T G M | k h da | d c m | M n p
10^{12} 10^{9} 10^{6} | 10^{3} 10^{2} 10^{1} | 10^{-1} 10^{-2} 10^{-3} | 10^{-6} 10^{-9} 10^{-12}

Metric Conversions Worksheet I

Going up the table move the decimal to the left

Going down the table move the decimal to the right

T	tera-	1 000 000 000 000	10^{12}
G	giga-	1 000 000 000	10^{9}
M	mega-	1 000 000	10^{6}
k	kilo-	1 000	10^{3}
h	hecto-	100	10^{2}
da	deca	10	10^{1}
NO PREFIX		**1**	10^{0}
d	deci	1/10	10^{-1}
c	centi-	1/100	10^{-2}
m	milli-	1/1000	10^{-3}
μ	micro-	1/1000000	10^{-6}
n	nano-	1/1000000000	10^{-9}

These are the metric divisions of quantity. The letter in the first column is used as the *prefix* before the type of quantity. Some common types of quantity are **grams (g), metres (m), joules (J), seconds (s),** and **bytes (B).**

EXAMPLES

1.0 kg = **?** mg 1.000000 kg = 1 000 000 mg	kilo and milli differ by six zeros; kilo → milli is going down the table; therefore move the decimal six places to the right

2.3 cm = **?** m 002.3 = 0.023 m	centi and no prefix differ by two zeros; centi → no prefix is going up the table; therefore move the decimal two places to the left

From			To			Zeros difference	Move decimal left or right?
	prefix	quantity		prefix	quantity		
km	kilo	metres	m	*no prefix*	metres	3	right
Gg	giga	~~Mega~~ grams	Mg	Mega	grams	3	right
Mg	Mega	~~giga~~ grams	Gg	giga	grams	3	Lefte
mL	milli	leder	L	no prefix	leder	4	Lefte
kJ	Killo	joules	mJ	milli	joules	3	right
μs	micro	seconds	ms	milli	seconds	3	Lefte
B	bytes	No prefix	kB	Kilo	bytes	3	Lefte
cm	Centi	milli	mm	milli	metres	1	right
cL	Centi	Leder	μL	micro	Leder	5	right.
mJ	milli	joules	cJ	Centi	joules	1	Lefte

Some Common Units and Their Equivalents T G M k h da c m μ n p (1)

1 km = 0.6214 mi	1 kg = 2.205 lb	1 US gal = 3.785 L
1 m = 39.37 in	1 lb = 453.59 g	1 hr = 60 min
1 m = 1.097 yd	1 oz = 28.35 g	1 min = 60 sec
1 ft = 30.48 cm	1 L = 1000 mL	1 cal = 4.184 J (exact)
1 in = 2.54 cm (exact)	1 L = 1000 cm^3	1 atm = 760 mmHg
1 acre = 43,560 ft^2	1 L = 1.057 qt	1 atm = 760 torr

1 ton = 2000 lb

Segment 2: Single Step Unit Conversions

Example 1 **Convert 56.0 cm to inches**

Given: 56.0 cm
Find: in
Conversion Factor: 1 in = 2.54 cm

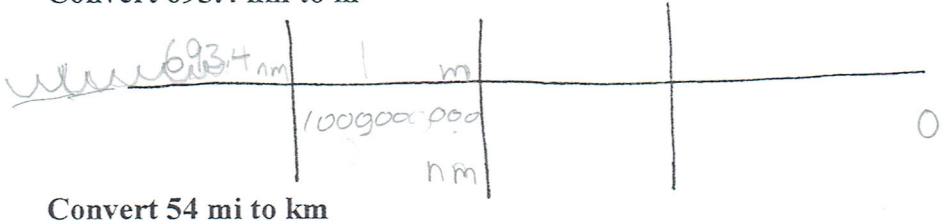
$$56.0\ cm \times \frac{1\ in}{2.54\ cm} = 22.0\ in = 2.20x10^{1}\ in$$

Example 2 **Convert 78.9 mg to g**

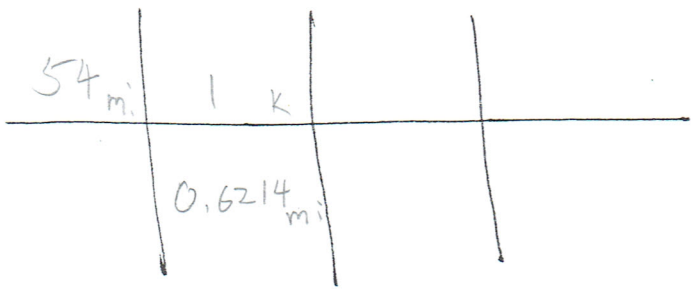
Given: 78.9 mg
Find: g
Conversion Factor: 1000 mg = 1 g

