1. Methanol is used as a rocket fuel for the following chemical reaction:

CH3OH (l) + 3/2 O2 (g) 🡪H2O (g) + CO2 (g)

1. Predict the sign of ∆S for the above reaction and explain your answer with sound reasoning.
2. Predict the sign of ∆H for the above reaction (knowing that it is combustion) and explain your answer with sound reasoning.
3. Is the sign of ∆G temperature dependent in this reaction? Explain your answer.
4. Predict the signs for ∆G, ∆H and ∆S for the following situations and explain your answer.
5. The vaporization of water above 100 oC.
6. Does ∆H or ∆S favour the vaporization process?
7. For the reaction CO (g) + H2O (g) 🡪 CO2 (g) + H2 (g)

∆H = -41.2 kJ and ∆S = -135 J/K

1. Calculate ∆G at room temperature, 298 K.
2. Calculate ∆G at 700K, assuming ∆H and ∆S are not affected by temperature.
3. Does raising the temperature favour this reaction, as written?
4. Which factor, entropy or enthalpy, favours this reaction at high and low temperature?
5. Calculate the boiling point for the reaction: BCl3 (l) 🡪 BCl3 (g)

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|  | ∆Ho (kJ/mol) | ∆So (J/mol∙K) |
| BCl3 (l) | -418 | 209 |
| BCl3 (g) | -395 | 290 |