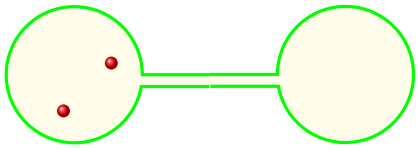
1. 💎 **STUDY CHECK**

We cool dow a cup of vegetable oil with a water bath, so that the oil releases 20KJ of heat to the bath. Calculate the entropy change experienced by the oil at 40°C.

Show work to get full credit

2. 💎 **STUDY CHECK**

The image below represents six ideal gas-molecules in a two-bulb container. The molecules are able to travel from one side to the other.



Answer the following questions: (a) What is the total number of microstates in this system (b) What is the most likely arrangement of the molecules (c) What is the least likely arrangement of the molecules (d) What is the probability of finding the system in the most likely arrangement of the molecules

Show work to get full credit

3. 💎 **STUDY CHECK**

Compare entropy for the following systems: (a) CO_2 at 25°C and 1 bar and SO_2 at 25°C and 1 bar (b) 3L of a gas at 25°C and 1 bar and 4L of the same gas at 25°C and 1 bar (c) H_2 at 25°C and 1 bar and He at 25°C and 1 bar

Show work to get full credit

4. 💎 **STUDY CHECK**

A 1L sample of methane at 6atm is heated from 100K to 300K. Assuming ideal gas behavior: (a) Calculate the entropy change is the gas is heated at constant volume. (b) Calculate the entropy change is the gas is heated at constant pressure.

Show work to get full credit

5. **STUDY CHECK**

Calculate the entropy change of the following reaction and give an interpretation based on the sign of the change:

$$C_2H_{4(g)} + H_{2(g)} \longrightarrow C_2H_{6(g)}$$

Given: $S^\circ(C_2H_{4(g)})$= 219.5 J/K· mol, $S^\circ(C_2H_{6(g)})$= 229.5J/K· mol, $S^\circ(H_{2(g)})$=131 J/K· mol.
Show work to get full credit

6. **STUDY CHECK**

For the reaction:

$$H_{2(g)} + \frac{1}{2}\,O_{2(g)} \longrightarrow H_2O_{(g)}$$

we have that ΔH_R° is -250kJ/mol and ΔS_R° is -58J/mol. Calculate the entropy change on the system, its surroundings and the overall universe at 289K.

Show work to get full credit

7. **STUDY CHECK**

Calculate the residual entropy for one mole of methane water at 0K and compare your value with the experimental result of $3.4 J/K$.
Show work to get full credit

8. **STUDY CHECK**

For the reaction:

$$C_2H_{4(g)} + H_{2(g)} \longrightarrow C_2H_{6(g)}$$

we have that ΔH_R° is -135kJ/mol and ΔS_R° is -120J/mol. Indicate under which conditions will the reaction will proceed spontaneously.

Show work to get full credit

9. **STUDY CHECK**

Use the data below to calculate the Gibbs free-energy of the reaction at 298K:

$$C_2H_{4(g)} + H_{2(g)} \longrightarrow C_2H_{6(g)}$$

Compound	ΔH_f°	S°
$C_2H_{4(g)}$	-52.5	219.5
$H_{2(g)}$	0	130.6
$C_2H_{6(g)}$	-84.7	229.5

Show work to get full credit

10. **STUDY CHECK**

Estimate the fusion and vaporization temperatures in celcius of water given that ΔH_{fus}°= 6.007kJ/mol, ΔH_{vap}°= 40.66kJ/mol, ΔS_{fus}°= 22.00J/mol· K and ΔS_{vap}°= 109.00 J/mol· K.