$$78.9\ mg \times \frac{1\ g}{1000\ mg} = 0.0789\ g = 7.89x10^{-2}\ g$$

Practice 1 **Convert 693.4 nm to m**



Practice 2 **Convert 54 mi to km**



=
86.9 km

Segment 3: Multistep Unit Conversions

Example 3 **Convert 1789 ft to km.**

Given: 1789 ft
Find: km
Conversion Factors: 1 ft = 12 in, 1 m = 39.37 in, 1 km = 1000 m

$$1789\ ft \times \frac{12\ in}{1\ ft} \times \frac{1\ m}{39.37\ in} \times \frac{1\ km}{1000\ m} = 0.5452\ km = 5.452 x 10^{-1}\ km$$

Example 4 **Ethylene glycol has a density of 1.11 g/cm³. What is the volume in liters of 7.9 kg of this liquid?**

Given: 7.9 kg
Find: L
Conversion Factors: 1.11 g = 1 cm³, 1 mL = 1 cm³, 1 L= 1000 mL, 1 kg = 1000 g

$$7.9\ kg \times \frac{1000\ g}{1\ kg} \times \frac{1\ cm^3}{1.11\ g} \times \frac{1\ mL}{1\ cm^3} \times \frac{1\ L}{1000\ mL} = 7.1\ L$$

Practice 3 **Convert 0.35 oz to µg.**

10⁶ ← lots of small things

0.35 oz | 28.35 g | 10⁺⁶ µg

1 oz | 1 g

big thing

9.9225

9.9 x 10⁶ µg ✓

Practice 4 **A car has a mileage rating of 42 miles per gallon of gasoline. How many liters of gasoline is needed for the car to travel 75.5 kilometers?**

42 miles / 1 gal gas

75.5 km | 1 g | 0.6214 mi | 3.785 L = 4.227998 L

42 mi | 1 km | 1 g

1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 6s, 4f, 5d, 6p

Electron Configuration Practice Worksheet

4

In the space below, write the full (unabbreviated) electron configurations of the following elements:

1) sodium $1s^2, 2s^2, 2p^6, 3s^1$

2) iron $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^6$

3) bromine $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^{10}, 4p^5$

4) barium $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^{10}, 4p^6, 5s^2, 4d^{10}, 5p^6, 6s^2$

5) neptunium $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^{10}, 4p^6, 5s^2, 4d^{10}, 5p^6, 6s^2, 4f^{14}, 5d^{10}, 6p^6, 7s^2, 5f^{14}$

56 = 70

70 80

In the space below, write the Noble Gas (abbreviated) electron configurations of the following elements:

6) cobalt _____

7) silver _____

8) tellurium _____

9) radium _____

10) lawrencium _____

Determine what elements are denoted by the following electron configurations:

11) $1s^2 2s^2 2p^6 3s^2 3p^4$ Sulfur S

12) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1$ Rb

13) [Kr] $5s^2 4d^{10} 5p^3$ Sb

14) [Xe] $6s^2 4f^{14} 5d^6$ Os

15) [Rn] $7s^2 5f^{11}$ Es

56 70+6 = 76

86

Determine which of the following electron configurations are not valid: State which rule has been violated.

16) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^5$ _____

17) $1s^2 2s^2 2p^6 3s^3 3d^5$ _____

18) [Ra] $7s^2 5f^8$ _____

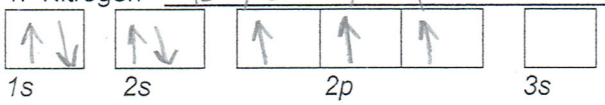
19) [Kr] $5s^2 4d^{10} 5p^5$ _____

20) [Xe] _____

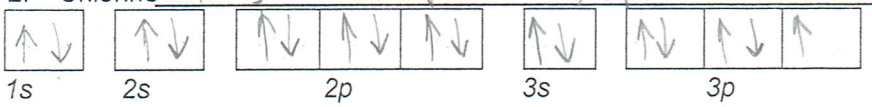
Where are the Electrons?

Write the full electron configuration, short-hand electron configuration, and fill in the orbital diagrams, for the following elements.

