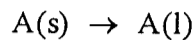


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1. The density of the vapor of perfume at 260°C is $0.480 \text{ g}\cdot\text{L}^{-1}$ when the pressure is 103 Torr. Calculate the molar mass of perfume molecule. (5%)
2. Predict the trend in boiling point of HCl, HBr and HI, and explain the trend. (5%)
3. Predict the geometries of the following species using the VSEPR method: a. PCl_3 b. TeCl_4 c. AlCl_3 d. N_2O e. XeF_4 (5%)
4. How can one measure the mass of electron? (5%)
5. Build a period table with 6 period of elements assuming that the selection rules for assigning quantum numbers are following:
 1. The principal quantum number can be any integer greater than or equal to 1.
 2. The angular quantum number can have any value between 0 and n.
 3. The magnetic quantum number can have any value between -1 and 1.
 4. The spin quantum number can have a value of -1, 0 and 1. (5%)
6. At 1 atm, liquid water is evaporated below 100°C . For this process which of the following choices (a-d) is correct for ΔS_{surr} ? ΔS ? ΔS_{univ} ? ΔH ? ΔG ?
 - a. greater than zero
 - b. less than zero
 - c. equal to zero
 - d. cannot be determined(5%)

7. Consider the process



if $\Delta H = 35.2 \text{ kJ/mol}$ and $\Delta S = 9.565 \text{ J/mol-K}$.

- What is the value ΔG of this process at melting point?
- Calculate the melting point of $A(s)$.
(5%)

8. Write the structural formula of the following compounds.

- 3-methyl-1-pentene
- 5,5-dimethyl-1-hexyne
- trans-2-butene
- 4-ethyl-2-methylhexane
- 2,2,4-trimethylpentane
(5%)

9. Define each of the following equilibrium constants.

- K_C
- K_P
- K_w
- K_a
- K_{sp}
(5%)

10. The rate of a reaction increased from $3.00 \text{ mol}\cdot\text{L}^{-1}\cdot\text{s}^{-1}$ to $4.35 \text{ mol}\cdot\text{L}^{-1}\cdot\text{s}^{-1}$ when the temperature was raised from 18°C to 30°C . Calculate the activation energy of the reaction. (5%)