

Chemistry Sub Plans Week, High School

Week-long sub plans: five days of print and go work for grades 9 to 12, planned Monday to Friday.

PREVIEW

What is included

- Sub binder: notes, the filled-in week plan, a blank schedule, class list, Monday opener (11 pages)
- Chemistry sets for five days (15 pages)
- Calm puzzles and reset sheets (10 pages)
- Chemistry team tasks (9 pages)
- Chemistry games (10 pages)
- Answer keys (8 pages)

How it works

1. Open the week plan. Every set already has its day and page number.
2. Each day: one chemistry set per period (a lesson with worked examples, practice and a challenge), a calm puzzle, a team task and an optional game for the last 15 minutes.
3. Every set stands alone: swap sets between days, or use one with another class when it fits.
4. No prep, no tech: print and go. The sub needs no subject knowledge. Every answer is in the key.
5. Print in color or ink-saver black and white, US Letter or A4.

What this preview shows: the week at a glance, the filled-in week plan, the note to the substitute, the Monday opener, and all of Day 1 (the chemistry set, the calm block, the team task and the game), one answer-key page and one ink-saver page. Every product page is watermarked. The full kit has 64 pages.



Every chemistry set of the week, with its page and what it reviews. The day's set runs in every period you teach; any set works on any day.

MONDAY (DAY 1)

Opener	Meet Your Sub Fifteen minutes at the top of every period on Monday: the sub sheet, three questions, the class agreement and the voice levels.	p. 10 · 15 min
Chemistry set 1	Atomic Structure and the Periodic Table Reviews: protons, neutrons and electrons in atoms and ions, isotopes and average atomic mass, groups and periods, electron shells, periodic trends.	p. 13 · 50 min
Calm puzzle	Word Search and Reset Sheet A quiet subject word search and a two-minute reset sheet for a loud day, a long wait or anyone who finishes early.	p. 16 · 20 min
Team task	The Mole Line-Up Groups of four rank twelve samples by how many particles they hold, first by gut, then by working out moles, and score against the chemist's order.	p. 18 · 40 min
Game (optional)	Whiteboard Quiz Game Optional fun to end the class.	p. 19 · 15 min

TUESDAY (DAY 2)

Chemistry set 2	Bonding and Naming Compounds Reviews: ionic and covalent bonds, the octet rule, writing ionic formulas from ion charges, naming ionic compounds with Roman numerals, covalent prefixes.	p. 21 · 50 min
Calm puzzle	Sudoku and Grounding Sheet A hard sudoku with exactly one answer and a 5-4-3-2-1 grounding sheet for anyone who needs to come back into the room.	p. 24 · 20 min
Team task	The Lab Week Plan Groups of four turn moles of acid into milliliters, then plan the chemistry labs that earn the most learning points inside a budget and an acid supply.	p. 26 · 40 min
Game (optional)	Paper Password Optional fun to end the class.	p. 28 · 15 min

WEDNESDAY (DAY 3)

Chemistry set 3	The Mole and Stoichiometry Reviews: molar mass from a printed table, grams, moles and particles, mole ratios from balanced equations, mass to mass stoichiometry, limiting reactant.	p. 30 · 50 min
Calm puzzle	Secret Codes and Control Sheet Two coded sayings to crack in silence and a sheet that sorts what you can and cannot control this week.	p. 33 · 20 min
Team task	The Paper Molecule Kit Groups of four tear two sheets into atom cards and bond strips, build three molecules where every atom makes its usual number of bonds, and get judged.	p. 35 · 40 min
Game (optional)	Class Feud Optional fun to end the class.	p. 37 · 15 min

THURSDAY (DAY 4)

Chemistry set 4	Gases and States of Matter Reviews: kinetic molecular theory, states and phase changes, reading a heating curve, kelvin conversion, Boyle's, Charles's, Gay-Lussac's and combined gas laws.	p. 39 · 50 min
Calm puzzle	Maze and Brain Dump A long maze with exactly one true path and a brain dump sheet that turns a crowded head into one next step.	p. 42 · 20 min
Team task	Chemistry Night Four chemistry club officers, each holding facts nobody else has, decide which demos fill a 25-minute show and which teach a chemistry myth.	p. 44 · 40 min
Game (optional)	Classroom Millionaire Optional fun to end the class.	p. 46 · 15 min

