

REVIEW for HONORS CHEMISTRY

Final

Part II

UNIT 8: The Mole

154. Count atoms in formulae.
155. Define the mole
- ◆ Avogadro's number
 - 6.022×10^{23} particles
 - 22.4 Liters of a gas at STP
156. Define and calculate the g-formula mass for any substance
157. Understand that formulas represent either molecules (formula units) or moles.
158. Complete mole conversions using FLM.
159. Define and identify Molarity.
- i. Calculate the molarity of a solution
 - ii. Calculate the molarity of ions in a solution.
 - iii. Calculate the mass of solute needed to make a certain molar solution.
 - iv. Calculate the volume of solution needed to make a certain molar solution.
160. Molarity by Dilution ($M_1V_1 = M_2V_2$)
- i. Calculate the amount of water needed to dilute a solution to a desired concentration.
161. Define and identify molality.
- i. Calculate the molality of a solution.
 - ii. Calculate the mass of solute needed to make a certain molal solution.
 - iii. Calculate the mass of solvent needed to make a certain molal solution.
162. Identify the effect a solute has on the freezing and boiling points of pure solvents. (colligative properties.)
- i. Raising the boiling point
 - ii. Lowering the freezing point
163. Calculate the change in boiling or freezing points of a solvent
- Using $\Delta T = mK_i$
- ◆ Add ΔT to boiling point.
 - ◆ Subtract ΔT to freezing point
 - ◆ Utilize the van't Hoff factor (i) for ionic compounds.

164. Calculate the formula mass of a solute from ΔT data.
165. Define and identify the percent concentration of a solution.
166. Calculate the percent concentration of a solution.
i. Calculate the mass of solute needed to make a certain percent concentration.
167. Calculate the percentage composition of a compound.
168. Use percentage composition data to calculate the empirical formula of a compound.
i. Percent to mass, mass to mole, divide by the smallest, multiply 'til whole.
169. Calculate the molecular formula of a compound if given its empirical formula and its molecular mass.
170. Define and identify a hydrate.
171. Define and identify an anhydrous substance
172. Calculate the formula of a hydrate from mass of anhydrous and mass of water removed.

UNIT 9: Chemical Equations and Reactions

173. Define a chemical reaction.
174. Define and identify reactants in a chemical reaction.
175. Define and identify products in a chemical reaction.
176. Define and identify phases in a chemical reaction.
177. Balance chemical equations.
178. Identify relationships from a correctly balanced equation.
179. Recognize common symbols in a chemical equation.
180. Classify reactions as either:
- Synthesis
 - Decomposition
 - Single displacement
 - Double displacement (Metathesis)
 - Complete combustion
 - Incomplete combustion
 - Neutralization
 - Redox
181. Predict products of:
- Synthesis
 - Decomposition
 - Single displacement
 - a. USE ACTIVITY SERIES
 - b. WATCH OUT FOR ACTIVE METAL AND WATER!!!!
 - i. PRODUCTS ARE METALLIC HYDROXIDE AND HYDROGEN GAS
 - Double displacement
 - a. FORMS A PRECIPITATE
 - b. FORMS A GAS
 - i. NH_3 , CO_2 , OR H_2S (volatile acid)
 - c. FORMS WATER
 - Complete combustion
 - a. FORMS CO_2 AND H_2O
 - Incomplete combustion
 - a. FORMS CO AND H_2O
 - Neutralization
 - a. FORMS A SALT AND H_2O
182. Write complete ionic equations.
- Dissociate soluble salts, strong acids, and strong bases only.
183. Write net ionic equations.
- Define and identify spectator ions.
184. Define and identify redox reactions.
185. Determine oxidation numbers of any element in a compound.

