The exam of Principles of Physical Chemistry (CHEM-C1230) at 22.1.2024. has been corrected. There is an Excel file in the MyCourses which has all the points (also the exercises and quiz). Please check the points. I also reread all answers of the persons who did not pass the course.

I will add the marks to Sisu after few days. There is not scheduled exams in spring 2024.

The exam weight was 70 %, the exercise 25 % and the quiz 5 %.

The point score is below.

|  |  |
| --- | --- |
|  | lowest points |
|  |  |
| 1 | 50 |
| 2 | 60 |
| 3 | 70 |
| 4 | 80 |
| 5 | 90 |

Correction notes

1. Hydogen production from water and methene

1 p. reaction equations

2 p. how to compute the reaction enthalpy, where you got the data, why some values are set to =0.

1 p. correct calculation of reaction enthalpy

1 p. how many moles of H2

1 p. correct calculation of reaction enthalpy per mole of H2

1. Boiling, volume, enthalpy and entropy

1 p. volume will change a lot, from liquid to gas

1 p. numbers: liquid molar volume (OK at 25 C but 100 C is better) and ideal gas molar vol (at 100 C)

1 p. the boiling requires a lot of heat. The heat is = to enthalpy

1 p. numbers: the enthalpy change is mostly the evaporation enthalpy (Table 8.2.) it OK to compute the liquid and gas entalpies. If you use the values from Table 4.1 they are at 25 C, you should extrapolate them to 100 C with C\_p

1 p. entropy increases since the disorder increase a lot liq vs gas.

1 p. $ΔS=\frac{q}{T}=ΔH\_{vap} /T$

some of you used equations that are valid in a single phase, like ideal gas law over the phase transition. That is not correct.

1. Constant pressure calorimeter

1 p. General explanations of calorimeter - you observe temperature change and you measure enthalpy and heat capacity

1 p. Na2SO3 calibration -> you need the heat capacity/enthalpy of the calorimeter

1 p. from table data get the heat of solution of Na2SO4

1 p. Na2SO4: from total heat subtract the heat of water to get the heat of calorimeter

2 p. NaCl: from total heat subtract the heat of water and the calorimeter

1. The van der Waals equation

2p. Why to use van der Waals equation. The equation and explanation of its components (parameters)

1 p. compression factor (it is NOT P\_vdw/P\_id)

1 p. explanation of ideality form the table P and T dependencies

1 p. computations of P\_vdw(Vid)/P (Vid is NOT 22.4 L/mol)

1 p. general explanations of how the computations are done

1. Gibbs energy

1 p. gibbs energy and spontaneity of the reaction.

1 p. gibbs energy at non-1atm pressure

1 p. the difference of $ΔG$ and $ΔG^{o}$

1 p. compute the $ΔG^{o} $ where to get the data

1 p. compute the $ΔG$ conclusions

1 p. general explanations of how the computations are done

The problem can be done also by using the equilibrium constant

1. CO2 solvation

1 p. how to get the mole fraction of CO2(aq)

1 p. how much CO2 in 1 L of water

1 p. dissolution reaction

1 p. and its equilibrium constant

1 p. [H+] and pH

1 p. general explanations of how the computations are done

The problem can be done also by using the equilibrium constant