FRIDAY (DAY 5)

Chemistry set 5	Solutions, Acids and Bases Reviews: solutes and solvents, molarity, dilution, the pH scale with whole-number pH values, neutralization, titration, reading indicator colors.	p. 48 · 50 min
Calm puzzle	Word Ladders and Three Good Things Four five-letter word ladders, three scrambled words and a three good things sheet to close out the week.	p. 51 · 20 min
Team task	The Hydrogen Bus Vote Groups of four sort an evidence bank by side and by area of chemistry, then debate switching a town's buses to hydrogen two against two.	p. 53 · 40 min
Game (optional)	Mystery Box Optional fun to end the class.	p. 55 · 15 min

How the sets work

- One set per day covers every period you teach: Monday's set runs in every Monday class.
- Every set stands alone. Swap sets between days, or use one with another class when it fits.
- Each set opens with a line that says what it reviews, so you can match it to what your class covered.
- The calm puzzle fits any gap, the team task fills a block period, and the game is optional fun for the last 15 minutes.
- No prep, no tech. Every answer is in the keys at the back, so the sub needs no subject knowledge.



This Week's Plan

You teach one subject to several classes, so every period you teach runs this same plan, first period to last: Monday's column in every Monday period, Tuesday's in every Tuesday period. Planning, lunch and duty periods: nothing to do. List your periods and classes on the blank schedule on the next page. This order is a sample: every set stands alone, so swap any set into any slot or any day.

WHEN	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
First 15 minutes: attendance, voice level, then	Meet Your Sub p. 10 · 15 min	Go over yesterday's answers Read them out from the key at the back; students mark their own (10 min)	Go over yesterday's answers Read them out from the key at the back; students mark their own (10 min)	Go over yesterday's answers Read them out from the key at the back; students mark their own (10 min)	Go over yesterday's answers Read them out from the key at the back; students mark their own (10 min)
Rest of the period: the day's set (one copy per student)	Chemistry 1 Atomic Structure and the Periodic Table p. 13 · 50 min	Chemistry 2 Bonding and Naming Compounds p. 21 · 50 min	Chemistry 3 The Mole and Stoichiometry p. 30 · 50 min	Chemistry 4 Gases and States of Matter p. 39 · 50 min	Chemistry 5 Solutions, Acids and Bases p. 48 · 50 min
If a class finishes early or gets loud	Word Search and Reset Sheet p. 16 · 20 min	Sudoku and Grounding Sheet p. 24 · 20 min	Secret Codes and Control Sheet p. 33 · 20 min	Maze and Brain Dump p. 42 · 20 min	Word Ladders and Three Good Things p. 51 · 20 min
Block period (90 minutes) only	The Mole Line-Up p. 18 · 40 min	The Lab Week Plan p. 26 · 40 min	The Paper Molecule Kit p. 35 · 40 min	Chemistry Night p. 44 · 40 min	The Hydrogen Bus Vote p. 53 · 40 min
Last 15 minutes (optional): a fun way to end the class, or for extra time	Whiteboard Quiz Game p. 19 · 15 min	Paper Password p. 28 · 15 min	Class Feud p. 37 · 15 min	Classroom Millionaire p. 46 · 15 min	Mystery Box p. 55 · 15 min

How this week works

- You are covering a teacher who teaches one subject to several classes. Each class comes to this room once a day, for one period.
- So every class gets the same set on the same day: Monday's set in every Monday period, Tuesday's set in every Tuesday period.
- One set per day covers all your classes. Copy that day's set once per student in the morning. Planning, lunch and duty periods: nothing to run.
- Each set fills one period (45 to 55 minutes); the challenge at the end stretches it to a 90-minute block.

How to use this plan

- Page numbers point to the first page of each set. Copy one per student.
- The calm block is always allowed: a period that runs short, a loud class, or anyone who finishes early.
- The game is optional: a fun way to end the class, or something for extra time.



