4 High School Science Sub Plans Bundle: Biology, Chemistry, Physics, No Prep

BUNDLE PREVIEW Everything in this bundle, on one page. Sample pages of each product follow.

WHAT'S INCLUDED: 4 PRODUCTS

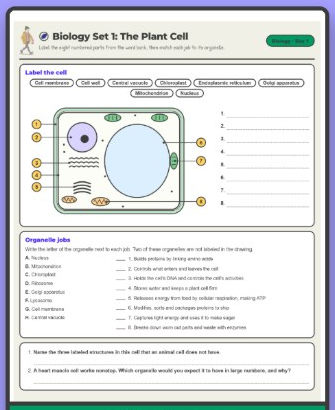


4 HIGH SCHOOL SCIENCE SUB PLANS

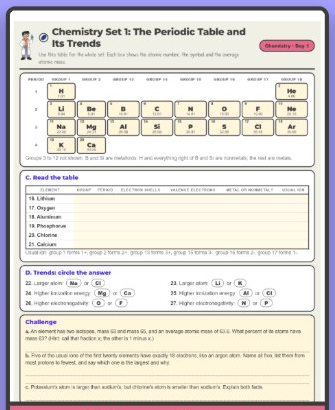


WEEK-LONG • GRADES 9 TO 12 • BUNDLE

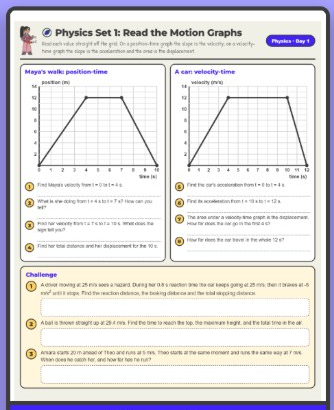
Classroom Review Games



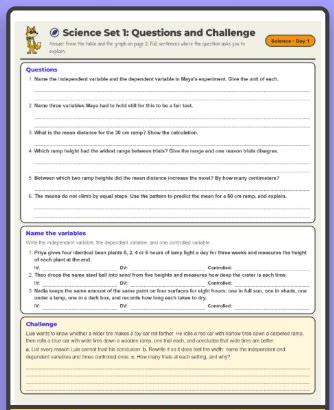
Biology
64 pages • week plan pre-filled



Chemistry
64 pages • week plan pre-filled



Physics
62 pages • week plan pre-filled

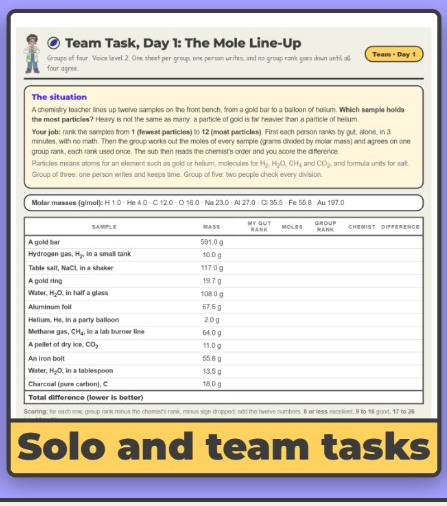


High School Science
68 pages • week plan pre-filled

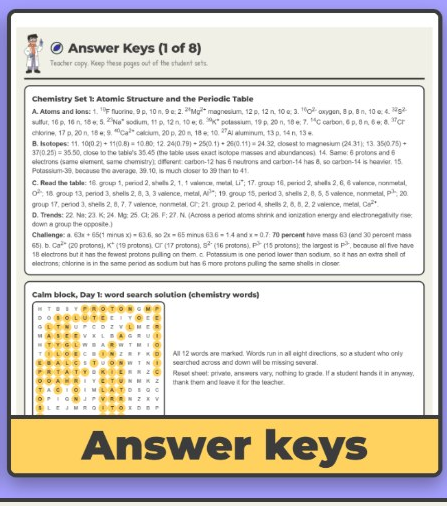
Inside every kit



Week plan



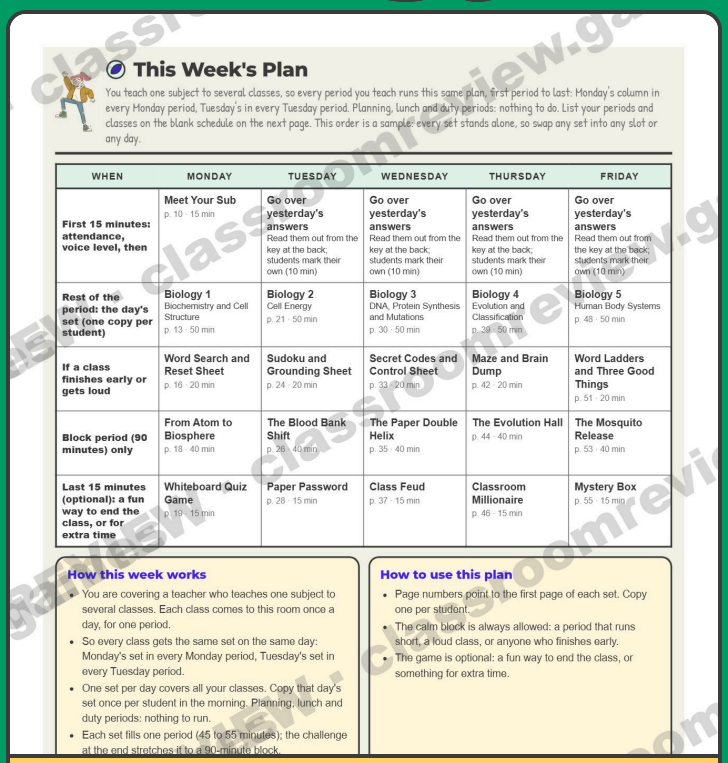
Solo and team tasks



Answer keys

KIT 1 OF 4 64 pages · week plan pre-filled · grades 9 to 12

Biology



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)	**Biology 1** Biochemistry and Cell Structure p. 13 · 50 min	**Biology 2** Cell Energy p. 21 · 50 min	**Biology 