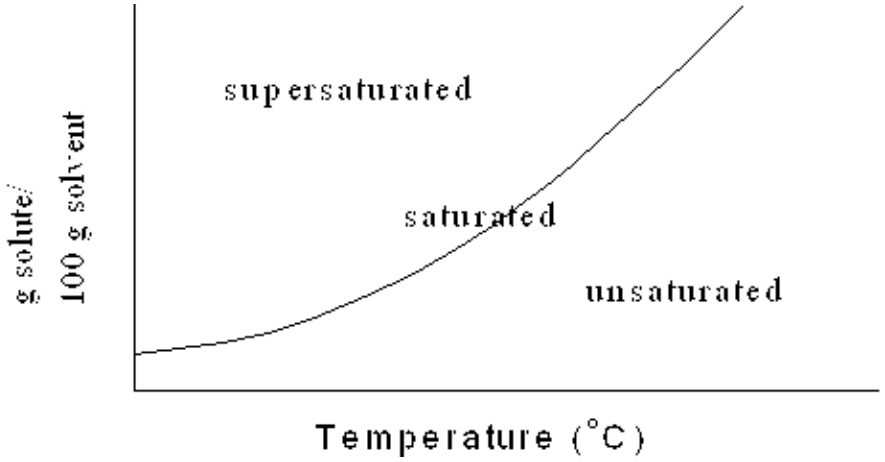
About 100 More Ways to Do Better on the Chemistry Regents Exam

101. Memorize this table.

Compound Type	Properties
Ionic --->	Hard, High melting and boiling points, Conduct electricity when molten (melted into a liquid) or when in aqueous solution
Covalent --->(Molecular) --->	Softer, Low melting and boiling points, Does not conduct electricity (insulators)

102. Hydrogen bonds form when hydrogen bonds to the elements N, O, or F and gives the compound unusually high melting and boiling points. Hydrogen bonding occurs between different molecules because the hydrogen "loses" its electron to these HIGHLY ELECTRONEGATIVE atoms in the very POLAR COVALENT BOND.

103. Use Table F to predict the solubility of various compounds. Careful with the exceptions!
104. Remember substances tend to be soluble in solvents with similar properties…. "Like dissolves like" Water is a polar molecule, it dissolves polar molecules + most ionic ones. Oil is nonpolar, it doesn't mix with water.
105. As temperature increases, solubility increases for most solids in water.
106. At low temperatures and high pressures solubility increases for most gases.
107. Use Table G to determine whether a solution is saturated or unsaturated. Nothing on table G will supersaturate.

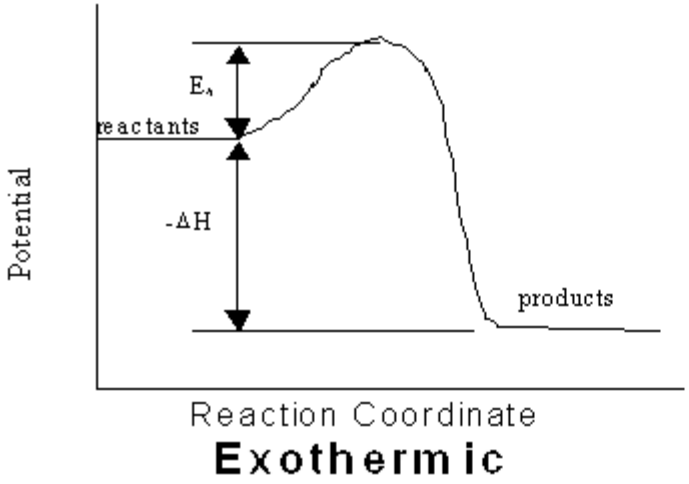


108. Molarity is a way to measure the concentration of a solution. Molarity is equal to the number of moles of solute divided by the number of liters of solution. The formula is on the back of the reference tables.
109. Percent composition by mass = mass of the part / mass of the whole x 100%
110. Parts per million (ppm) = grams of solute / grams of solution x 1,000,000

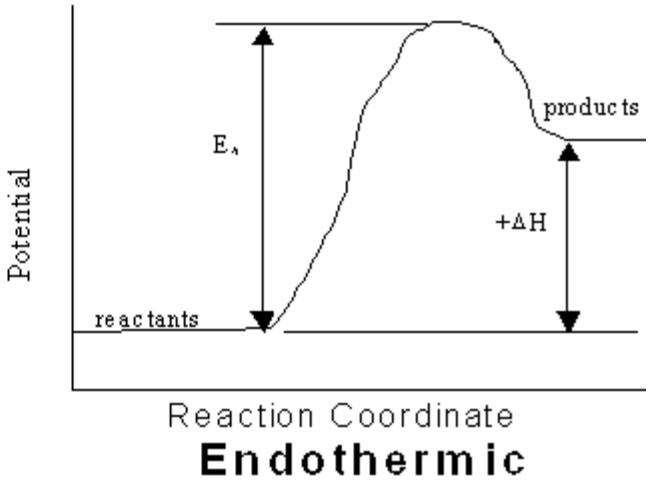
111. Solutes raise the boiling points and lower the melting points of solvents.
112. Liquids boil when their vapor pressure is equal to the atmospheric pressure.
113. The normal boiling point of a substance is the temperature at which it boils at 1 atm (101.3 kPa) of pressure. (see Table H)
114. Covalently bonded substances tend to react more slowly than ionic compounds. Ions are in the "already ready to react" mode. Molecules must "unbond" before they can make new bonds.