Note to the Substitute

Grades 9 to 12 · five days · every set runs from the printout alone

Thank you for covering my classes this week

Everything you need is in this binder. The front pages (important information, weekly schedule, class list) are filled in for this week. After them come the work sets, one per day: **Chemistry 1** is Monday's set, **Chemistry 2** is Tuesday's, and so on to **Chemistry 5** on Friday. Run the day's set in every period you teach that day. Each set is one period (45 to 55 minutes), stands alone, and has its own answer key at the back of the binder, so you never have to make anything up or know the subject. The first page of every set tells you what to say. Every set ends with a challenge, so it stretches to a 90-minute block when you need it.

After the subject sets come the shared blocks, one of each per day. The **calm block** is always allowed: for a period that runs short, a loud class, or anyone who finishes early. The **team task** fills a period on its own. The **game** is optional: a fun way to end the class, or something for extra time. Fifteen minutes, from the script.

Each day has

- One Chemistry set (one period, with a challenge to stretch it)
- A calm and quiet block: a puzzle page and a reset sheet
- A team task for groups of four
- A paper game from the script

If the class is loud

- Set a voice level with a number, 0 to 3, and use it all week (the Day 1 opener explains it).
- Switch to the calm block. Nobody needs to move.
- Every set has a challenge at the end, so fast finishers always have something.
- If a set is not working, stop it and use the calm block or the team task. Every set starts cold.

At the end of each day

Please fill in that day's line on the "How it went" page. It takes two minutes and I read every word.

Did this kit work well for your class? A quick review helps other teachers find it and earns you TpT credits. Thank you!



Meet Your Sub

Day 1 opener, 15 minutes at the start of every period on Monday, before the set. Nothing to prepare.

Opener

Sub script (the same five minutes in every class)

1. **Before first period, fill in the introduction sheet** on the next page, once, for the whole day. Keep it short and honest. A high school class reads a sub in about ten seconds, so give them something real to read.
2. **Introduce yourself from the sheet** in two minutes. Then hold up the Ask the Sub list and take three questions from raised hands. Three, not ten. Say when you are done taking questions.
3. **Read the class agreement out loud** and ask this period to add one line of their own. Write that line on the board for the period. The line they wrote is the one they keep.
4. **Set the voice level with a number** from 0 to 3, using the box at the bottom of the sheet. Say which level today's set needs, and use the same numbers in every class all week.
5. **Start the set** with one sentence: this is today's work, it has a challenge at the end, and the calm block is always allowed when you are finished.

If the room is loud

- Skip the questions. Keep the agreement and the voice level, and say the number out loud.
- Start the set sooner. Work on the desk beats a speech about behavior every time.
- Name the level again after four minutes. A number is easier to follow than a lecture.

If a period runs ten minutes short

- Run Common Ground in groups of four. Six minutes of work, four minutes of reading out.
- Or hand out the reset sheet from the calm block and let the room go quiet early.
- Or have each student write one question they would ask the teacher when they get back.

Monday checklist (before first period)

- ☐ Read the Important Information page: office extension, exits, the nurse, the teacher next door.
- ☐ Check the class list for allergies, medical needs, early releases and students who carry a pass.
- ☐ Find today's set on the weekly schedule and count copies for every period, plus five spares.
- ☐ Fill in the About Your Sub sheet once and post it where the back row can read it.
- ☐ Write the voice levels 0 to 3 on the board and leave them there all week.
- ☐ Keep the answer keys inside the binder, not face up on the desk.



Chemistry Set 1: Atomic Structure and the Periodic Table

Chemistry • Day 1

Read the three paragraphs and the worked examples. Pencil and paper only; a calculator if the school allows one.

This set reviews: protons, neutrons and electrons in atoms and ions, isotopes and average atomic mass, groups and periods, electron shells, periodic trends

An atom has a tiny, dense nucleus at its center, surrounded by electrons. The nucleus holds protons, which carry a positive charge, and neutrons, which carry no charge. Protons and neutrons have almost the same mass, and each is about 1,800 times heavier than an electron, so nearly all of an atom's mass is in its nucleus. The number of protons is the atomic number, and it decides which element the atom is: every atom with 6 protons is carbon, and every atom with 8 protons is oxygen. The mass number is the number of protons plus the number of neutrons.

