When it comes to the Trends of the Periodic Table ANSWERS

B MTLD	K M	Li M	C NM	Ar NM
Sb MTLD	H NM	Fe M	Au M	S NM
F NM	Si MTLD	Fr M	He NM	Rn NM
Ge MTLD	Al M	As MTLD	Bi M	I NM

2. Group 1: alkaline metals, Group 2: alkaline earth metals, Group 17: halogens, Group 18: noble gases

3. Elements in the same group have identical valence electron configurations, so they all make the same sorts of ions (cations for metals, anions for non metals, no ions for noble gases). Since they make the same sorts of ions, they bond the same way. Bonding is exactly what chemical properties are. .

4. Noble gases don't usually react because they have FULL valence orbitals, they don't want to transfer or gain electrons from other atoms. They are non-reactive because of their electron arrangement.

5. STP is Standard Temperature and Pressure, found on table A of the reference tables.

6. The only 2 elements that are liquid at STP are bromine and mercury.

7. The gases are: H, He, N, O, F, Ne, Cl, Ar, Kr, Xe, and Rn.

8. The elements of the periodic table are arranged in order of increasing atomic number.

9. The 7 diatomic elements are the HONClBrIF twins.

10. electronegativity is the scale that measures the tendency to gain electrons in a bonding situation by an atom, developed by Linus Pauling. It's both arbitrary, which means the numbers don't have an intrinsic meaning - he just choose 0 to 4 because he could, and the scale is relative, which means that all atoms are ranked by this tendency as compared to the atom fluorine. Fluorine has the highest electronegativity value of 4.0

1st ionization energy is the amount of energy required to make one mole of atoms into a "first order" cation of +1 charge. This energy is in kJ/mole. For some atoms, like in group 1, this is sensible. For other atoms there is also 2nd ionization energy, third ionization energy, etc. Further, none of the nonmetals have any normal tendency to become +1 cations, but this can be forced upon them if you provide enough energy.

atomic radius is the distance from the center of the nucleus to the outer edge of the electron orbital, in picometers. ionic radius is the size of the cation, or the anion. In high school this is just relative size, we have no chart with actual measurements. Cations are smaller than atoms they form from, anions are always larger than the atoms they formed from.

10 continued

net nuclear charge is the overall, or net charge, of just the nucleus of an atom. Since that part contains only + protons and neutral neutrons, it's always positive. How positive? That matches the number of protons. The atom with 12 protons, magnesium, has a net nuclear charge of +12 (not JUST +, not 12 either).

metallic + non-metallic character means if you were to rank all of the properties of metals (or nonmetals) your would be able to rank the atoms as more or less metallic, and also more or less nonmetallic. The most metallic element is francium (bottom left), most nonmetallic is helium (top right). It's based upon general location on the periodic table, it's specifically not exact.

allotropes are identical atoms that are bonded together in different ways, they have a different physical arrangement of atoms and they also have different chemical properties too. Common examples are oxygen and ozone (O_2 and O_3) and diamonds and graphite (both pure carbon).

11. The group trend for electronegativity is decreasing, the period trend for electronegativity is increasing. All atoms are ranked relative to fluorine, the closer you are to F the higher your EN Value. The noble gases tend to have no EN values, this is an exception to this trend.

12. The group trend for 1^{st} ionization energy is decreasing, because the further those electrons get from the nucleus the weaker the inward attraction is, the easier (the less energy it takes) to remove them. The period trend for 1^{st} ionization energy is increasing because in a period the elements all have the same number of orbitals but ever increasing numbers of protons. These extra protons exert a greater inward attraction making the electrons more strongly attracted to the nucleus, harder to pull off.

13. skip

14. The group trend for atomic radius energy is increasing because as you go down any group you are adding full orbitals. That makes the atoms get progressively larger. The period trend for atomic radius is decreasing for the same reason that the 1st ionization energy increases in question 12: Because in a period the elements all have the same number of orbitals but ever increasing numbers of protons. These extra protons exert a greater inward attraction pulling the electrons closer to the nucleus.

15. The group trend for metallic character is increasing because with this silly trend, the closer the atom's box on the periodic table is to Fr, francium, the more metallic it is. The period trend for metallic character is decreasing for the same reason, the closer the atom's box on the periodic table is to Fr, francium, the more metallic it is.

16. The group trend for non-metallic character is decreasing, because in this silly trend, the closer an atom's box on the periodic table is to He, helium, the more non-metallic it is. The period trend for non-metallic character is increasing for the same reason: the closer an atom's box on the periodic table is to He, helium, the more non-metallic it is.

17. The group trend for net nuclear charge is increasing, because the number of protons increases dramatically as you go down the boxes of a group on the periodic table. The period trend for net nuclear charge also increases, although it does so at a much slower rate since the protons are added one per box in the periods.

18. The group trend for cation size is increasing. Although cations are much smaller than the atoms they form from because they lose the whole outermost orbital (the valence orbital) when the cation forms, the atoms are bigger and the cations are bigger because going down a group the box below always has a whole orbital more than the box above it.
The period trend for cation size is decreasing, because even though the atoms of a period have the same number of orbitals (as atoms and as cations) the number of protons is ever increasing, pulling the electrons inward making the cation sizes smaller.

19. The group trend for anion sizes follows the same plan as above. Even though the anions are slightly larger than the atoms they form from, going down the group the atoms or the anions all have one more orbital than the box above.
The period trend for anion size is decreasing, because even though the atoms of a period have the same number of orbitals as atoms and as anions, the number of protons in ever increasing, pulling the electrons inward making the anion sizes smaller.

20. Compared to the nonmetals, metals have the tendency to lose electrons and form cations, have luster, conduct heat and electricity better, are malleable and ductile, have a higher density, higher melting points, have higher boiling points, have lower electronegativity values, lower first ionization energy, greater atomic size (compared to the nonmetals in their same period), and have lower specific heat capacity constants.

21. Compared to the metals, nonmetals have the tendency to gain electrons and form into anions, are dull (non-lustrous), are brittle (shatter when banged on), have lower density, lower melting points, lower boiling points, have higher electronegativity values (not including the noble gases), higher first ionization values (including the noble gases), smaller atomic size (compared to metals in their same period), and have higher specific heat capacity constants.