1°

Дано:
V, T_1, T_2
$p = const$

Найти: ΔU

Решение:

$U = \frac{i}{2} pV$; т.к. p и $V = const \Rightarrow U = const$
$\Rightarrow \Delta U = 0$

Ответ: $\Delta U = 0$

2°

Дано:
$V_0, 2V_0$
$T = const = 300 K$

Найти: A

Решение:

$\delta A = p dV = \nu RT \frac{dV}{V}$

$A = \nu RT \int \frac{dV}{V} = \nu RT \ln \frac{V_2}{V_1} = 1728$ Дж

3°

Дано:
$T = 273 K$
$\Delta T = 1 K$

Найти: Δc

$c = \sqrt{\frac{3RT}{M}}$; $\ln c = \frac{1}{2} \ln \frac{3R}{M} + \frac{1}{2} \ln T$

$\frac{\Delta c}{c} = \frac{\Delta T}{2T} \Rightarrow \Delta c = \frac{1}{2} \cdot \frac{1}{273} \cdot 333 \approx 0{,}61$ м/с

№1.47

Дано:
$p \sim V$
C_V

Найти: C

Решение:

1) $p = \alpha V \Rightarrow \frac{p}{V} = \alpha \Rightarrow pV^n = \alpha$ и $n = -1$

$n = \frac{C - C_p}{C - C_V} = \frac{C - C_V - R}{C - C_V} = -1$

$C - C_V - R = -C + C_V$

$2C = 2C_V + R$

$C = C_V + \frac{R}{2}$

Ответ: $C = C_V + \frac{R}{2}$

№1.42

Дано:
V_1, V_2

Найти: A

Решение:

$pV^n = \alpha$; $p_1 V_1^n = p_2 V_2^n$

$$\delta A = p\,dV = \frac{\alpha\, dV}{V^n} \Rightarrow$$

$$\Rightarrow A = \alpha \int \frac{dV}{V^n} = \frac{\alpha}{1-n} V^{1-n} \Big|_{V_1}^{V_2} = \frac{\alpha}{1-n}\left(V_2^{1-n} - V_1^{1-n}\right) =$$

$$= \frac{p_2 V_2 - p_1 V_1}{1-n} = \frac{\frac{p_1 V_1^n}{V_2^{n-1}} - p_1 V_1}{1-n} = \frac{p_1 V_1}{1-n}\left(\left(\frac{V_1}{V_2}\right)^{n-1} - 1\right)$$

Семинар

$pV^n = \text{const}$; $n = \frac{c - c_p}{c - c_V}$

$n(C=0) = \frac{C_p}{C_V} = \gamma = \frac{5}{3}$

$$C = \frac{\delta Q}{dT}$$

$pV = \alpha$ $(T = \text{const},\ C = \infty)$

$$c_{зв} = \sqrt{\frac{E}{\rho}}$$

$$\boxed{c_{зв} = \sqrt{\left(\frac{dp}{d\rho}\right)_{пр}}}$$

$$\rho = \frac{m}{V}; \quad d\rho = -\frac{m\,dV}{V^2}$$

$$c_{зв} = \sqrt{-\frac{V^2}{m}\left(\frac{dp}{dV}\right)_{пр}} = \sqrt{\frac{\gamma pV}{m}} = \sqrt{\frac{\gamma \nu RT}{m}} = \boxed{\sqrt{\frac{\gamma RT}{M}}}$$

$$pV^n = \alpha$$

$$\ln p + \gamma \ln V = const$$

$$\frac{dp}{p} + \gamma\frac{dV}{V} = 0 \Rightarrow \left(\frac{dp}{dV}\right)_{пр} = -\gamma\frac{p}{V}$$

$$\ln c = \frac{1}{2}\ln T + C$$

$$\frac{dc}{c} = \frac{dT}{2T} \Rightarrow dc = \frac{c \cdot dT}{2T}$$

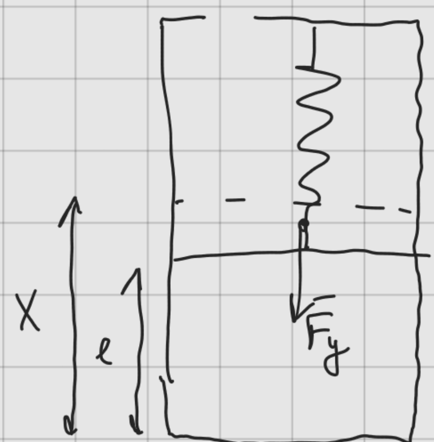
N154

Дано:
V_0, p_0, $S^2 = kV_0$

Найти: c

Решение:

$$pV = \nu RT$$



$$p = p_0 + \frac{k(x-l)}{S} =$$

$$= p_0 + \frac{kx}{S} - \frac{kl}{S} = \frac{kx}{S}$$

$$\frac{dp}{p} + \frac{dV}{V} = \frac{dT}{T}$$

$$\frac{dpS}{kx} + \frac{dV}{V} = \frac{dT}{T}$$

$$\boxed{C = \frac{\delta Q}{dT}} = \left(\frac{\partial U}{\partial T}\right)_V + \left(\underset{0}{\underset{\parallel}{\left(\frac{\partial U}{\partial V}\right)_T}} + p\right)\frac{dV}{dT_{проц}} =$$

$$pV^n = \alpha \qquad\qquad C = C_V + p\frac{dV}{dT}$$

$$\frac{dp}{p} + n\frac{dV}{V} = 0$$

$$\frac{dp\cancel{S}}{kx} + \frac{n\cancel{S}dx}{V} = 0$$

$$\frac{dV}{V}(1-n) = \frac{dT}{T}$$

$$F_y = k\frac{V_k - V_0}{S}$$

$$p = p_0 + \frac{F_y}{S} = p_0 + \frac{p_0}{V_0}S^2\frac{(V-V_0)}{S^2} = \frac{p_0 V}{V_0}$$

$$\frac{p}{V} = \frac{p_0}{V_0} = \alpha \Rightarrow n = -1 \Rightarrow -1 = \frac{C-C_p}{C-C_V}$$

$$-1 = \frac{C - C_V + R}{C - C_V}$$

$$C_V - C = C - C_V + R$$

$$2C = 2C_V + R$$

$$C = C_V + \frac{R}{2}$$

N1.83

Дано:

$T = 600\,^\circ C$

Решение:

$$C_p = 0{,}14\ \text{Дж}/\text{г}\cdot\text{К}$$
$$A = 126{,}9$$

$$C_p = \frac{\sum \nu C_p}{\sum \nu} = \frac{\frac{1-\alpha}{M_1} C_{p_1} + \frac{2\alpha}{M_2} C_{p_2}}{\frac{1-\alpha}{M_1} + \frac{2\alpha}{M_2}}$$

$$I_2 \rightarrow I$$

$\nu_1 =$ o–o

$(1-\alpha)\nu$ - ост

$\nu_2 =$ o

$\nu(2\alpha)$ - новоб

$(1+\alpha)\nu$

$$C_p = \frac{7}{2}\nu_1 R + \frac{5}{2}\nu_2 R$$

$$C = \frac{\sum C_i}{\sum m_i}$$

$$C_p = \frac{\frac{7}{2}(1-\alpha)\cancel{\nu} R + \frac{5}{2} 2\alpha \cancel{\nu} R}{\cancel{\nu}\mu}$$

$$2 \cdot 0{,}28\mu = 7(1-\alpha)R + 10\alpha R \Rightarrow \alpha \approx 0{,}5$$