

Unit 3 Test Review

Concepts

- Temperature vs thermal energy, exothermic vs endothermic, open vs close system
- First and second law of thermodynamics
- Rate of reactions
- Average vs instantaneous reaction rates
- Collision theory
 - Effective vs ineffective collision, transition state vs activated complex
- Rate determining step
- Factors that may impact reaction rate
- First order vs second order reactions
- Symbol and units for:
 - Specific heat capacity
 - Heat
 - Molar Enthalpy
 - Enthalpy of a system (reaction)

Skills

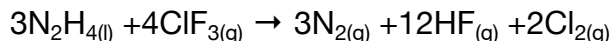
- Be able to calculate:
 - Heat of a reaction
 - Molar enthalpy of a substance
 - Number of moles using mass of concentration
 - Use data from calorimetry to solve for molar enthalpy
 - Use Hess's Law to determine total enthalpy
 - Use the standard enthalpy of formation
 - Calculate rate of reaction
 - Be able to recognize a first and second order reaction

Practice Questions:

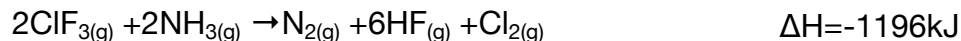
- 1) A 7.0 g sample of cesium is sealed in a vial and placed into a calorimeter containing 250.0 mL of water at 90.00 °C. When the cesium had melted, the temperature of the water had dropped to 88.98 °C. Determine the molar heat of fusion for cesium in kJ/mol.
- 2) A 12.7 g sample of sulfur (S₈) is burned in a calorimeter. The calorimeter contains 2.20 kg of water at 21.08 °C. The reaction mixture is ignited and the temperature rises to 33.88 °C. From this data, calculate the molar heat of combustion of sulfur. Assume Q= 100 J of energy.
- 3) Calculate the mass of pentane required to combust to heat 250.0 g of water at -6°C to 85°C. The enthalpy of combustion for pentane is -3509 kJ/mol. The formula for pentane is C₅H₁₂.

SCH 4U
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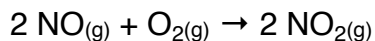
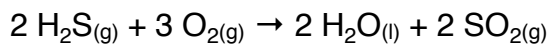
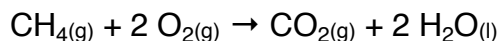
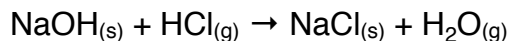
4) Calculate ΔH for the reaction:



use the following data:



5) For each of the following, calculate the enthalpy change for each reaction, ΔH_f . Provide your answer in kJ.



Compound ΔH_f (kJ/ mol)

$\text{CH}_4(\text{g})$ -74.8	$\text{CO}_2(\text{g})$ -393.5	$\text{NaCl}(\text{s})$ -411.0	$\text{H}_2\text{O}(\text{l})$ -285.8
$\text{H}_2\text{S}(\text{g})$ -20.1	$\text{H}_2\text{SO}_4(\text{l})$ -811.3	$\text{MgSO}_4(\text{s})$ -1278.2	$\text{MnO}(\text{s})$ -384.9
$\text{MnO}_2(\text{s})$ -519.7	$\text{NaCl}(\text{s})$ -411.0	$\text{NaF}(\text{s})$ -569.0	$\text{NaOH}(\text{s})$ -426.7
$\text{NH}_3(\text{g})$ -46.2	$\text{HCl}(\text{g})$ -92.3	$\text{H}_2\text{O}(\text{g})$ -241.8	$\text{SO}_2(\text{g})$ -296.1
$\text{NH}_4\text{Cl}(\text{s})$ -315.4	$\text{NO}(\text{g})$ +90.4	$\text{NO}_2(\text{g})$ +33.9	$\text{SnCl}_4(\text{l})$ -545.2
$\text{SnO}(\text{s})$ -286.2	$\text{SnO}_2(\text{s})$ -580.7	$\text{SO}_2(\text{g})$ -296.1	$\text{SO}_3(\text{g})$ -395.2
$\text{ZnO}(\text{s})$ -348.0	$\text{ZnS}(\text{s})$ -202.9		

6) If k_{HI} is $1.8 \times 10^{-4} \text{ M}^{-1}\text{s}^{-1}$, $[\text{I}_2]$ is 4.0 M and $[\text{H}_2]$ is 2.0 M, find the reaction rate for the following reaction. Assume it is first order with respect to both reactants.