186. Define and identify reduction.
187. Define and identify oxidation.
188. Define and identify oxidizing agent (oxidant).
189. Define and identify reducing agent (reductant).
190. Balance redox reactions in an acidic environment.
- Divide into half-reactions.
 - Balance elements besides O and H.
 - Balance O using H_2O .
 - Balance H using H^+ .
 - Balance charge using electrons.
 - If necessary multiply half-reaction to equalize charge.
 - Add reactions and cancel identical species.
191. Balance redox reactions in a basic environment.
- Divide into half-reactions.
 - Balance elements besides O and H.
 - Balance O using H_2O .
 - Balance H using H^+ .
 - Balance charge using electrons.
 - If necessary multiply half-reaction to equalize charge.
 - Add OH^- to both sides to eliminate H^+ .
 - Eliminate as many water molecules as possible.
192. Add reactions and cancel identical species.

UNIT 10: Stoichiometry

- 193. Define Stoichiometry.
- 194. Complete Stoichiometry calculations.
- 195. Define and identify Limiting reagent.
- 196. Solve limiting reagent problems.
 - a. Determine amount of product produced.
 - b. Determine amount of excess reactant used in reaction.
 - c. Determine amount of excess reactant remaining.
- 197. Define and calculate the theoretical yield of a reaction.
- 198. Define actual yield.
- 199. Define and calculate percent yield.

UNITS 11: Thermodynamics

- 200. Define thermodynamics.
- 201. Define product-favored.
- 202. Define reactant-favored.
- 203. Explain potential energy of sub-microscopic particles.
- 204. Define enthalpy
- 205. Define and identify endothermic and exothermic reactions.
 - Nature prefers exothermic
- 206. Write and solve thermochemical equations.
- 207. Define activation energy.
- 208. Define activated complex
- 209. Define ΔH of reaction
- 210. Interpret Potential energy diagrams
 - Enthalpy of reactants and products
 - Activation energy
 - Activated complex
 - ΔH_{rxn}
 - endothermic/exothermic
 - effect of catalyst
 - reverse reaction
- 211. Define and identify ΔH_f°
- 212. Define standard state.
- 213. Write formation equations.
- 214. Calculate ΔH°_{rxn} from heats of formations data.
- 215. Use Hess's Law to determine ΔH_{rxn} .
- 216. Define and identify entropy.
 - i. Nature prefers disorder.
- 217. Identify changes in entropy (increase or decrease) based on chemical equations.
- 218. Calculate ΔS°_{rxn} from entropy values.

Unit 13: Bonding and VSEPR Theory

253. Identify reason(s) why atoms bond.
254. Define and identify bonding.
255. Define and identify causes and strengths of
- Ionic bonds
 - Covalent bonds
 - Polar covalent bonds
256. Define and identify ionic bond.
257. Describe how an ionic bond is formed.
258. Describe an ionic crystal.
259. Define and identify covalent and polar covalent bonds.
260. Describe how a covalent bond is formed.
261. Define and identify a sigma bond.
262. Define and identify bond order.
263. Define and identify shared and lone (unshared) pair of electrons.
264. Define and identify a pi bond.
265. Define and identify a double bond.
266. Define and identify a triple bond.
267. Define and identify bond length
- How does it change as the bond order changes?
268. Define and identify bond energy
- How does it change as the bond order changes?
269. Define and identify metallic bonding.
270. Identify general characteristics of ionic, covalent, covalent network, and metallic compounds.
- Melting points
 - Solubility
 - Conductivity (electrolytes)
 - Malleability
271. Use Coulomb's Law to explain bond energies of covalent and ionic compounds
272. Define VSEPR theory
273. Identify the principles upon which it is based.
274. Define and identify hybridization of various molecules and ions.
275. Define and identify Lewis Structures of compounds.
276. Define and identify VSEPR structures
277. Define names of various VSEPR shapes
278. Define bond angles of various VSEPR shapes
279. Identify hybridization of various VSEPR shapes
280. Define and Identify resonance structures.
281. Define and identify polar covalent bonds.
282. Define and identify polar and nonpolar molecules.