Presentation of Data: *Tables and Graphs*

Scientific data should be presented:

- clearly
- concisely
- and ***unambiguously***

Consider density data for air at 1.00 bar reported as:

t(° C)	air density x 10^{-3} gram per mL
0	1.292
10	1.247
20	1.204
30	1.165

What does this mean?

1.292 is the air density multiplied by 10^{-3}?

Then the density of air at 0 °C is 1.292 x 10^{3} gram/ mL = 1,292. gram/mL!!!

t(° C)? This means t is a function of °C? Or t multiplied by °C?

Quantity Calculus

Unambiguous designation of the units of data presented in graphs and tables.

Every physical quantity (T, p, V, H, …)
is a **pure number** multiplied by a **unit**.

Example: air density = **1.292 x 10^{-3}** x **gram mL^{-1}**

physical quantity = pure number **x** unit

$$\text{pure number (in a table)} = \frac{\text{physical quantity}}{\text{unit}}$$

Quantity Calculus

Better presentation of the air density data:

t / ° C	air density / (10^{-3} gram mL^{-1})
0	1.292
10	1.247
20	1.204
30	1.165

Quantity Calculus

Even better:

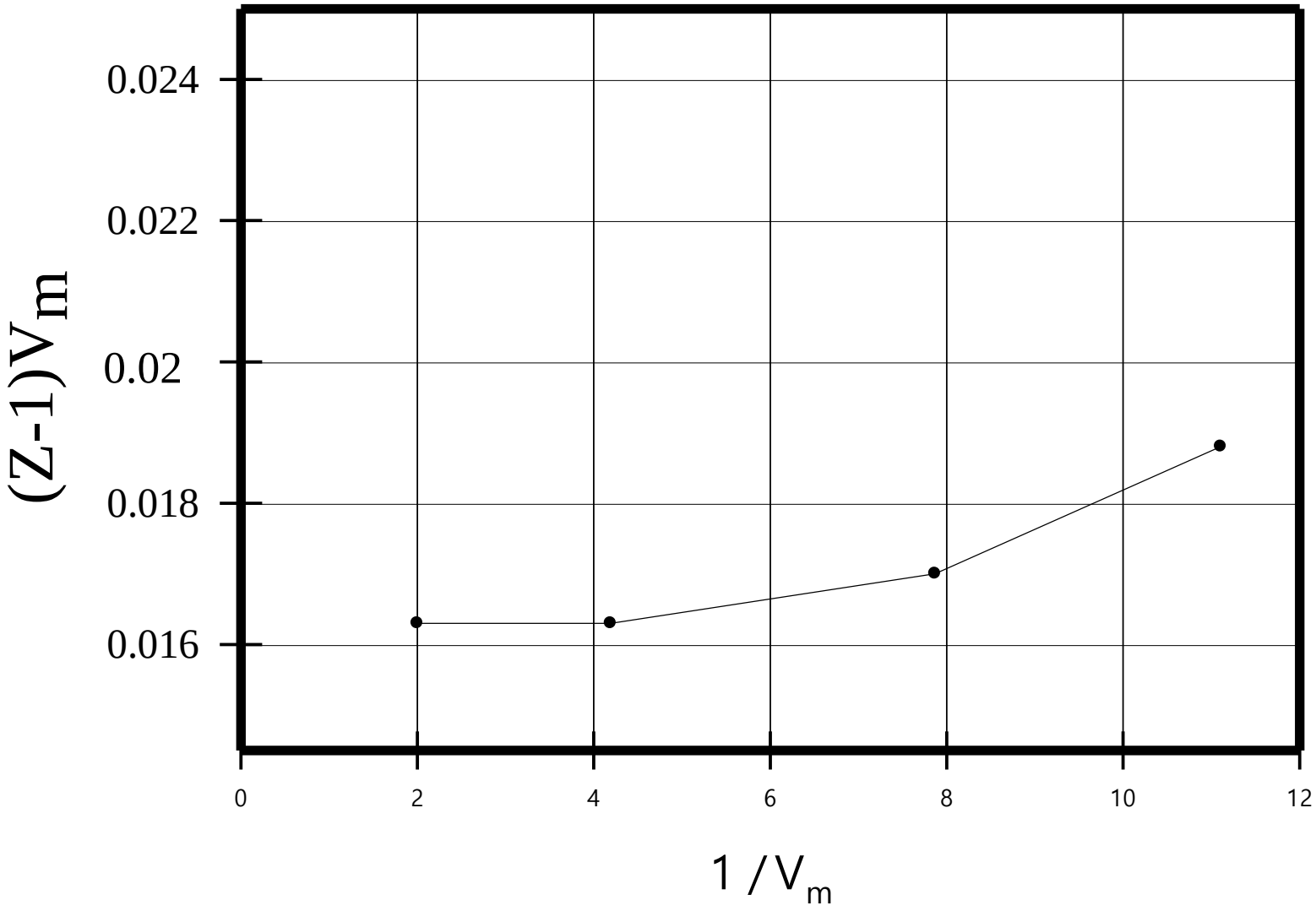
t / ° C	air density / (mg mL^{-1})
0	1.292
10	1.247
20	1.204
30	1.165

