# CHEM 241: Chapter 3 Homework

**1.** Round each number to two significant figures.

233.356 — Number: 230 or $2.3 \times 10^2$

0.002353 — Number: 0.0024 or $2.4 \times 10^{-3}$

Round up ↗

1.005 = — Number: 1.0

Final zeros in whole numbers are not significant.

Leading zeros are not significant

**2** To what decimal place should each answer be rounded? How many significant figures does the rounded answer have?

Rules on adding + subtracting applies

(a) $9\ \text{cm} + 2.8\ \text{cm} = 11.8\ \text{cm}$ (unrounded) ⇒ round to ones = 12

↳ round off

ones vs tenth

After rounding, the number should be reported to the
- [x] ones place
- [ ] tenths place
- [ ] hundredths place

and thus has
- [ ] 1 significant figure.
- [x] 2 significant figures.
- [ ] 3 significant figures.

(b) $0.135\ \text{atm} + 0.6\ \text{atm} = 0.735\ \text{atm}$ (unrounded) ⇒ round to tenth = 0.7

thousandth tenth

After rounding, the number should be reported to the
- [ ] ones place
- [x] tenths place
- [ ] hundredths place

and thus has
- [x] 1 significant figure.
- [ ] 2 significant figures.
- [ ] 3 significant figures.

#3 is on next page ↓

**4.** Perform the following calculation. Report the answer using the proper number of significant figures.

$$\frac{1.012 \times 10^{-3}\ \text{J}}{(0.023456\ \text{g})(298.3682 - 298.3567)\ \text{K}} =$$

4 sig fig

5 sig fig

(298.3682 − 298.3567) = 0.0115 (3 sig. fig.)

= 3.751705...

Number: 3.75 J/g·K

After the digit with the least # sig. fig.

*You must round correctly and answer with the proper number of significant figures.*

3. To how many significant figures should each answer be rounded?

constants; 4-5 sig figs.

(a) $\dfrac{(6.626 \times 10^{-34}\ \text{J} \cdot \text{s})(2.9979 \times 10^{8}\ \text{m/s})}{4.710 \times 10^{-7}\ \text{m}} = 4.217427898089 \times 10^{-19}\ \text{J}$ (unrounded)

4 sig fig

4 sig fig

After rounding, the answer should have

- ○ 1 significant figure.
- ○ 2 significant figures.
- ○ 3 significant figures.
- ☑ 4 significant figures.
- ○ 5 significant figures.

(b) $\dfrac{(6.022 \times 10^{23}\ \text{atoms/mol})(0.833\ \text{g})}{20.18\ \text{g/mol}} = 2.486 \times 10^{22}\ \text{atoms}$ (unrounded)

4 SF, 3 SF, 4 SF

After rounding, the answer should have

- ○ 1 significant figure.
- ○ 2 significant figures.
- ☑ 3 significant figures.
- ○ 4 significant figures.
- ○ 5 significant figures.

Lowest SF is 3, so answer must have 3 SF

5. Evaluate the expression below and report the answer to the *proper number of significant figures*.

$\log(8.9 \times 10^{6}) =$ Number: 6.95

Round

$= 6.94939\ldots$

log x where x has 2 SF
answer must have 2 decimal places

6. Round the answer to the correct number of significant figures.

hundredths

$\left(\dfrac{22.70}{3.35}\right) + 5.7 = 12.476$

tenths

tenths

$= 6.78$ (3 SF)

Number:

7. Suppose you were measuring 25.0 mL of water using a volumetric flask. The flask temperature was at 20°C, and you assume that the distilled water was as well. However, you discover later that the actual water temperature was at 12°C instead.

Is the mass of water you measured greater or less than the mass of 25.0 mL of distilled water at 20°C?

- ☑ greater
- ○ less

Water is generally denser at lower T.
↳ more "massive" ($g/mL$)

Is this error in mass a systematic or random error?

- ☑ systematic
- ○ random

because it can be corrected (source of error is known)