

Crazy mistakes on the June 2015 Chem Regents compiled by Charlie Arbuiso

Any question listed here has a lower than 80% correct response level. That should not happen again this year.

1. Atoms that have the same number of protons, but different numbers of neutrons are CALLED ISOTOPES. (55%)
2. The proton number sets the atomic number. The number of protons = the number of electrons.
Different numbers of protons means different isotopes of the atom
3. Protons have equal but opposite charge as electrons. Protons have mass of 1 amu, in high school electrons have almost no mass. Protons and neutrons have just about the same mass, both being 1 amu.
4. Element X (!) XCl_4 , this means that an element (X) must make 4 bonds. There are no unknown atoms.
5. A balanced chemical equation represents conservation of matter (mass), conservation of charge (in redox mostly) and conservation of energy (thermochem). You can only change coefficients (big numbers IN FRONT of species). You can't adjust the compound formulas themselves.
6. Unknown elements do not exist. If two atoms are in a group, one known, and the other "unknown", they have similar electron configurations, which means that they will bond the same way. This means that they share CHEMICAL PROPERTIES. They're similar that way.
7. Percent comp by mass requires you to write the formula and to think. The % comp by mass of sodium in sodium chloride is found by dividing the mass of JUST THE SODIUM by the mass of THE WHOLE compound, then X 100% So, $[23g/58g] \times 100\% = 39.7\%$ Na by mass. That means that 39.7% of ANY amount of NaCl is sodium, the REST is chlorine.
8. Formulas can be: molecular (or chemical), structural (diagrams), empirical (ratio/dopey).
9. Ionic bonds transfer electrons from metals to nonmetals, and are then attracted together strongly by opposite charge. These are never single, double or triple. By definition they are polar (positive and negative sides exist). Covalent bonds are between 2 or more non metals, and electrons are shared. Atoms can share one electron each (2 total) in a single bond, or two electrons each (4 total) in a double bond, or even three electrons each (6 total) in a triple bond. These bonds can be nonpolar or polar, depending upon difference in electronegativity values.
10. Lewis Dot diagrams show ONLY VALENCE ELECTRONS, each dot is an electron. Dots show up in pairs when not bonding, and only use brackets with ions.
11. Great difference in electronegativity value means a strongly polar bond, no difference in EN value is nonpolar bond.
12. Metals and nonmetals bond ionically. Nonmetals only bond covalently. Pure metals make metallic bonds.
13. Solutions are homogeneous mixtures. Concentration of these solutions is in PPM or Molarity. Solute into solvent.
14. Avogadro's Hypothesis: equal volumes of different gases at the same temp and pressure have equal numbers of moles and equal number of particles. Ex: 22.4 L of carbon dioxide and 22.4 L of methane, both at STP. Both are ONE MOLE, both have 6.02×10^{23} molecules. This works for any pressure/temp combo.

15. The kinetic molecular theory talks mostly about IDEAL (fake) GASES. They act like gases all of the time. Most gases act that way too. But real gases have attraction and repulsion for each other. Real gases can form into liquids. Real gases have particles that in fact DO take up space. The real gas particles ARE in constant, fast, straight line but random motion.
16. Adding solute to water increases the BP, decreases the FP. The more you add, the bigger the change. Solutes ALSO decrease the vapor pressure (how well stuff evaporates).
17. At equilibrium, the RATE of the forward reaction EQUALS the RATE of the reverse. Because of this, the amounts of reactants and products remains constant, but the actual particles change sides.
18. The difference between the potential energy of the reactants and products is the HEAT OF REACTION, which means ΔH .
19. The rate of chemical reaction is increased by increasing heat, increasing concentration of reactants, using more surface area, or adding a catalyst. All increase the rate of collisions between reactant particles, except for catalysts. A catalyst lowers the activation energy, or offers an alternate pathway (of lower energy).
20. ISOMERS have similar chemical formulas, but different structures; they have different properties. Examples are ethanol and dimethyl ether, both C_2H_6O .
21. Oxidation numbers are assigned as ZERO to all atoms + all diatomic atoms. All ions have their charge as their oxidation number. Ionic compounds sum to zero but are internally charged. Molecules are not ionic, but have oxidation numbers too.
22. Electrolytes are aqueous solutions with loose ions so they conduct electricity. OR, they are ionic solids that would form into aqueous solutions, if you put them in water. Acids and bases are also electrolytes (they must be aqueous to be acid or base).
23. Alternate acid base theory: AMMONIA is a base, it ACCEPTS H^{+1} ions. Since water provides these H^{+1} ions, water is an acid in THIS reaction. Water is not really an acid in our life. Any substance that can accept a H^{+1} ion is a base. Any substance that can donate an H^{+1} ion is a base.
24. Nuclear reactions include: fusion, fission, natural and artificial transmutation.
25. Spontaneous decay (natural transmutation) has nuclei emitting radiation in the form of alpha, beta, gamma, and positron emission. Sometimes protons and neutrons could be emitted, but we did not see that in class.
26. Hotter reactions with gases are faster since the particles move faster, more collisions per second. Increasing the rate of collisions results in faster reactions.