3** DNA, Protein Synthesis and Mutations p. 30 · 50 min	**Biology 4** Evolution and Classification p. 39 · 50 min	**Biology 5** Human Body Systems 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	**From Atom to Biosphere** p. 18 · 40 min	**The Blood Bank Shift** p. 26 · 40 min	**The Paper Double Helix** p. 35 · 40 min	**The Evolution Hall** p. 44 · 40 min	**The Mosquito Release** 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

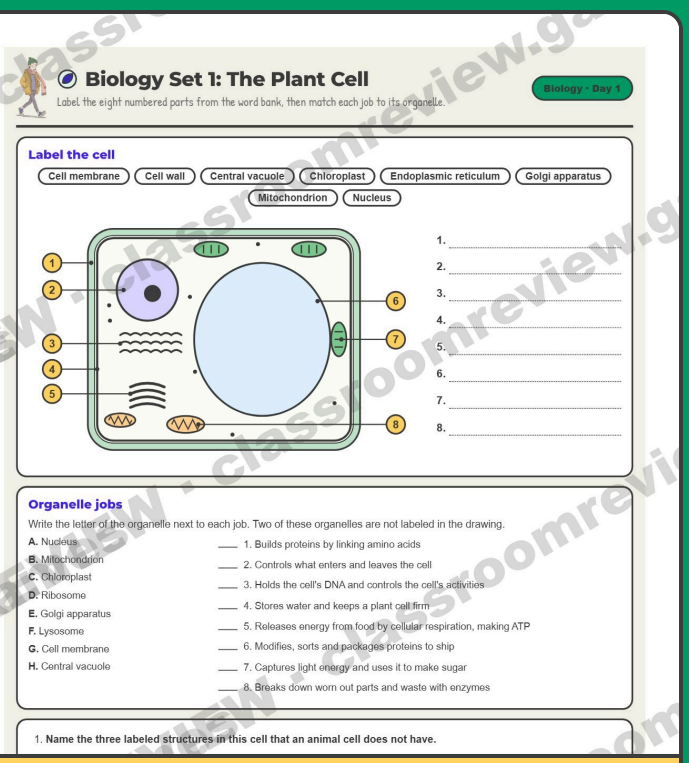
How this week works

- 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.

Week plan, pre-filled



Biology Set 1: The Plant Cell

Biology · Day 1

Label the eight numbered parts from the word bank, then match each job to its organelle.

Label the cell

Cell membrane · Cell wall · Central vacuole · Chloroplast · Endoplasmic reticulum · Golgi apparatus · Mitochondrion · Nucleus

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

Organelle jobs

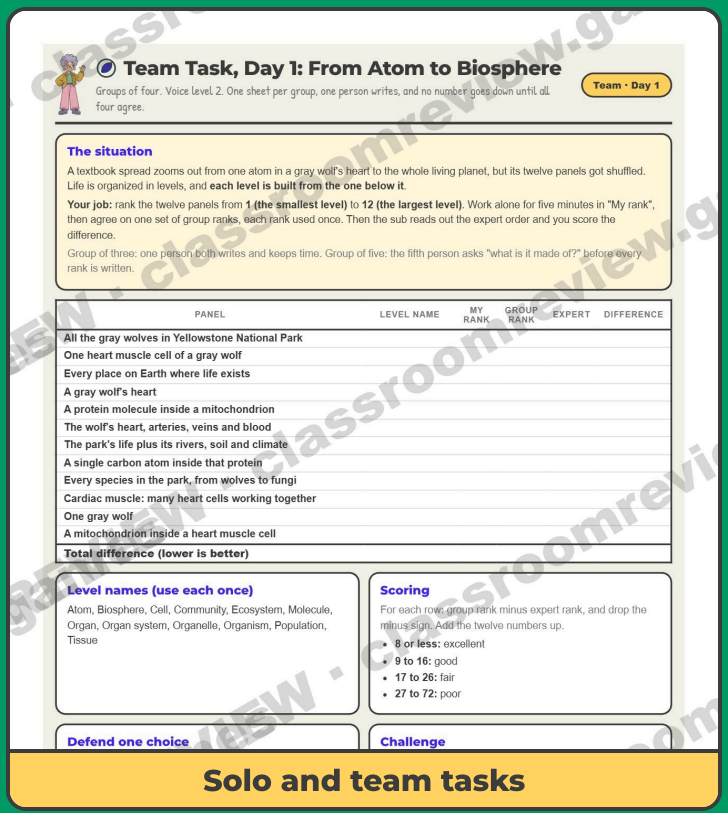
Write the letter of the organelle next to each job. Two of these organelles are not labeled in the drawing.