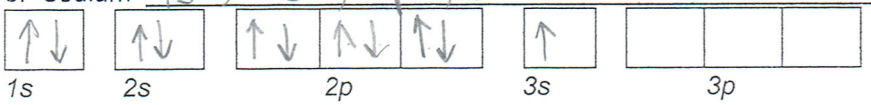
1. Nitrogen $1s^2, 2s^2, 2p^3$



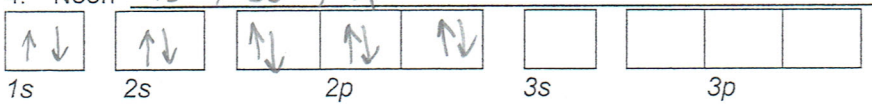
2. Chlorine $1s^2, 2s^2, 2p^6, 3s^2, 3p^5$



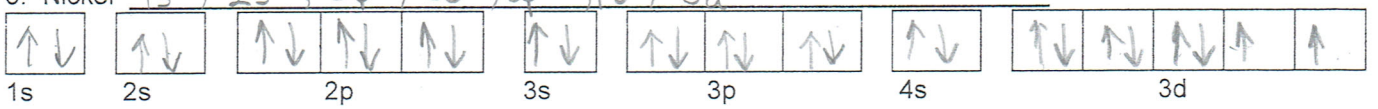
3. Sodium $1s^2, 2s^2, 2p^6, 3s^1$



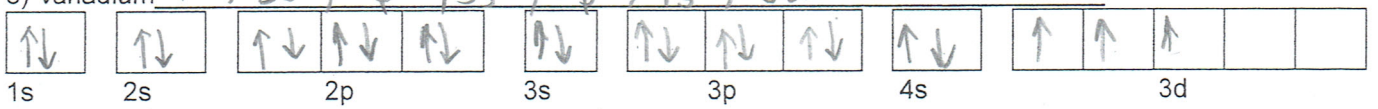
4. Neon $1s^2, 2s^2, 2p^6$



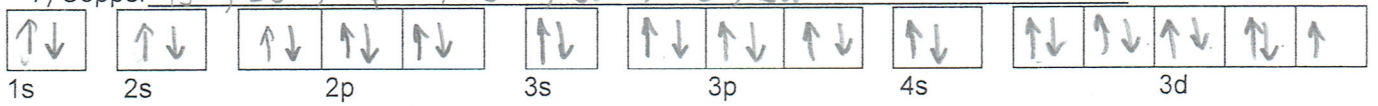
5. Nickel $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^8$

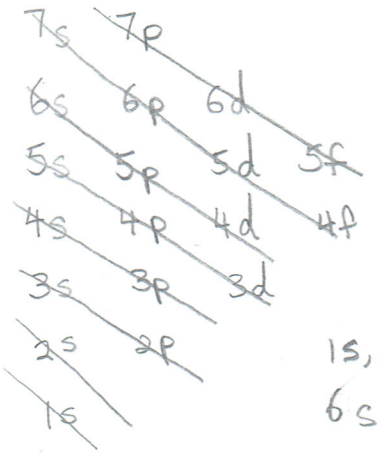


6) Vanadium $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^3$



7) Copper $1s^2, 2s^2, 2p^6, 3s^2, 3d^6, 4s^2, 3d^9$





1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 6s, 4f, 5d, 6p, 7s, 5f, 6d, 7p

Helen

$+ 2.2 \times 10^6$ — 2.653×10^6 — 2.7×10^6

$- 4.6 \times 10^3$ — -3.853×10^3

c) 2.34×10^{24}
$+ 1.92 \times 10^{23}$ — 2.532×10^{24} — 2.53×10^{24}

d) 2.130×10^3
$- 6.6 \times 10^2$ — 2.070×10^3 — 2.07×10^3

e) 9.10×10^3
$+ 2.2 \times 10^6$ — 2.2×10^6

f) 1113.0
$- 14.6 \times 10^2$ — -3.47×10^2 — -3.5×10^2

g) 6.18×10^{-45}
$+ 4.72 \times 10^{-44}$ — 5.34×10^{-44}

h) 4.25×10^{-3}
$- 1.6 \times 10^{-2}$ — -1.175×10^{-2} — -1.2×10^{-2}

5. Calculate the following. Give the answer in correct scientific notation.

a) $3.95 \times 10^2 / 1.5 \times 10^6$ — 2.633×10^4 — 2.6×10^{-4}

b) $(3.5 \times 10^2)(6.45 \times 10^{10})$ — 22.575×10^{12} — 23×10^{12}

c) $4.44 \times 10^7 / 2.25 \times 10^5$ — 1.973 — $10^2 \times 1.97$

d) $(4.50 \times 10^{-12})(3.67 \times 10^{-12})$ — 16.515×10^0 — 16.5×10^0

e) $1.05 \times 10^{-26} / 4.2 \times 10^{56}$ — 0.25×10^{-82}

f) $(2.5 \times 10^9)(6.45 \times 10^4)$ — 16.125 — 16×10^{13}

g) $6.022 \times 10^{23} / 3.011 \times 10^{-56}$ — 0.200×10^{32}

h) $(6.88 \times 10^2)(3.45 \times 10^{-10})$ — 23.7×10^{12}

answers

Scientific Notation/ Significant Figures Worksheet 2
Scientific Notation/ Significant Figures Worksheet 3