115. Increasing the concentration of reactants will increase reaction rate. (more collisions)
116. Increasing the surface areas of the reactants will increase reaction rate. (more collisions)
117. Increasing the pressure on <u>gases</u> increases reaction rate. (more collisions)

118. Catalysts speed up reactions by lowering their activation energies. They are not changed themselves and can be reused many times over. (this is not due to more collisions). Catalysts are said to offer a different chemical pathway for the reaction, which has a lower energy requirement.
119. Increasing temperature increases reaction rate. (more kinetic energy, the more collisions, more likelihood for reactions)



Exothermic



Endothermic

120. Be able to recognize and read potential energy diagrams like these two.

121. +ΔH is for endothermic reactions and is -ΔH for exothermic reactions.
122. Rates of the forward and reverse reactions are equal at dynamic equilibrium.

123. Adding any reactant or product to a system at equilibrium will shift the equilibrium away from the added substance.
124. Removing any reactant or product from a system at equilibrium will shift the equilibrium point toward that removed substance.

125. An increase in temperature shifts an equilibrium system in the endothermic direction. (Move away from the heat)

126. A decrease in temperature shifts an equilibrium system in the exothermic direction. (Move toward the heat)
127. Increasing the pressure on a gaseous equilibrium will shift the equilibrium point toward the side with fewer moles of gas. (Because volume decreased)
128. Decreasing the pressure on a gaseous equilibrium will shift the equilibrium point toward the side with more moles of gas.
129. Catalysts have no effect on equilibrium. It just establishes an equilibrium quicker.

130. Changes to dynamic equilibrium were studied by LeChatlier in France. He said that systems in dynamic equilibrium tend to stay at equilibrium, and systems that are stressed chemically or physically will shift to relieve the stress, and find a new equilibrium.
131. Entropy is high in a highly unorganized system, such as a gas, a messy room, etc. Solids have lower entropy than liquids. Liquids have lower entropy than gases. Gases have the highest entropy of all 3 phases. Larger particles (molecules) have less entropy than smaller ones. The Universe is tending toward higher entropy.

133. Oxidation is the loss of electrons by an atom or ion. The oxidation number increases as a result. The electrons are on the right side of the reaction arrow. $Zn^0 \text{ ---> } Zn^{2+} + 2e^-$
134. Reduction is the gain of electrons by an atom or ion. The oxidation number decreases (is reduced!) as a result.
The electrons are on the left side of the reaction arrow. $Cl° + e^- \text{ ---> } Cl^-$
135. Redox reactions always involve the exchange of electrons.

136. Remember…. "LEO the lion says GER!" Loss of Electrons is Oxidation; Gain of Electrons is Reduction
137. Identify redox reactions by seeking an uncombined element on one side of a reaction that is in a compound on the other side. $Zn + 2HCl \text{ ---> } ZnCl_2 + H_2$

138. Oxidizing agents are what get reduced in a redox reaction.
Reducing agents are what get oxidized in a redox reaction.
139. Volataic cells are one type of electrochemical cells. They produce electricity with a spontaneous redox reaction.

140. In both kinds of electrochemical cells, the anode gets oxidized and REDuction occurs at the CAThode. (Red-Cat)

141. Memorize this " RED CAT" which reminds you that
Reduction happens at the Cathode.
142. Electrolytic cells use an applied electrical current to force a non-spontaneous redox reaction to take place.
143. Electrolytic cells are usually used for metal plating of objects.

144. Acids and bases are both good electrolytes. Their solutions conduct electricity well. They ionize well in water.
145. Weak acids taste sour. Strong acids destroy your tongue.
146. Weak bases taste bitter. Strong bases destroy your tongue.
147. Acids and bases turn indicators different colors. They're listed on Table M.
148. Acids have a pH 0-7. Bases have a pH 7-14.
149. Strong acids are at the top of Table K, strong bases are at the top of table L. Strength is measured by the number of hydrogen ions in an acid, or the number of hydroxide ions in a base. Total quantity is measurable and determines pH. Some compounds, like hydrogen acetate that makes acetic acid for weak acids because not all of the compound will ionize, most in fact, will remain dissolved as a polar molecule.

150. Tables K & L list names and formulas of common acids and bases asked about on the Regents.

151. The metals above H_2 on Table J will react with acids to make H_2 gas bubbles.
152. Arrhenius says: "Acids have excess H^+ ions in solution."
"Bases have excess OH^- ions in solution."

152.5 Bronsted Lowry theory says it's about donating protons (the acid) and accepting protons (the base). NH_3 is the base that has no hydroxides of its own, so this theory is ONLY about ammonia in our class!
153. Acids and bases react in neutralization reactions to make water and a salt.
154. Titration's are neutralization reactions used to find the concentration of an acid or base sample. Note formula on Table T.

