

Karta wybranych wzorów i stałych fizycznych

Mechanika

$v(t) = v_0 + at$ $s(t) = s_0 + v_0 t + \frac{at^2}{2}$ $\bar{a} = \frac{\Delta \vec{v}}{\Delta t} \quad \bar{a} = \frac{\vec{F}}{m}$ $\vec{p} = m\vec{v}$ $\vec{F} = \frac{\Delta \vec{p}}{\Delta t}$ $F_T = \mu F_N$ $W = Fs \cos \angle(\vec{F}, \vec{s})$ $E_{\text{kin}} = \frac{mv^2}{2}$	$P = \frac{\Delta W}{\Delta t}$ $\omega = \frac{\Delta \phi}{\Delta t} = \frac{2\pi}{T}$ $f = \frac{1}{T}$ $a_d = \frac{v^2}{r}$ $F_d = \frac{mv^2}{r}$ $F_g = G \frac{Mm}{r^2}$	$\vec{\gamma} = \frac{\vec{F}_g}{m}$ $E_{\text{pot}} = -G \frac{Mm}{r}$ $\Delta E_{\text{pot}} = mgh \quad h \ll R_Z$ $V = \frac{E_{\text{pot}}}{m}$ $v_I = \sqrt{\frac{GM}{R_Z}}$ $v_{II} = \sqrt{\frac{2GM}{R_Z}}$	$\frac{T^2}{R^3} = \text{const.}$ $F = -kx$ $x(t) = A \sin(\omega t + \phi)$ $v(t) = A\omega \cos(\omega t + \phi)$ $a(t) = -A\omega^2 \sin(\omega t + \phi)$ $E_{\text{pot}} = \frac{1}{2} kx^2$ $T = 2\pi \sqrt{\frac{l}{g}}$
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Termodynamika i własności materii

$p = \frac{F}{S}$ $\rho = \frac{m}{V}$ $\Delta Q = mc_w \Delta T$ $\Delta Q = mL \quad \Delta Q = mR$	$pV = nRT$ $\kappa = \frac{c_p}{c_v}$ $c_p = c_v + R$ $\Delta U = Q + W$	$W = p\Delta V$ $\eta = \frac{W_u}{W_c} \quad \eta = \frac{W}{Q}$ $\eta = \frac{Q_1 - Q_2}{Q_1}$
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Elektryczność, magnetyzm, fale i fizyka współczesna

$F = \frac{1}{4\pi\epsilon_0} \frac{Qq}{r^2}$ $\vec{E} = \frac{\vec{F}}{q}$ $E_{\text{pot}} = \frac{1}{4\pi\epsilon_0} \frac{Qq}{r}$ $V = \frac{E_{\text{pot}}}{q}$ $ E = \frac{U}{d}$ $C = \frac{Q}{U} \quad C = \epsilon_0 \epsilon_r \frac{S}{d}$ $\frac{1}{C_{\text{calk}}} = \frac{1}{C_1} + \frac{1}{C_2} + \dots + \frac{1}{C_n}$ $C_{\text{calk}} = C_1 + C_2 + \dots + C_n$	$I = \frac{\Delta Q}{\Delta t}$ $U = IR$ $R = \rho \frac{l}{S}$ $R_{\text{calk}} = R_1 + R_2 + \dots + R_n$ $\frac{1}{R_{\text{calk}}} = \frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_n}$ $I_{\text{calk}} = \sum_{k=1}^n I_k$ $\sum_{k=1}^n U_k + \sum_{j=1}^m E_j = 0$ $I = \frac{E}{R_z + r_w}$ $P = IU$ $F = qvB \sin \angle(\vec{v}, \vec{B})$ $F = BIl \sin \angle(\vec{l}, \vec{B})$	$\Phi = BS \cos \angle(\vec{B}, \vec{S})$ $B = \frac{\mu_0 I}{2\pi r} \quad B = \frac{\mu_0 I}{2r}$ $B = \mu_0 N \frac{I}{l} \quad F = \frac{\mu_0 I_1 I_2 l}{2\pi r}$ $E_{\text{SEM}} = -\frac{\Delta \Phi}{\Delta t} \quad E_{\text{SEM}} = -L \frac{\Delta I}{\Delta t}$ $L = \mu_0 \mu_r N^2 \frac{S}{l}$ $\frac{U_2}{U_1} = \frac{n_2}{n_1}$ $\lambda = \frac{v}{f} \quad n\lambda = d \sin \alpha$ $\frac{v_1}{v_2} = \frac{\sin \alpha}{\sin \beta} = \frac{n_2}{n_1}$ $E = mc^2$
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Mnożnik	Przedrostek	Oznaczenie	Mnożnik	Przedrostek	Oznaczenie
10 ⁶	mega	M	10 ⁻⁶	mikro	μ
10 ³	kilo	k	10 ⁻³	mili	m
10 ²	hekto	h	10 ⁻²	centy	c
10 ¹	deka	da	10 ⁻¹	decy	dc

Uwaga! Ta karta jest załącznikiem do obu arkuszy egzaminacyjnych.

