1. Assuming the apparatus itself absorbs no heat, what will be the final temperature of a bomb calorimeter's heat sink consisting of 100 mL of water at 15 °C if the reaction releases 6.276 kJ of heat?

1. 30 K
2. 303 °C
3. 30 °C
4. 0 °C
5. -303 °C
6. 273 K

2. Calculate the change in enthalpy for the reaction below based on the provided data.

$N_2H_4(l) + H_2(g) \rightarrow 2NH_3(g)$ $\Delta H = -201.1\ kJ \cdot mol^{-1}$

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ $\Delta H = -91.8\ kJ \cdot mol^{-1}$

$CH_3OH(l) \rightarrow CH_2O(g) + H_2(g)$ $\Delta H = 85.2\ kJ \cdot mol^{-1}$

$CH_2O(g) + N_2(g) + 3H_2(g) \rightarrow N_2H_4(l) + CH_3OH(l)$ $\Delta H = ?$

1. $\Delta H = -28.4\ kJ \cdot mol^{-1}$
2. $\Delta H = -207.7\ kJ \cdot mol^{-1}$
3. $\Delta H = 194.5\ kJ \cdot mol^{-1}$
4. $\Delta H = -378.1\ kJ \cdot mol^{-1}$
5. $\Delta H = 24.1\ KJ \cdot mol^{-1}$

3. Calculation the work (w) for the following reaction conducted at 1000 °C:

$SF_6(g) + O_3(g) \rightarrow SO_3(g) + 3\ F_2(g)$

1. 21.2 kJ
2. -21.2 kJ
3. 16.6 kJ
4. -16.6 kJ

4. Consider the reaction below.

$2\ S_2O_2(g) + 4\ F_2(g) \rightarrow 2\ S_2(g) + 4\ OF_2(g)$

Its change in entropy would likely be (positive/negative/either) and (large/small)

1. either, small
2. negative, small
3. positive, small
4. either, large
5. negative, large
6. positive, large

5. Which of the follwing reactions would spontaneous at some temperatures and non-spontaneous at other temperatures?

rxn	$\Delta S_{rxn}(J \cdot mol^{-1} \cdot K^{-1})$	$\Delta H_{rxn}\ (kJ \cdot mol^{-1})$
I	-25.20	2.45
II	1.15	879.23
III	13.93	-367.10
IV	-4.76	-98.04

1. I ans II
2. I and III
3. I and IV
4. II and III
5. II and IV

6. III and IV

6. What would be the total energy associated with the motion of a gaseous system composed of 1 mole each of CO_2, O_2 and O_3?

1. 12 RT
2. 24 RT
3. 18RT
4. 9RT
5. 6RT
6. 15RT