EXAM 3 Practice

Recommended REVIEW

* Vocabulary
* All Guiding Questions, all i-clicker Discussion questions, Webassign homework, worked in-class & in-lab examples & calculations.

The following practice questions contain a selection of problems, which resemble the type of questions on Exam 3. They are not comprehensive, but only a representation for you to measure your level of understanding. Exam 3 is structured the same as Exams 1 & 2: 25 M/C, 10 T/F, matching, fill-in and quantitative math problems.

Answers and solutions are not provided to the practice questions. Please review the questions, and see me if you are stuck on any of them.

Practice Questions

REFER to the questions in the FOLLOWING LINKS:

Solutions/ Aqueous Reactions: Discussion Guide questions

1) http://chemconnections.org/general/chem108/1.10%20Class%20Questions.pdf
2) http://chemconnections.org/general/chem108/1.11%20Class%20Questions.pdf

Acid-Base Equilibrium: Discussion Guide questions
http://chemconnections.org/general/chem108/1.12%20Class%20Questions.pdf

Thermochemistry: Discussion Guide questions
http://chemconnections.org/general/chem108/1.13%20Class%20Questions.pdf

Gases: Discussion Guide questions
http://chemconnections.org/general/chem108/1.14%20Class%20Questions.pdf

Equilibrium & Kinetics: Discussion Guide questions
http://chemconnections.org/general/chem108/1.15%20Class%20Questions.pdf

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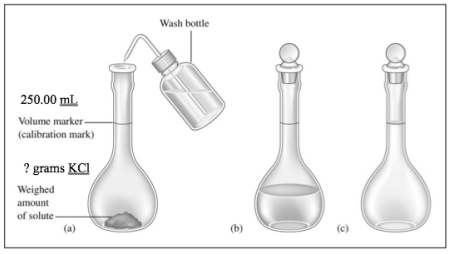
Additional questions to consider :

Samantha prepared a 1.0 M (mol/L) solution of $CaCl_2$. Which action(s) will increase the concentration of the solution?

(1) Add more $CaCl_2$
(2) Evaporate water
(3) Drain solution

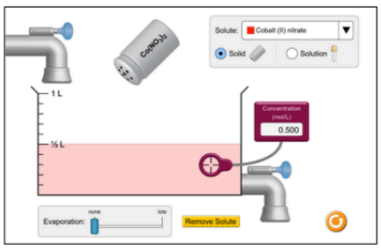
a. (1) only
b. (1) and (2)
c. (2) and (3)
d. (1) and (3)
e. (1), (2), and (3)

The correct way to prepare a standard solution is shown below.



Which of the following choices correlates to the illustration that when followed will accurately prepare a 0.100 M solution of potassium chloride?

a. Add 7.45 g of the solute and add 250.00 mL of water.
b. Add 7.45 g of the solute and add water to the 250.00 mL mark.
c. Add 3.72 g of the solute and add water to the 250.00 mL mark.
d. Add 1.86 g of the solute and add water to the 250.00 mL mark.
e. Add 1.86 g of the solute and add 250.00 water.



Which action(s) will change the number of moles of solute in the container? (1) Add more Co(NO3)2 (2) Evaporate water (3) Drain solution *

- (1) only
- (1) and (2)
- (2) and (3)
- (1) and (3)
- (1), (2), and (3)

What will happen to the concentration and the number of moles when water is added? Molarity (M) = Moles solute / Liter solution *

- concentration: increases; # of moles: decreases
- concentration: increases; # of moles: remains constant
- concentration: no change; # of moles: increases
- concentration: decreases; # of moles: decreases
- concentration: increases; # of moles: increases
- concentration: decreases; # of moles: remains constant

You are given 200 mL of a 0.400 M solution of KMnO4. If you add water until total volume is 800 mL, what will be the final concentration of the solution? Molarity (M1) x Volume (V1) = Molarity (M2) x Volume (V2) *

- 0.080M
- 0.10 M
- 0.20 M
- 0.40 M
- 1.6 M

https://www.youtube.com/watch?v=VEQaH4LruUo

Which statement(s) regarding the term "Calorie" (a "large" food energy value, which is C- not the c- calorie that is 1/1000 of a Calorie) is (are) incorrect. *

Check all that are incorrect. [You will need to do some research beyond this video to answer this and some of the other questions.]

- 1 Calorie is the amount of energy needed to raise 1 kilogram (2.2 pounds) of water 1 degree Celcius.
- 1 Calorie equals 4,184 Joules
- 1 /1000 of a Calorie will raise 1 liter of water (1,000 grams) 1 degree Celcius.
- 1 gram of protein produces about the same amount of energy when digested as 1 gram of carbohydrate.
- 400 grams of fat produces the same number of Calories of energy as 900 grams of protein when digested.
- The same mass of either a fat, a carbohydrate, or a protein will produce the same relative amount of energy when fully digested.

The energy from photosynthesis is stored in plants by _____ chemical bonds. *

Select which best completes the statement.

