraffin molecule. the paraffin molecules stay in position and are surrounded by always the same neighboring paraffin molecules (solid wax)
2. as the temperature increases, the molecules start to vibrate more and eventually they start moving around and changing neighbors (liquid wax). the carbon atom is still part of the same molecule.
3. as liquid wax, the paraffin molecule with our carbon atom gets sucked up the wick towards the flame.
4. as the temperature near the flame increases even more, there is enough energy for the molecule to fall apart, so our carbon atom is now alone or as a fragment
5. The hydrogen reacts first inside the flame (bluish invisible part of flame) and the carbon atom reacts with oxygen from the air to build carbon dioxide. this reaction sets energy free in form of an orange light and heat

o) carbon has one electron each in all four outer orbital and can therefore bind (take up) four electrons (here from four H atoms)
p) Mg donates 2 electrons to either of the Cl atoms...
q) see periodic table
r) a silver atom gives one electron into the pool, into the freely moving electron “glue”...
s) the iron atoms give 3 electrons each to the oxygen atoms present.

Biology

1. cells are the smallest building blocks of organisms. all organisms are made from cells. some are only one cell, others are made from many different cell. in a suitable environment they can survive even outside the mother organism.
2. membranes separate two spaces from each other. in cells it controls what enters and what leaves the cell, so it is the barrier between inside and outside. also cell organelles are separated form the cytoplasma through membranes.

3. a partially permeable membrane is selectively permeable. some molecules can pass with no problems, others can't pass at all. In cells, the cell membrane is permeable for small molecules like water, oxygen, carbon dioxide etc. but not for bigger ones like proteins, sugars etc. (these ones need special transport proteins or transport channels inside the membrane to pass, like doors in a wall)
4. a) same, b) 4 g, c)100g d) 6mg
5. the left side with the stone has the higher water molecule concentration. on the right side, the sugar molecules dissolved in water take up some space. so if you compare the same volume of liquid from left and right, the left has more water molecules, because they can fill up all the volume, there is nothing else than water molecules...
6. our skin is also made from cells. since the inside of our cells is a salty solution, the osmotic pressure brings water from the bath tub into our cells. so they become heavier...
7. to transport oxygen and food to the body cells and take up the waste products.
8. if the arteries of the heart, coronary arteries, get clogged, some heart muscle cells may not get enough oxygen and food and they stop to work, if many stop to work, the heart stops to beat all together, this is a heart attack. the factors are: genetic, and life style like fatty foods, high cholesterol intake, high blood pressure, nicotine. this factor can all lead to atherosclerotic disease, where wall of the arteries build a so called plaque (thickening of the cells of the blood vessel), if calcium and cholesterol are present, the bore of the vessel will get smaller and smaller and if a blood clot gets stuck... bad luck!!!
9. the blood needs to get faster to the cells because they need more food and oxygen. the heart beat rate increases and so does the intensity of contraction of the heart: the blood gets squeezed out of the heart with more pressure (systolic blood pressure)
10. the energy which is produced during photosynthesis inside the guard cells plays a role in the regulation of the stomata. this energy is used to run the proton pump. it pumps protons out of the cell and creates therefore an electric potential (many positive particles outside the cell) which drives K^+ ions inside the cell. this creates an osmotic situation where water flows into the cell and this makes the cell swollen and this opens the stomatas...
11. in form of two molecules, one is called ATP (energy currency of living cells) and the other NADPH (carries the electrons). We just called them molecules A and B.