CHAPTER 1

(5) Answers Vary

(10) ACEG: QUANTITATIVE // B, D, F: QUALITATIVE

(11) HYPOTHESIS: Possible explanation for something that is observed
THEORY: AN EXPLANATION BASED ON MANY EXPERIMENTS (the results of)

∴ → BOTH ARE EXPLANATIONS
HYP is w/o experiment, Theory is result of expt.

CHAPTER 2

(2) 3314 = 3.314×10^3 [3] (4) .0021 = 2.1×10^{-3} [negative, positive]

4540 = 4.54×10^3

(6) (a) 0.000067 = 6.7×10^{-5} (b) 9,331,442 = 9.331442×10^6

(c) $\frac{1}{10,000} = 0.0001 = 1 \times 10^{-4}$ (d) $163.1 \times 10^2 = (1.631 \times 10^2) \times 10^2$
$= 1.631 \times 10^4$

(8) (a) 0.04731 = 4.731×10^{-2} (b) 4284 = 4.284×10^3

(c) 4.201 = 4.201×10^0 (d) 0.0000000001411 = 1.411×10^{-10}

(e) 52.3 = 5.23×10^1 (f) 4.909×10^{-2} (g) 5 4,331,000
5.4331×10^7

(h) 0.981 = 9.81×10^{-1}

(10) (a) $1.83 \times 10^2 = 1.83 \times 100 =$ 483

(b) 7.221×10^{-4}

.0007221

(c) $6.1 \times 10^0 = 6.1 \times 1 \neq 6.1$

(d) 9.11×10^{-8}

.000000911

(e) $4.221 \times 10^6 = 4.221 \times 1{,}000{,}000$

$= 4{,}221{,}000$

(f) 1.22×10^{-3}

0.00122

(g) 9999

(h) .0001016

(i) ~~1016~~ ~~0.0001016~~

101,600

(j) 0.411

(k) 97100

(l) 0.000971

(12) (a) $131.2 \times 10^{-3} = (1.312 \times 10^2) \times 10^{-3} = 1.312 \times 10^{-1}$

(b) $14.72 \times 10^2 = (1.472 \times 10^1) \times 10^2 = 1.472 \times 10^3$

(c) $1201 \times 10^{-6} = (1.201 \times 10^3) \times 10^{-6} = 1.201 \times 10^{-3}$

(d) $44.3 \times 10^4 = (4.43 \times 10^1) \times 10^4 = 4.43 \times 10^5$

(e) $0.00721 \times 10^3 = (7.21 \times 10^{-3}) \times 10^3 = 7.21 \times 10^0$

(f) $0.0914 \times 10^{-4} = (9.14 \times 10^{-2}) \times 10^{-4} = 9.14 \times 10^{-6}$

(g) $0.000129 \times 10^5 = (1.29 \times 10^{-4}) \times 10^5 = 1.29 \times 10^1$

(h) $0.00001901 \times 10^{-6} = (1.901 \times 10^{-5}) \times 10^{-6} = 1.901 \times 10^{-11}$

CHAPTER 2

(14) (a) $\frac{1}{0.00032} = 3125 = 3.1\ldots \times 10^3$ (b) $\frac{10^3}{10^{-3}} = 10^6 = 1\times10^6$

$3-(-3)=3+3=6$

(c) $\frac{10^3}{10^8} = 10^0 = 1 = 1\times10^0$ (d) $\frac{1}{55,000} = .000018182 = 1.8182\times10^{-5}$

$= 1.8\times10^{-5}$

(e) $\frac{10^5 \cdot 10^4 \cdot 10^{-4}}{10^{-2}} = \frac{10^5}{10^{-2}} = 10^7 = 1\times10^7$ (f) $\frac{43.2}{4.32\times10^{-5}} = \frac{1\times10^1}{10^{-5}}$

(g) $\frac{4.32\times10^{-5}}{432} = \left(\frac{4.32}{432}\right)\times10^{-5} = 0.01\times10^{-5} = 1\times10^{-2}\times10^{-5}$

