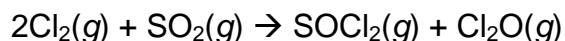


## Thermodynamics Problems

1. Calculate  $\Delta H_{\text{reaction}}$



•  $H_f$  (kJ/mol)

$\text{Cl}_2$ (g)	0
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$\text{SO}_2$ (g)	-296.8
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$\text{SOCl}_2$ (g)	-212.5
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$\text{Cl}_2\text{O}$ (g)	80.3

2. The heat of fusion for water is 6.01 kJ/mol, and the heat of vaporization is 54 kJ/mol. Calculate the enthalpy change if 72 grams of ice at  $-10^\circ\text{C}$  is heated to  $175^\circ\text{C}$ .

Specific Heat Values:	Water	$c = 4.184 \text{ J/g}^\circ\text{C}$
	Ice	$c = 2.03 \text{ J/g}^\circ\text{C}$
	Vapor	$c = 2.01 \text{ J/g}^\circ\text{C}$

Calculate the enthalpy change for the reverse process in which the gas molecules are cooled from  $175^\circ\text{C}$  to  $-10^\circ\text{C}$ .

3. If the system provides 2.4 J of work and displaces -2.1 J of heat, the internal energy of the SURROUNDINGS is equal to \_\_\_\_\_ J.
4. A system at a starting pressure of 4 atm and an initial volume of 20 L is compressed to a volume of 13 L. Calculate work, heat, internal energy, and enthalpy of the system.
5. Identify the systems below that will yield a negative value for work for the system.
- A piston in a chamber (the system) is heated causing the gas molecules to expand using the heat from the surroundings.
  - A chimney is placed over a candle (the surrounding) and gases are allowed to exit the top of the chimney. A pinwheel is not placed at the top of the chimney.
  - An isothermal expansion is allowed to take place in a cylindrical piston.
  - An isothermal compression is allowed to take place in a cylindrical piston.

6. For a given compound, the following values are observed for the enthalpy of vaporization and entropy of sublimation:

$$H_{\text{fus}} = 4 \text{ J/K}$$

$$H_{\text{sub}} = 52 \text{ J/K}$$

What is the enthalpy of condensation?

7. Determine the identity of an unknown metal given the following information.

Mass of Metal = 131.4 g

Mass of Water = 50.01 g

Initial Temperature of Water = 22.0°C

Initial Temperature of Metal = 99.5°C

Final Temperature of Water = 41.3°C

Specific Heat Table (specific heat is in J/g°C)

Al	Aluminum	0.903
Cr	Chromium	0.461
Co	Cobalt	0.440
Cu	Copper	0.385
Au	Gold	0.132
Fe	Iron	0.449
Pb	Lead	0.129
Mg	Magnesium	1.025
Mn	Manganese	0.448
Ni	Nickel	0.461
Pt	Platinum	0.134
Ag	Silver	0.235
Sn	Tin	0.213
Ti	Titanium	0.528
W	Tungsten	0.138
U	Uranium	0.112
Zn	Zinc	0.444