Formler for bruk ved eksamen i KJ1000 Generell kjemi med laboratorium

Gjennomsnittlig kinetisk energi pr. molekyl:
$$\overline{KE} = \frac{3}{2}k_B T = \frac{1}{2}m\overline{u^2}$$

Midlere kvadrathastighet:
$$\overline{u^2} = \frac{3RT}{M}$$

Grahams diffusjonslov:
$$\frac{r_1}{r_2} = \sqrt{\frac{M_2}{M_1}}$$

Van der Waals tilstandsligning:
$$\left(P + \frac{an^2}{V^2}\right)(V - nb) = nRT$$

Varmekapasitet:
$$C = ms, \qquad q = ms\Delta T = C\Delta T$$

Trykk-volum arbeid (konstant trykk):
$$w = -P\Delta V$$

Standard entalpiendring for en reaksjon:
$$\Delta H^\circ_{\text{rxn}} = \Sigma n\Delta H^\circ_{\text{f}}(\text{produkter}) - \Sigma m\Delta H^\circ_{\text{f}}(\text{reaktanter})$$

Frekvens og bølgelengde:
$$\nu = \frac{c}{\lambda}$$

Fotonets energi:
$$\text{E} = h\nu$$

de Boglies bølgelengde:
$$\lambda = \frac{h}{mu}$$

Coulombs lov:
$$E = k\frac{Q_1 Q_2}{r}$$

Dipolmoment:
$$\mu = Q \times r$$

Clausius-Clapeyrons ligning:
$$\ln P = -\frac{\Delta H_{\text{vap}}}{RT} + C$$
$$\ln\frac{P_1}{P_2} = \frac{\Delta H_{\text{vap}}}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$

Henrys lov:
$$c = kP$$

Raoults lov:
$$P_1 = x_1 P_1^\circ$$

Kokepunktsforhøyelse:
$$\Delta T_{\text{b}} = K_{\text{b}} m$$

Frysepunktsnedsettelse:
$$\Delta T_{\text{f}} = K_{\text{f}} m$$

Osmotisk trykk:
$$\pi = MRT$$

Hastighetsloven:
$$v = k[\text{A}]^x[\text{B}]^y$$

Integrerte hastighetslover:

Orden	Integrert lov
0	$[\text{A}]_t = -kt + [\text{A}]_0$
1	$\ln[\text{A}]_t = -kt + \ln[\text{A}]_0$
2	$\frac{1}{[\text{A}]_t} = kt + \frac{1}{[\text{A}]_0}$

Halveringstider:

Orden	Integrert lov
0	$t_{½} = \frac{[\text{A}]_0}{2k}$
1	$t_{½} = \frac{\ln 2}{k} = \frac{0{,}693}{k}$
2	$t_{½} = \frac{1}{k[\text{A}]_0}$

Arrhenius' ligning:
$$k = Ae^{-E_{\text{a}}/RT}$$
$$\ln k = \left(-\frac{E_{\text{a}}}{R}\right)\left(\frac{1}{T}\right) + \ln A$$

K_c og K_P:
$$K_P = K_c(RT)^{\Delta n}$$

Henderson-Hasselbach ligningen:
$$\text{pH} = \text{p}K_{\text{a}} + \log\frac{[\text{base}]}{[\text{syre}]}$$

Termodynamikkens første lov (lukket system):
$$\Delta U = q + w$$

Entropi:
$$S = k_{\text{B}} \ln W$$

Entropiendring:
$$\Delta S_{\text{universet}} = \Delta S_{\text{system}} + \Delta S_{\text{omgivelser}} \geq 0$$

$$\Delta S_{\text{omgivelser}} = \frac{-\Delta H_{\text{system}}}{T}$$

Endring i Gibbs energi ved konstant T:
$$\Delta G = \Delta H - T\Delta S$$

Fri energi og kjemisk likevekt:
$$\Delta G = \Delta G^\circ + RT\ln Q$$
$$\Delta G^\circ = -RT\ln K$$

Cellespenning:
$$E^\circ_{\text{celle}} = E^\circ_{\text{katode}} - E^\circ_{\text{anode}}$$

Fri energi og cellespenning:
$$\Delta G = -nFE_{\text{celle}}$$
$$\Delta G^\circ = -nFE^\circ_{\text{celle}}$$

Cellespenning og likevektskonstant:
$$E^\circ_{\text{celle}} = \frac{RT}{nF}\ln K$$

Ved 25 °C:
$$E^\circ_{\text{celle}} = \frac{0{,}0257\ \text{V}}{n}\ln K = \frac{0{,}0592\ \text{V}}{n}\log K$$

Nernsts ligning:
$$E = E^\circ - \frac{RT}{nF}\ln Q$$

Konstanter:	Tallverdi	Benevning
Avogadros tall, N_A	$6{,}0221415 \times 10^{23}$	Ubenevnt
Gasskonstanten, R	0,082057	L×atm/(mol×K)
	8,3145	J/(mol×K)
Boltzmanns konstant, k_B	$1{,}3807 \times 10^{-23}$	J/K
Faradays konstant, F	96485	J/(mol×V)
Plancks konstant, h	$6{,}6261 \times 10^{-34}$	J s
Lyshastighet i vakuum	$2{,}9979 \times 10^{8}$	m/s

Omregning trykkenheter	pascal	bar	atm	mmHg
1 pascal =	1	10^{-5}	$9{,}869 \times 10^{-6}$	$7{,}501 \times 10^{-3}$
1 bar =	10^5	1	0,9869	750,1
1 atm =	$1{,}013 \times 10^5$	1,013	1	760,0
1 mmHg =	133,3	$1{,}333 \times 10^{-3}$	$1{,}316 \times 10^{-3}$	1

Andre omregninger:

$1\ \text{J} = 1\ \text{N m} = 1\ \text{W s} = 1\ \text{V C}$	$1\ \text{N} = 1\ \text{kg m s}^{-2}$	$1\ \text{C} = 1\ \text{A s}$	$1\ \text{Pa} = 1\ \text{N m}^{-2}$	$1\ \text{W} = 1\ \text{V A} = 1\ \Omega\ \text{A}^2$