A. Nucleus
B. Mitochondrion
C. Chloroplast
D. Ribosome
E. Golgi apparatus
F. Lysosome
G. Cell membrane
H. Central vacuole

____ 1. Builds proteins by linking amino acids
____ 2. Controls what enters and leaves the cell
____ 3. Holds the cell's DNA and controls the cell's activities
____ 4. Stores water and keeps a plant cell firm
____ 5. Releases energy from food by cellular respiration, making ATP
____ 6. Modifies, sorts and packages proteins to ship
____ 7. Captures light energy and uses it to make sugar
____ 8. Breaks down worn out parts and waste with enzymes

1. **Name the three labeled structures in this cell that an animal cell does not have.**

A daily set



Team Task, Day 1: From Atom to Biosphere

Team · Day 1

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

The situation

A textbook spread zooms out from one atom in a gray wolf's heart to the whole living planet, but its twelve panels got shuffled. Life is organized in levels, and **each level is built from the one below it**.

Your job: rank the twelve panels from **1 (the smallest level)** to **12 (the largest level)**. Work alone for five minutes in "My rank", then agree on one set of group ranks, each rank used once. Then the sub reads out the expert order and you score the difference.

Group of three: one person both writes and keeps time. Group of five: the fifth person asks "what is it made of?" before every rank is written.

PANEL	LEVEL NAME	MY RANK	GROUP RANK	EXPERT	DIFFERENCE
All the gray wolves in Yellowstone National Park					
One heart muscle cell of a gray wolf					
Every place on Earth where life exists					
A gray wolf's heart					
A protein molecule inside a mitochondrion					
The wolf's heart, arteries, veins and blood					
The park's life plus its rivers, soil and climate					
A single carbon atom inside that protein					
Every species in the park, from wolves to fungi					
Cardiac muscle: many heart cells working together					
One gray wolf					
A mitochondrion inside a heart muscle cell					
Total difference (lower is better)					

Level names (use each once)

Atom, Biosphere, Cell, Community, Ecosystem, Molecule, Organ, Organ system, Organelle, Organism, Population, Tissue

Scoring

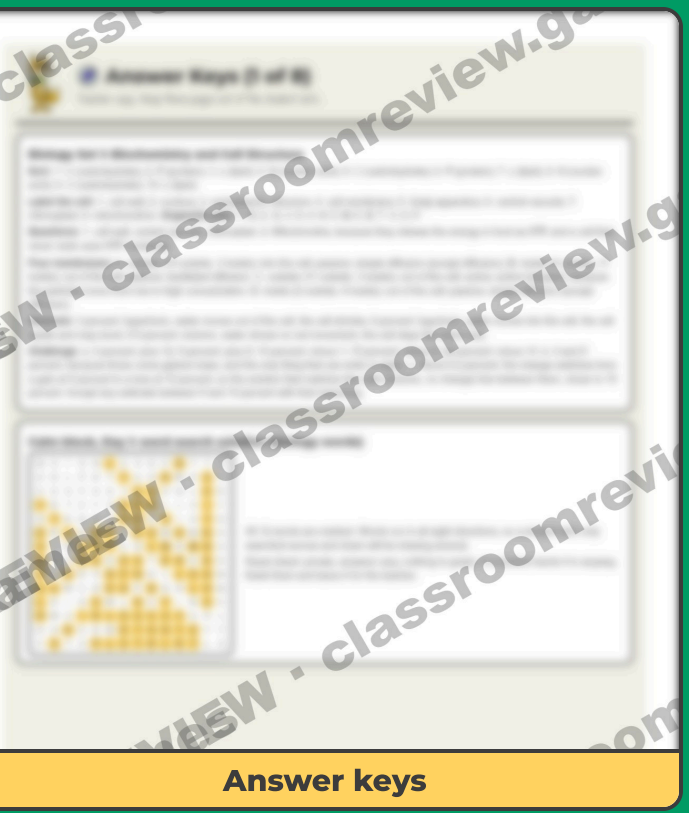
For each row: group rank minus expert rank, and drop the minus sign. Add the twelve numbers up.

- **8 or less:** excellent
- **9 to 16:** good
- **17 to 26:** fair
- **27 to 72:** poor

Defend one choice

Challenge

Solo and team tasks



Answer keys

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Biology 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)
- Biology sets for five days (15 pages)
- Calm puzzles and reset sheets (10 pages)
- Biology team tasks (9 pages)
- Biology 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 biology 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 biology 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 biology 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.





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YOUR WEEK AT A GLANCE (1 OF 2)

Every biology 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
Biology set 1	**Biochemistry and Cell Structure** Reviews: the four macromolecules, prokaryotic and eukaryotic cells, labeling a plant cell, organelle jobs, diffusion and active transport, osmosis.	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	**From Atom to Biosphere** Groups of four rank twelve things from one atom to the biosphere by level of organization, score the gap against the expert order and defend a choice.	p. 18 · 40 min
Game (optional)	**Whiteboard Quiz Game** Optional fun to end the class.	p. 19 · 15 min

TUESDAY (DAY 2)

Biology set 2	**Cell Energy** Reviews: ATP and ADP, the photosynthesis and respiration equations, comparing the two processes, fermentation, a light and oxygen bubble experiment.	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 Blood Bank Shift** Groups of four use ABO and Rh compatibility to plan which surgeries a hospital blood bank can supply, for the most priority points.	p. 26 · 40 min
Game (optional)	**Paper Password** Optional fun to end the class.	p. 28 · 15 min

WEDNESDAY (DAY 3)

Biology set 3	**DNA, Protein Synthesis and Mutations** Reviews: DNA base pairing, transcription and translation with a codon table, silent, missense, nonsense and frameshift mutations, sickle cell.	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 Double Helix** Groups of four build a sixteen base pair DNA model from paper, pass a zip test, then unzip and copy it to show how DNA replicates.	p. 35 · 40 min
Game (optional)	**Class Feud** Optional fun to end the class.	p. 37 · 15 min

THURSDAY (DAY 4)

Biology set 4	**Evolution and Classification** Reviews: the four conditions of natural selection, evidence for evolution, the eight taxonomy levels, scientific names, cladograms, a dichotomous key.	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	**The Evolution Hall** Four museum curators, each holding facts nobody else has, decide which evolution exhibits fill twelve wall panels and which teach a myth.	p. 44 · 40 min
Game (optional)	**Classroom Millionaire** Optional fun to end the class.	p. 46 · 15 min

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Biology Set 1: Biochemistry and Cell Structure

Biology · Day 1

Read the three paragraphs and the table, then sort the ten molecules. Pencil and paper only.

