CHEM 1B – B.Kunkel

INSTRUCTIONS: Bubble in **Form A** on your Parscore Form

Write your perm number and **bubble in your perm number** (7 digits only)

Completely fill bubbles / answers 

There are 20 questions. Each question is worth 5 points. It is to your benefit to **SHOW ALL YOUR WORK ON THE EXAM and CIRCLE YOUR ANSWERS. Turn in the Parscore form only**. Keep the exam so you can check your work and your answers later. The answers to the exam will be posted on our course web page. **NOTE:** No hats with caps allowed. No sharing of calculators. No NOTES allowed. **Cell phones and all other electronic devices must be turned off and put away.**

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1. At constant pressure, the reaction is

$$2NO_2(g) \rightarrow N_2O_4(g)$$

A) spontaneous at low temperatures but not at high temperatures.
B) spontaneous at high temperatures but not at low temperatures.
C) always spontaneous.
D) never spontaneous.

2. Calculate the standard heat of formation, ΔH_f°, for $FeS_2(s)$, given the following information:

$$2FeS_2(s) + 5O_2(g) \rightarrow 2FeO(s) + 4SO_2(g)$$

$\Delta H^\circ_{rxn} = -1370$ kJ
ΔH_f° for $SO_2(g) = -297$ kJ/mol
ΔH_f° for $FeO(s) = -268$ kJ/mol

A) +808 kJ
B) -1550 kJ
C) -774 kJ
D) -686 kJ
E) -177 kJ

3. The specific heat capacities of three metals are given below. If 1.00 g of each metal is heated to 100 °C and added to 10.0 g of H_2O at 25.0 °C, what is the order of the temperatures of the final mixtures from the lowest to the highest?

Metal	Specific heat, J/g°C
Fe	0.470
Pb	0.130
Zn	0.388

A) Fe < Zn < Pb
B) Pb < Zn < Fe
C) Zn < Pb < Fe
D) Zn < Fe < Pb
E) none of the above

More Questions

4. 2 mol of gas initially at 325 K are placed in a piston. The gas is cooled from 325 K to 225 K against a constant external pressure of 3 atm. Calculate the work.

A) 16.4 J
B) 2,494 J
C) -1,663 J
D) 1,663 J
E) none of the above

5. At a constant pressure, the complete combustion of 1.00 mole of methane, CH_4, releases 802 kJ of heat. When 3.00 mol of oxygen gas react completely with excess methane at a constant pressure, what is the change in enthalpy?

A) –1203 kJ
B) –802 kJ
C) –2406 kJ
D) 1203 kJ
E) none of the above

6. The following reaction has a $\Delta G°$ value of 42.6 kJ/mol at 25°C. Calculate K_a for the acid HB at 25 °C.

$$HB(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + B^-(aq)$$

A) 42,600
B) 1.63
C) 3.41×10^{-8}
D) 14.0
E) –17.2

More Questions

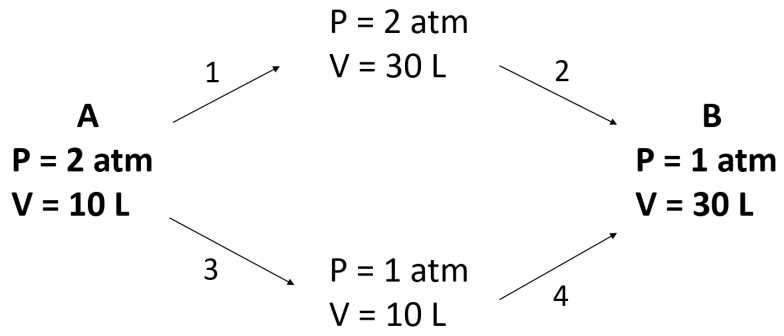
7. For the reaction $2HF(g) \rightleftharpoons H_2(g) + F_2(g)$, $\Delta G° = 28.3$ kJ at 1000 K. If, at this temperature, 5.00 mol of HF(g), 0.500 mol of $H_2(g)$, and 0.75 mol of $F_2(g)$ are mixed in a 1.00-L container, which of the following will happen?
A) Some HF will be formed (from H_2 and F_2).
B) The system is at equilibrium.
C) Some HF will decompose (to yield H_2 and F_2).

8. The heat of vaporization for a compound is 17.2 kJ/mol at 25 °C. What is the change of entropy for one mole of the liquid compound when it vaporizes at 25 °C?
A) 57.7 J/K
B) 0.688 J/K
C) 5.13×10^3 kJ/K
D) 3.16 J/K
E) 239 J/K

9. Calculate the change in entropy when 2.0 mol of water are heated from 50 °C to 150 °C at P = 1 atm. $\Delta H_{fusion} = 6.01$ kJ/mol, $\Delta H_{vaporization} = 40.7$ kJ/mol, $C_{H2O(s)} = 2.01$ J/g °C, $C_{H2O\ (l)} = 4.18$ J/g °C, $C_{H2O(g)} = 2.03$ J/g °C
A) 80.0 J/K
B) 249 J/K
C) 165 J/K
D) 30.86 J/K
E) none of the above