Układ okresowy pierwiastków

1,0079 1H Wodór	9,01218 4Be Beryl	47,88 22Ti Tytan	50,941 23V Wanad	54,938 25Mn Mangan	58,933 27Co Kobalt	58,69 28Ni Nikiel	63,546 29Cu Miedź	65,39 30Zn Cynk	12,011 6C Węgł	14,006 7N Azot	15,999 8O Tlen	18,998 9F Fluor	4,0026 3He Hel
6,941 3Li Lit	24,205 12Mg Magnez	91,224 40Zr Cyrkon	92,906 41Nb Niob	96,905 43Tc Molibden	102,905 45Rh Ruten	106,42 46Pd Pallad	107,868 47Ag Srebro	112,411 48Cd Kadm	12,011 6C Węgł	14,006 7N Azot	15,999 8O Tlen	18,998 9F Fluor	20,179 10Ne Neon
22,9897 11Na Sód	24,205 12Mg Magnez	91,224 40Zr Cyrkon	92,906 41Nb Niob	96,905 43Tc Molibden	102,905 45Rh Ruten	106,42 46Pd Pallad	107,868 47Ag Srebro	112,411 48Cd Kadm	12,011 6C Węgł	14,006 7N Azot	15,999 8O Tlen	18,998 9F Fluor	20,179 10Ne Neon
39,0983 19K Potas	40,078 20Ca Wapń	91,224 40Zr Cyrkon	92,906 41Nb Niob	96,905 43Tc Molibden	102,905 45Rh Ruten	106,42 46Pd Pallad	107,868 47Ag Srebro	112,411 48Cd Kadm	12,011 6C Węgł	14,006 7N Azot	15,999 8O Tlen	18,998 9F Fluor	20,179 10Ne Neon
85,467 37Rb Rubid	87,62 38Sr Stront	178,49 72Hf Hafn	180,947 73Ta Tantal	186,207 75Re Ren	192,22 77Ir Osm	195,08 78Pt Platyna	196,966 79Au Złoto	200,59 80Hg Rtęć	118,710 50Sn Cyna	121,75 51Sb Antymon	127,60 52Te Telur	126,904 53I Jod	131,29 54Xe Ksenon
132,905 55Cs Cez	137,327 56Ba Bar	178,49 72Hf Hafn	180,947 73Ta Tantal	186,207 75Re Ren	192,22 77Ir Osm	195,08 78Pt Platyna	196,966 79Au Złoto	200,59 80Hg Rtęć	118,710 50Sn Cyna	121,75 51Sb Antymon	127,60 52Te Telur	126,904 53I Jod	131,29 54Xe Ksenon
223,02 87Fr Franc	226,025 88Ra Rad	261,1 104Unq	262,1 105Unp	262,1 106Unh	265,1 108Uno	266,1 109Une	266,1 109Une	266,1 109Une	207,2 82Pb Ołów	208,980 83Bi Bismut	208,982 84Po Polon	209,987 85At Astat	222,018 86Rn Radon

138,905 57La Lantan	140,907 59Pr Praseodym	144,24 60Nd Neodym	144,913 61Pm Promet	150,36 62Sm Samar	151,965 63Eu Europ	157,25 64Gd Gadoln	158,925 65Tb Terb	162,50 66Dy Dysproz	164,930 67Ho Holm	167,26 68Er Erb	168,93 69Tm Tul	173,04 70Yb Ierb	174,967 71Lu Lutet
227,028 89Ac Aktyn	231,036 91Pa Protaktyn	238,028 92U Uran	237,048 93Np Neptun	244,064 94Pu Pluton	243,061 95Am Ameryk	247,07 96Cm Kür	247,07 97Bk Berkel	251,08 98Cf Kaliforn	252,08 99Es Einstein	257,095 100Fm Ferm	258,099 101Md Mendelew	259,1 102No Nobel	260,1 103Lr Lorens

Ważniejsze stałe fizyczne

Przyspieszenie ziemskie $g = 9,81 \frac{m}{s^2} \approx 10 \frac{m}{s^2}$	Stała grawitacji $G = 6,67 \cdot 10^{-11} \frac{Nm^2}{kg^2}$	Stała gazowa $R = 8,31 \frac{J}{molK}$	Przenikalność dielektryczna próżni $\epsilon_0 = 8,85 \cdot 10^{-12} \frac{C^2}{Nm^2}$	Masa spoczynkowa elektronu $m_e = 9,11 \cdot 10^{-31} kg$	Masa spoczynkowa neutronu $m_n = 1,68 \cdot 10^{-27} kg$
Masa Ziemi ²⁴ $M_Z = 5,98 \cdot 10^{24} kg$	Liczba Avogadro $N_A = 6,02 \cdot 10^{23} \frac{1}{mol}$	Stała Boltzmanna $k_B = 1,38 \cdot 10^{-23} \frac{J}{K}$	Przenikalność magnetyczna próżni $\mu_0 = 4\pi \cdot 10^{-7} \frac{N}{A^2}$	Masa spoczynkowa protonu $m_p = 1,67 \cdot 10^{-27} kg$	Jednostka masy atomowej $\mu = 1,66 \cdot 10^{-27} kg$
Średni promień Ziemi $R_Z = 6370 km$	Objętość 1 mola gazu w warunkach norm. alnych $V = 22,4 \frac{dm^3}{mol}$	Stała Plancka $h = 6,62 \cdot 10^{-34} Js$	Prędkość światła w próżni $c \approx 3 \cdot 10^8 \frac{m}{s}$	Ładunek elementarny $e = 1,6 \cdot 10^{-19} C$	$\mu = 931,5 \frac{MeV}{c^2}$