This set reviews: the four macromolecules, prokaryotic and eukaryotic cells, labeling a plant cell, organelle jobs, diffusion and active transport, osmosis

Every living thing is built mostly from four kinds of large molecules, the macromolecules. Carbohydrates, proteins and nucleic acids are polymers: long chains made by linking many small units called monomers, the way a train is made of cars. Carbohydrates are chains of simple sugars such as glucose; they supply quick energy, and cellulose builds the walls of plant cells. Proteins are chains of amino acids. They build muscle and hair, carry oxygen in the blood, and work as enzymes, which speed up chemical reactions without being used up. Nucleic acids, DNA and RNA, are chains of nucleotides that store and carry genetic information. Lipids, the fats, oils, waxes and steroids, are not one repeating chain, but they share one feature: they do not mix with water. They store energy for the long term and form the membrane around every cell.

Cells come in two basic designs. Prokaryotic cells, such as bacteria, have no nucleus; their DNA sits in the cytoplasm. Eukaryotic cells, the cells of plants, animals and fungi, keep their DNA inside a nucleus and divide their work among organelles, small structures that each do one job. Ribosomes build proteins, the Golgi apparatus packages them, mitochondria release energy from food, and in plants, chloroplasts capture energy from light. Plant cells also have a rigid cell wall outside the membrane and a large central vacuole that stores water.

The cell membrane is a double layer of phospholipids with proteins set into it. It is selectively permeable: some substances cross it easily, others need help, and some cannot cross at all. In diffusion, particles spread from where they are more concentrated to where they are less concentrated, and the cell spends no energy, so diffusion is passive transport. Osmosis is the diffusion of water across a membrane. Facilitated diffusion is still passive, but the particles pass through a protein channel. When a cell must move particles the other way, from low concentration to high, it uses active transport, which costs energy in the form of ATP.

The four macromolecules

MACROMOLECULE	BUILDING BLOCK	MAIN JOBS	EXAMPLES
Carbohydrates	simple sugars	quick energy; plant cell walls	glucose, starch, cellulose
Lipids	fatty acids and glycerol	long term energy storage; cell membranes	fats, oils, phospholipids
Proteins	amino acids	enzymes, muscle, carrying oxygen	hemoglobin, keratin
Nucleic acids	nucleotides	store and carry genetic information	DNA, RNA

Sort the molecules

Write C for carbohydrate, L for lipid, P for protein or N for nucleic acid in each box.

- ☐ **1.** sucrose, the sugar in a sugar bowl
- ☐ **2.** collagen, the tough fiber in skin and tendons
- ☐ **3.** cholesterol, a steroid
- ☐ **4.** a gene on a chromosome
- ☐ **5.** glycogen, the energy store in liver cells
- ☐ **6.** amylase, the enzyme in saliva
- ☐ **7.** the wax coating a leaf
- ☐ **8.** messenger RNA
- ☐ **9.** cellulose in a stalk of celery
- ☐ **10.** olive oil

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Calm Block, Day 1: Word Search

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

Calm · Day 1

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

ADAPTATION · LYSOSOME · GENETICS · HEREDITY · PLATELET · VACUOLE · GLUCOSE · HORMONE · SPECIES · ALLELE · KIDNEY · ZYGOTE

Faster than reading every square

- Hunt the rare letters first. Only one word in the list has a Z in it, so every Z 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.

EVIEW · classroomr



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 (kidneys for the kidney, CO2 for carbon dioxide).

Cells

100 What is the basic unit of life?
The cell

200 Which organelle holds most of a eukaryotic cell's DNA?
The nucleus

300 What rigid layer surrounds a plant cell's membrane?
The cell wall

400 What is the movement of water across a membrane called?
Osmosis

500 What type of cell, like a bacterium, has no nucleus?
Prokaryotic

Evolution

100 Whose 1859 book proposed evolution by natural selection?
Charles Darwin

200 What is an inherited trait that helps an organism survive?
An adaptation

300 What are the preserved remains of ancient life called?
Fossils

400 What is the most specific level of classification?
Species

500 What is the two-part naming system for species called?
Binomial nomenclature

Energy

100 What green pigment absorbs light in plants?
Chlorophyll

200 Which gas do cells release during cellular respiration?
Carbon dioxide

300 What sugar do plants make in photosynthesis?
Glucose

400 Which type of fermentation runs in muscles short of oxygen?
Lactic acid fermentation

500 What first stage of cellular respiration splits glucose?
Glycolysis

Body Systems

100 Which system moves blood through the heart and vessels?
Circulatory

200 Which organ filters waste from the blood to make urine?
The kidney

300 Which system fights infection with white blood cells?
The immune system

400 What is keeping a stable internal balance called?
Homeostasis

500 Which hormone lowers the level of sugar in the blood?
Insulin

DNA

100 What is the shape of a DNA molecule called?
A double helix

200 Which base replaces thymine in RNA?
Uracil

300 What process copies a gene from DNA into messenger RNA?
Transcription

400 What process builds a protein from mRNA at a ribosome?
Translation

500 How many mRNA bases code for a chain of 20 amino acids, stop codon aside?
60

Final Wager: Meiosis

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 human body cell has 46 chromosomes. How many are in a human egg cell?
23

