Pop Quiz 6, Chemistry 481, 21 Oct 2019. Name: \_\_\_\_\_

1 mole of an ideal, monatomic gas  $(C_v = \frac{3}{2}nR)$  at temperature  $T_1 = 300$  K expands at constant pressure (isobarically) from volume  $V_1 = 25\ell$  to volume  $V_2 = 2 \times V_1$ . Answer the following questions:

- 1. What is the final pressure  $P_2$  (in Pa)? (3 pts) The final pressure is equal to the initial pressure, since it's a constant pressure transformation. We know from the ideal gas law that P = nRT/V, so, here  $P_2 = P_1 = nRT_1/V_1 = 1 \times 8.314 \times 300/25$ e-3 = 9.97e4 Pa.
- Plot the temperature (in K) as a function of V over the range V<sub>1</sub>=25ℓ = 2.5 × 10<sup>-2</sup> m<sup>3</sup> to V = 2 × V<sub>1</sub>. (4 pts) For full credit, you have to justify the dependence of T (the dependent variable) on V (the independent variable). (3 pts) Since the pressure is constant, nRT/V is constant. Thus, if the volume doubles then the temperature doubles. So, T goes from 300 K to 600 K. Further, the variation of T with V is linear, T ~ V. The plot is



FIG. 1: Note that axes should be labelled for full credit; you can give V in liters or  $m^3$