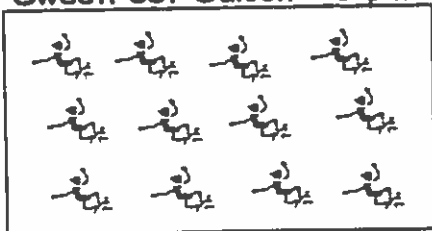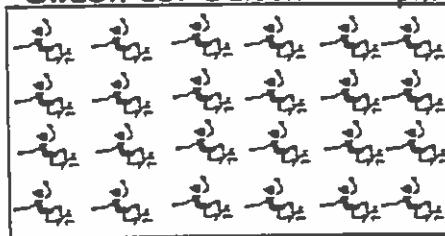# DON'T BE SO DENSE!

SweetFeet Saloon hosted a Mardi Gras celebration. At 8 pm, they had 16 people dancing in the conga line, but by 10 pm, there were 48 people strutting their stuff as they bounced around the room. They considered the event a bouncing success!

SweetFeet Saloon – 8 pm

SweetFeet Saloon – 10 pm

Joe Angstrom was one of the people at the party and he asked himself a few questions:
- ⇒ Did the room change size when more people arrived?
- ⇒ What is the term for size (or amount of space) in science?
- ⇒ When did the room have a greater mass?

Joe was comparing the dance hall to science class when he was measuring the **density** of substances. He realized that at 10 pm, the room was more dense with people than at 8 pm, even though it was the same size! He was pretending that the people in the conga line were like particles in a lab sample.

Scientists use grams (g) as the unit of mass and milliliters (mL) as the units of volume when talking about density. For example, the density of glycerol is $1.26 \frac{g}{mL}$, which means that every 1 mL of oil has a mass of 1.26 g. Here is a sample of Joe's lab work:

Q: You have 25 L of glycerol, what is its mass?

Step 1:
Organize your work, with the correct units

$$D = \frac{m}{V}$$

$D = 1.26 \frac{g}{mL}$
$m = ?$
$v = 25 L$
$= 25000 \, mL$

$$1.26 \frac{g}{mL} = \frac{m}{25000 \, mL}$$

$m = 31500 \, g$

∴ The glycerol sample has a mass of 31.5 kg.

Step 2:
Explains the calculation being performed

Step 3:
Substitute the correct numbers

Step 4:
Cross-multiply and solve

Step 5:
A concluding statement completes the work.

When solving any problem, you should:
- ☐ organize your information (Step 1)
- ☐ convert quantities to proper units (Step 1)
- ☐ show your work (Steps 2-4)
- ☐ write a concluding statement (Step 5)
- ☐ check over your work for errors

Density Worksheet

Density

Use the densities given in Table 2-5 to answer the questions.

1. (a) What is the most dense substance listed in the table?
   (b) What is the least dense substance listed?
2. (a) Name two gases that are less dense than air.
   (b) Name two gases that are more dense than air.
3. (a) Name all the solids listed in Table 2-5 that will float on liquid mercury.
   (b) Name all the solids listed Table 2-5 that will sink if placed on liquid mercury.

4. If the three liquids, glycerol, mercury, and water were placed in the same container, in which order would you expect to find them (from top to bottom)?
5. A block of an unknown metal is 5 cm × 3 cm × 2 cm. The block has a mass of 235 g. Of what metal do you think the block is made? Give reasons to support your answer.

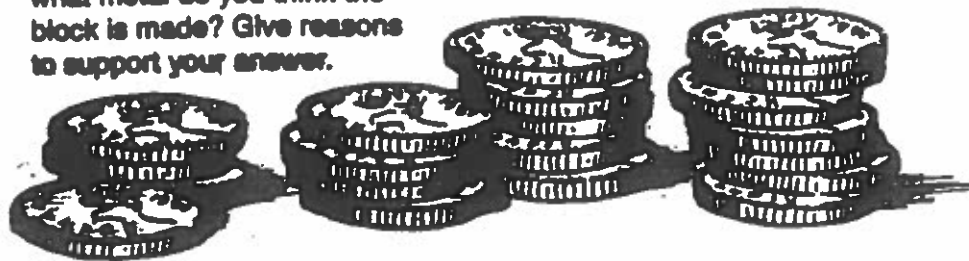Table 2-5 *Approximate Densities of Common Materials*

FLUID	DENSITY (g/mL)	SOLID	DENSITY (g/cm³)
helium	0.0002	wood (western red cedar)	0.37
nitrogen	0.00125	wood (birch)	0.66
air	0.0013	sugar	1.59
oxygen	0.0014	salt	2.16
carbon dioxide	0.002	aluminum	2.70
isopropanol	0.79	iron	7.87
vegetable oil (varies)	0.9	nickel	8.90
water	1.00	copper	8.92
glycerol	1.26	lead	11.34
mercury (a metal)	13.55	gold	19.32