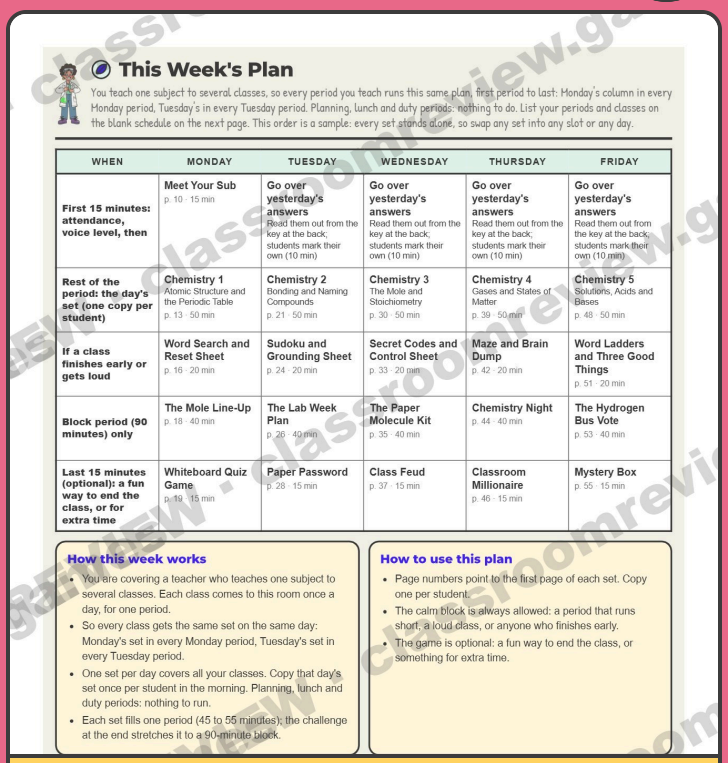
Right: add the wager. Wrong: subtract it. That is the final score.

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KIT 2 OF 4 64 pages · week plan pre-filled · grades 9 to 12

Chemistry



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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

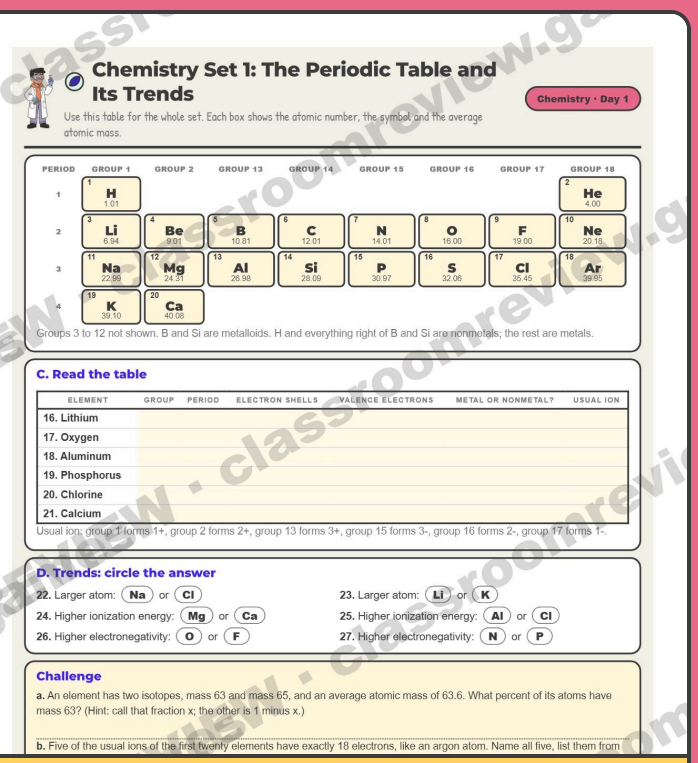
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How to use this plan

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- The game is optional: a fun way to end the class, or something for extra time.