$= 1\times10^{-7}$

$= 1.00\times10^{-6}$

(h) ~~$\frac{1}{(10^5)(10^{-6})} \neq 1/(10^5)(10^{-6})$~~ → PEMDAS

$1/(10^5)(10^{-6}) = 1\div10^5\times10^{-6}$

$= 1\times10^{-1}$

(16) gram (18) (a) Mega = million "M" (b) m (c) n (d) M

(e) c (f) μ → Greek letter "mu"

(20) 1 mile = 1.6 km (approx). Thus, 100 miles > 100 km

(22) 1 qt (24) 1 kg = 2.2 lbs, → 1 kg is bigger than 1 lb,

(34) uncertainty (36) The measuring instrument is only certain to the nearest tenth of a cm; thus, the length must be estimated to the nearest one hundredth.

38 (a) unlimited (definition) (b) 1 (c) unlimited

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(d) 1 (e) unlimited

40 Final 42 (a) $312.54 \rightarrow 313 \rightarrow \boxed{3.13 \times 10^2}$

42 (b) $0.0003\,1254 \rightarrow 3.1254 \times 10^{-4} \rightarrow \boxed{3.13 \times 10^{-4}}$

(c) $31,254,000 \rightarrow 3.1254 \times 10^{7} \rightarrow \boxed{3.13 \times 10^{7}}$

(d) $0.31254 \rightarrow 3.1254 \times 10^{-1} \rightarrow \boxed{3.13 \times 10^{-1}}$

(e) $31.254 \times 10^{-3} \rightarrow 3.1254 \times 10^{-2} \rightarrow \boxed{3.13 \times 10^{-2}}$

44 (a) $0.00.034159 \rightarrow 3.4159 \times 10^{-4} \rightarrow \boxed{3.42 \times 10^{-4}}$

(b) $103.351 \times 10^{2} \rightarrow 1.03351 \times 10^{4} \rightarrow \boxed{1.034 \times 10^{4}}$

(c) $17.9915 \rightarrow 17.992 \rightarrow \boxed{1.7992 \times 10^{1}}$

(d) $3.365 \times 10^{5} \rightarrow \boxed{3.37 \times 10^{5}}$

46 decimal 48 3 50 ~~none~~ none

52 (a) answer should have 1 # to the right of the decimal

$640.99 \rightarrow \boxed{641.0}$

52 (b) $1.0028 + 0.221 + 0.10337 = 1.32717$

↑ 4 to the right of decimal; ↑ 3 to the right; ↑ 5 to the right

$\boxed{= 1.327}$

(c) $77.3429 \rightarrow \boxed{77.34}$

(d) $2.01 \times 10^{2} + 3.014 \times 10^{3} = 201 + 3014 = \boxed{3215}$

↑ Zero to the right; ↑ Zero to the right

54 (a) 124 (b) ~~7.233×10^{24}~~ 7.233×10^{24} (c) 22.0 (d) 5.35×10^{-4}

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56) last sig fig ↓ $\frac{14.3147233}{7.009} = 2.045 \rightarrow \frac{(4 \text{ sig figs})}{(4 \text{ sig figs})}$

b) $\frac{(142 + 1021)}{3.1 \times 10^{-1}} = \frac{1163}{3.1 \times 10^{-1}} \frac{(4 \text{ s.f.})}{(2 \text{ s.f.})}$

$= 3800 = 3.8 \times 10^3$ ← 4 s.f.

c) $\frac{9.762 \times 10^{-3}}{1.43 \times 10^2 + 4.51 \times 10^1} = \frac{9.762 \times 10^{-3}}{14.3 \times 10^1 + 4.51 \times 10^1} = \frac{9.762 \times 10^{-3}}{18.81 \times 10^1} = 5.19 \times 10^{-5}$

↑ only 3 s.f. ↑

d) $3.841768 \times 10^{-7} = \cancel{3.842 \times 10^{-7}}$

$= 3.8418 \times 10^{-7}$

58) unlimited (infinite)

