P #4

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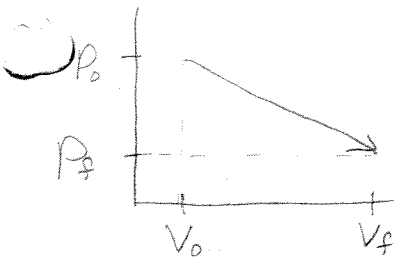

$P_o = 11 \times 10^5$ Pa
$P_f = 1 \times 10^5$ Pa

$V_o = 8.00\,cm^3 = 8 \times 10^{-6}\,m^3$
$V_f = 40.0\,cm^3 = 40 \times 10^{-6}\,m^3$

W = -area under graph

$= -\frac{1}{2} \cdot (\Delta P)(\Delta V) + -P_f \cdot \Delta V$
(triangle) (rectangle)

$= -\frac{1}{2}((11 \times 10^5) - (1 \times 10^5))((40 \times 10^{-6}) - (8 \times 10^{-6}))$
$+ -(1 \times 10^5\,Pa)((40 \times 10^{-6}\,m^3) - (8 \times 10^{-6}\,m^3))$

$= -\frac{1}{2}(10 \times 10^5)(3.2 \times 10^{-5}\,m^3) +$
$-(1 \times 10^5\,Pa)(3.2 \times 10^{-5}\,m^3)$

$W = -19.2$ J

$W = KE = \frac{1}{2} \cdot m \cdot v^2$

$19.2\,J = \frac{1}{2}(.040\,kg)(v^2)$

$v = 31$ m/s

b) The air exerts a force, causing work of $W = F \cdot d$

$P = \frac{F}{A}$ so $F = P \cdot A$

$= (1.0 \times 10^5\,Pa)(1.0 \times 10^{-4}\,m^2)$

$P = 1.0 \times 10^5$ Pa
$A = 1.0\,cm^2 = 1.0 \times 10^{-4}\,m^2$

$F = 10$ N

$W = F \cdot d$
$= (10\,N)(.32\,m)$

$W = 3.2$ N·m

$\frac{W_{air}}{W} = \frac{3.2\,N \cdot m}{19.2\,J} = \frac{1}{6}$