Week plan, pre-filled



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

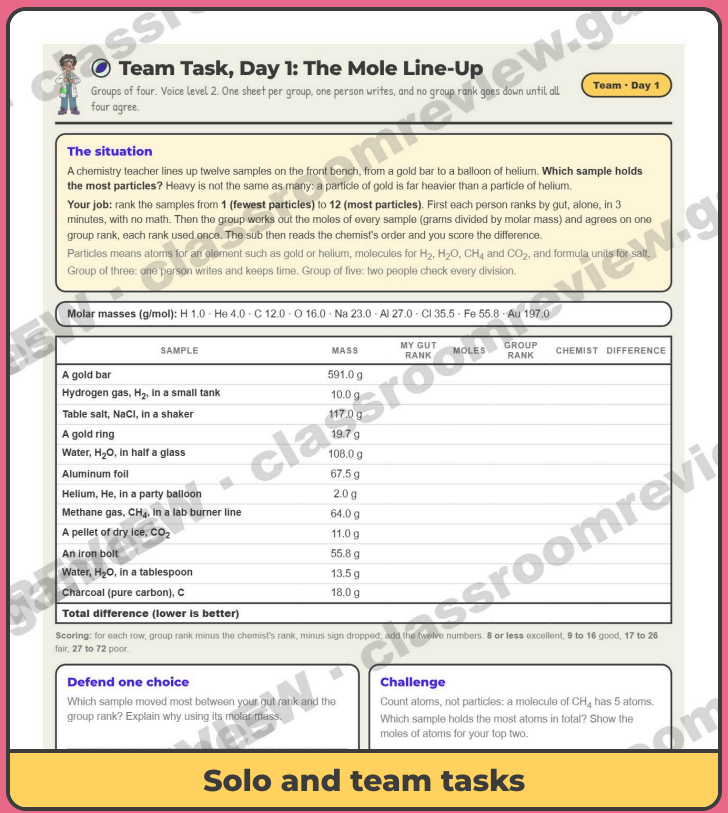
22. Larger atom: (Na) or (Cl)
23. Larger atom: (Li) or (K)
24. Higher ionization energy: (Mg) or (Ca)
25. Higher ionization energy: (Al) or (Cl)
26. Higher electronegativity: (O) or (F)
27. Higher electronegativity: (N) or (P)

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

A daily set



Team Task, Day 1: The Mole Line-Up

Team · Day 1

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

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.

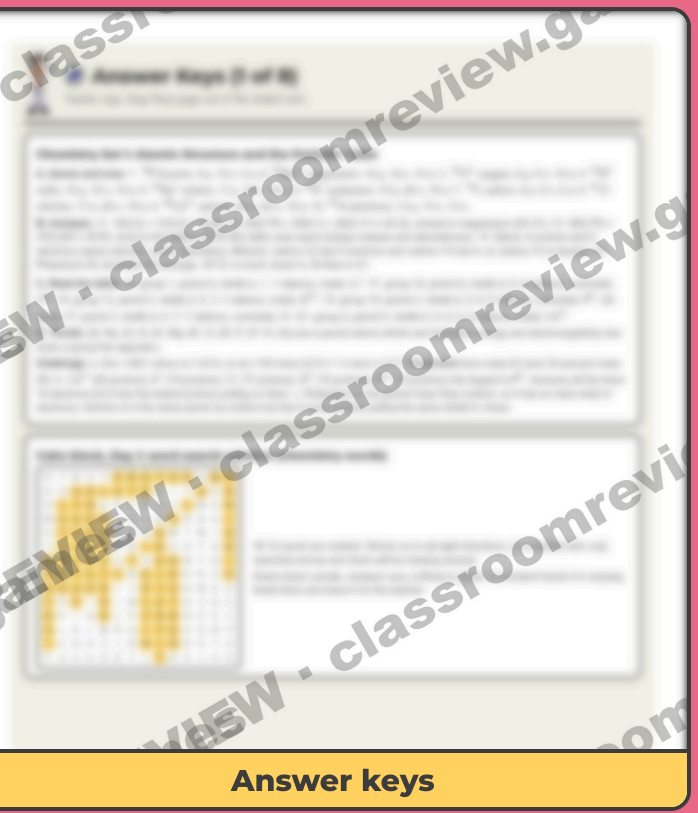
Defend one choice

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

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.

Solo and team tasks



Answer keys

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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.





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YOUR WEEK AT A GLANCE (1 OF 2)

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

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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: $^{23}Na^{+}$.
- **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 $^{35}Cl^{-}$

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 $^{27}Al^{3+}$

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

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Chemistry Set 1: Atomic Structure and the Periodic Table



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.

EVIEW · classroomr



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 x 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.

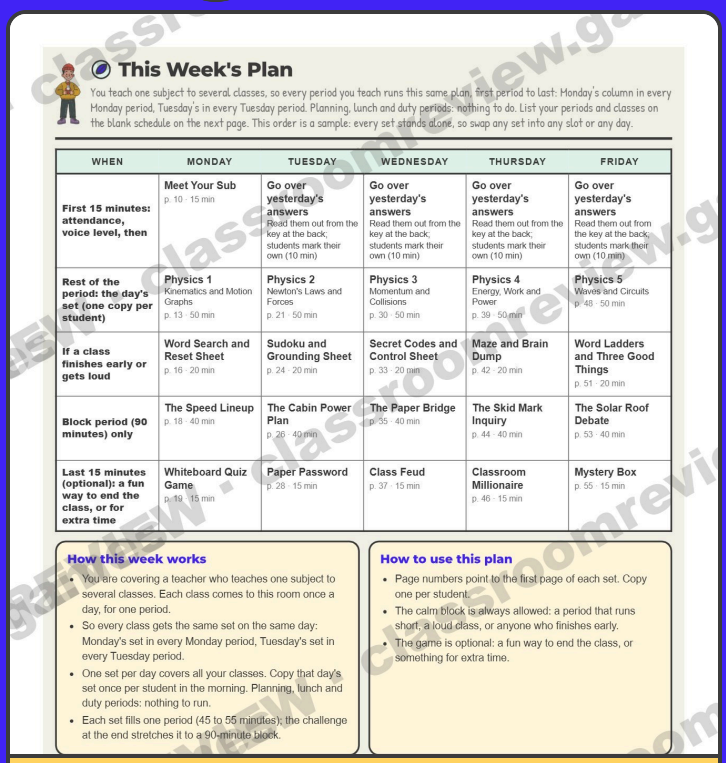
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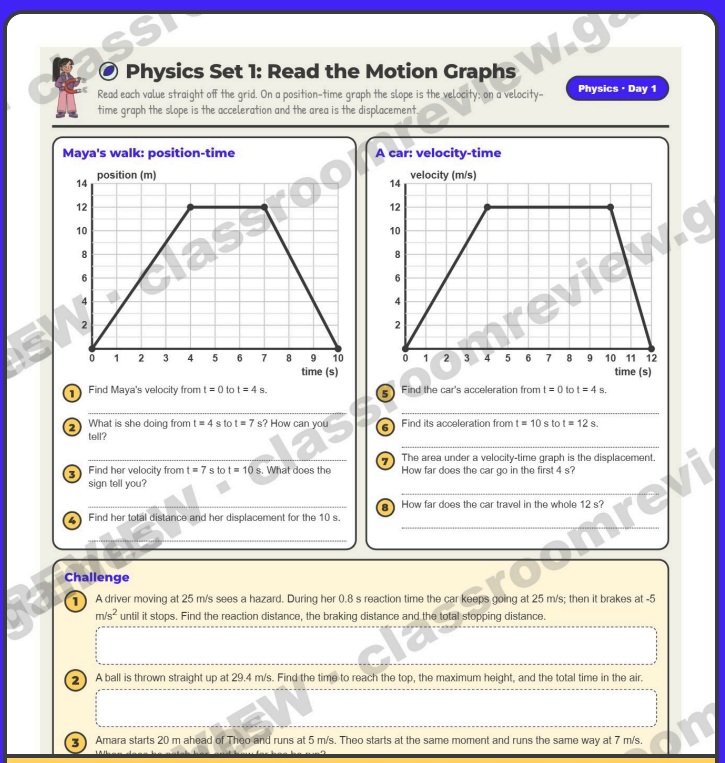
KIT 3 OF 4