A neutral atom has as many electrons as protons, so the charges cancel. An ion is an atom that has gained or lost electrons. Losing electrons leaves more protons than electrons and a positive charge; gaining electrons gives a negative charge. Isotopes are atoms of the same element with different numbers of neutrons. Carbon-12 and carbon-14 both have 6 protons, but carbon-14 has 8 neutrons instead of 6. The atomic mass printed on the periodic table is a weighted average of an element's natural isotopes, which is why it is rarely a whole number.

The periodic table lists the elements in order of atomic number. Each row is a period and each column is a group. Elements in the same group have the same number of valence electrons, the electrons in the outer shell, so they react in similar ways: the group 1 metals all lose one electron to form 1+ ions, and the group 17 halogens all gain one to form 1- ions. From left to right across a period, atoms get smaller, because more protons pull the electrons in closer, and ionization energy and electronegativity rise. Down a group, atoms get larger, because each period adds a shell of electrons, and ionization energy and electronegativity fall.

Remember

- **Protons** = the atomic number. **Neutrons** = mass number minus atomic number. **Electrons** = protons minus the charge, so a 2+ ion has 2 fewer electrons than protons and a 1- ion has 1 more.
- **Isotope names** give the mass number: sodium-23, or ^{23}Na . The charge of an ion is written at the top right: $^{23}\text{Na}^+$.
- **Average atomic mass** = (mass of isotope 1 x its fraction) + (mass of isotope 2 x its fraction) + ... A fraction is the percent divided by 100.
- **Electron shells** for the first twenty elements fill 2, then 8, then 8, then 2. The last shell holds the valence electrons.

1 Particles in $^{35}\text{Cl}^-$

Chlorine has atomic number 17, so 17 protons. Neutrons: 35 minus 17 = 18. The charge is 1-, so electrons = 17 plus 1 = 18.

17 protons, 18 neutrons, 18 electrons

2 Particles in $^{27}\text{Al}^{3+}$

Aluminum has atomic number 13, so 13 protons. Neutrons: 27 minus 13 = 14. The charge is 3+, so electrons = 13 minus 3 = 10.

13 protons, 14 neutrons, 10 electrons

3 Average atomic mass of lithium

A sample is 7.5 percent lithium-6 and 92.5 percent lithium-7. Average = $6(0.075) + 7(0.925) = 0.45 + 6.48$.

6.93, close to the table value 6.94

4 Shells of phosphorus

Phosphorus has 15 electrons. Fill 2, then 8, then the 5 that are left. The outer shell holds 5, which matches its group number, 15, minus 10.

2, 8, 5: 5 valence electrons, period 3



Chemistry Set 1: Particles and Isotopes

Use the periodic table on page 3 for atomic numbers. Fill every blank box in the table, then do the isotope problems.

Chemistry • Day 1

A. Atoms and ions

Some rows give the symbol: find the protons, neutrons and electrons. Other rows give the particles: write the symbol with its mass number and charge, like $^{23}\text{Na}^+$.

ROW	SYMBOL	ELEMENT NAME	PROTONS	NEUTRONS	ELECTRONS
1	^{19}F				
2	$^{24}\text{Mg}^{2+}$				
3			8	8	10
4	$^{32}\text{S}^{2-}$				
5			11	12	10
6	$^{39}\text{K}^+$				
7	^{14}C				
8			17	20	18
9	$^{40}\text{Ca}^{2+}$				
10			13	14	13

B. Isotopes and average atomic mass

Use each isotope's mass number as its mass. Show the multiplication for every isotope.

11. A sample of boron is 20 percent mass 10 and 80 percent mass 11. Find the average atomic mass to two decimal places.

12. A sample of a mystery element is 79 percent mass 24, 10 percent mass 25 and 11 percent mass 26. Find the average atomic mass to two decimal places. Which element on the table has the closest average atomic mass?

13. A sample of chlorine is 75 percent mass 35 and 25 percent mass 37. Find the average atomic mass to two decimal places. Compare it with the table value, 35.45.

14. Carbon-12 and carbon-14 are isotopes. Name two things that are the same in their atoms and one thing that is different.

.....

15. The table gives potassium 39.10. Its two main isotopes are potassium-39 and potassium-41. Without any math, which is more common? How can you tell?

.....



Chemistry Set 1: The Periodic Table and Its Trends

Chemistry • Day 1

Use this table for the whole set. Each box shows the atomic number, the symbol and the average atomic mass.

