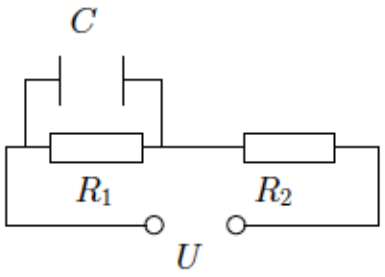
2. izpit iz Fizike II za študente Biokemije

2. september 2010

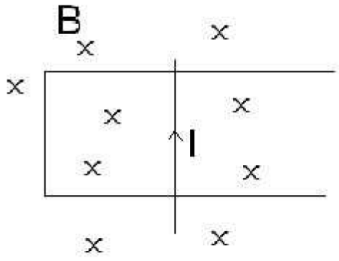
Naloge

1. 1 kg neznane kovine damo iz vrele vode v kalorimeter, v katerem je 0.5 kg vode s temperaturo 20 °C. Temperatura v kalorimetru se ustali na 34 °C. Kolikšna je specifična toplota neznane kovine? Specifična toplota vode je 4200 J/kgK. Toplotno kapaciteto kalorimetra zanemari.

2. Kolikšen naboj je shranjen na kondenzatorju s kapaciteto 1 pF, če sta upornosti uporov $R_1 = 1\ \Omega$ in $R_2 = 2\ \Omega$, gonilna napetost baterije pa je 9 V?



3. Pravokotna zanka širine 50 cm z drsečo žico z maso 20 g in upornostjo 10 Ω je postavljena v magnetno polje z gostoto 0.2 T, ki je pravokotno na ravnino zanke. Žico vlečemo po zanki s hitrostjo 10 cm/s v desno. Kolikšna magnetna sila deluje na žico in v katero smer kaže? Nato žico spustimo. Po kolikšnem času pade njena hitrost na polovico začetne vrednosti? Med žico in zanko ni trenja, upornost zanke zanemari.