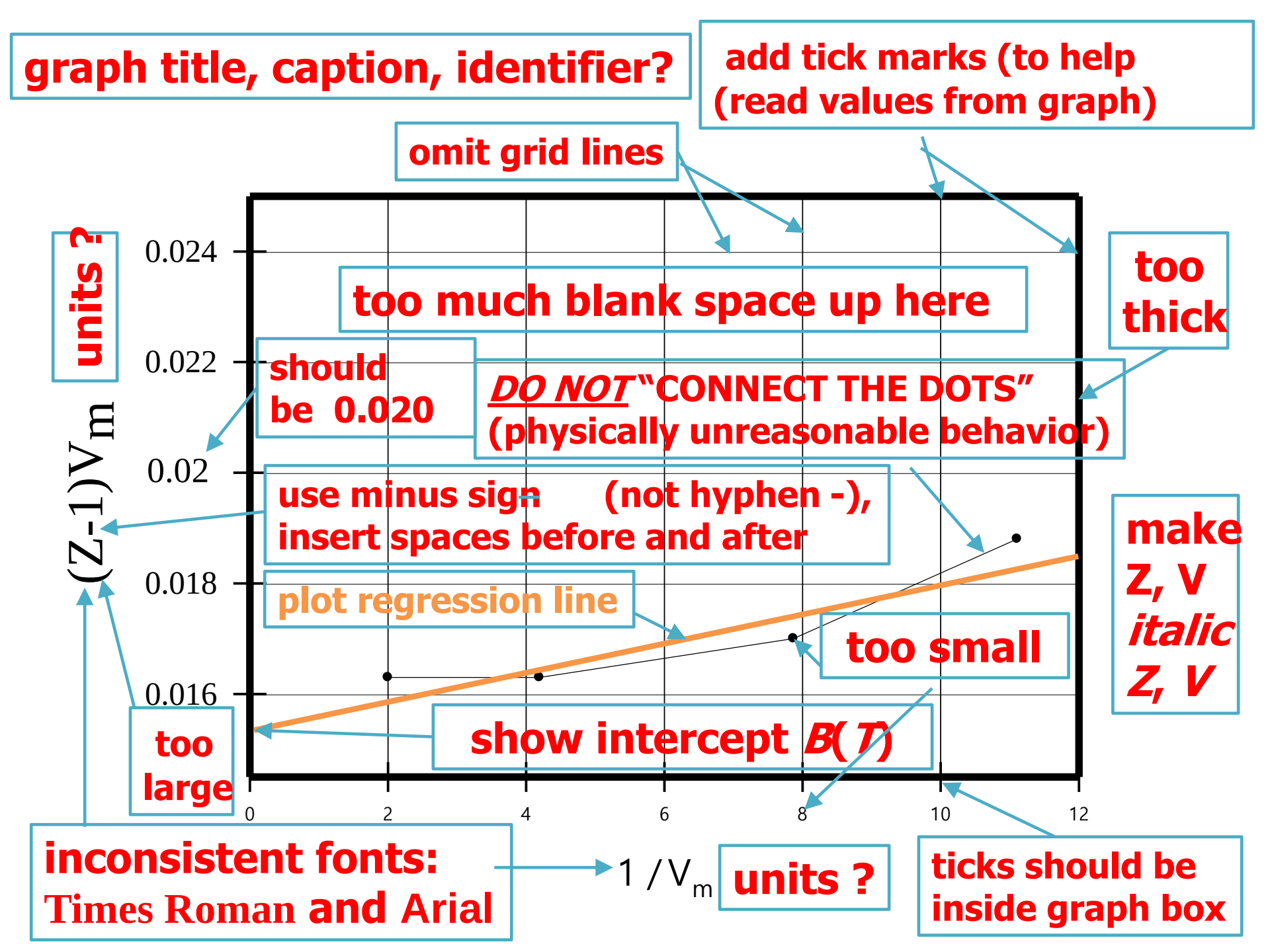
at °C: $1.292 = \dfrac{\text{air density}}{\text{mg mL}^{-1}}$ ← multiply both sides by mg mL^{-1}

$1.292 \text{ mg mL}^{-1} = \text{air density}$

This is a *BAD* graph. *WHY?*

(about 10 reasons!)




graph title, caption, identifier?
add tick marks (to help read values from graph)
omit grid lines
units ?
too much blank space up here
too thick
should be 0.020
DO NOT "CONNECT THE DOTS" (physically unreasonable behavior)
use minus sign (not hyphen -), insert spaces before and after
make Z, V italic Z, V
plot regression line
too small
too large
show intercept B(T)
inconsistent fonts: Times Roman and Arial
units ?
ticks should be inside graph box
(Z-1)Vm
1 / Vm
0.024
0.022
0.02
0.018
0.016
0
2
4
6
8
10
12

GOOD graph !

$(Z - 1)V_m$ plotted against $1/V_m$ for H_2 at 0.00 °C
to calculate the second virial coefficient $B(T)$
and the third virial coefficient $C(T)$