PERIOD	GROUP 1	GROUP 2	GROUP 13	GROUP 14	GROUP 15	GROUP 16	GROUP 17	GROUP 18
1	1 H 1.01							2 He 4.00
2	3 Li 6.94	4 Be 9.01	5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
3	11 Na 22.99	12 Mg 24.31	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
4	19 K 39.10	20 Ca 40.08						

Groups 3 to 12 not shown. B and Si are metalloids. H and everything right of B and Si are nonmetals; the rest are metals.

C. Read the table

ELEMENT	GROUP	PERIOD	ELECTRON SHELLS	VALENCE ELECTRONS	METAL OR NONMETAL?	USUAL ION
16. Lithium						
17. Oxygen						
18. Aluminum						
19. Phosphorus						
20. Chlorine						
21. Calcium						

Usual ion: group 1 forms 1+, group 2 forms 2+, group 13 forms 3+, group 15 forms 3-, group 16 forms 2-, group 17 forms 1-.

D. Trends: circle the answer

22. Larger atom: **Na** or **Cl**

23. Larger atom: **Li** or **K**

24. Higher ionization energy: **Mg** or **Ca**

25. Higher ionization energy: **Al** or **Cl**

26. Higher electronegativity: **O** or **F**

27. Higher electronegativity: **N** or **P**

Challenge

a. An element has two isotopes, mass 63 and mass 65, and an average atomic mass of 63.6. What percent of its atoms have mass 63? (Hint: call that fraction x ; the other is 1 minus x .)

b. Five of the usual ions of the first twenty elements have exactly 18 electrons, like an argon atom. Name all five, list them from most protons to fewest, and say which one is the largest and why.

c. Potassium's atom is larger than sodium's, but chlorine's atom is smaller than sodium's. Explain both facts.



Calm Block, Day 1: Word Search

Find all 12 chemistry words. Any direction, including backward and diagonal. Pencils only, voices at 0.

Calm • Day 1

H	T	B	S	Y	P	R	O	T	O	N	G	M	P
D	O	S	O	L	U	T	E	E	I	Y	O	E	E
G	L	T	N	U	P	C	D	Z	V	L	M	E	R
M	A	S	E	E	V	X	L	B	A	G	R	U	I
H	T	Y	G	L	W	B	A	R	W	T	M	I	O
T	I	L	O	E	C	B	I	N	Z	R	F	K	D
E	B	A	L	C	S	T	U	O	N	W	T	N	I
P	R	T	A	T	Y	B	K	I	E	R	R	Z	C
O	O	A	H	R	I	Y	E	T	U	N	M	K	Z
T	A	C	I	O	I	M	L	A	T	D	S	Q	C
O	P	I	Q	N	J	P	V	R	R	N	Z	X	V
S	L	E	J	M	R	Q	I	T	O	X	D	B	P
I	C	G	O	S	J	B	N	I	N	R	O	T	X
F	A	Z	U	R	K	T	L	T	K	X	J	U	Z

TITRATION

ELECTRON

MOLARITY

CATALYST

PERIODIC

ISOTOPE

NEUTRON

HALOGEN

ORBITAL

PROTON

SOLUTE

KELVIN

Faster than reading every square

- Hunt the rare letters first. Only one word in the list has a K in it, so every K in the grid is worth a second look.
- Scan one row at a time for a word's first two letters, then check all eight directions from that square.
- Cross a word off the list the second you circle it, or you will search for it twice.



Calm Block, Day 1: Reset Sheet

For one person, at your own pace. Nobody collects this and nobody reads it but you.

Calm • Day 1

Two minutes, then back to it

This is not a mood test and it is not therapy. It is a short routine for the moments when your head is somewhere else and the work in front of you is going nowhere: slow the breath, put a name on the feeling, pick the next five minutes. Work down the page and stop at the bottom.

Step 1: make the breath out longer

Breathe in through your nose while you count to four, then out through your mouth while you count to six. The long breath out is the part that slows your heart rate down. Six rounds, then stop.

Check a box for each round so you are not counting in your head.

□ □ □ □ □ □

Step 2: name it

A feeling you can name gets smaller. Tired, annoyed, behind, worried, bored, flat, wired. One word is enough, and it does not have to be the right word.