Helen

T G M | k h da | d c m | μ n p
10^{12} 10^{9} 10^{6} 10^{3} 10^{2} 10^{1} 10^{0} 10^{-1} 10^{-2} 10^{-3} 10^{-6} 10^{-9} 10^{-12}

Metric Conversions Worksheet II

Helen

1. Convert the following to km:

1600.0 m = 1.6 km 2050 cm = 0.0205 1.033 Mm = 1033

245.565 mm = 0.245565 20 099 m = 20.099 499 m = 0.499

2. Convert the following:

10.034 mJ = 1.0034 cJ 36.45 cL = 364500 μL

0.05 cm = 0.5 mm 1024 B = 1.024 kB

0.0325 kJ = 3250 cJ 1202.5 mL = 1.2025 L

0.42101 Gg = 421.01 Mg 25.5 km = 25500 m

0.12907 cm = 1.2907 mm 756 900 μs = 756.9 ms

5600.4 Ms = 5.6004 Gs 268 000 cm = 2.68 km

25.50 km = 25500. m
2.550×10^{4}

Metric Conversions Worksheet III

Convert the following:

0.0075 Gm = 7500 km 0.00091 TL = 910 ML

0.00046 ks = 46 cs 244475.3 μs = 0.00244475 hs

4096 MB = 4.096 GB 210 hm = 2,100,000 cm

0.0002 μg = 0.0000002 mg 448.5 cg = 4.485 g

0.00034 μL = 0.0000034 cL ← 0.000000034 2103.55 s = 0.210355 ks → 2.10355 $\times 10^{11}$

11120.33 ng = 0.00111203 cg 0.0000012 GL = 120000. cL

1.2×10^{5}

Helen

Significant Digit Worksheet

Give the number of significant digits in each of the following measurements:

1. ~~1278.50~~	6	7. ~~8.002~~	4	13. ~~43.050~~	5
2. 120000	2	8. ~~823.012~~	6	14. ~~0.147~~	43
3. ~~90027.00~~	7	9. ~~0.005789~~	4	15. ~~6271.91~~	6
4. ~~0.0053567~~	5	10. 2.60	3	16. 6	1
5. 670	2	11. ~~542000.~~	6	17. ~~3.47~~	3
6. 0.00730	3	12. ~~2653008.0~~	8	18. ~~387465~~	6

Round off the following numbers to three significant digits:

19. 120000	1.20×10^5	22. 4.53619	4.54
20. 5.457	5.46	23. 43.659	43.7
21. 0.0008769	8.77×10^{-4} 0.00877	24. 876493	876000

Perform the following operations giving the proper number of significant figures in the answer:

25. 23.4 x 14	3.3×10^{-2}	28. 0.005 - 0.0007	0.004
26. 7.895 + 3.4	11.3	29. 7.895 / 34	0.23
27. 0.0945 x 1.47	0.139	30. 0.2 / 0.0005	4×10^2

31. $(8.71 \times 0.0301)/0.056 =$ 5.2

32. $(7.6 \times 10^4)(5.823 \times 10^{-3}) =$ 4.4×10^0 440

33. $(4 \times 972) + (76.4 \times 29.3) - (12 \times 7) =$ 6000

34. $\dfrac{(72.67 - 72.63) \times (4.2694)}{(9.72 + 0.01)} =$ 0.02

35. $\dfrac{4.1 \times 10^{-3} - 6.9 \times 10^{-2}}{7.2 \times 10^{-6} + 8.943 \times 10^{4}} =$ 9

36. $\dfrac{10{,}000{,}000 \times 0.0003845 \times 4.55}{4.331 \times 10^{-6}} =$ 4.04×10^{-9}

Write each number in scientific notation.

33. 0.07882 = 7.882×10^{-2}	33. 0.00002786 = 2.786×10^{-5}
33. 87200 = $8.72 \times 10^{+4}$	33. 74171.7 = $7.41717 \times 10^{+4}$
33. 450 = 4.5×10^{2}	33. 118000 = $1.18 \times 10^{+5}$
33. 0.0000085 = 8.5×10^{-6}	33. 0.000000664 = 6.64×10^{-7}
33. 0.00000272338 = 2.72338×10^{-6}	33. 770 = $7.7 \times 10^{+2}$
33. 62360 = $6.236 \times 10^{+4}$	33. 0.000044547300 = 4.45473×10^{-5}
33. 500260 = $5.0026 \times 10^{+5}$	33. 0.0000087038 = 8.7038×10^{-6}

Write each number in standard format.

47. 3.443×10^{-7} = 0.0000003443	47. 7.75763×10^{-7} = 0.000000775763
47. 5.8×10^{-7} = 0.0000005.8	47. 1.525×10^{6} = 1,525000
47. 6.58157×10^{7} = 6,581570	47. 5.1821×10^{-4} = 0.00051821