155. ALL organic compounds contain the element carbon.
156. Carbon ALWAYS makes four bonds in molecules. This can be four single bonds, or any combination of single, double and triple bonds that sums to 4.
157. Saturated hydrocarbons have all single bonds within them (alkanes).
158. Unsaturated hydrocarbons have double or triple bonds in them these are the alkenes & alkynes.
159. Hydrocarbons contain ONLY the elements hydrogen and carbon.

160. The homologous series of hydrocarbons' formulas are in Reference Table Q. That's their pattern of C:H ratio.
161. The functional groups on organic molecules are listed on Reference Table R.

162. Isomers of organic compounds have different structural formulas but the same molecular formula.
163. Number the parent carbon chain in an organic molecule from the end closest to the alkyl group(s). Alkyl are methyl, ethyl, propyl groups (etc.)
164. Combustion reactions occur when a hydrocarbon reacts with oxygen to make CO_2 and H_2O.

165. Organic substitution reactions occur when an alkane and a diatomic halogen reacts so that 1 hydrogen atom on the alkane are replaced with one halogen atom. The extra hydrogen combines with the loose halogen atom.

166. Organic addition reactions occur when an alkene or alkyne combine with a halogen to make one product (halide). Pairs of atoms are added to the hydrocarbon when the double bond opens up (or the triple bond becomes a double bond).

167. Esterification occurs when an organic acid and an alcohol react to make water and an ester.
168. Saponification occurs when a triple ester reacts with 3 bases to make a triple alcohol and soap.
169. Fermentation reactions occur when yeast catalyzes a sugar to make carbon dioxide and ethanol.

170. Polymers are long chains of repeating units called monomers or just mers.
171. Polymers form by polymerization reactions.
172. Addition polymerization occurs when unsaturated monomers join in a long polymer chain.

$$nC_2H_2 \text{ ---> } (C_2H_2)_n$$

174. Condensation polymerization occurs when monomers join to form a polymer by removing water. Water is a product!
175. Natural polymers include starch, cellulose, and proteins.
176. Synthetic polymers include plastics such as nylon, rayon, kevlar, teflon, PVC, and polyester.

177. Unstable atoms that are radioactive are called radioisotopes. (Table N)
178. Radioisotopes can decay by giving off any of the particles listed in Table N.
179. Alpha particles (see Table O) are positively charged (+).
Beta particles (see Table O) are negatively charged (-).

180. Fission reactions split heavy nuclei into smaller ones.

$$^{235}U + n° \longrightarrow {}^{236}U \longrightarrow {}^{142}Ba + {}^{91}Kr + 2n° + \text{energy}$$

note that 235 + 1 = 236, but 142 + 91 + 2 = 235 in this reaction. There is a loss of one amu of matter, which is changed into energy via the $E=mc^2$ formula. There are more than one U-235 fission reactions.

182. Fusion reactions occur when light nuclei combine to form a heavier nucleus and a lot of energy. On Earth.. .

$$^{2}H + {}^{3}H \text{ ---> } {}^{4}He + n° + \text{ENERGY}$$

On the Sun, 4 hydrogen atoms produces one He + energy + 2 neutrons

184. C-14 is used to determine the ages of organic material up to about 70,000 years old.

185. U-238 is used to determine the ages of rocks.
186. I-131 is used to treat thyroid disorders.
187. Co-60 is used to treat cancerous tumors.
188. Radiation can be used to kill bacteria on foods to slow the spoilage process.
189. Disposal of radioactive waste is a problem associated with nuclear reactors.

189a. Spontaneous nuclear decay (natural transmutation) happens (on paper) when an isotope has an arrow to 2 smaller atoms/particles. If the reaction requires a particle to start it (electron, alpha, beta, etc.) then the reaction is non-spontaneous, also known as artificial transmutation.

190. ALWAYS USE YOUR REFERENCE TABLES!
191. Be sure to answer every question. NO BLANKS ARE EVER ALLOWED.
192. You have three hours to take the test, take your time. Paper is cheap, knowledge is valuable.

193. Try substituting words that seem confusing with a different word. Sometimes this makes the question make more sense. (for example: substitute the word "false" for "not true", or find the opposite of what is being asked, and then reverse your answers)

194. Consider for every question if the answer might be in the reference tables or if the reference tables could remind you of something, then look for it.

195. Your first choice is usually your best one. Only change an answer if you find an obvious mistake when checking your work.

196. Even if you think you know a formula, look it up. Most are on Table T (the last page).

196B. Ask a teacher a question. Teachers are not permitted to answer chemistry questions, but sometimes a simple encouraging word or two will give you confidence to go on when you really want to quit on a particular question.

197. Skip a question if it is giving you a hard time. Something else in the test may help you remember something about the harder question.
198. Eat a healthy meal the night before and a good breakfast as well.
199. Get a good night's sleep. A tired mind is not as sharp and clear as a well-rested one.

200. Go to the bathroom before you get through the multiple choice questions, you need a break. Don't be a test martyr.

200. Relax – you've seen all this stuff before!
201. No matter what, you're still a good person.