Answers to Exercise 1.2
Significant Figures

1.

(a) 1020 (b) 102.0 (c) 10.20

(d) 0.201 (e) 2.01×10^2 (f) 1.020×10^2

2. It is not clear whether or not the second zero in 1020 is significant.
To make it clear that this zero is significant, rewrite the number as 1020. or as 1.020×10^3

3.

(a) $pH = -log[H^+]$

$pH = -log(1.00 \times 10^2)$

$pH = -2.000$

When you take the log of a number with 3 sig.fig., you get 3 sig. fig. after the decimal place.

The number(s) before the decimal place tell you what the $\times 10^x$ part of your original number was.

(b) $pH = -log[H^+]$ *therefore* $-pH = log[H^+]$ *therefore* $10^{-pH} = [H^+]$

$[H^+] = 10^{-pH}$

$[H^+] = 10^{-(6.00)}$

$[H^+] = 1.0 \times 10^{-6}$

When your exponent has 2 sig.fig. after the decimal place, you get 2 sig. fig.

The number(s) before the decimal place in the exponent tell you what the $\times 10^x$ part of your answer should be.

As you can see, there is a flaw in this formula because you got a concentration with no units. You will learn about (and use) the proper form of this equation in CHEM 2000 so that you don't have to make units "magically appear" from nowhere.

4. *Note that rounding within answers is only done to show how the significant figures are carrying through the calculation. All numbers are left in the calculator and the only "real" rounding is done on the final answer! You don't need to show this many steps but it does help prevent mistakes.*

(a) $13.4\,A = 14.2 \times 0.26 \times 124$

$A = \frac{14.2 \times 0.26 \times 124}{13.4}$

$A = 34$

(b) $16.37\,A = 12.47 + 6.2$

$A = \frac{12.47+6.2}{16.37}$

$A = \frac{18.7}{16.37}$

$A = 1.14$

(c) $4\,A = 15\,A - 3.21$

$3.21 = 15\,A - 4\,A$

$3.21 = 11\,A$

$\frac{3.21}{11} = A$

$0.29 = A$

(d) $63.5\,A - 18.7 = \frac{86 - 12.5\,A}{3}$

$3(63.5\,A - 18.7) = 86 - 12.5\,A$

$(2 \times 10^2)\,A - (6 \times 10^1) = 86 - 12.5\,A$

$(2 \times 10^2)\,A + 12.5\,A = 86 + (6 \times 10^1)$

$(2 \times 10^2)\,A = 1.4 \times 10^2$

$A = \frac{1.4 \times 10^2}{2 \times 10^2}$

$A = 0.7$

(e) $A = (6.37 \times 10^3) + (1.24 \times 10^4)$

$A = 6370 + 12400$

$A = 18770$

$A = 1.88 \times 10^4$

Alternatively, convert 6.37×10^3 to 0.637×10^4. Then add $(1.24+0.637)\times10^4$ to get 1.877×10^4 which will only have two decimal places that are significant (therefore 3 sig. fig.) This also gives 1.88×10^4.