Review Guide for Chem 151 Midterm Exam #2 Feb. 26, 2004, Thursday

The test will mainly focus on material in Chapters 4-6. Study your lecture notes, and homework assignments. Expect to solve problems. Test yourselves by doing problems similar to the homework under time constraints. MAKE SURE YOU BRING SCANTRONS. You will be responsible for pages 97-171 of the text.

The following sample questions are meant to get you started in review and to touch on topics covered in these chapters. The actual exam will most likely be multiple choice.
TRUE OR FALSE: (IF THE STATEMENT IS FALSE, WRITE DOWN THE TRUE STATEMENT)

Chapter 3:

1) The H-C-H angle in methane, CH_4 is 90°. F(109.5°)
2) The molecule NO_2 has 17 valence electrons and does not follow the octet rule. T
3) The molecule hydrogen sulfide, H_2S, is a linear molecule. F (bent)
4) The molecule CH_2O is a polar molecule. T
5) CO_2 is a polar molecule because it contains 2 polar bonds. F (the 2 polar bonds cancel out)

Chapter 4:

1) After balancing the equationA: $Fe + O_2 \rightarrow Fe_2O_3$, the coefficient of O_2 is 2.F(3)
2) The number of oxygen atoms in the formula: $Al(C_2H_3O_2)_3$ is 5. F(6)
3) Less than 30 grams of acetylene, C_2H_2 (26.0g/mol)+ H_2 can be produced from 64 grams of methane (16.0g/mol).
   F : $2CH_4 \text{ --> } C_2H_2 + 3H_2$ (g C_2H_2=64gCH_4x(1mol/16g)(1molC_2H_2/2molCH_4)(26gC_2H_2/molC_2H_2)=52
4) In the reaction: $2CO + O_2 \rightarrow 2CO_2$, 10 moles of CO_2 are formed from 5 moles of CO.
   F(only 5 are formed: mol CO_2=5 mol CO (2mol CO_2/2mol CO) = 5 molCO)
5) The burning of paper is exothermic because a flame is needed to start the reaction. F(it is exo bec. it releases heat net)
6) In the reaction of $H_2 + O_2 \rightarrow H_2O$, an increase in activation energy will not lead to an increased rate of reaction. T
7) According to Le Chatelier's Principle, adding heat to the system represented by the reactants and products in the following equilibrium, $H_2 + Cl_2 \text{ <==> } 2HCl$ + heat, produces more HCl. F(favors left, lessens HCl)
8) The formula weight of $Al(NO_3)_3$ is 213 amu. T
9) The number of moles of $CaCO_3$ in 250 g $CaCO_3$ is 5.0 moles. F(250/100=2.5)
10) The minimum energy required to get a chemical reaction going is called a catalyst. F
11) The heat absorbed or released during a chemical reaction is called enthalpy. T
12) If 2.5 moles of H_2 are added to 2.1 moles of CO to form CH_3CH_2OH, the limiting reagent is H_2.
    T ($2CO+3H_2 \text{ --> } C_2H_6O$; #mol H_2 needed =2.1molCO x(3molH_2/2mol CO)=3.15. We only have 2.5 g H_2.
13) A catalyst is formed during the transition from reactant to product. F
14) A catalyst can alter the enthalpy ΔH of a reaction. F (it only lowers the E_a)
15) An example of an endothermic process is the boiling of H_2O at 100°C. T
16) A factor for increasing the rate of a reaction is an increase in concentration of the reactants. T

Chapter 5

1) In the reaction $2 SO_2 + O_2 \rightarrow 2 SO_3$, the SO_2 is oxidized. T(SO_2 gains an O)
2) In the reaction: $CH_4 + 2 O_2 \rightarrow CO_2 + 2 H_2O$, methane is an oxidizing agent. F(it is reducing agent)
3) In the reaction: $Hg_2Cl_2 \rightarrow Hg + HgCl_2$, mercury is both oxidized and reduced. T
4) $KMnO_4$ is a common oxidizing agent while Cl_2 is a common reducing agent. T
5) In photosynthesis: $6 CO_2 + 6 H_2O \rightarrow C_6H_{12}O_6 + 6 O_2$, CO_2 is oxidized. F(it's reduced)
6) Living cells obtain energy by reducing carbohydrates. F (the opposite)
7) Oxidation and reduction always occur together. T
8) An example of oxidation is: iron rusting. T
9) The oxidation number of sulfur in $Al_2(SO_4)_3$ is –2. F (S is +6)

Chapter 6

1) Temperature is the same as heat, F (heat is energy. Temp is a measure of the average kinetic energy)
2) Newtons is used to measure pressure. F (newtons/m^2 is used, or atm, or mm Hg or Torr).
3) STP means 0°C and 1 atm. T
4) If a bubble released by a deep sea diver at a depth of 21 m triples in volume by the time it reaches the surface where the pressure is at 760 Torr, then the pressure at the level of the diver is 2000 Torr. F (P_2=3(760)=2280)
5) If the pressure on 10.0 L of gas is changed from 0.75 atm to 2.5 atm, with the temperature constant, its new volume will be 2.5L. F (V_2 = (.75)(10)/2.5 = 3L)
6) A gas occupies 400 cm^3 at 0°C, what volume will it occupy at 273°C if the pressure remains constant? 400 cm^3. V_2=2(400)
7) If you raise the temperature of a gas in a container of fixed volume, the molecules will strike the walls harder but less frequently. F (more frequently)
8) As an automobile tire becomes hotter, it shrinks because the rubber contracts. F(P increases with T).
9) A 1.00 L tank can explode if the pressure exceeds 12.5 atm. At 25°C the gas inside is at a pressure of 2.07 atm. At 1527°C, the tank is expected to explode. T(P_2=(2.07)(1527+273)/(298)=12.5 so yes!
10) At STP, the approximate density of nitrogen gas (N_2) is 1.25 g/cm^3. F(28/22.4=1.25g/L)