

25PY101: Engineering Physics

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Test 2: CGS to SI Conversion

Name: _____

Total marks: 20

Registration No.: _____

Instructions:

1. Each blank carries 1 mark.
 2. Report measured quantities in scientific notation.
 3. Extra marks for reporting in engineering notation.
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Conversion factors

1. $1 \text{ cm}^3 = \underline{\hspace{2cm}} \text{ m}^3$
2. $1 \text{ cm}^2/(\text{V}\cdot\text{s}) = \underline{\hspace{2cm}} \text{ m}^2/(\text{V}\cdot\text{s})$
3. $1 \text{ cm}^{-3} = \underline{\hspace{2cm}} \text{ m}^{-3}$
4. $1 \text{ V/cm} = \underline{\hspace{2cm}} \text{ V/m}$
5. $1 \text{ A/cm}^2 = \underline{\hspace{2cm}} \text{ A/m}^2$
6. $1 \text{ S/cm} = \underline{\hspace{2cm}} \text{ S/m}$
7. $1 \Omega \cdot \text{cm} = \underline{\hspace{2cm}} \Omega \cdot \text{m}$
8. $1 \mu\Omega \cdot \text{cm} = \underline{\hspace{2cm}} \Omega \cdot \text{m}$
9. $1 \text{ F/cm} = \underline{\hspace{2cm}} \text{ F/m}$
10. $1 \text{ fs} = \underline{\hspace{2cm}} \text{ s}$

Measured quantities

1. A cube of side 2.5 cm has a volume of 15.6 cm³.
In SI units, the volume is $\underline{\hspace{2cm}} \text{ m}^3$.

2. The electron mobility in GaAs is $8500 \text{ cm}^2/\text{V}\cdot\text{s}$.
In SI units, $\mu = \underline{\hspace{2cm}} \text{ m}^2/\text{V}\cdot\text{s}$.
3. A doped silicon sample has carrier concentration $4.8 \times 10^{16} \text{ cm}^{-3}$.
In SI units, $n = \underline{\hspace{2cm}} \text{ m}^{-3}$.
4. Doping concentration is 1 ppm. The atomic density is $5 \times 10^{22} \text{ cm}^{-3}$. In SI units, the doping concentration is $\underline{\hspace{2cm}} \text{ m}^{-3}$.
5. The breakdown field in air is approximately 30 kV/cm .
In SI units, $E = \underline{\hspace{2cm}} \text{ V/m}$.
6. A current density of 25 A/cm^2 flows through a contact.
In SI units, $J = \underline{\hspace{2cm}} \text{ A/m}^2$.
7. A semiconductor has conductivity $3.5 \times 10^{-3} \text{ S/cm}$.
In SI units, $\sigma = \underline{\hspace{2cm}} \text{ S/m}$.
8. The resistivity of copper is $1.68 \times 10^{-6} \Omega \cdot \text{cm}$.
In SI units, $\rho = \underline{\hspace{2cm}} \Omega \text{ m}$.
9. The resistivity of tungsten is $8.55 \mu\Omega \cdot \text{cm}$.
In SI units, $\rho = \underline{\hspace{2cm}} \Omega \text{ m}$.
10. A coaxial cable has capacitance $2.1 \times 10^{-11} \text{ F/cm}$.
In SI units, $C' = \underline{\hspace{2cm}} \text{ F/m}$.

Hints (Geometrical / Scaling Analogies)

- Volume scales as (length)³: multiply by 10^{-6} .
- Mobility scales as area: multiply by 10^{-4} .
- Carrier concentration is per volume: multiply by 10^6 .
- Electric field is volts per length: multiply by 10^2 .
- Current density is per area: multiply by 10^4 .
- Conductivity = $J/E \Rightarrow 10^4/10^2 = 10^2$.
- Resistivity = $1/\sigma \Rightarrow 10^{-2}$.
- Micro-ohm-cm adds 10^{-6} : multiply by 10^{-8} .
- Capacitance per length (area/length): multiply by 10^2 .
- milli $\rightarrow$ micro $\rightarrow$ nano $\rightarrow$ femto.

End of Test