Purpose: To learn / practice significant figures which scientist use:

1. To decrease the amount of numbers used

2. To indicate the accuracy of measurements performed

3. To indicate the precision of a measuring tool

Rules for Significant Figures

1. All digits except zero are ALWAYS significant …

Ex. 343 🡪 3 sig. fig. .8764 🡪 4 sig. fig.

2. Zeroes ARE significant IF …

a. exist BETWEEN two numbers

Ex. 304 🡪 3 sig. fig. .12304 🡪 5 sig. fig.

b. follow a number CONTAINING A DECIMAL

Ex. 10. 🡪 2 sig. fig. .200 🡪 3 sig. fig.

3. Zeroes are NOT significant IF …

a. precede a number (place holder)

Ex. 0.00001 🡪 1 s. f. 012. 🡪 2 s. f.

a. follow a number without a decimal (place holder)

Ex. 10,000 🡪 1 s. f. 0.00000000067. 🡪 2 s. f.

# Practice Problems 🡪 Write the number of significant figures and place a line over the “estimate” if this were a measurement in liters.

1. 3450323450 11. 0.000305

2. 0.01 12. 3.45 x 10-4

3. 46000001.00 13. 0.10

4. 3.2604 x 106 14. 100000

5. 0.000030 15. 19.010 x 103

6. 60 16. 5.0000000

7. 0.92005 17. 1023

8. 1000 18. 0.04060306020

9. 10-34 19. 450.

10. 13000000. 20. 0.0

A. Determine the number of significant figures in each of the following measurements:

1. 43.65 m 4. 0.0000354 km

2. 123413413 mg 5. 9.000000 Hl

3. 0.0100004305 ds 6. 1.01 cg

B. Perform the following mathematical operations. Express the solutions using proper scientific notation and significant figures.

1. .35 m + 57 cm 6. 6785 mg X 0.023 kg

2. 0.0003 cl / 0.0054 dl 7. 8900 dg - 0.03 Hg

3. 27,000,000 um X 35,012 mm 8. 92.47 Dl / 0.0000267 kl

4. 3500 ds + 372,000 cs 9. 140000000 nm X 0.00000000017 km

5. 0.00000463 Hg - 73.4 mg 10. 0.0028 Ds / 32 cs

C. (ENRICHMENT) For each of the following measurements given below, state what the precision of the measuring tool was and place a line over the estimated measurement.

1. 3.423451 m 6. 0.0002 g

2. 980000 dl 7. 7.60 cs

3. 0.010300 kg 8. 230,000 ml

4. 90. Hs 9. 54.000 ks

5. 0.000000006 m 10. 412.948 g

# ANSWER KEY

# Practice Problems 🡪 Write the number of significant figures and place a line over the “estimate” if this were a measurement in liters.

* Remember that significant figures are numbers that are PART OF A MEASUREMENT. E.g. you can see that digit or number when measuring (along with one estimate).
* The LAST significant figure would be the estimate IF one uses the most precise measurement on the measuring tool.
* Follow the rules listed on page one to determine the number of sig. Figs.

1. 34503234**5**0 9 (the final 0 doesn’t count because there is no decimal)

2. 0.0**1** 1 (zeroes before a decimal are placeholders, not significant)

3. 46000001.0**0** 10 (zeroes after a decimal are significant; part of measurement)

4. 3.260**4** x 106 5 (Exponents are NOT part of significant figures/measurement)

5. 0.00003**0** 2 The final “0” is part of the measurement

6. **6**0 1 The “0” is NOT part of the measurement

7. 0.9200**5** 5 (zeroes in between numbers ARE significant)

8. **1**000 1 (zeroes without a decimal are NOT significant)

9. 10-34 1 (assume a “1” because the number can be written as *1 x 10-34*)

10. 1300000**0**. 8 Each digit is part of the measurement (due to decimal)

11. 0.00030**5** 3 zeroes before numbers are placeholders

12. 3.4**5** x 10-4 3 exponents are not part of the measurement

13. 0.1**0** 2 the final “0” is part of the measurement

14. **1**00000 1 zeroes after a number w/o a decimal are placeholders

15. 19.01**0** x 103 5 all the digits (except exponent) are part of the measurement

16. 5.000000**0 8** the decimal makes all the digits part of the measurement

17. 1023 1 (assume a “1” because the number can be written as *1 x 1023*)

18. 0.0406030602**0 10** the zeroes before the number are not significant

19. 45**0**. 3 the decimal makes the “0” part of the measurement

20. 0.00 (there is no “0” measurement)

A. Determine the number of significant figures in each of the following measurements:

1. 43.65 m 4 4. 0.0000354 km 3

2. 123413413 mg 9 5. 9.000000 Hl 7

3. 0.0100004305 ds 9 6. 1.01 cg 3

B. Perform the following mathematical operations. Express the solutions using proper scientific notation and significant figures.

