

# Solutions

Physics 161 Fall 2010 Exam 1

Round all answers to 1 significant figure and report in the form  $a \times 10^b$ . You may have to round up or down; round to the nearest number.

$pV = nRT$

Helpful equation(s):  $Q = nC_v \Delta T$  at const. volume

$C_v = \frac{3}{2}R$  monatomic ideal gas

A monatomic ideal gas is taken through the reversible paths shown on the  $pV$  diagram (not to scale.) Path BC is isothermal. Path AC is isochoric. Path AB is a straight line.

	A	B	C
P	10 N/m <sup>2</sup>	18	54
V	1 m <sup>3</sup>	3	1
T	100 K	540 K	540 K

$pV = nRT$       $nR = 1/10$

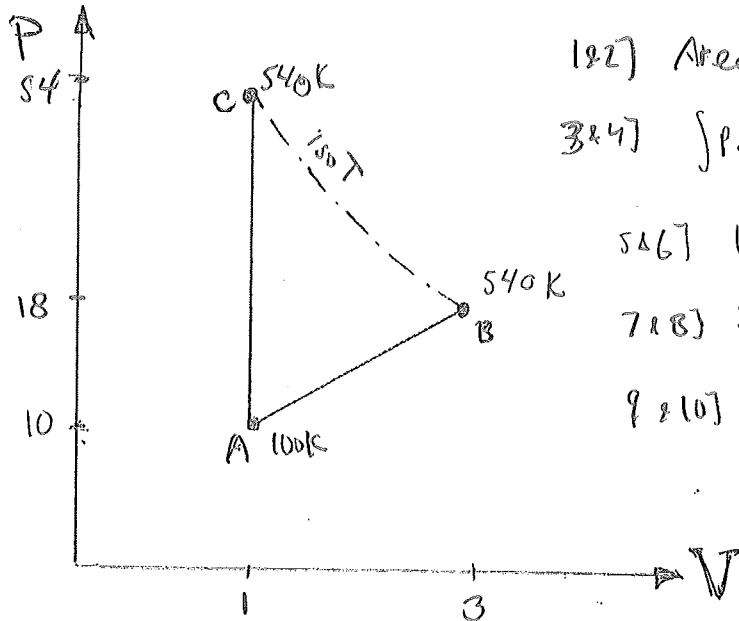
1&2. How much work is done by the gas on the path AB, in Joules? Answer 1  $\times 10^{\text{answer2}}$

3&4. How much work is done on the gas on the path BC, in Joules? Answer 3  $\times 10^{\text{answer4}}$

5&6. What is the temperature of the gas at point A, in K? Answer 5  $\times 10^{\text{answer6}}$

7&8. What is the temperature of the gas at point C, in K? Answer 7  $\times 10^{\text{answer8}}$

9&10. What is the heat added to the gas on path AC, in Joules? Answer 9  $\times 10^{\text{answer10}}$



122] Area =  $W = 2 \times 10 + \frac{1}{2} \cdot 2 \cdot 8 = 28 \text{ J}$

3&4]  $\int p dV = \int \frac{nRT}{V} dV = nRT \ln \frac{V_f}{V_i} = 54 \ln 3 = 59 \text{ J}$

5&6] 100 K

7&8] 540 K

9&10]  $Q = nC_v \Delta T = n \cdot \frac{3}{2}R \cdot (540 - 100) = 66 \text{ J}$