

Uitwerkingen oefenopgaven EE1320 Meettechniek - college 1: Inleiding meten en meetsystemen

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Regtien: opgaven 1.8, 1.9, 7.6, 7.7 \Rightarrow Zie pdf met uitwerkingen op Blackboard

1.3 Insertion of SI basic units yields:

$$[s]^{-1} = [m]^2([N]/\{[kg][m]^{-3}\})^{1/2} = [m]^2([kg][m/s^2]/\{[kg][m]^{-3}\})^{1/2} = [s]^{-1}.$$

The unit expression would be correct in case the SI-units would be specified. Since the units are NOT specified, this is not necessarily the case (length could e.g. be given in inches). Therefore, the correct answer is D.

1.4 $C = Q/V = I \cdot t/V$: $[F] = [A][s]/[V]$, $[V] = [kg][m]^2/([A][s]^3) \rightarrow$
 $[F] = [A][s]\{[A][s]^3/([kg][m]^2)\} = [A]^2[s]^4[kg]^{-1}[m]^{-2}$
Note: The Volt [V] is NOT a basic SI unit.

2.2 Largest deviation from calibration temperature is: $\max\{60-20, 20-(-10)\} = 40 \text{ }^\circ\text{C} \rightarrow$
Repr. = $0.01\%/^\circ\text{C} \times 40^\circ\text{C} + 0.1\%/month \times 3 \text{ months} = 0.7\%$.

2.3 Display with 4 digits and 10 V full scale \rightarrow Resolution = $10^{-4} \times 10 \text{ V} = 1 \text{ mV}$.

2.4 Inaccuracy = $0.002 \times 10 \text{ V} + 0.005 \times 7.2 \text{ V} = 56 \text{ mV}$.

2.5 Calibration temperature preferably at mid-range: $T_{\text{cal}} = 15 \text{ }^\circ\text{C}$. The maximum temperature deviation from the calibration temperature is then $\Delta T_{\text{max}} = 15 \text{ }^\circ\text{C}$. To obtain a reproducibility of 1%, we need $\Delta T_{\text{max}} \times 0.04\%/^\circ\text{C} + t_{\text{max}} \times 0.1\%/month = 1\%$. Therefore, the maximum time t_{max} before re-calibration is $t_{\text{max}} = 4 \text{ months}$.