60) a) $72 \text{ in} = \underline{\quad ? \quad} \text{ ft} \Leftrightarrow 72 \text{ in} \times \frac{\text{ft}}{\text{in}} = \underline{\quad} \text{ ft}$

answer

$72 \text{ in} \times \frac{1 \text{ ft}}{12 \text{ in}} = \underline{\quad} \text{ ft}$

b) $3.5 \text{ ft} \times \frac{12 \text{ in}}{1 \text{ ft}} = \underline{\quad} \text{ in}$

answer

63) f) $458 \cancel{\text{g}} \times \frac{1 \text{ kg}}{10^3 \cancel{\text{g}}} = \frac{0.458}{} \text{ kg} = 4.58 \times 10^{-1} \text{ kg}$

h) $3.5 \cancel{\text{hr}} \times \frac{60 \text{ min}}{1 \cancel{\text{hr}}} = \frac{210}{} \text{ min} = 2.1 \times 10^2 \text{ min}$

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(C) (g) $36.2 \text{ m} \times \frac{1 \text{ km}}{1000 \text{ m}} = .0362 \text{ km} = \boxed{3.62 \times 10^{-2} \text{ km}}$

(h) $0,501 \text{ km} \times \frac{10^3 \text{ m}}{1 \text{ km}} \times \frac{10^2 \text{ cm}}{1 \text{ m}} = 0.501 \times 10^5 = \boxed{5.01 \times 10^4 \text{ cm}}$

66 a $254.3 \text{ g} \times \frac{1 \text{ kg}}{10^3 \text{ g}} = 0.2543 \text{ Kg} = \boxed{2.543 \times 10^{-1} \text{ kg}}$

~~d 2.15~~

~~b~~ (70) $10^{-10} \text{ m} \times \frac{10^2 \text{ cm}}{1 \text{ m}} = \boxed{10^{-8} \text{ cm}}$

$10^{-10} \text{ m} \times \frac{10^9 \text{ nm}}{1 \text{ m}} = \boxed{10^{-1} \text{ nm}}$

(71) Fahrenheit, but perhaps Celsius in our part of the U.S./EEUU

(72) Celsius (74) 273 (77) add 273 to each ~~degree~~ temperature

(73) 212°F, 100°C (75) 100

(a) 73 K (d) 296 K

(b) 423 K (e) 173 K

(c) 233 K (f) 77 K

(78) Subtract 273 from each temperature

(a) 2°C (d) -196°C

(b) 172°C (e) 972 K °C

(c) -273°C (f) -271°C

CHAPTER 2

(83) Density ($D = \frac{m}{V}$) (84) g/cm^3 (85) lead (86) volume (87) low

(88) same (89) Aluminum (90) mercury

(92) (a) $D = \frac{m}{V}$

$= \frac{122.4\,g}{5.5\,cm^3}$

$= 22\,g/cm^3$

(b) $D = \frac{m}{V}$

$= \frac{19,302\,g}{0.57\,m^3}$

$= 33,863\,g/m^3$

→ however, the problem asks for g/cm^3, not g/m^3.

since $100\,cm = 1\,m$, then

$(100\,cm)^3 = (1\,m)^3$

$10^6\,cm^3 = 1\,m^3$

$\frac{33,863\,g}{m^3} \times \frac{1\,m^3}{10^6\,cm^3} = \frac{0.034\,g}{cm^3}$ or

$= 3.4 \times 10^{-2}\,g/cm^3$

(c) $D = \frac{m}{V}$

$= \frac{0.0175\,kg}{18.2\,ml}$

$= 9.615 \times 10^{-4} \frac{kg}{ml} \times \frac{1000\,g}{1\,kg} = 0.962\,g/ml$ → same as g/cm^3

(d) $D = \frac{m}{V} = \frac{2.49\,g}{0.12\,m^3} = 20.75\,\frac{g}{m^3} \times \frac{1\,m^3}{10^6\,cm^3} = 2.075 \times 10^{-5}$

$= 2.1 \times 10^{-5}\,g/cm^3$

(94) $D = \frac{m}{V} = \frac{67.1\,ml}{55.221\,g} = 1.22$.

