**Review Stuff For Final Exam – General, 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:

* Moles and mole calculations: You should be able to convert between moles and grams. This will require you understand how to find molar mass.
* Balancing equations: Pretty straightforward – just know how to balance equations.
* 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.
* 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: Keep in mind that these are *representative* examples of what you might expect to see, and cover the same material. The phrasing of the problems on the final may differ from this somewhat.

1. How many moles are there in 45 grams of CuSO4?

To solve, divide grams by molar mass. In this case, 45 g/160 g = 0.28 mol

1. Balance the following equations:
   1. 3 NaOH + 1 H3PO4 🡪 3 H2O + 1 Na3PO4
   2. 1 S8 + 8 F2 🡪 8 SF2
2. 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. What is the volume of 1.5 moles of a gas at a temperature of 25o C and a pressure of 1.00 atm? R = 0.08206 L atm/mol K.

PV = nRT

Solving for V, we get 36.6 L.

1. If I heat the gas from #4 to a temperature of 85o C, what will the volume of the gas be?

If you can’t do #4, you can’t do #5 either. Sorry.

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?

A colloid consists of very small particles that stay suspended in a liquid.

1. 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 #8, 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 = 0.52 oC/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. What are acids and bases? Not on the final
2. How do indicators work? Not on the final
3. Define the following terms: molality, kinetic molecular theory, molarity, aqueous, colloid, solution, suspension, saturated, unsaturated

* molality: Moles of solute / kg of xolvent
* KMT: The behavior of a gas can be explained in terms of the molecules behave. If you gave me the postulates of KMT, that would be fine, too.
* molarity: Moles of solute/L of solution
* aqueous: Dissolved in water
* solution: When one thing (solute) is dissolved in another (solvent)
* suspension: When small particles of a thing are mixed into a liquid, then settle to the bottom.
* saturated: When the maximum amount of stuff has been dissolved.
* unsaturated: When a solution can still dissolve more solvent.