

**ASTR 5110 Atomic and Molecular Processes Fall 2024. Problem Set 3. Due  
Wed 18 Sep.**

**20.1.** (7 points) Short. A concept problem.

**21.1.** (9 points) Assume here that the system is an ideal gas. The question suggests using equation (24.3), and you should certainly read the paragraph containing that equation. The key thing here is that irreducible moments are additive over independent subsystems, therefore proportional to volume in an ideal gas. This question reveals a link between statistical mechanics and statistics: the partition function of stat mech is just the ‘characteristic function’, or ‘moment generating function’, of statistics.

**21.2.** (7 points) Short. Useful to know. The result can be derived from the definition of  $C_V$  and from equations given in section 21, which you may quote without proof.

**26.1.** (7 points) Short. Argument is similar to the one done for the canonical ensemble in the notes. What is your quantity the same as, given equations (27.5) and (27.6)?