Type of uncertainty	Uncertainty evaluation
Uncertainties of direct measurements	
Standard uncertainty: **Type A** (quantity *X* estimated from *n* direct, independent, repeated observations x_i)	For an input quantity *X* determined from *n* independent repeated observations the standard uncertainty is represented by standard deviation estimator calculated according to the following formula: $$\boldsymbol{u_A(x)} \equiv s_{\bar{x}} = \sqrt{\frac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n(n-1)}}$$ where $$X \approx \bar{X} = \frac{1}{n}\sum_{i=1}^{n} x_i$$ is the arithmetic mean (average) of the *n* observations.
Standard uncertainty: **Type B** (quantity *X* obtained from single measurement or experimental results are not spread)	The standard uncertainty is evaluated by scientific judgement based on all of the available information on the possible variability of measurand including: - calibration uncertainty (e.g. uncertainty of used instrument $\Delta_p x$ resulting from finite instrument resolution or discrimination threshold); - experimentalist uncertainty$\Delta_e x$ (e.g. personal bias in reading analogue instruments); - inexact values of constants $\Delta_t x$… $$\boldsymbol{u_B(x)} = \sqrt{\frac{(\Delta_p x)^2}{3} + \frac{(\Delta_e x)^2}{3} + \frac{(\Delta_t x)^2}{3} + \cdots}$$
Total standard uncertainty: Assumption: **Type A** and **Type B** evaluation appears at the same time	$$\boldsymbol{u(x)} = \sqrt{u_A^2(x) + u_B^2(x)} =$$ $$= \sqrt{\frac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n(n-1)} + \frac{(\Delta_p x)^2}{3} + \frac{(\Delta_e x)^2}{3} + \frac{(\Delta_t x)^2}{3} + \cdots}$$
Uncertainties of indirect measurements	
Combined standard uncertainty: is calculated using an appropriate combination of some measured quantites x_i and its standard uncertainties.	If the measurand $y = f(x_1, x_2, \ldots, x_j)$ then: $$\boldsymbol{u_c(y)} = \sqrt{\sum_{j=1}^{k}\left(\frac{\partial f}{\partial x_j}\right)^2 u^2(x_j)}$$ (all input quantities x_i are independent)
Expanded uncertainty: a *coverage factor k* may be used e.g. when the empirical result is	$U(x) = ku(x)$ or $U_c(x) = ku_c(x)$ in most cases (including the General Physics Laboratory experiments) it is assumed that $k=2$.

based on a few measurements	
Reporting results and uncertainty: 1. Round uncertainty up to two significant figures. 2. Round the value to the same digit.	For standard uncertainties it is recommended to present it using parentheses, whereas for expanded uncertainties the '±' symbol should be used. Example: • Mass measurement Let assume that $m = 2{,}026\ kg$ and $u(m) = 0{,}036\ kg$. Then $m = 2{,}026(36) kg$ • Empirical results of a block volume calculation: $V = 23{,}5835\ m^3$, $u_c(V) = 0{,}786\ m^3$ Expanded uncertainty: $U_c(V) = 1{,}572\ \ m^3 \approx 1{,}6\ \ m^3$ Final result: $V = 23{,}6 \pm 1{,}6\ m^3$