62 pages · week plan pre-filled · grades 9 to 12

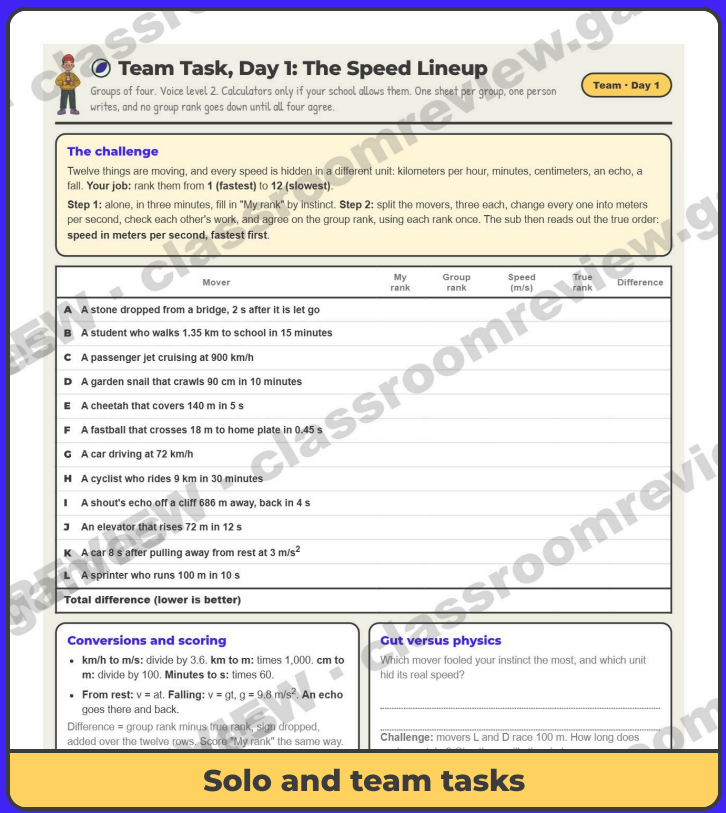
Physics



Week plan, pre-filled



A daily set



Solo and team tasks



Answer keys

classroomreview.games · NEW

Physics 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)
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- Calm puzzles and reset sheets (10 pages)
- Physics team tasks (9 pages)
- Physics games (10 pages)
- Answer keys (6 pages)

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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 physics 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 62 pages.





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YOUR WEEK AT A GLANCE (1 OF 2)

Every physics 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
Physics set 1	**Kinematics and Motion Graphs** Reviews: distance and displacement, speed, velocity and acceleration, the kinematic equations, free fall, reading position time and velocity time graphs.	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 Speed Lineup** Groups of four rank twelve movers from a snail to the speed of sound by gut, then by converting each to meters per second, and score the gap.	p. 18 · 40 min
Game (optional)	**Whiteboard Quiz Game** Optional fun to end the class.	p. 19 · 15 min

TUESDAY (DAY 2)

Physics set 2	**Newton's Laws and Forces** Reviews: Newton's three laws, net force, F = ma, weight with g = 9.8 N/kg, sliding friction, reading free-body diagrams.	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 Cabin Power Plan** Groups of four work out current and energy for nine appliances and build the comfiest plan a solar battery and a 20 A breaker allow.	p. 26 · 40 min
Game (optional)	**Paper Password** Optional fun to end the class.	p. 28 · 15 min

WEDNESDAY (DAY 3)

Physics set 3	**Momentum and Collisions** Reviews: momentum p = mv, impulse and change in momentum, conservation of momentum in collisions and push-offs, elastic and inelastic collisions.	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 Bridge** Groups of four fold a bridge from one or two sheets of paper that spans the gap between two books, then load it with pencils and explain why it holds.	p. 35 · 40 min
Game (optional)	**Class Feud** Optional fun to end the class.	p. 37 · 15 min

THURSDAY (DAY 4)

Physics set 4	**Energy, Work and Power** Reviews: work, kinetic and gravitational potential energy, conservation of energy on a roller coaster, power and efficiency.	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	**The Skid Mark Inquiry** Four members of a traffic review, each holding facts nobody else has, work out a skidding car's speed from its marks and test a witness's story.	p. 44 · 40 min
Game (optional)	**Classroom Millionaire** Optional fun to end the class.	p. 46 · 15 min

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Physics Set 1: Kinematics and Motion Graphs

Physics · Day 1

Read the four worked examples and the Remember box, then do the quick check. Use g = 9.8 m/s². A calculator is fine if your school allows one; every number also works by hand.