- forming
- breaking
- neither forming nor breaking, but rearranging the same number of

The energy produced from digesting food comes from _____ chemical bonds. *

- forming
- breaking
- neither forming nor breaking, but rearranging the same number of

Comparing two balloons having 25 liters of gas at the same temperature and pressure, one balloon has helium and the other neon, which one of the following statements is TRUE?

A) Each balloon has an equal number of atoms.
B) The helium balloon has more atoms.
C) The neon balloon has more atoms.
D) None of the above

Gases have relatively high kinetic energy (in other words, they move around very fast). How do they compare respectively to molecules in liquids and in solids? *

Select the best choice that ranks them from lowest to highest kinetic energy.

- solid < gas < liquid
- solid < liquid < gas
- gas < liquid < solid
- gas < solid < liquid
- liquid < gas < solid
- liquid < solid < gas

Consider separate containers of 1 mole of each of 4 different gases: oxygen molecules ,helium atoms, chlorine molecules and hydrogen molecules. Which gas would be moving the slowest? *

Select the best choice.

- oxygen
- helium
- chlorine
- hydrogen

How does the pressure of a container change as the volume is changed? *

Select the best choice.

- As volume increases, pressure increases as well. It is a direct proportion.
- As volume decreases, pressure decreases as well. It is a direct proportion.
- As volume increases, pressure decreases. It is an indirect proportion.
- As volume increases, pressure increases. It is a direct proportion.

Why does a balloon increase its size when you blow into it?. *

Select the best choice.

- The balloon expands because you're adding gas molecules.
- The balloon expands because you're heating up the air inside.
- The balloon expands because there is no where for the gas already inside to go.
- The balloon expands because you're lowering the pressure inside.

If a gas is cooled, how does the volume change? *

Select the best choice.

- The volume of the gas increases.
- he volume of the gas decreases.
- The volume should stay the same.
- The volume will decrease slightly, then increase.

Which of the following explains why a hot air balloon inflates when it is heated? *

Select the best choice.

- The increased temperature causes the gases to spread out and inflate the balloon.
- The flame forces more gas particles into the balloon, causing it to inflate.
- The balloon lets the cool air out through the bottom, where it is circulated by the flame.
- The flame lowers the gas pressure inside by heating up the air, causing it to inflate.

If you have a 2.0L container of oxygen and a separate 2.0L container of nitrogen at the same temperature, and you compress them both to a volume of 1.0L, what can you expect? *

Select the best choice.

- The oxygen will have a higher pressure than the nitrogen.
- The nitrogen will have a higher pressure than the oxygen.
- The pressure will not change for either container.
- The containers will have the same pressure.

Which of the following best describes why pressure builds up in the cylinders of an internal combustion engine?

a. When the piston moves down into the cylinder, the volume occupied by a gaseous mixture of gasoline and air decreases.

b. When the gasoline burns, the number of moles of gaseous products formed is greater than the number of moles of gaseous reactants.

c. The temperature of the product mixture after the combustion reaction is greater than the original temperature.

d. All of the above contribute to the increased pressure.

Methane gas (CH_4), on complete combustion in air, produces:

1. CO_2
2. H_2
3. H_2O

a. 1 and 2 only
b. 1 and 3 only
c. 2 and 3 only
d. All of them: 1, 2 and 3

The following equilibrium is reached in 4 minutes.: $A \rightleftharpoons B$ When at equiibrium, in every one minute, 80% of reactants A form products B, while during that same period of time, 20% of products B react in the opposite direction to form reactants A. This continues every minute over time. The equilibrium constant, K = [Products] / [Reactants], for this reaction when equilibrium is reached is numerically:

a. < 1 b. >1 c. 0 d. -1 e. There is no way to estimate the value.

TRUE/FALSE

When an HCl gas molecule is dissolved in water, a water molecule pulls an H^+ ion away from the HCl molecule to form $H_3O^+$and Cl^-.

HF(*aq*) is a strong acid.

H_3PO_4 is a strong acid since it hs 3 protons.

The nuclear reaction that takes place in a nuclear electrical generating plant is exothermic because heat is given off as part of the nuclear decay process.

When the bonds in the product of a chemical reaction are more stable than those in the reactants, they are stronger than the bonds in the reactants. Therefore, in this case energy is released overall.

If the temperature and volume of an ideal gas are held constant, the number of particles in a container and the gas pressure are directly proportional.

Two hot-air balloons with the same volume and pressure of air were launched exactly at the same time. But, balloon A had a more efficient heating system, so the air in balloon A was at a higher temperature than the gas in balloon B. Therefore, balloon A rises faster since its gas molecules have a higher average velocity.

The ideal gas model is used to predict changes in four related gas properties number of moles, pressure, temperature & volume.

The greenhouse effect results from infrared radiation being absorbed by certain trace gas molecules such as CO_2, which have certain bond bending and stretching vibrations, that are found in the lower atmosphere.