Write yours on the first line below.

Name it in one word, then write the sentence your head keeps repeating

.....

.....

What is actually true right now, in this room, that I could check in ten seconds

.....

.....

The next five minutes: what I will do the moment I put this sheet down

.....

.....

What usually helps me

- ☐ Water and a real breath of air
- ☐ Writing the thing down instead of holding it
- ☐ Two minutes of a puzzle or a doodle
- ☐ Starting the smallest piece of the work
- ☐ Standing up and stretching my shoulders
- ☐ Putting my phone face down in my bag
- ☐ Asking one person one question
- ☐ Deciding to deal with it after school

My own line

Something that works for you that is not on that list.

.....

.....

Right now I feel (circle one)

1 2 3 4 5 6 7 8 9 10

1 = settled, 10 = about to boil over. Check the same number again in ten minutes. Down by one is the whole point.



Team Task, Day 1: The Mole Line-Up

Groups of four. Voice level 2. One sheet per group, one person writes, and no group rank goes down until all four agree.

Team • Day 1

The situation

A chemistry teacher lines up twelve samples on the front bench, from a gold bar to a balloon of helium. **Which sample holds the most particles?** Heavy is not the same as many: a particle of gold is far heavier than a particle of helium.

Your job: rank the samples from **1 (fewest particles)** to **12 (most particles)**. First each person ranks by gut, alone, in 3 minutes, with no math. Then the group works out the moles of every sample (grams divided by molar mass) and agrees on one group rank, each rank used once. The sub then reads the chemist's order and you score the difference.

Particles means atoms for an element such as gold or helium, molecules for H_2 , H_2O , CH_4 and CO_2 , and formula units for salt.

Group of three: one person writes and keeps time. Group of five: two people check every division.

Molar masses (g/mol): H 1.0 · He 4.0 · C 12.0 · O 16.0 · Na 23.0 · Al 27.0 · Cl 35.5 · Fe 55.8 · Au 197.0

SAMPLE	MASS	MY GUT RANK	MOLES	GROUP RANK	CHEMIST	DIFFERENCE
A gold bar	591.0 g					
Hydrogen gas, H_2 , in a small tank	10.0 g					
Table salt, NaCl, in a shaker	117.0 g					
A gold ring	19.7 g					
Water, H_2O , in half a glass	108.0 g					
Aluminum foil	67.5 g					
Helium, He, in a party balloon	2.0 g					
Methane gas, CH_4 , in a lab burner line	64.0 g					
A pellet of dry ice, CO_2	11.0 g					
An iron bolt	55.8 g					
Water, H_2O , in a tablespoon	13.5 g					
Charcoal (pure carbon), C	18.0 g					
Total difference (lower is better)						

Scoring: for each row, group rank minus the chemist's rank, minus sign dropped; add the twelve numbers. **8 or less** excellent, **9 to 16** good, **17 to 26** fair, **27 to 72** poor.

Defend one choice

Which sample moved most between your gut rank and the group rank? Explain why using its molar mass.

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Challenge

Count atoms, not particles: a molecule of CH_4 has 5 atoms. Which sample holds the most atoms in total? Show the moles of atoms for your top two.

.....



Game, Day 1: Whiteboard Quiz Game

Sub script and questions. 15 minutes at the end of the period, or for extra time. Optional.

Game • Day 1

Set up (2 minutes)

1. Draw a 5 by 5 grid on the board, or tape up the board sheet. Write the five category names across the top and the values 100 to 500 down each column.
2. Teams of four to six. Team 1 picks a category and a value.
3. Read the question. The team gets 15 seconds and one answer. Right: they take the points and pick again.
Wrong: the next team may steal, then play moves on.
4. Cross the square off. Highest total when time is up wins.

Read this out

"One voice per team: pick a captain who says the final answer. Shouted answers do not count and the square is dead. Team 1, choose a category and a value."

Keep the running score in a corner of the board. If a team argues a call, the script wins and the game moves on. The bold answer is the one to accept, but take a clear equivalent too (18 or 18 g/mol, H+ or hydrogen ion).

