

The Math You'll Use in Chemistry Checklist

Once you have completed everything on this checklist you will feel more confident in your class, you'll make less math related mistakes and you'll have a better chance of passing Chemistry!

Here's how to use this checklist:

Print this out now and use this checklist to check everything off as you go.

Watch each video in the playlist found here:
[melissa.help/mathinchem](https://www.youtube.com/playlist?list=PL561815671948240)

After you finish each video, try out the practice problems for that video here:
[melissa.help/practice](https://www.youtube.com/playlist?list=PL561815671948240)

Pre-Algebra

- 📺 Video 1: Rounding and Order of Operations Used in Significant Figures
 - 📺 Video 1 Practice Problems
- 📺 Video 2: Scientific Notation and Their Operations
 - 📺 Video 2 Practice Problems
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 - 📺 Video 3 Practice Problems
- 📺 Video 4: How to Use Fractions in Chemistry
 - 📺 Video 4 Practice Problems
- 📺 Video 5: The Percentages You'll See in Chemistry
 - 📺 Video 5 Practice Problems

Algebra

- 📺 Video 6: How to Determine Your Units in Chemistry
 - 📺 Video 6 Practice Problems
- 📺 Video 7: How to Convert Units in Chemistry
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Algebra 2

- 📺 Video 14: Using Logarithms and Natural Logarithms in Chemistry
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How to Use Your Calculator

- 📺 Video 15: How to Use Your Scientific Calculator

More Chemistry Resources

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✦ NOTES ✦

Video 1 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

1. Round the number 13.9572 to the following number of significant figures:

- a) 2 sig figs
- b) 3 sig figs
- c) 4 sig figs
- d) 5 sig figs

2. Identify how many significant figures are in the following numbers:

- a) 8.0002
- b) 0.0008
- c) 8×10^{-2}
- d) 8.000
- e) 8000

3. Round the number 4591 to 3 significant figures

4. Round the number 8984.324 to 3 significant figures

Video 1 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

5. Round to the correct number of significant figures for each question below:

a) $4.00 \times 0.020 \times 1.57$

b) $(568.99 - 232.1) \div 5.3$

c) $\frac{(1.41 - 0.2)}{7.32} + 0.86$

d) $(2.756 \times 1.20) \div (9.5 + 11.28)$

e) $[(1.7 \times 10^6) \div (2.61 \times 10^5)] + 7.31$

Video 2 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

1. Write the following numbers in scientific notation:

- a) 57,000
- b) 0.000812
- c) 2.35
- d) 17.4

2. Write the following numbers in standard notation:

- a) 9.91×10^{-3}
- b) 1.34×10^1
- c) 7.22×10^0
- d) 1.25×10^6

3. Write the following numbers in scientific notation:

- a) 347.81×10^{-5}
- b) 74.5×10^2
- c) 0.49×10^{-3}

Video 2 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

4. Write each answer in scientific notation and round to the correct number of sig figs:

a) $(2 \times 10^{-4})(8.1 \times 10^{-1})$

b) $(9.9 \times 10^{-1}) \div (9 \times 10^1)$

c) $(7 \times 10^{-5})^3$

d) $(6.91 \times 10^{-2}) + (2.4 \times 10^{-3})$

e) $(1.33 \times 10^5) - (4.9 \times 10^4)$

Video 3 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

1. Write the chemical formula for each compound name:

a) manganese (IV) oxide

b) aluminum oxide

c) lead (IV) chloride

2. Balance the half reactions:

a) Oxidation: $\text{Sn}(s) \rightarrow \text{Sn}^{2+}(aq) + 2e^{-}$

Reduction: $\text{VO}_2^{+}(aq) + 1e^{-} \rightarrow \text{VO}^{2+}(aq)$

b) Oxidation: $\text{Sn}^{2+}(aq) \rightarrow \text{Sn}^{4+}(aq) + 2e^{-}$

Reduction: $\text{NO}_3^{-}(s) + 3e^{-} \rightarrow \text{NO}(g)$

Video 4 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

1. Balance the following chemical equation:



2. Balance the following chemical equation:



3. Balance the following chemical equation:

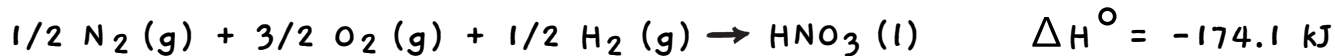


Video 4 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

4. Find the ΔH for the following reaction: $2\text{N}_2 (\text{g}) + 5\text{O}_2 (\text{g}) \rightarrow 2\text{N}_2\text{O}_5 (\text{g})$

