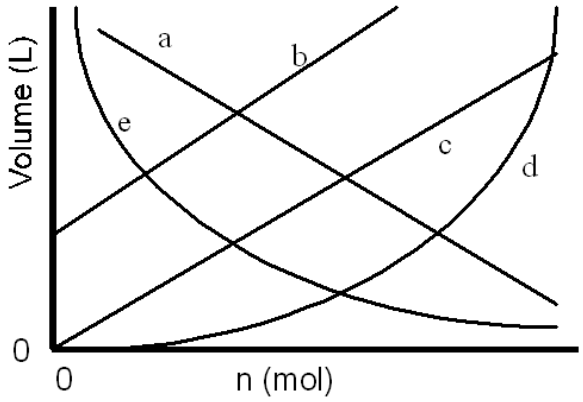
Birzeit University
Chemistry Department
Chem141

Instructor: HW # 3
Student name: Student no.:

Part I: choose the most correct answer

1. Which of the lines on the figure below is the best representation of the relationship between the volume and the number of moles of a gas, measured at constant temperature and pressure? (1 point each)



A) a B) b C) c D) d E) e

2. A sample container of carbon monoxide occupies a volume of 635 mL at a pressure of 822 torr and a temperature of 22°C. What would its temperature be if the volume was changed to 322 mL at a pressure of 644 torr?

A) 96 K B) 194 K C) 322 K D) 295 K E) 486 K

3. A sample of butane gas, has a volume of 28.3 L at 22°C and 823 torr. What is its volume at STP?

A) 25.2 L B) 28.4 L C) 33.6 L D) 37.1 L E) 49.2 L

4. Calcium hydroxide, which reacts with carbon dioxide to form calcium carbonate.

$Ca(OH)_2(s) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(g)$ ΔH = -69.1 kJ

What is the enthalpy change if 1.6 mol of carbon dioxide is reacted?

A) -187 kJ
B) -69 kJ
C) -111 kJ
D) -43 kJ
E) None of these choices is correct.

5. A 235-g sample of aluminum at l00.0°C is placed in 100.0 mL of water at 27.0°C. What is the final temperature of the water? Assume that no heat is lost to or gained from the surroundings. Specific heat capacity of aluminum = 0.900 J/(g·K), Specific heat capacity of water = 4.18 J/(g·K)

A) 36.1°C B) 43.8°C C) 51.53°C D) 69.7°C E) 72.3°C

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6. Which one of the following is not a correct formation reaction? (products are correct)

A) $H_2(g) + O(g) \rightarrow H_2O(l)$

B) $\frac{1}{2} H_2(g) + \frac{1}{2} Br_2(g) \rightarrow HBr(g)$

C) $6C(graphite) + 6H_2(g) \rightarrow C_6H_{12}(l)$

D) $C(graphite) \rightarrow C(diamond)$

E) $2C(graphite) + 2H_2(g) + O_2(g) \rightarrow C_2H_4O_2(s)$

Part II: Answer the following questions clearly (2 points each)

1. Calculate the $\Delta H°_{rxn}$ for the combustion of propanol. $\Delta H°_f [C_3H_7OH(l)] = -298.15 kJ/mol$;

$\Delta H°_f [CO_2(g)] = -393.5$ kJ/mol; $\Delta H°_f [H_2O(g)] = -241.8$ kJ/mol

2. A system expands against a constant pressure of 1.50 atm, from an initial volume of 1.00 L to a final volume of 10.0 L. Calculate the work (w) involved in this process, in kJ.

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3. When 8.6 g of solid NaOH is dissolved in 100.00 g of water in a coffee cup calorimeter, all the reagents initially being at 27.0°C. Calculate the final temperature of the solution obtained, given the following information (**Heat capacity of NaOH solution = 4.18 J/(g·K**):

   $NaOH(s) \rightarrow NaOH(aq)$ $\Delta H° = -43.0$ kJ

4. Use the $\Delta H°$ data given below to calculate $\Delta H°$ for the reaction:

   $C_2H_4(g) + H_2(g) \rightarrow C_2H_6(g)$

   Data:

	$\Delta H°$ (kJ)
$C_2H_6(g) + 3.5O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$	-1560
$C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(l)$	-1411
$2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$	-572

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5. A 300 mL sample of a pure gas weighs 0.365 g and is at 655 torr and 27.0°C.

   a. What is the molar mass of the gas?

   b. If the volume and temperature are kept constant while 0.300 g of the same gas are added to that already in the container, what will the new pressure be?

Part III: Answer the following statements by true or false (1 point each)

1. At a temperature of absolute zero, the volume of an ideal gas is zero.
2. From the postulates of kinetic-molecular theory, it follows that the molecules of all gases at a given temperature have the same average speed.
3. For an ideal gas, a plot of PV/nRT versus P gives a straight line with a positive slope.
4. Standard heats (enthalpies) of formation of compounds, $\Delta H°_f$, may be positive, zero or negative.