Chemistry 232 Final Exam (80 minutes, 50 points 21 questions. The more time-consuming questions are at the end so space out the work evenly. This practice quest is about the same difficulty of the actual quest. Just like the quests/quizzes, no partial credit. Open note but not open internet. Complete by yourself. Good luck!) Name:

1)Mark is climbing Mount Everest. He needs to melt 2.00 kg of ice at 0 degrees C for drinking water. He has small cylinders of camping gas that provide 155 kJ of energy each. How many cylinders will Mark need to melt the ice? (2 points)

2)Consider the system $SO_{2(g)} + CO_{2(g)} \rightleftharpoons CO_{(g)} + SO_{3(g)}$ Kc=6.76

$[SO_2] = 1.03$ $[CO_2] = 1.56$ M $[CO]=2.93$ $[CO_3] = 2.90$

Which of the following are true? (2 points)

A) The system is at equilibrium
B) The system is not at equilibrium and more product will form
C) The system is not at equilibrium and more reactant will form
D) The system is not at equilibrium and more product will be needed to add
E) The system is not at equilibrium and more reactant will be needed to add

3)Given the data in the table below, what would the ΔH_{rxn} for the reaction be? (3 points)

$$Ca(OH)_2 + 2H_3AsO_4 \rightarrow Ca(H_2AsO_4)_2 + 2H_2O$$

Substance	ΔH_f° (kJ/mol)
$Ca(OH)_2$	−986.6
H_3AsO_4	−900.4
$Ca(H_2AsO_4)_2$	−2346.0
H_2O	−285.9

4)For a second order reaction, it takes 13 minutes to go from 50 percent to 25 percent of its concentration. How long will it take to reduce to 15 percent of concentration remaining?

5) How much gallium must be prepared to start a reaction that produces 5.8 liters of gas with a pressure of 723 torr at 27 degrees C?

$2Ga_{(s)} + 6HCl_{(aq)} \rightarrow 2GaCl_{3(aq)} + 3H_{2(g)}$

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6) Which will have the largest volume occupied? (1)

O_2 or Cl_2 where there is twice the amount of Cl_2 than O_2 and Cl_2 is at 350K and O_2 is at 300K

O_2 Cl_2 They are equal Can't be determined.

7)A solution composed of two volatile liquids, A and B, has a vapor pressure of 369 torr at 0 o degrees C. Pure A and pure B have vapor pressures of 252 torr and 417 torr respectively at 0 degrees C. What is the mole fraction of A in the solution? (2)

8)Which gas would you expect to behave the most "ideal" at STP? (2)

Br_2 CO Ar F_2 SO_2 C_4H_{10}

9)Select all the p-type indicators: (3)

silicon doped with gallium germanium doped with antimony

arsenic doped with selenium tin doped with indium

aluminum doped with silicon tin doped with tellurium

10)An ideal gas fills a balloon at a temperature of 27ºC and 1 atm pressure. By what factor will the volume of the balloon change if the gas in the balloon is heated to 127ºC at constant pressure? (2)

27/127 3/4 4/3 2/1 127/27

11) Of the following, _____ will lower the activation energy for a reaction. (2) (select all)

increasing the concentrations of reactants

adding a catalyst for the reaction

raising the temperature of the reaction

removing products as the reaction proceeds

increasing the frequency factor

increasing the rate constant, k

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12) For a certain endothermic reaction, what can be said about the K_{eq} once the temperature has decreased? (2)

K_{eq} after > K_{eq} before K_{eq} after < K_{eq} before K_{eq} after = K_{eq} before

13) A 47.5-gram sample of gold at a temperature of 425°C is placed in 1.50 liters of water which had an initial temperature of 18°C. What is the thermal equilibrium temperature of the whole system after this addition? (2)

14)Consider a system at equilibrium (4 points)

$$2A_{(g)} + B_{(g)} \rightleftharpoons 2D_{(g)} \quad \text{exothermic}$$

How would the system change if:

Temperature is decreased Volume increases

B is increased by 6x and A is reduced by a third D is doubled and B is doubled

15) Find the activation energy required to have a reaction with a rate of 2.5 $x10^{-4}$ $M^{-1}S^{-1}$ at 327 deg C to transition to a rate of 3.5 x 10^{-3} $M^{-1}S^{-1}$ at 377 deg C. (2)

16) What is the freezing point of a solution comprised of 55.1g KCl dissolved in 433 ml of chloroform? water? (2)

17) Rank by increasing boiling point: NH_3, CF_4, PH_3, $CaCl_2$, O_2 (2)

18) A gaseous mixture with a total pressure of 680 torr contains 2.6 mol CO_2 and 1.7 mol N_2 at 85 degrees C. What is the density of carbon dioxide? (3)

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19) Condensation is an exothermic process where thermal energy is released from system to surroundings. $H_2O(g) \rightarrow H_2O(l)$ $\Delta Hrxn = -44kJ$

Today, James' signature DutchBro's drink, the usual, is iced and the initial temperature of the cup is 12 degrees C. The longer James holds his cup, the more thermal energy is being transferred to the surroundings, causing water vapor to condense into liquid droplets.

If on his way back to the dorm, the cup warms by 0.85 degrees C and assuming the mass of the drink is 25 grams and has a heat capacity of 4.184 J/g C, how much water is collected onto the cup? (3)

20) Find Keq for the reaction. (3)

$A + B_2 \rightleftharpoons C + 3D$ Keq= ?

Given:

$C + \frac{1}{2} E \rightleftharpoons F_2$ Keq= 332.5

$D + \frac{1}{2} E \rightleftharpoons B_2$ Keq= 2.137

$A + 2E \rightleftharpoons F_2 + 2B_2$ Keq= 425.0

21) At equilibrium, there are 0.030 moles of A and 0.115 moles of B at 350K in a 3000 mL container. The volume decreased to a third of its size. Calculate the new equilibrium pressure of A. (4)

$$A_{(g)} \rightleftharpoons 2B_{(g)}$$