(1.) (a) the pure element could be (i).
(must be a diatomic element, like F_2, Cl_2, etc.)
(b) (V.) and (VI.) represent mixtures of elements
(in this case, the elements are monoatomic..
could be Ne, He, Ar, etc.)
(c) (iv) contains a pure compound.
(d) (ii) and (iii) contain mixtures of an element and a compound.

(2.) It is a chemical change. In the first picture, the "red atoms" are bonded to each other on the left molecule. In the second picture, the "red atoms" are bonded only to the "yellow atoms." Since those "red atoms" broke a bond (to each other) and formed a new bond (to a yellow atom), a chemical change must have occurred.

(11.) (a) rice pudding : mixture (heterogeneous).
(b) sea water : mixture (homogeneous)
(c) magnesium : pure substance (it is an element)
(d) crushed ice : pure substance (it is a compound; H_2O)
(I am only considering the ice part of this.. If you consider the trapped air mixed with ice, it is a heterog. mixt.)

(17.) silvery, white, lustrous : physical properties.
mp of 649°C, bp of 1105°C : physical properties.
Density of 1.738 g/cm3 : physical property
able to burn in air : chemical property
reacts with Cl_2 : chemical property
That the chloride that forms is brittle and white and solid : physical
can be pounded into sheets (malleable) and drawn into wires (ductile) : physical
good electrical conductor : physical

(19.) (a) metal rusting : chemical (the metal becomes oxidized)
(b) boiling water : physical (phase change!)
(c) pulverizing aspirin : physical
(d) digesting candy bar : chemical (includes combustion rxns)
(e) exploding of nitroglycerine : chemical (decomposition rxn)

29. (a) $D = \frac{m}{V} = \frac{38.5\,g}{45\,mL} = 0.85\bar{5} \rightarrow \boxed{0.86\ g/mL}$

isopropyl alcohol has D = 0.785 g/mL
toluene has a D = 0.866 g/mL ← so the liquid could be <u>toluene</u>.

(b) $D = \frac{m}{V}$ $\quad V = \frac{m}{D} = \frac{45.0\,g}{1.114\,g/mL} = \boxed{40.4\ mL}$

(c) $V = (5.00\,cm)^3 = 125\,cm^3$

$m = V \cdot D = (125\,cm^3)(8.90\,\frac{g}{cm^3}) = 1112.5\,g \rightarrow \boxed{1110\,g}$

39. (a) $14.3505 + 2.65 = 17.0005 \rightarrow \boxed{17.00}$ (2 dec. places)

(b) $952.7 - 140.7389 = 811.9611 \rightarrow \boxed{812.0}$ (1 dec. place)

(c) $(3.29 \times 10^4)(0.2501) = 8228.29 \rightarrow \boxed{8230}$ (3 Sig. Figs)
(or 8.23×10^3)

(d) $0.0588 / 0.677$

$= 0.086854 \rightarrow \boxed{0.0869}$ (3 SF)

40. (a) $320.5 - \frac{6104.5}{2.3} = 320.5 - \underbrace{26}54.1304 = -2333.63 \rightarrow \boxed{-2300}$

division, can keep 2 SF

2 SF, so the last SF is in the 100's place

(b) $[(285.3 \times 10^5) - (1.200 \times 10^3)] \times 2.8954$

$= [285.3 \times 10^5 - .012 \times 10^5] \times 2.8954$

$= [285.288 \times 10^5] \times 2.8954$

the last SF is here, so it has 1 dec. place, 4 SF

$= 8.260229 \times 10^7 \rightarrow \boxed{8.260 \times 10^7}$

multiply a 4SF# by a 5SF#, so get to keep 4SF.

Chapter One

#40 Cont'd

(C) $(0.045 \times 20000.0) + (2813 \times 12)$

2SF 6SF 2SF 2SF

$= 90. + \underline{33}756$

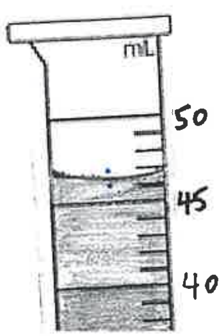
(2 SF since we multiplied) (2 SF since we multiplied)

$= 33846 \longrightarrow \boxed{34000}$

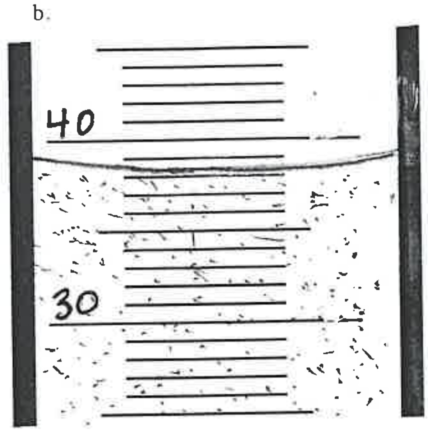
then when we added, the least precise # (33756) was valid to the 1000's place, so round to 1000's place

1.42. Read and record each volume of liquid to the correct number of significant figures.

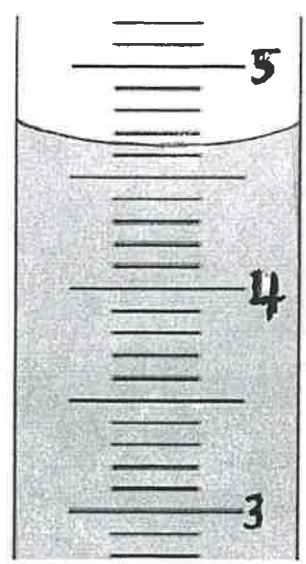
a.



b.



c.



a. 46.4 mL

↑ Should have 1 decimal place

b. 38.3 mL

↑ 1 dec. place

c. 4.64 mL

↑ 2 decimal places

47. (a) $(5.00\,\text{day})\left(\frac{24\,\text{hr}}{\text{day}}\right)\left(\frac{60\,\text{min}}{\text{hr}}\right)\left(\frac{60\,\text{s}}{\text{min}}\right) = \boxed{432000\ \text{seconds}}$.

