From the table on back of this page, what trends can you observe about absolute entropies for substances ?

Without doing any calculations, predict if the entropy for each of the following reactions is **1. positive 2. negative** or **3. approximately zero** Explain !!

- A. $2 \text{ NO}_2(g) \longrightarrow N_2O_4(g)$
- B. $N_2(g) + O_2(g) ----> 2 NO(g)$
- C. $CaCO_3(s) + 2 H^+(aq) Ca^{+2}(aq) + CO_2(g) + H_2O(l)$

Predict the sign of ΔS_{rxn}^0 for the reaction. 1. positive 2. negative or 3. approximately zero. C(graphite) + O₂(g) -----> CO₂(g)

Using the table on the back of this page, calculate ΔS^{0}_{rxn}

Predict the sign of ΔH^0 for this reaction. 1. positive 2. negative or 3. approximately zero

Using the table on the back of this page, calculate ΔH^0_{rxn}

Predict the sign of ΔS_{rxn} and ΔH_{rxn} for each of the following reactions. Classify whether they are favorable or unfavorable for a spontaneous reaction.

| | | ΔH_{rxn} | ΔS_{rxn} |
|----|---|------------------|------------------|
| A. | $2 \text{ NO}_2(g) \longrightarrow N_2O_4(g)$ | | |
| B. | Combustion of sucrose, $C_{12}H_{22}O_{11}(s)$ | | |
| C. | Crystallization of a supersaturated solution of sodium acetate. | | |

| Table 19. | Some Standard Molar Entropy Values at 298 K | | | |
|---------------------|---|---------------------|--------------------------------------|--|
| Element | Entropy, S° (J/K · mol) | Compound | Entropy, S [°] (J/K•mol) | |
| C(graphite) | 5.6 | $CH_4(g)$ | 186.3 | |
| C(diamond) | 2.377 | $C_2H_6(g)$ | 229.2 | |
| C(vapor) | 158.1 | $C_3H_8(g)$ | 270.3 | |
| Ca(s) | 41.59 | $CH_3OH(\ell)$ | 127.2 | |
| Ar(g) | 154.9 | CO(g) | 197.7 | |
| H ₂ (g) | 130.7 | $CO_2(g)$ | 213.7 | |
| 0 ₂ (g) | 205.1 | H ₂ O(g) | 188.84 | |
| N ₂ (g) | 191.6 | $H_2O(\ell)$ | 69.95 | |
| $F_2(g)$ | 202.8 | HCl(g) | 186.2 | |
| Cl ₂ (g) | 223.1 | NaCl(s) | 72.11 | |
| $Br_2(\ell)$ | 152.2 | MgO(s) | 26.85 | |
| $I_2(s)$ | 116.1 | $CaCO_3(s)$ | 91.7 | |

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| | Standard Molar Enthalpies of Formation (kJ/mol) |
|-------------------------|--|
| CH ₄ (g) | - 75 |
| CO ₂ (g) | - 394 |
| NO ₂ (g) | 33.2 |
| H ₂ O(g) | - 242 |
| H ₂ O(l) | - 286 |
| NH ₃ (g) | - 46 |
| Mg(OH) ₂ (s) | - 602 |
| CO(g) | -111 |