Enačbe

$v = \frac{\mathrm{d}s}{\mathrm{d}t} \quad a = \frac{\mathrm{d}v}{\mathrm{d}t} \quad \omega = \frac{\mathrm{d}\varphi}{\mathrm{d}t} \quad \alpha = \frac{\mathrm{d}\omega}{\mathrm{d}t}$
$s = s_0 + vt \quad \varphi = \varphi_0 + \omega t$
$s = s_0 + v_0 t + \frac{1}{2}at^2 \quad v = v_0 + at \quad \varphi = \varphi_0 + \omega_0 t + \frac{1}{2}\alpha t^2 \quad \omega = \omega_0 + \alpha t$
$\omega = 2\pi\nu \quad v = \omega r \quad a_r = \frac{v^2}{r} \quad a_t = \alpha r$
$\vec{F} = m\vec{a} \quad \vec{M} = J\vec{\alpha} \quad \vec{M} = \vec{r} \times \vec{F}$
$F_\mathrm{g} = mg \quad F_\mathrm{vzm} = kx \quad F_\mathrm{lep} = k_\mathrm{lep}F_\mathrm{p} \quad F_\mathrm{tr} = k_\mathrm{tr}F_\mathrm{p}$
$J_\mathrm{valj} = \frac{1}{2}mr^2 \quad J_\mathrm{krogla} = \frac{2}{5}mr^2 \quad J_\mathrm{palica} = \frac{1}{12}ml^2 \quad J_\mathrm{točka} = mr^2 \quad J = J^* + mr^{*2}$
$\Delta W = A' \quad W_\mathrm{kin} = \frac{1}{2}mv^2 \quad W_\mathrm{pot} = mgh \quad W_\mathrm{pr} = \frac{1}{2}kx^2 \quad W_\mathrm{rot} = \frac{1}{2}J\omega^2 \quad A = \vec{F} \cdot \vec{s}$
$\Delta\vec{G} = \vec{F}\Delta t \quad \vec{G} = m\vec{v}$
$\Delta\vec{\Gamma} = \vec{M}\Delta t \quad \vec{\Gamma} = \vec{r} \times \vec{G} = J\vec{\omega}$
$\vec{r}^* = \frac{\sum_i m_i \vec{r}_i}{\sum_i m_i}$
$F_\mathrm{g} = \frac{Gm_1m_2}{r^2}$
$p = p_0 + \rho gh \quad p + \frac{1}{2}\rho v^2 + \rho gh = \mathrm{konst.}$
$F_\mathrm{vzg} = \rho V g$
$F_\mathrm{u} = \frac{1}{2}C_\mathrm{u}\rho S v^2 \quad F_\mathrm{u} = 6\pi\eta r v \quad \mathrm{Re} = \frac{l\rho v}{\eta}$
$t_0 = 2\pi\sqrt{\frac{l}{g}} \quad t_0 = 2\pi\sqrt{\frac{m}{k}} \quad s = s_0 \sin\omega t \quad \omega = 2\pi\nu = \frac{2\pi}{t_0}$
$c = \lambda\nu \quad c = \sqrt{\frac{F}{\rho S}} \quad s = s_0 \sin(kx - \omega t) \quad k = \frac{2\pi}{\lambda}$
$s_1 - s_2 = N\lambda \quad s_1 - s_2 = \left(N + \frac{1}{2}\right)\lambda \quad d\sin\alpha = N\lambda \quad d\sin\alpha = \left(N + \frac{1}{2}\right)\lambda$
$\frac{\Delta l}{l} = \frac{1}{E}\frac{F}{S} \quad \frac{\Delta l}{l} = \alpha\Delta T \quad \frac{\Delta V}{V} = \beta\Delta T \quad \beta = 3\alpha$
$pV = \frac{m}{M}RT \quad pV^\kappa = \mathrm{konst.} \quad \kappa = \frac{c_p}{c_V} \quad c_p = c_V + \frac{R}{M} \quad W_\mathrm{n} = mc_V T$
$\Delta W = A' + Q \quad A = -\int_{V_1}^{V_2} p\mathrm{d}V \quad Q = mc\Delta T \quad Q = C\Delta T \quad Q = mq_\mathrm{t} \quad Q = mq_\mathrm{i}$
$\eta = \frac{A_\mathrm{opr}}{Q_\mathrm{dov}} \quad \eta_\mathrm{C} = 1 - \frac{T_1}{T_2}$
$P = S\lambda\frac{\Delta T}{d}$
$\vec{F}_\mathrm{e} = e\vec{E} \quad F_\mathrm{e} = \frac{e_1e_2}{4\pi\varepsilon\varepsilon_0 d^2} \quad W_\mathrm{e} = eV \quad V = \frac{e}{4\pi\varepsilon\varepsilon_0 d}$
$E = \frac{\sigma}{2\varepsilon\varepsilon_0} \quad E = \frac{\sigma}{\varepsilon\varepsilon_0} \quad e = CU \quad C = \frac{\varepsilon\varepsilon_0 S}{d} \quad C = C_1 + C_2 \quad \frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} \quad W_\mathrm{e} = \frac{e^2}{2C}$
$U = RI \quad R = \frac{\xi l}{S} \quad R = R_1 + R_2 \quad \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} \quad P = UI$
$\mathbf{F} = I\mathbf{l} \times \mathbf{B} \quad B = \frac{\mu_0 I}{2\pi r} \quad B = \frac{\mu_0 NI}{l} \quad \mathbf{F} = e\mathbf{E} + e\mathbf{v} \times \mathbf{B} \quad \mathbf{M} = \mathbf{p}_m \times \mathbf{M} \quad \mathbf{p}_m = NI\mathbf{S}$
$U_i = -\frac{\mathrm{d}\Phi_m}{\mathrm{d}t} \quad \Phi_m = N\mathbf{S} \cdot \mathbf{B} \quad I_{ef} = \frac{I_0}{\sqrt{2}} \quad U_{ef} = \frac{U_0}{\sqrt{2}} \quad \bar{P} = I_{ef}U_{ef} \quad \omega = \frac{1}{\sqrt{LC}} \quad L = \frac{\mu_0 N^2 S}{l}$
$k_1 \sin\alpha = k_2 \sin\beta \quad \frac{1}{a} + \frac{1}{b} = \frac{1}{f} \quad \frac{h_1}{h_2} = \frac{a}{b}$