(b) $\left(0.0550\ \text{miles}\right)\left(\frac{1.6093\,\text{km}}{\text{mi}}\right)\left(\frac{1000\,\text{m}}{\text{km}}\right) = 88.5115 \rightarrow \boxed{88.5\ \text{m}}$

from page inside back cover

or $(.0550\ \text{mile})\left(\frac{5280\,\text{ft}}{\text{mi}}\right)\left(\frac{12\,\text{in}}{1\,\text{ft}}\right)\left(\frac{2.54\,\text{cm}}{\text{in}}\right)\left(\frac{1\,\text{m}}{100\,\text{cm}}\right) = 88.5139$

(c) $\left(\frac{\$1.89}{\text{gallon}}\right)\left(\frac{1\ \text{gallon}}{3.7854\,\text{L}}\right) = \boxed{\frac{\$0.499}{\text{liter}}}$

(d) $\left(\frac{0.510\,\text{in}}{\text{ms}}\right)\left(\frac{2.54\,\text{cm}}{\text{in}}\right)\left(\frac{1\,\text{km}}{10^5\,\text{cm}}\right)\left(\frac{1000\,\text{ms}}{1\,\text{s}}\right)\left(\frac{3600\,\text{s}}{\text{hr}}\right) = \boxed{46.6\ \text{km/hr}}$

(e) $\left(\frac{22.50\,\text{gal}}{\text{min}}\right)\left(\frac{3.7854\,\text{L}}{\text{gal}}\right)\left(\frac{1\,\text{min}}{60\,\text{s}}\right) = 1.419525 \rightarrow \boxed{1.420\ \frac{\text{liter}}{\text{second}}}$

(f) $(.02500\ \text{ft}^3)\left(\frac{12\,\text{in}}{1\,\text{ft}}\right)^3\left(\frac{2.54\,\text{cm}}{\text{in}}\right)^3 = 707.921 \rightarrow \boxed{707.9\ \text{cm}^3}$

exact conversion   exact conversion

(56) 150 lb copper ($D = 8.94\ g/cm^3$)
how long can the wire be (in feet) if Diameter = 7.50 mm.

$$\text{Volume} = \frac{\text{mass}}{\text{Density}} = \frac{(150\ lb)\left(\frac{1\ kg}{2.2046\ lb}\right)\left(\frac{1000\ g}{1\ kg}\right)}{(8.94\ g/cm^3)} = 7610.688\ cm^3$$

$$\text{Radius} = \frac{D}{2} = \left(\frac{7.50\ mm}{2}\right)\left(\frac{1\ cm}{10\ mm}\right) = 0.375\ cm$$

$$V = \pi R^2 H \quad \text{so} \quad H = \frac{V}{\pi R^2} = \frac{7610.688\ cm^3}{\pi(.375\ cm)^2} = 17227.1\ cm$$

or "length"

$$(17227.1\ cm)\left(\frac{1\ in}{2.54\ cm}\right)\left(\frac{1\ ft}{12\ in}\right) = 565.19 \rightarrow \boxed{570\ \text{feet}}$$

OR $V = \pi R^2 H$ and $V = \frac{m}{D}$

so $\pi R^2 H = \frac{m}{D}$ so $H = \frac{m}{\pi R^2 D}$

$$\text{so } H = \frac{(150\ lb)\left(\frac{1\ kg}{2.2046\ lb}\right)\left(\frac{1000\ g}{1\ kg}\right)}{\pi(.375\ cm)^2\left(8.94\ \frac{g}{cm^3}\right)} = 17227.1\ cm$$

(convert to feet, as above)

76 Total human power usage (worldwide): 15 TW (terawatts)
Sunlight reaching earth: 1.336 kW/m² (if no clouds)
earth S.A.: 197,000,000 square miles

To collect 15 TW by using solar collectors that can convert 10% of light energy to "useful" energy, how much of earth's surface would need to be covered w/ solar collectors?

if need 15 TW, we really need to collect 10 times ~~that amount if cells are collecting 10% of sun energy~~

$\left(10\% = 0.1 \text{ , and } \frac{1}{0.1} = 10\right)$

so need to collect 150 TW or 150×10^{12} Watts

$$(150 \times 10^{12}\,W)\left(\frac{1\,m^2}{1.336 \times 10^3\,W}\right) = 1.123 \times 10^{11}\,m^2$$

$$(1.123 \times 10^{11}\,m^2)\left(\frac{1\,km}{1000\,m}\right)^2\left(\frac{1\,mile}{1.6093\,km}\right)^2 = 43,352 \text{ miles}^2$$

so, need to cover $\approx$ $\boxed{43000 \text{ square miles}}$

(or a square with 208 mile sides!)

$$\left(\frac{43\,352\,mi^2}{197000000\,mi^2} \times 100 = .022\% \text{ of earth's surface area}\right)$$