Atoms

100 Which particle in an atom has a negative charge?

The electron

200 What is the charge of a proton?

Positive

300 The atomic number counts which particle?

Protons

400 How many neutrons are in carbon-14?

8

500 What are atoms of one element with different neutrons?

Isotopes

Moles

100 About how many particles are in one mole?

6.02×10^{23}

200 H is 1 and O is 16. What is the molar mass of H₂O?

18 g/mol

300 CO₂ is 44 g/mol. How many moles are in 88 g of it?

2

400 Na is 23 and Cl is 35.5. What is the molar mass of NaCl?

58.5 g/mol

500 2H₂ + O₂ gives 2H₂O. How many mol of water from 4 mol H₂?

4

Elements

100 What is the chemical symbol for gold?

Au

200 What are the columns of the periodic table called?

Groups

300 Which element has atomic number 1?

Hydrogen

400 What name do the group 18 elements share?

Noble gases

500 How many valence electrons does oxygen have?

6

Acids

100 What pH is neutral?

7

200 Is a solution with pH 3 acidic or basic?

Acidic

300 Which ion do acids release in water?

H+ (hydrogen ion)

400 An acid plus a base makes a salt and what else?

Water

500 pH 2 has how many times the H+ of pH 4?

100

Bonds

100 What bond forms when electrons are shared?

Covalent

200 What bond holds Na+ and Cl- ions together?

Ionic

300 What is the name of CO₂?

Carbon dioxide

400 How many electrons are shared in a triple bond?

6

500 What is the formula of magnesium chloride?

MgCl₂

Final Wager: Gas Laws

Play this when the board is clear, or when two minutes are left. Announce the category, then every team writes a secret wager of up to the points it already has. Read the question. Teams get 60 seconds of silent writing, then hold their answers up together.

A gas takes up 6.0 L at 2.0 atm. At the same temperature the pressure rises to 3.0 atm. What is the new volume?

4.0 L

Right: add the wager. Wrong: subtract it. That is the final score.



Game, Day 1: The Board

Tape this to the whiteboard or copy it. Cross squares off as they are played.

Game • Day 1

ATOMS	ELEMENTS	BONDS	MOLES	ACIDS
100	100	100	100	100
200	200	200	200	200
300	300	300	300	300
400	400	400	400	400
500	500	500	500	500

Scores

Team 1

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Team 2

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Team 3

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Team 4

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Team 5

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Team 6

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Final Wager: Gas Laws

Write your wager before you hear the question. A team may bet any amount up to the points it already has. Right answer: add the wager. Wrong answer: subtract it.

Team 1

WAGER

ANSWER

Team 2

WAGER

ANSWER

Team 3

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Team 4

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Team 5

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Team 6

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Answer Keys (1 of 8)

Teacher copy. Keep these pages out of the student sets.

Chemistry Set 1: Atomic Structure and the Periodic Table

A. Atoms and ions: 1. ^{19}F fluorine, 9 p, 10 n, 9 e; 2. $^{24}\text{Mg}^{2+}$ magnesium, 12 p, 12 n, 10 e; 3. $^{16}\text{O}^{2-}$ oxygen, 8 p, 8 n, 10 e; 4. $^{32}\text{S}^{2-}$ sulfur, 16 p, 16 n, 18 e; 5. $^{23}\text{Na}^{+}$ sodium, 11 p, 12 n, 10 e; 6. $^{39}\text{K}^{+}$ potassium, 19 p, 20 n, 18 e; 7. ^{14}C carbon, 6 p, 8 n, 6 e; 8. $^{37}\text{Cl}^{-}$ chlorine, 17 p, 20 n, 18 e; 9. $^{40}\text{Ca}^{2+}$ calcium, 20 p, 20 n, 18 e; 10. ^{27}Al aluminum, 13 p, 14 n, 13 e.