When 16 grams of methane CH_4 and 116 grams of butane C_4H_{10} are mixed separately with 224 liters (10 moles) of oxygen and then reacted with a spark, all of the oxygen is consumed in the butane reaction but not the methane reaction.

The following 3 questions relate to the formation of ammonia in the exothermic reaction:

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

1. When nitrogen is added, hydrogen will decrease to form more ammonia.

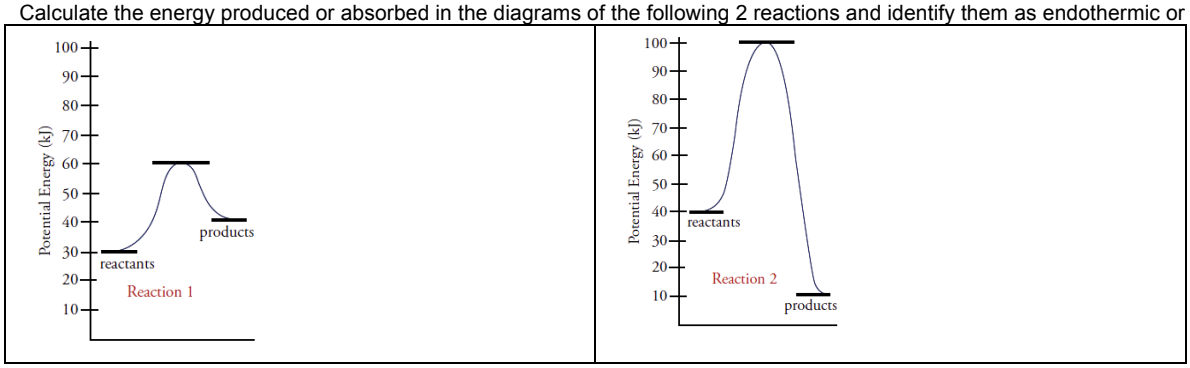
2. When the temperature is increased the concentration of ammonia will decrease.

3. When the pressure is adjusted to 0.5 atm, the concentration of ammonia will decrease.

Define:

Acid:
Base:
Buffer:
Heat:
Enthalpy:
Condensation:
Vaporization:
Sublimation:
Deposition:
Neutralization:
Limiting Reactant (Reagent):
Photosynthesis:
Activation Energy:
Endothermic:
Exothermic:

Calculate the energy produced or absorbed in the diagrams of the following 2 reactions and identify them as endothermic or exothermic.



Complete, Balance & Provide a Net Ionic Equation:

$H_3PO_4(aq) + KOH(aq) \rightarrow$

$Co(OH)_2(s) + HNO_3(aq) \rightarrow$

_____ + _____ $\rightarrow H_2O(l) + CO_2(g) + 2\ KCl(aq)$

$H_3PO_4(aq) + 3\ NaOH(aq) \rightarrow 3\ H_2O(l) +$ _____

Iron(III) sulfate is made in industry by the neutralization reaction between solid iron(III) hydroxide and aqueous sulfuric acid. The iron(III) sulfate is then added with sodium hydroxide to municipal water in water treatment plants. These compounds react to form a precipitate that settles to the bottom of the holding tank, taking impurities with it. Write the complete equations for both the neutralization reaction that forms iron(III) sulfate and the precipitation reaction between water solutions of iron(III) sulfate and sodium hydroxide. (Use the lowest possible coefficients. Include states-of-matter in your answer.)

Consider various possible mathematical problems requiring dimensional analysis:

Potassium chloride is commonly used to treat electrolyte imbalances. How much potassium chloride must be accurately weighed to prepare 250.00 mL of a 0.200 M solution of potassium chloride?

How many grams of KCl are contained in 350. mL of a 0.250 M solution of potassium chloride?
A 10.00 mL sample of hydrochloric acid of unknown concentration was titrated with 42.30 mL of 0.2250 M KOH. What is the concentration of the HCl?

Correctly balance the equation below which has been used to fill balloons.

$$\_\_\_\_ HCl\ (aq) + \_\_\_\_ NaHCO_3\ (s) \rightarrow \_\_\_\_\_ CO_2(g) + \_\_\_\_\_ H_2O(l) + \_\_\_\_\_ NaCl\ (aq)$$

Calculate the number of moles of sodium bicarbonate that are needed to neutralize 70.0 ml of a 1.0M solution of HCl.
If 5.0 grams of sodium bicarbonate were reacted with the hydrochloric acid would any be left? Is sodium bicarbonate the limiting reactant in this case?

A typical total capacity for 150 lb human being's lungs is approximately 5,500 mL. At a temperature of 37°C (average body temperature) and pressure of 1.0 atm, how many moles of air does the person carry inside their lungs when inflated? (R = 0.08206 L atm/ K mol)

When one gram of methane gas, $CH_4(g)$, is burned, 55.5 kJ of heat are released. How many pounds of methane gas must be burned to release 2.686×10^3 kJ of heat?

There are about $1. \times 10^5$ chemical reactions per second in each of the 10 billion nerve cells in the brain. How many chemical reactions take place in a day in a single nerve cell?