* Convert to a common unit **OR** convert each to the standard unit

1. .35 m + 57 cm

0.35 **m** + 0.57 **m** = 0.92 **m** = 9.2 x 10-1 **m**

35 cm + 57 cm = 92 cm = 9.2 x 101 cm

2. 0.0003 cl / 0.0054 dl

0.000003 **l** / 0.00054 **l** = 0.6 = 6 x 10-3

0.0003 cl / 0.054 cl = 0.6 = 6 x 10-3

0.00003 dl / 0.0054 dl = 0.6 = 6 x 10-3

3. 27,000,000 um X 35,012 mm

27 **m** X 35 **m** = 9.5 x 102 **m**2

27,000,000 um X 35,012,000 um = 9.5 x 1011 um2

27,000 mm X 35,012 mm = 945,324 mm2 = 9.4 x 108 mm2

4. 3500 ds + 372,000 cs

350 **s** + 3,720 **s** = 4070 **s** = 4.07 x 103 **s**

3500 ds + 37,200 ds = 40700 ds = 4.07 x 104 ds

35,000 cs + 372,000 cs = 407,000 cs = 4.07 x 105 cs

5. 0.00000463 Hg - 73.4 mg m c d // D H

0.000463 **g** - 0.0734 **g** = -0.0729 **g** = -7.29 x 10-2 **g**

0.00000463 Hg - 0.000734 Hg = -0.000729 mg = -7.29 x 10-4 Hg

0.463 mg - 73.4 mg = -72.9 mg = -7.29 x 101 mg

6. 6785 mg X 0.023 kg m c d // D H k

6.785 **g** X 23 **g** = 1.6 x 102 **g**2

6785 mg X 23,000 mg = 1.6 x 108 mg2

0.006785 kg X 0.023 kg = 1.6 x 10-4 kg2

7. 8900 dg - 0.03 Hg d // D H

890 **g** - 3 **g** = 887 **g** = 8.87 x 102 **g** = 8.9 x 102 **g 2 Sig Figs**

8900 dg - 30 dg = 8870 dg = 8.87 x 103 dg = 8.9 x 103 dg

8.9 Hg - 0.03 Hg = 8870 Hg = 8.87 Hg = 8.9 Hg

8. 92.47 Dl / 0.0000267 kl

924.7 **l** / 0.0267 **l** = 3.46 x 104

92.47 Dl / 0.00267 Dl = 3.46 x 104

0.9247 kl / 0.0000267 kl = 3.46 x 104

9. 140000000 nm X 0.00000000017 km

0.14 **m** X 0.00000017 **m** = 2.4 x 10-8 **m**2

1.4 x 108 nm X 1.7 nm = 2.4 x 1010nm2

1.4 x 10-4 km X 1.7 x 10-10 km = 2.4 x 10-14km2

10. 0.0028 Ds / 32 cs

2.8 x 10-2 **s** / 3.2 x 102 **s** = 8.8 x 10-2

2.8 x 10-3 Ds / 3.2 x 10-1 Ds = 8.8 x 10-2

2.8 cs / 3.2 x 101 cs = 8.8 x 10-2

C. (ENRICHMENT) For each of the following measurements given below, state what the precision of the measuring tool was and place a line over the estimated measurement.

**Each example assumes that the LAST digit is an ESTIMATE. So the 2nd to last digit is the actual precision of the instrument.**

1. 3.423451 m precision: 10 um (5) estimate: um (1)

2. 980000 dl precision: 10 kl (9) estimate: kl (8)

3. 0.010300 kg precision: cg (0) estimate: mg (0)

4. 90. Hs precision: ks (9) estimate: Hs (0.)

5. 0.000000006 m precision: 10 nm (0) estimate: nm (6)

6. 0.0002 g precision: mg (0) estimate: 0.1 mg (2)

7. 7.60 cs precision: ms (6) estimate: 0.1 ms (0)

8. 230,000 ml precision: Hl (2) estimate: Dl (3)

9. 54.000 ks precision: Ds (0) estimate: s (0)

10. 412.948 g precision: cg (4) estimate: mg (8)