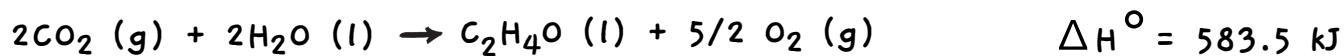
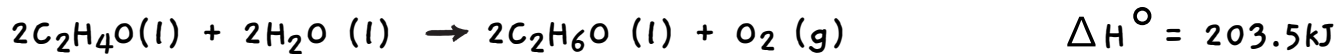


Video 4 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

5. Find the ΔH for the following reaction: $C_2H_6O(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$



Video 6 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

1. Convert 161 in³ to liters. (1 ft = 12 in, 1 ft³ = 28.317 L)

2. Simplify the following units:

$$\frac{\left(\frac{\text{kg m}^2}{\text{s}^2}\right) \cdot \text{s}}{\frac{\text{kg m}}{\text{s}}}$$

Video 6 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

3. Simplify the following units:

$$\frac{\frac{M}{s}}{M^2 M^0}$$

4. Simplify the following units:

$$\frac{\frac{M^2}{s}}{\frac{M^3}{s}}$$

5. Convert 2.1 mm^3 to cm^3 . ($1 \text{ mm} = 10^{-3} \text{ m}$, $1 \text{ cm} = 10^{-2} \text{ m}$)

Video 7 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

1. Convert 28.9 nm to cm

2. How many grams of Na are in a 8.2g sample of Na_3PO_4 ?

3. How many liters of NH_3 are produced at STP if 80.28g of H_2 gas are reacted in an excess of nitrogen? $\text{N}_2 (\text{g}) + 3\text{H}_2 (\text{g}) \rightarrow 2\text{NH}_3 (\text{g})$

Video 7 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

4. How many moles of oxygen are needed to fully react 837.4g of C_8H_{18} ?



5. How many molecules are there in 230 grams of NH_4OH ?

Video 8 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

Write the balanced chemical equation for the following questions:

1. Sodium metal combines with chlorine to produce solid sodium chloride.
2. Water decomposes to produce hydrogen gas and oxygen gas.
3. Water vapor combines with sodium metal to produce aqueous sodium hydroxide and hydrogen gas.
4. When solid $C_6H_{12}O_6$ is burned in oxygen, carbon dioxide gas and water vapor are formed.
5. Dissolved beryllium chloride reacts with dissolved silver nitrate to produce aqueous beryllium nitrate and a precipitate of silver chloride.

Video 9 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

1. Solve for P_2 in: $\frac{P_1}{T_1} = \frac{P_2}{T_2}$

2. Solve for T_2 in: $\frac{P_1}{T_1} = \frac{P_2}{T_2}$

3. Solve for λ in: $E = \frac{hc}{\lambda}$

Video 9 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

4. Solve for V_2 in:
$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

5. Solve for T_1 in:
$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

Video 10 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

1. Find the oxidation numbers for each element: PtCl_6^{2-}

2. Find the oxidation numbers for each element: Al_2O_3

Video 10 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

3. Pb has an average atomic mass of 207.19 amu. The three major isotopes of Pb are Pb-206 (205.98 amu), Pb-207 (206.98 amu), Pb-208 (207.98 amu). If the isotopes of Pb-207 and Pb-208 are present in equal amounts, calculate the percent abundance of Pb-206, Pb-207, and Pb-208.

Video 10 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

4. Find the oxidation numbers for each element: H_3AsO_3

5. Br has an atomic mass of 79.904 amu and has two naturally occurring isotopes ^{79}Br and ^{81}Br with masses of 78.9183 amu and 80.9163 amu.

Find the percent abundance of each isotope.

