

Assignment 1: CHM221A

Topic: Fundamental relation

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To students: These assignments are designed to strengthen your understanding in the lessons taught in class as well as develop your problem solving skills. If you copy from other sources without understanding, those purposes will be defeated and you will receive no benefits. **If you cannot solve them, try and bring your problems to the instructor. He will definitely help. Also, there may be some typo - discuss with me if you think there are any.**

Notation: A and B are positive definite constants and U, V and N_i are internal energy, volume and the number of moles of i^{th} chemical species, respectively.

1. Which amongst the following relations are acceptable fundamental relations? If not, why not?

(a) $S = Ae^{-\frac{U}{VN}}$

(b) $S = A\frac{U}{N} \ln \frac{V}{B}$

(c) $S = AVe^{-\frac{U}{N}}$

(d) $\ln S = A - BUVN$

(e) $S^2 = \frac{A}{\sqrt{NV}}U^3$

2. For which value of α the following equation can be an acceptable fundamental relations

$$S = AU^2V^{-1/2}N^\alpha$$

3. Suppose Argon gas has the fundamental relation

$$U = A\frac{SV}{N}.$$

- (a) Find out the unit of A in SI unit system
- (b) For 400 g Argon gas, at temperature $T = 300\text{K}$, the volume of the system is 125 ml. Find out A in SI units.