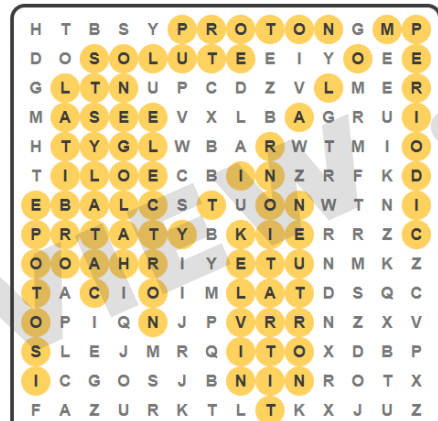
B. Isotopes: 11. $10(0.2) + 11(0.8) = 10.80$; 12. $24(0.79) + 25(0.1) + 26(0.11) = 24.32$, closest to magnesium (24.31); 13. $35(0.75) + 37(0.25) = 35.50$, close to the table's 35.45 (the table uses exact isotope masses and abundances). 14. Same: 6 protons and 6 electrons (same element, same chemistry); different: carbon-12 has 6 neutrons and carbon-14 has 8, so carbon-14 is heavier. 15. Potassium-39, because the average, 39.10, is much closer to 39 than to 41.

C. Read the table: 16. group 1, period 2, shells 2, 1, 1 valence, metal, Li^{+} ; 17. group 16, period 2, shells 2, 6, 6 valence, nonmetal, O^{2-} ; 18. group 13, period 3, shells 2, 8, 3, 3 valence, metal, Al^{3+} ; 19. group 15, period 3, shells 2, 8, 5, 5 valence, nonmetal, P^{3-} ; 20. group 17, period 3, shells 2, 8, 7, 7 valence, nonmetal, Cl^{-} ; 21. group 2, period 4, shells 2, 8, 8, 2, 2 valence, metal, Ca^{2+} .

D. Trends: 22. Na; 23. K; 24. Mg; 25. Cl; 26. F; 27. N. (Across a period atoms shrink and ionization energy and electronegativity rise; down a group the opposite.)

Challenge: a. $63x + 65(1 \text{ minus } x) = 63.6$, so $2x = 65 \text{ minus } 63.6 = 1.4$ and $x = 0.7$: **70 percent** have mass 63 (and 30 percent mass 65). b. Ca^{2+} (20 protons), K^{+} (19 protons), Cl^{-} (17 protons), S^{2-} (16 protons), P^{3-} (15 protons); the largest is P^{3-} , because all five have 18 electrons but it has the fewest protons pulling on them. c. Potassium is one period lower than sodium, so it has an extra shell of electrons; chlorine is in the same period as sodium but has 6 more protons pulling the same shells in closer.

Calm block, Day 1: word search solution (chemistry words)



All 12 words are marked. Words run in all eight directions, so a student who only searched across and down will be missing several.

Reset sheet: private, answers vary, nothing to grade. If a student hands it in anyway, thank them and leave it for the teacher.



Chemistry Set 1: Particles and Isotopes

Use the periodic table on page 3 for atomic numbers. Fill every blank box in the table, then do the isotope problems.

Chemistry • Day 1

A. Atoms and ions

Some rows give the symbol: find the protons, neutrons and electrons. Other rows give the particles: write the symbol with its mass number and charge, like $^{23}\text{Na}^+$.

ROW	SYMBOL	ELEMENT NAME	PROTONS	NEUTRONS	ELECTRONS
1	^{19}F				
2	$^{24}\text{Mg}^{2+}$				
3			8	8	10
4	$^{32}\text{S}^{2-}$				
5			11	12	10
6	$^{39}\text{K}^+$				
7	^{14}C				
8			17	20	18
9	$^{40}\text{Ca}^{2+}$				
10			13	14	13

B. Isotopes and average atomic mass

Use each isotope's mass number as its mass. Show the multiplication for every isotope.

11. A sample of boron is 20 percent mass 10 and 80 percent mass 11. Find the average atomic mass to two decimal places.

12. A sample of a mystery element is 79 percent mass 24, 10 percent mass 25 and 11 percent mass 26. Find the average atomic mass to two decimal places. Which element on the table has the closest average atomic mass?

13. A sample of chlorine is 75 percent mass 35 and 25 percent mass 37. Find the average atomic mass to two decimal places. Compare it with the table value, 35.45.

14. Carbon-12 and carbon-14 are isotopes. Name two things that are the same in their atoms and one thing that is different.

15. The table gives potassium 39.10. Its two main isotopes are potassium-39 and potassium-41. Without any math, which is more common? How can you tell?

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Thank you! If this works for your class, a quick review helps other teachers find it, and earns you TpT credits.

