**Review Stuff For Final Exam – Honors, 2021-22 School Year**

**ANSWERS**

The following is a general list of topics that will be covered during this year’s final exam, as well as a sample final exam that can give you an idea of the sorts of things I’ll ask. Before I go any further, here are a few things you need to keep in mind:

* This study guide will point you toward the information that you’ll need to know. Will it contain references to every single fact? No. However, it shouldn’t be too hard to guess what’s on the final from the information I give you here. For example, if I give you a question about how the kinetic molecular theory describes pressure, you shouldn’t be too surprised if I ask you how the KMT describes volume. If you read (not very deeply) between the lines, this sheet will give you an extraordinarily complete guide to what you need to know.
* The final exam will be in short answer format, exactly as our quizzes are. There will be no bizarre matching sections, true/false questions, or interpretive dance section. Just the type of questions you’ve come to know and love on my quizzes.
* How should you study for the final exam? Here are my suggestions:
  + Do the homework problems again. I love to recycle old homework questions.
  + Do the quiz problems again for the same reason.
  + Go over the PowerPoint presentations and make sure you understand them.
  + Look at the tutorials on my website ([www.chemfiesta.com](http://www.chemfiesta.com)).
  + Do the practice problems on my website. Again, I like to recycle questions.
  + Look at my teacher website ([www.teachercav.com](http://www.teachercav.com)). Though I don’t use any of the questions here directly, they are yet another good source of practice questions.
  + Read between the lines. If I ask you how to convert grams to moles on the review sheet, it’s probably not too surprising that I might also ask you to convert moles to grams.
  + Ask me for help. If you don’t understand anything, please come see me for help. I’m always happy to go over old material with you. And don’t feel stupid for not knowing something – it’s inherently smart to get help when you need it.
* Show your work! Ultimately, whether you get full credit on the final will depend on whether you give me the right answer. However, if you make a small mistake, or at least one that’s not disastrous, you can usually get some credit for a wrong answer. In some cases, you can get very nearly all of the credit if the mistake is trivial.
* Generally speaking, what will the final exam cover? Fourth quarter information (and any information from earlier quarters that are required to solve problems from the fourth quarter). No sig figs!

And with that, here are the main topics for the final exam:

* Writing complete equations: You should be able to write equations from their descriptions using the five big criteria: Write the formulas, balance the equation, write the states of matter, write any needed reaction conditions around the arrow, and indicate whether the reaction is exothermic or endothermic.
* Stoichiometry: Given a reaction, you should know how to convert grams of reagent to grams of product (and vice-versa). You should understand the concept of limiting reagent and be able to solve limiting reagent problems. It should go without saying that this will require you know how to find the molar masses of chemical compounds.
* Reaction types: Know them, love them.
* Predicting reaction products: You should be able to predict the products of a chemical reaction and indicate whether the reaction will actually occur. Additionally it would be reasonable to ask you for an equation that will result in the formation of [some compound] – this will either be single or double replacement.
* Kinetic molecular theory: What it’s for, what the postulates of the theory are, and how they affect the properties of gases. You should understand the shortcomings of the kinetic molecular theory with real gases.
* Going along with KMT, you should know what ideal gases are and how they behave. You should be aware that they don’t actually exist, but are stand-ins for real gases.
* You should be familiar with the combined and ideal gas laws, and be able to solve problems involving both of them.
* You should know the differences between solutions, colloids, and suspensions, and know the properties of each.
* You should be able to calculate the concentration of a solution in units of molarity (M) and molality (m).
* You should understand colligative properties and how they affect the behavior of solutions. You should also be able to do colligative property questions involving molality.

Practice final exam:

1. Write the complete equation for the following reaction: Dissolved carbonic acid spontaneously breaks apart into carbon dioxide bubbles and liquid water at room temperature. This is the reaction that forms the bubbles in cola, so you can infer reaction conditions and exo/endothermic from this.

H2CO3(aq) 🡪 H2O(l) + CO2(g)

1. For the reaction in problem 1, how many grams of carbon dioxide will be formed if 12 grams of carbonic acid decompose?

8.51 grams

1. For the problem in #2, what will be the volume of the gas that’s formed if the temperature is 25o C and the pressure is 1.00 atm? R = 0.08206 L atm/mol K.

PV=nRT

P = 1.00 atm, V = unknown, n = 8.51 g/44 g = 0.19 mol, T = 298 K

V= 4.6 L

1. If I heat the captured gas from #3 to a temperature of 85o C, what will the volume of the gas be?

You can just do the same calculation as #3, except use 358 K for the temperature (85o + 273). 5.5 L.

1. If I wanted to do a double displacement reaction that would form lead (II) phosphate, devise a reaction that would allow me to do this.

Any double displacement reaction that has two soluble reagents and one soluble product would work. Offhand, I’d say that lead (II) nitrate + lithium phosphate should work.

1. If I wanted to do a single displacement reaction that would form lead (II) phosphate, devise a reaction that would allow me to do this.

I’d have to combine lead (II) phosphate with an element higher on the activity series than lead. Iron, lithium, zinc, etc.

1. List the postulates of the kinetic molecular theory and explain why they either are/aren’t reasonable. Be complete in your answer.

Particles are infinitely small: Reasonable because the particle volume is negligible compared to the overall volume of the gas.

Particles are in constant, random motion: Reasonable, because they are.

Particles don’t experience IM forces: Reasonable, because they’re small and travel very quickly.

Particle energy is proportional to temperature in Kelvin. Reasonable, because it is.

1. What is the structure of a colloid? Little particles of solid that don’t sink in a liquid.
2. What is the molarity of a solution that contains 3.0 grams of C6H12O6 dissolved in 1.25 L of water?

M = mol / L

moles = grams/molar mass = 3.0 g/180 g = 0.017 mol

M = 0.017 mol/1.25 L = 0.014 M.

1. What is the molality of a solution formed by adding 3.0 grams of C6H12O6 to 1.25 L of water?

Same answer as #9, basically the same calculation, except that you need kg of water rather than liters. Since 1 L = 1 kg, it’s the same thing.

1. What would the boiling point of the solution in problem 10 be? Kb = 0.51oC/m

ΔTb = mKb = 0.014 m X 0.52 oC/m = 0.0073o. Since the boiling point of water is 100o C and it increases by 0.0073 degrees, the overall boiling point is 100.0073o.

1. Define the following terms: molarity, molarity, suspension, colloid, solution, kinetic molecular theory, colligative property, stoichiometry, limiting reagent, excess reagent, synthesis reaction (and all the other types of reaction), solubility, ideal gas, real gas, and anything else you can think of.

* molarity: mol solute/L solution
* molality: mol solute/kg solution
* suspension: when little particles of stuff in a mixture sink to the bottom.
* colloid: when they don’t.
* solution: when one thing dissolves another
* KMT: The idea that the behavior of the particles of a gas determine its properties.
* colligative property: properties that change when concentration changes
* limiting reagent: In stoichiometry, the reagent you run out of first.
* excess reagent: The reagent that doesn’t run out.
* synthesis: you make stuff. Check your notes for the others.
* solubility: whether or not something dissolves
* ideal gas: Gas that follows KMT exactly
* real gas: Actual gases that don’t.
* anything else: check your notes.