Show work to get full credit

11. **STUDY CHECK**

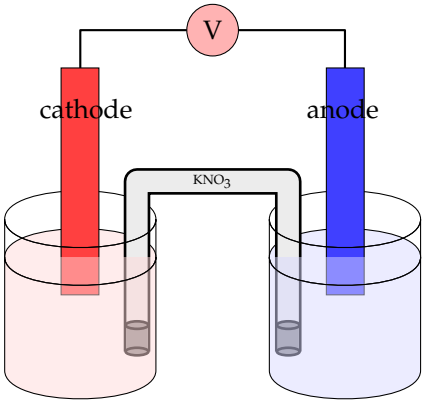
Predict whether the reaction will proceed spontaneously at 298K under the following pressure conditions: $P_{NO_2} = 1 \times 10^{-5}$ atm and $P_{N_2O_4} = 1 \times 10^{5}$ atm

$N_2O_{4(g)} \longrightarrow 2\,NO_{2(g)}$ $\Delta G^{\circ}_{R} = 5.4\text{kJ/mol}$

Show work to get full credit

12. **STUDY CHECK**

For the galvanic cell below, indicate: (a) label the signs of the electrodes (b) identify the flow of electrons (c) identify the flow of cations and anions (d) identify the oxidation and reduction



Show work to get full credit

13. **STUDY CHECK**

Sketch a semi-cell for the semi reaction below, indicate if the electrode is a solid-liquid electrode or gas-liquid electrode. Assume standard conditions:

$$2\,H_2O_{(l)} + 2\,e^- \rightleftharpoons H_{2(g)} + 2\,OH^-_{(aq)}$$

Show work to get full credit

14. **STUDY CHECK**

We want to build up a galvanic cell based on the reactions below.

$Cr^{3+} + e^- \rightleftharpoons Cr^{2+}$ $\mathcal{E}^\circ = -0.42V$

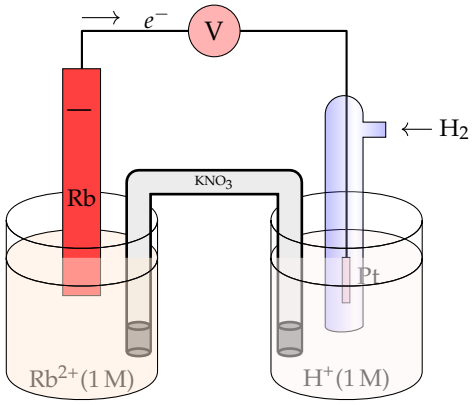
$Cu^+ + e^- \rightleftharpoons Cu_{(s)}$ $\mathcal{E}^\circ = 0.52V$

Indicate: (a) the anodic and cathodic reactions (b) the balanced overall redox (c) the number of electrons flowing (d) the overall voltage of the cell

Show work to get full credit

15. **STUDY CHECK**

Give the line notation for the galvanic cell below:



Show work to get full credit

16. **STUDY CHECK**

Calculate the standard Gibbs free energy change ΔG° for the following redox reaction:

$F_{2(g)} + 2\,H^+ + 2\,e^- + 2\,Cs_{(s)} \rightleftharpoons 2\,HF_{(aq)} + 2\,Cs^+ + 2\,e^-$ $\mathcal{E}^\circ_{cell} = 6.08V$

Show work to get full credit

17. **STUDY CHECK**

Compare the oxidizing power of the following species:

$$Cu_2O_{(s)} \text{ and } BrO^{3-}$$

Show work to get full credit

18. **STUDY CHECK**

For the concentration cell below:

$$Au\text{—}\ Au^{3+}(10^{2}\ M)\text{—}Au^{3+}(10^{-1}\ M)\text{—}\ Au$$

(a) Identify the anode and the cathode (b) calculate the cell potential at 298.15K
Show work to get full credit

19. **STUDY CHECK**

For the galvanic cell below:

$$Pb\text{—}\ Pb^{2+}(10^{-1}\ M)\text{——}Ce^{4+}, Ce^{2+}(10^{-2}\ M)\text{—}Pt$$

(a) Calculate the standard voltage of the cell, given $\mathcal{E}^{\circ}(Pb^{2+}/Pb)$=$-0.13$V and $\mathcal{E}^{\circ}(Ce^{4+}/Ce^{2+})$=1.61V
(b) calculate the cell potential at 298.15K
Show work to get full credit

20. **STUDY CHECK**

How much intensity should be applied for 30 seconds to an electrolytic cell based on the reaction below in order to produce 2×10^{-5} moles of Ni.

$$3\,Ni^{2+}_{(aq)} + 2\,Cr_{(s)} \xrightarrow{6\,e^-} 2\,Cr^{3+}_{(aq)} + 3\,Ni_{(s)}$$

Show work to get full credit