

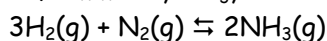
## Chemistry Second Semester Essay Questions

Mr. Allan

FOUR of these essay questions will be drawn on the day of the final. YOU must select TWO of those to answer. They are worth 10 points EACH. In order to prepare for the questions, which will be drawn randomly, it is suggested that you prepare for ALL of the questions.

1. When solving gas law problems, it is essential that temperatures be converted to the Kelvin scale. Why is the Celsius scale not appropriate for solving gas law problems?
2. When driving across Death Valley in the summer time, it is recommended that you release some air from your tires before making the crossing. Using the principles of Kinetic Molecular Theory (KMT), explain why it is a good idea to follow this recommendation.

3. The equation for the formation of ammonia,  $\text{NH}_3$ , is written:

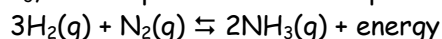


This equation can be read as "Three liters of hydrogen gas react with one liter of nitrogen gas to produce two liters of ammonia gas." Thus, we have three liters + one liter = 2 liters. What happened to the missing liters?

4. Explain how you can distinguish between an exothermic process and an endothermic process using a Styrofoam cup and a thermometer.
5. You are given three unlabeled samples:
  - A) aqueous solution of a sugar
  - B) aqueous solution of an acid
  - C) pure ethyl alcohol (ethanol)

You are given a conductivity tester and some matches (and goggles, of course!) Explain how you will correctly identify which substance is the alcohol, which is the sugar and which is the acid.

6. The formation of ammonia,  $\text{NH}_3$ , is an important industrial process:



Explain how, using LeChatelier's Principle, you can manipulate the temperature and the pressure to favor the formation of ammonia in this equilibrium.

7. When a 50 gram piece of metal at  $100^\circ\text{C}$  is placed in 50 grams of water at  $20^\circ\text{C}$ , the water and metal will reach thermal equilibrium at some intermediate temperature. Explain why the equilibrium temperature is not at the midpoint between  $20^\circ\text{C}$  and  $100^\circ\text{C}$ .
8. Explain why the solubility of gases in water solution decreases as the temperature of the water increases.
9. The energy required to melt a mole of ice at  $0^\circ\text{C}$  is about 6kJ per mole of ice. The energy required to boil a mole of water at  $100^\circ\text{C}$  is nearly 41kJ. Explain why the energy requirement for boiling is so much greater than for melting.
10. Draw an energy diagram for an exothermic reaction, labeling the reactants, products, activation energy ( $E_a$ ), and heat of reaction ( $\Delta H$ ).