More Questions

Questions 10 and 11. Consider 2.00 moles of a monatomic ideal gas that is taken from state A to state B by the following two different pathways:



10. Consider the above information. Calculate w from A to B via steps 3 and 4.
A) -2030 J
B) -20 J
C) 0 J
D) 3560 J
E) 2500 J

11. Consider the above information. Calculate ΔE from A to B via steps 1 and 2.
A) 2500 J
B) 1,500 J
C) 5500 J
D) -2030 J
E) 0 J

12. The standard enthalpy of reaction, ΔH° at 25 C° is -175.9 kJ mol^{-1}. Determine the value of ΔE_{rxn} for this reaction at a constant pressure.

$$NH_3(g) + HCl(g) \rightarrow NH_4Cl(s)$$

A) -164.8 kJ/mol
B) -170.9 kJ/mol
C) -175.9 kJ/mol
D) -180.9 kJ/mol
E) +5134 kJ/mol

More Questions

13. In a well-insulated container, 50.0 g ice at 0.0 °C is added to 350. g water at 32.0 °C. What is the final temperature when the mixture reaches equilibrium? ΔH_{fusion} = 6.01 kJ/mol, $\Delta H_{vaporization}$ = 40.7 kJ/mol, $C_{H2O(s)}$ = 2.01 J/g °C, $C_{H2O\ (l)}$ = 4.18 J/g °C, $C_{H2O(g)}$ = 2.03 J/g °C

A) 18.0 ºC
B) 20.6 ºC
C) 22.0 ºC
D) 28.0 ºC
E) none of the above

14. A sample contains 2 mol of Cl_2 (g) (C_p = 33.1 J/mol K) is heated from 298 K to 350 K at constant pressure of 1 atm. Calculate ΔE.

A) 3,442 J
B) -865 J
C) 1,209 J
D) 2,577 J
E) none of the above

More Questions

15. Using the following reaction, how much heat is released when 10.0 g Fe and 2.00 g of oxygen gas are reacted at a constant pressure of 1 atm?

$$4Fe\ (s) + 3\ O_2\ (g) \rightarrow 2\ Fe_2O_3\ (s)\ \ \Delta H = -1652\ kJ$$

A) 73.8 kJ
B) 34.4 kJ
C) 68.8 kJ
D) 103 kJ
E) none of the above

16. How much heat would your body lose if you were to ingest 800 g of ice at 0 °C and warm it to body temperature, 37 °C? Assume a constant pressure. ΔH_{fusion} = 6.01 kJ/mol, $\Delta H_{vaporization}$ = 40.7 kJ/mol, C_{ice} = 2.01 J/g °C, $C_{H2O\ (l)}$ = 4.18 J/g °C, $C_{H2O(g)}$ = 2.03 J/g °C

A) 124 kJ
B) 267 kJ
C) 144 kJ
D) 390 kJ
E) none of the above

More Questions

17. A coffee cup calorimeter having a heat capacity of 451 J/°C was used to measure the heat evolved when 0.0300 mol of NaOH(s) was added to 1000 mL of 0.0300 M HNO_3 initially at 23.000 °C. The temperature of the water rose to 23.639 °C. Calculate ΔH (in kJ/mol $NaNO_3$) for this reaction. Assume the specific heat of the final solution is 4.18 J/g°C; the density of each solution is 1.00 g/mL; and the addition of solid does not affect the volume of the solution.

$$HNO_3(aq) + NaOH(s) \rightarrow NaNO_3(aq) + H_2O(l)$$

A) -63.7 kJ/mol
B) -151 kJ/mol
C) -2.55 kJ/mol
D) -81.4 kJ/mol
E) -98.6 kJ/mol

18. One mole of an ideal gas with a volume of 1.0 L and a pressure of 5.0 atm is allowed to expand isothermally into an evacuated bulb to give a total volume of 2.0 L. Calculate ΔS.

A) 0 J
B) -5.76 J
C) 5.76 J
D) 506 J
E) none of the above

More Questions

19. Substance X has a heat of vaporization of 55.4 kJ/mol at its normal boiling point (423°C). For the process X(*l*) → X(*g*) at 1 atm and 423°C, calculate the value of ΔS_{surr}

A) –79.6 J/K•mol
B) 0 J/K•mol
C) –103 J/K•mol
D) 103 J/K•mol
E) 79.6 J/K•mol

20. The molar entropy of CH_4 (g) is 189 J/mol K at 25 °C and 1 atm pressure. Assuming ideal gas behavior, calculate the entropy of 0.39 mol CH_4 at 25 °C and a volume of 84 L.

A) 196.1 J/K
B) 80.8 J/K
C) 207.1 J/K
D) 73.7 J/K
E) none of the above

End of Exam

ANSWERS: 1. A 2. E 3. B 4. D 5. A 6. C 7. C 8. A 9. B 10. A 11. B 12. B 13. A 14. D 15. B 16. D 17. E 18. C 19. A 20. B