

**PHYS20352: Thermal and Statistical Physics**  
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**Example Sheet 1**

[Note: *Not all of the material for these questions will necessarily have been covered in lectures by the time you do this sheet. However, it was essentially all covered in first-year lectures, and is hence mostly revision material.*]

1. Name as many as you can thermodynamic quantities which are (a) extensive, or (b) intensive.
2. Show that the work done on an ideal gas during a reversible process which takes it from an initial state  $(P_i, V_i, T_i)$  to a final state  $(P_f, V_f, T_f)$  is given by:

(a)

$$W = P_i V_i \left( 1 - \frac{V_f}{V_i} \right) = nR(T_i - T_f),$$

if the process is done at constant pressure; and

(b)

$$W = P_i V_i \ln \left( \frac{V_i}{V_f} \right),$$

if the process is done at constant temperature.

3. The enthalpy  $H$  of a thermodynamic system with pressure  $P$ , volume  $V$ , and internal energy  $E$  is defined by

$$H \equiv E + PV.$$

Use the first law of thermodynamics to express the heat capacity at constant pressure  $C_p$  in terms of a suitable partial derivative of  $H$ .