Video 11 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

1. A metal with a mass of 5.0g and temperature of 0°C is placed in a glass of 1.0g of water with a temperature of 25°C . What is the final temperature after both substances have reached equilibrium? ($C_{\text{metal}} = 0.79 \text{ J/g}^{\circ}\text{C}$, $C_{\text{H}_2\text{O}} = 4.184 \text{ J/g}^{\circ}\text{C}$)

Video 11 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

2. Calculate the density of CO_2 gas at 745 mmHg and 65°C (1 atm = 760 mmHg).

3. What is the density of chlorine gas at 1.0 atm and 273K?

Video 11 Practice Problems

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4. Find the ratio of effusion rates of CO_2 and N_2 .

5. A 8.93 g sample of an unknown gas occupies a volume of 0.970 L at 1.75 atm and 304 K. What is the identity of the unknown gas?

Video 12 Practice Problems

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1. Determine the heat of vaporization using the data below:

Temperature (K)	Pressure (torr)
65	129.5
70	289.5
75	568.8
80	1027
85	1717

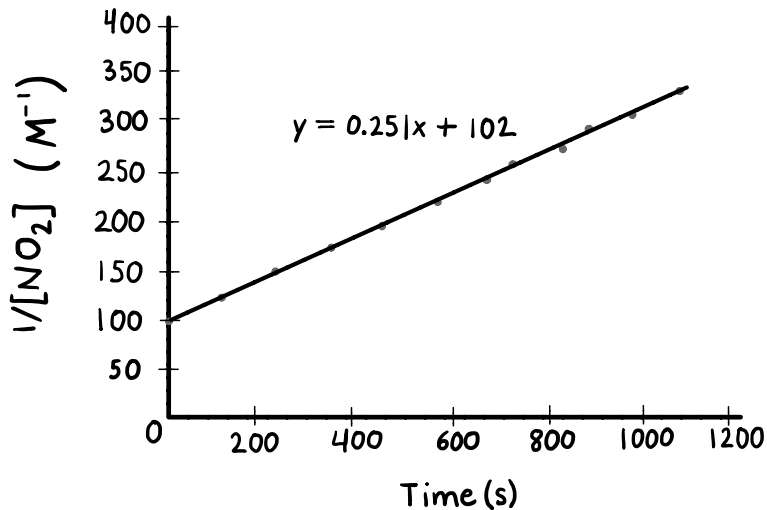
2. Determine the heat of vaporization of a graph with a trendline of $y = -3703x + 18.4$

Video 12 Practice Problems

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Use the following graph for numbers 3-5:



3. Determine the rate constant
4. Determine the reaction order
5. What would the concentration be of NO_2 at 2000s?

Video 13 Practice Problems

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You can find the answer key at melissa.help/practice

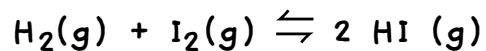
1. A reaction contains 0.120M CO and 0.120M H₂O. Calculate all concentrations at equilibrium for the below reaction: $\text{CO(g)} + \text{H}_2\text{O (g)} \rightleftharpoons \text{CO}_2 \text{(g)} + \text{H}_2 \text{(g)}$
(K=102 at 500K)

Video 13 Practice Problems

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2. If a chemist started mixing 0.050 mol of H₂ and 0.060 mol of I₂ in a 4.50 L flask. What would the concentrations at equilibrium be for each gas? (K=54.3)



Video 14 Practice Problems

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1. If $[\text{H}_3\text{O}^+] = 1.8 \times 10^{-4} \text{ M}$, what is the pH of the solution?

2. Find the $[\text{H}_3\text{O}^+]$ of a solution with a pH of 4.8.

Video 14 Practice Problems

Created by Melissa Maribel

You can find the answer key at melissa.help/practice

3. Determine the ratio of NaF to HF needed to form a buffer with a pH of 4.02.

$$(K_a = 3.50 \times 10^{-4})$$

4. Find the activation energy (E_a) if $k=0.05\text{s}^{-1}$, $A=1.2 \times 10^{13}\text{s}^{-1}$, $R=8.314\text{ J/mol K}$, $T=305\text{K}$ ($k = Ae^{-E_a/RT}$)