EXAM 3 study guide

Atoms First 2e sections: 11.1-11.8, 12.1-12.6, 9.5, 13.3, 8.1, 8.3

**DAY 16, Terms to know**:

Sections 11.1-11.2, 5.8, 11.3 Kinetic molecular theory (KMT), root-mean-square speed, molecular mass or molecular weight, formula mass or formula weight, pressure, diffusion, effusion, Graham’s Law, barometer, standard atmospheric pressure, manometer

**DAY 16, Specific outcomes and skills that may be tested on exam 3:**

Sections 11.1-11.2, 5.8, 11.3

* Be able to outline the key tenants of the kinetic molecular theory (KMT) of gasses, and be able to explain how each aspect of the KMT correlates with specific observations about the physical properties of gasses
* Given a molecular or structural formula, be able to determine the formula or molecular mass
* Given masses and temperatures of gasses, be able to determine which gas molecules have a greater average kinetic energy and which have a greater average root-mean-square speed
* Be able to rank the relative rates of effusion or diffusion for given gasses at specific temperatures
* Be able to explain how a measurement of length (mmHg) can represent a measurement of pressure for a gas
* Be able to explain how both barometers and manometers are used to measure pressures for gasses

**DAY 17, Terms to know**:

Sections 2.7, 5.10, 11.4-11.5 mole, Avogadro’s number, molar mass, Boyle’s Law, Charles’s Law, Avogadro’s law, combined gas law, ideal gas law, ideal gas, ideal gas constant, standard temperature and pressure (STP)

**DAY 17, Specific outcomes and skills that may be tested on exam 3:**

Sections 2.7, 5.10, 11.4-11.5

* Be able to use Avogadro’s number to convert from moles to number of items and vice versa
* Be able to use molar mass to convert grams to moles and vice versa
* Be able to use any of the conversion factors discussed so far to do multi-step conversions up to 4 steps
* Be able to explain how and WHY the pressure of a fixed amount of gas at a constant temperature changes when the volume of the gas is either increased or decreased
* Be able to explain how and WHY the volume of a fixed amount of gas at a constant pressure changes when the temperature of the gas is either increased or decreased
* Be able to explain how and WHY the pressure of a fixed amount of gas at a constant volume changes when the temperature of the gas is either increased or decreased
* Be able to explain how and WHY the volume of a gas at a constant pressure and temperature changes when the moles of gas is either increased or decreased
* Be able to explain how and WHY the pressure of a gas at a constant volume and temperature changes when the moles of gas is either increased or decreased
* Be able to use the ideal gas law to calculate any of the following four properties of a sample of gas given information about the other three: volume, pressure, moles, temperature

**DAY 18, Terms to know**:

Sections 11.6-11.7, 12.1-12.3 van der Waals equation, partial pressure, Dalton’s law of partial pressure, surface tension, capillary action, cohesion, adhesion, viscosity, crystalline solid, unit cell

**DAY 18, Specific outcomes and skills that may be tested on exam 3:**

Sections 11.6-11.7, 12.1-12.3

* Be able to explain how an ideal gas behaves and what distinguishes an ideal gas from a real gas and under what conditions a real gas will behave ideally
* Be able to use the van der Waals equation to determine the pressure of a gas given its volume, moles, temperature, and values for variables a and b
* Be able to use the van der Waals equation to determine the temperature of a gas given its volume, moles, pressure, and values for variables a and b
* Be able to determine overall pressure for a gas mixture given partial pressures or information that can be used to calculate partial pressures
* Be able to explain what they following physical properties are and how the strength of intermolecular forces affects each physical property: surface tension, capillary action, viscosity, vapor pressure, boiling point
* For a given set of molecules, rank them in increasing order for any of the following properties discussed : surface tension, viscosity, vapor pressure, boiling point
* Be able to describe and explain the relationship between vapor pressure and temperature
* Be able to describe and explain factors such as size and shape of molecules, strength of attraction between molecules, etc. that can affect the specific type of packing or unit cell formed in a crystalline solid

**DAY 19, Terms to know**:

Sections 12.4-12.6 phase, phase change, boiling point, molar heat of a process, melting point, heat of fusion, heating curve, sublimation, deposition, phase diagram

**DAY 19, Specific outcomes and skills that may be tested on exam 3:**

Sections 12.4-12.6

* Be able to describe and explain the differences between covalent, molecular, ionic, and metallic solids and the differences between crystals and amorphous solids
* Given a molecular formula or Lewis structure, be able to predict whether the molecules will form a covalent, molecular, ionic, or metallic solid and a crystalline or amorphous solid
* Be able to give examples of each of the 6 phase changes discussed
* Be able to predict and explain temperature and heat changes for any of the phase changes or areas between phase changes on a heating curve
* Given a phase diagram, be able to label the areas of solid, liquid, and gas, determine the state of matter at a given temperature and pressure and be able to find the melting point, boiling point, and triple point
* Be able to draw a phase diagram and label each of the three sections of the diagram

**DAY 20, Terms to know**:

Sections 9.5, 13.3, 8.1, 8.3, 11.8:aqueous,solution, solvent, solute, molarity or molar concentration, dilution, molality, mole fraction, mass percent, part per million, chemical equation, reactant, product, aqueous, stoichiometry, stoichiometric coefficients

**DAY 20, Specific outcomes and skills that may be tested on exam 3:**

Sections 9.5, 13.3, 8.1, 8.3, 11.8

* In a given solution, be able to identify the solvent and the solute
* Be able to perform calculations to determine molarity or use molarity as a conversion factor to convert moles to volume or volume to moles
* Given three out of four of the following terms, be able to calculate the fourth for a dilution question: initial volume, initial molarity, final volume, final molarity
* Given moles (or info that can be used to calculate moles) and volume, be able to calculate molarity
* Be able to use molarity as a conversion factor to convert moles into volume or vice versa
* Given moles (or info that can be used to calculate moles) and solvent mass, be able to calculate molality
* Be able to use molality as a conversion factor to convert moles into solvent mass or vice versa
* Given moles (or info that can be used to calculate moles) for solvent and solute, be able to calculate mole fraction for either substance in solution
* Be able to use molality as a conversion factor to convert moles of one substance into another or into total moles or vice versa
* Given mass (or info that can be used to calculate mass) for both solvent and solute, be able to calculate mass percent or part per million
* Be able to use mass percent or part per million as a conversion factor to convert mass of one substance into another or into total mass or vice versa
* Be able to identify reactants and products in a chemical equation
* Be able to balance chemical equations
* Be able to use mole ratios in a balanced chemical equation to determine quantities of product produced or quantities of reactants required in either grams or moles
* Be able to use pressure changes during a chemical reaction to determine how many moles of reaction have occurred and relate that to the quantity of reactants consumed, the quantity of products formed, or the amount of a gas needed to complete a reaction

**DAY 21: Exam 3**