$= \frac{55.221\,g}{67.1\,ml} = 0.823\,g/ml$

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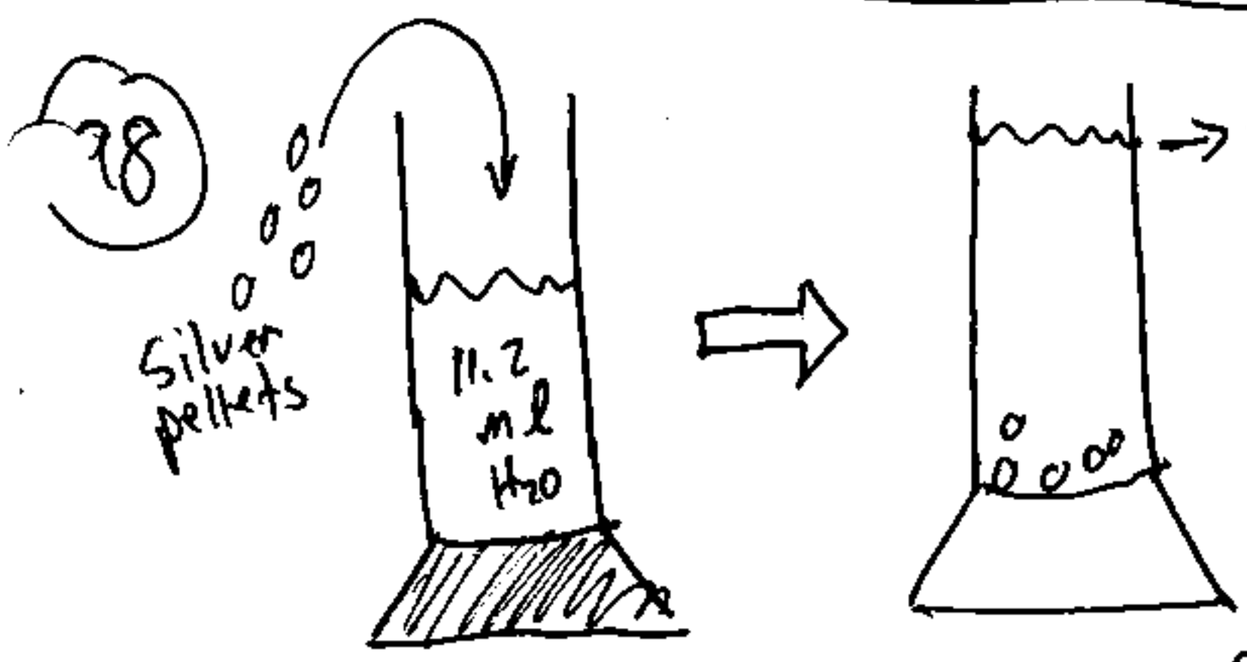
(98)



Key! if you know the volume of the silver pellets, then

V of silver pellets + V of water = total volume reading after adding pellets,

0.5 ml + 11.2 ml = 11.7 ml

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

$\frac{10.5\,g}{cm^3} = \frac{5.25\,g}{X}$

$X = \frac{5.25\,g}{10.5\,\frac{g}{cm^3}} = 0.5\,cm^3$

$= 0.5\,ml$

(100) OK, remember that $1.00\,m^3 = 10^6\,cm^3$ [because $100\,cm = 1\,m$, thus $(100\,cm)^3 = (1\,m)^3$]

(a) lead

$1.00 \times 10^3\,cm^3 \times \frac{11.34\,g}{cm^3} = 1.13 \times 10^4\,g$

* $1.00\,m^3$ is the same as $10^6\,cm^3$, so these answers will be 10^3 times bigger

(b) sodium chloride

$1.00 \times 10^3\,cm^3 \times \frac{2.16\,g}{cm^3} = 2.16 \times 10^3\,g$

(c) benzene

$1.00 \times 10^3\,cm^3 \times \frac{.880\,g}{cm^3} = 880\,g = 8.80 \times 10^2\,g$

(2 sig figs → 3 sig figs)

(d) answer = $7870 = 7.87 \times 10^3\,g$

100(a) = 1.13×10^7 g per m^3

100(b) = 2.16×10^6 g per m^3

100(c) = 8.80×10^5 g per m^3

100(d) = 7.87×10^6 g per m^3