

BIG CHEM: Unit 01 - Scientific Skills

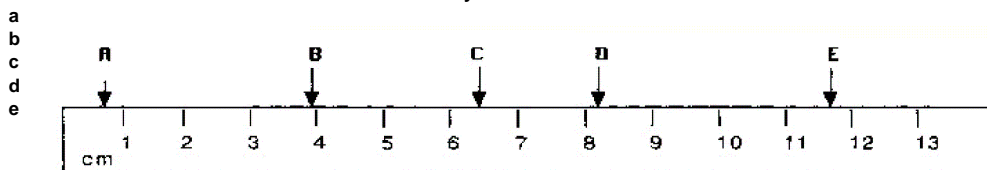
Problem Set #1

Due: Friday, Sept 22, 2007
Mr. Darlington

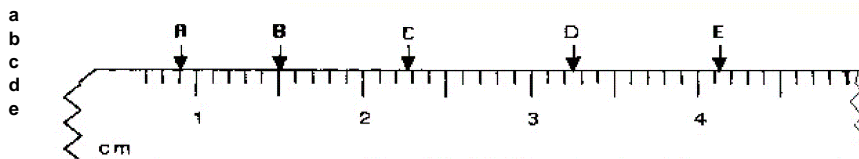
Make sure you are following the problem set formatting guidelines as outlined in the course information sheet.

- Your job at a tire store requires you to determine the cause of a customer's flat tire. Describe how you would investigate the situation using the scientific method. Make sure you explain each step of the scientific method as it applies to your investigation.
- For each group of values listed below, write the items in order from largest to smallest. Then state whether the values represent distance, mass, or volume.
 - 10 km, 10 pm, 10 μ m, 10 dm
 - 0.5 μ L, 0.5 nL, 0.5 cL
 - 1.2 mm, 1.2 km, 1.2 cm
 - 3.5 cg, 3.5 g, 3.5 ng, 3.5 μ g
 - 0.25 μ L, 0.25 dL, 0.25 cL
 - 7.3 g, 7.3 pg, 7.3 kg, 7.3 mg
 - 4 pL, 4 μ L, 4kL, 4mL, 4 dL
 - 8 μ m, 8 pm, 8 m, 8 km, 8 nm
 - 0.1 kL, 0.1 L, 0.1 μ L, 0.1 pL
 - 5.6 dg, 5.6 kg, 5.6 pg, 5.6 μ g

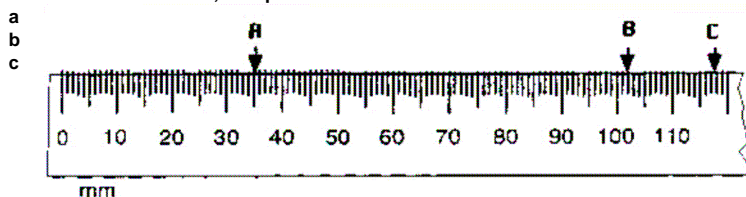
- Estimate the number of centimeters indicated by each of the arrows.



- Same as Number 3



- Same as Number 3, except units are mm.



- Convert the following to scientific notation

- 1,000,000
- 6,460,000,000
- 0.14
- 70
- 0.00789

- Convert the following to common notation

- 3.00 E 08
- 2.0 E 5
- 1.26 \times E-6
- 6.350 \times E-5
- 5.1 E 0

- Perform the following calculations. Express your answer in scientific notation.

- 2.1 E3 + 2.1 E2
- 3.25 E5 - 5.2 E3
- 8.7 E6 + 3.1 E7
- 9.63 E5 + 8.81 E4
- 1.3 E-4 - 5.6 E-5

- f $(5.7 \text{ E}4) \times (3.1 \text{ E}2)$
- g $(4.5 \text{ E}3) \div (1.5 \text{ E}1)$
- h $(8.8 \text{ E}4) \div (2.2 \text{ E}5)$
- l $(2.3 \text{ E}-1) \times (5.0 \text{ E}-1)$
- j $(1.24 \text{ E}2) \div (4.0 \text{ E}-2)$

9 Determine the number of significant digits in the following measurements.

- a 48 cm
- b 306.2 g
- c .329 m
- d 93.9520 degrees C
- e 3700 mm
- f 700. m
- g 82.000 g
- h $6.24 \text{ E}-4$ dm
- l 0.00432 mm
- j 10.0 kg

10 Perform each of the following calculations, expressing the answer with the correct number of significant digits.

- a $3.482 \text{ cm} + 8.51 \text{ cm} + 16.324 \text{ cm}$
- b $48.0032 \text{ g} + 9.17 \text{ g} + 65.4321 \text{ g}$
- c $80.4 \text{ cm} - 16.532 \text{ cm}$
- d $106.5\text{mL} - 30. \text{ mL}$
- e $48.2 \text{ cm} \times 1.6 \text{ cm} \times 2.12 \text{ cm}$
- f $8.3 \text{ m} \times 4.0 \text{ m} \times 0.9823 \text{ m}$
- g $64.34 \text{ cm}^3 \div 8.149 \text{ cm}$
- h $4.93 \text{ mm}^2 \div 18.71 \text{ mm}$

11 Draw targets from a rifle range representing shooters who are:

- a Accurately precise.
- b Accurately imprecise.
- c Inaccurately precise.
- d Inaccurately imprecise.

12 Answer the questions below based on your understanding of errors.

- a The freezing point of water is 273.2 K, but it was measured at 250.1 K. What is the percentage error?
- b The mass of a penny is 2.67 g, but it was measured at 2.55 g. What is the percentage error?
- c The air pressure was 101.3 kPa, but the weatherman said it was 1001.3 kPa. What is the percentage error?
- d The amount of heat released when 1 mole of CO₂ forms is 393.5 kJ, but it was measured at 378.2 kJ. What is the percentage error?

13 Use the factor label method to convert the measurements below

- a 35 mg = g
- b 0.14 dL = μ L
- c 832.5 nm = μ m
- d 0.0003 L = pL
- e 6.3 dm = mm
- f 72.1 mg = cg
- g 365 μ s = ms
- h 2.4 dm = cm
- l 0.002 cg = mg
- j 468 dm = km
- k 5,012 pL = nL
- l 12,987 ns = ks

14 Use the factor label method to convert the following:

- If 3 lumps equals 1 clump and 10 clumps equals 1 pile,
 - a How many piles are 96 lumps?
- If 1 byte equals 8 bits, 1 kilobyte equals 1,024 bytes, and 1 byte equals 2 nibbles,
 - b How many kilobytes is 36 nibbles?
 - c How many bits is 48 nibbles?
- Water has a density of 1 g/mL. This means, for water, 1 g = 1 mL. 1 kg = 1,000 g.
 - d Find the number of milliliters (mL) in 1.6 kg of water
 - e Find the number of kilograms (kg) in 75 mL of water

15 Graph the following information on paper or in Excel.

Use proper formatting and follow the guidelines for constructing graphs outlined in class.
Plot throw on the X-axis and # Particles on the Y-axis.

Throw	0	1	2	3	4	5	6	7	8	9	10	11
Particles	50	34	23	15	10	7	5	3	2	2	2	Clear
Particles	50	25	12	8	2	2	2	1	-	-	-	Clear + Yellow