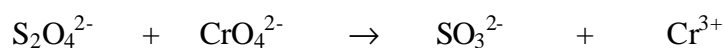


- (6) 4. Give the oxidation number of the indicated element in each of the following compounds or ions:

C in CO_2 _____Br in BrO_4^- _____P in HPO_3^{2-} _____

- (10) 5. Given the following oxidation-reduction reaction:



- (a) Identify: The **reagent** being oxidized _____
 The **reagent** being reduced _____
 The oxidizing agent _____
 The reducing agent _____

(This refers to the complete ion, not just the element changing oxidation number)

- (b) Balance the equation **in acidic solution**. (Show your work, including the beginning and ending oxidation numbers of the elements that undergo a change).

- (8) 6. Three 5-L flasks each contain 4 g of gas at 273 K. Flask A contains H_2 , flask B contains He, and flask C contains CH_4 . Rank the contents of each flask in terms of the following properties by circling the correct relationship:

Pressure: A>B>C C>B>A A=B=C

Density: A>B>C C>B>A A=B=C

Average Molecular Kinetic Energy: A>B>C C>B>A A=B=C

Average Molecular Velocity: A>B>C C>B>A A=B=C

7. Oxygen gas can be produced by the decomposition of potassium chlorate in the presence of a catalyst, according to the following reaction:



- (12) (a) A sample of KClO_3 was decomposed in this fashion, and the oxygen was collected over water by displacing the water from an upended container. The volume of the oxygen collected was 1.56 L at a temperature of 20 °C. The atmospheric pressure was 755 torr, and the vapor pressure of water at 20 °C is 17.5 torr. Calculate the **moles** of KClO_3 and the **grams** of KClO_3 in the sample. (Show your work). **R = 0.08206 L-atm-mol⁻¹-K⁻¹.**

- (6) (b) ΔH_f° for $\text{KClO}_3 (\text{s}) = -397.7 \text{ kJ/mol}$; ΔH_f° for $\text{KCl} (\text{s}) = -436.7 \text{ kJ/mol}$. Calculate ΔH for the decomposition of one mole of KClO_3 . Is the reaction **exothermic**, or **endothermic**?

- (4) (c) Calculate ΔH for the decomposition of the quantity of KClO_3 specified in part a.

(10) 8. A tank of gas with a volume of 3.6 L is under a pressure of 75 atmospheres at 30 °C. If the gas were completely released into plastic bag at 0.95 atmospheres pressure and 5 °C, what volume would the gas occupy in the bag?

(12) 9. An unknown metal weighing 44.7 g is heated to a temperature of 87.2 °C and placed in an insulated cup containing 105.6 g of water at a temperature of 20.5 °C. After the metal cools, the final temperature of the metal and the water is 23.4 °C.
(Specific heat of water = 4.184 J/g-°C)

(a) How much heat has the metal lost?

(b) What is the specific heat of the metal?

(12) 10. Heats of reaction can often be calculated using Hess's Law and data from combustion experiments in a calorimeter. An example is the reaction of ethylene (C₂H₄(g)) with water to form ethyl alcohol (C₂H₅OH(l)):



Write and balance the combustion equations for C₂H₄(g) and C₂H₅OH(l), and use their heats of combustion to calculate ΔH for the above reaction.