This set reviews: distance and displacement, speed, velocity and acceleration, the kinematic equations, free fall, reading position time and velocity time graphs

1 Distance or displacement?

A runner goes 60 m east, then turns and goes 25 m west. Distance counts every meter traveled: 60 + 25. Displacement is the change in position, with a direction: 60 east minus 25 west.

distance 85 m; displacement 35 m east

2 Acceleration

A car speeds up from 4 m/s to 22 m/s in 6 s. Acceleration is the change in velocity divided by the time: (22 - 4) ÷ 6.

a = 3 m/s^2

3 Distance while speeding up

A cart starts from rest ($v_0 = 0$) and accelerates at 2.5 m/s^2 for 8 s. Use $\Delta x = v_0t + \frac{1}{2}at^2 = 0 + \frac{1}{2} \times 2.5 \times 8^2$.

Δx = 80 m

4 No time given

A car moving at 20 m/s brakes at -5 m/s^2 until it stops (v = 0). Use $v^2 = v_0^2 + 2a\Delta x$: $0 = 20^2 + 2(-5)\Delta x$, so $\Delta x = 400 \div 10$.

Δx = 40 m

Remember

- **Distance** is the total length of the path (never negative). **Displacement** is the straight-line change in position from start to finish, and it has a direction.
- **Speed** = distance ÷ time. **Velocity** = displacement ÷ time, with a direction. Pick one direction (east, right or up) as positive; the opposite direction is negative.
- **Acceleration** = change in velocity ÷ time, in m/s^2. A negative acceleration on something moving in the positive direction means it is slowing down.
- **Constant acceleration:** $v = v_0 + at$ | $\Delta x = v_0t + \frac{1}{2}at^2$ | $v^2 = v_0^2 + 2a\Delta x$ | $\Delta x = \frac{1}{2}(v_0 + v)t$. List what you know and what you want, then choose the equation that leaves out the one quantity you do not have.
- **Free fall:** ignoring air, everything near Earth's surface accelerates downward at g = 9.8 m/s^2. "Dropped" means $v_0 = 0$. A ball thrown up has v = 0 at the very top.

Quick check

1. Theo walks 40 m north, then 40 m south. Give his distance and his displacement. _____

2. A bus travels 150 m in 30 s. Find its average speed. _____

3. A scooter speeds up from 6 m/s to 18 m/s in 4 s. Find its acceleration. _____

4. A stone is dropped from rest. How fast is it falling after 3 s? _____

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Physics Set 1: Kinematics and Motion Graphs



Calm Block, Day 1: Word Search

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

Calm · Day 1

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

VELOCITY · MOMENTUM · FRICTION · INERTIA · KINETIC · VOLTAGE · CIRCUIT · IMPULSE · NEWTON · VECTOR · JOULE · WATT

Faster than reading every square

- Hunt the rare letters first. Only one word in the list has a J in it, so every J 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.

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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 (20 newtons for 20 N, amps for amperes).

Motion

100 What is speed in a given direction called?
Velocity

200 What is the rate of change of velocity called?
Acceleration

300 What is the SI unit of acceleration?
Meters per second squared

400 A car covers 300 m in 20 s. What is its average speed?
15 m/s

500 A dropped stone falls for 2 s with g = 9.8 m/s squared. How fast is it going?
19.6 m/s

Waves

100 What is the highest point of a transverse wave called?
A crest

200 What unit is used to measure frequency?
The hertz

300 Is sound in air a transverse or a longitudinal wave?
Longitudinal

400 Which travels faster through air, light or sound?
Light

500 A wave has a frequency of 10 Hz and a wavelength of 2 m. What is its speed?
20 m/s

Forces

100 Which force pulls objects toward the center of Earth?
Gravity

200 What force opposes two surfaces sliding past each other?
Friction

300 Which of Newton's laws is called the law of inertia?
The first law

400 What net force gives a 5 kg cart an acceleration of 4 m/s squared?
20 N

500 What is the weight of a 10 kg mass, with g = 9.8 N/kg?
98 N

Electricity

100 What is the flow of electric charge called?
Current

200 What unit is used to measure resistance?
The ohm

300 Which law says voltage equals current times resistance?
Ohm's law

400 What is the total resistance of 4 ohms and 6 ohms in series?
10 ohms

500 A 12 V battery is connected to a 3 ohm resistor. How many amps flow?
4 amps

Energy

100 What is the energy of motion called?
Kinetic energy

200 What is the SI unit of work and energy?
The joule

300 What is the rate of doing work called?
Power

400 How much work is done pushing a box 4 m with a 50 N force?
200 J

500 What is the kinetic energy of a 2 kg ball moving at 3 m/s?
9 J

Final Wager: Momentum

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 2 kg cart moving at 3 m/s hits a 1 kg cart at rest, and they stick together. How fast do they move?
2 m/s

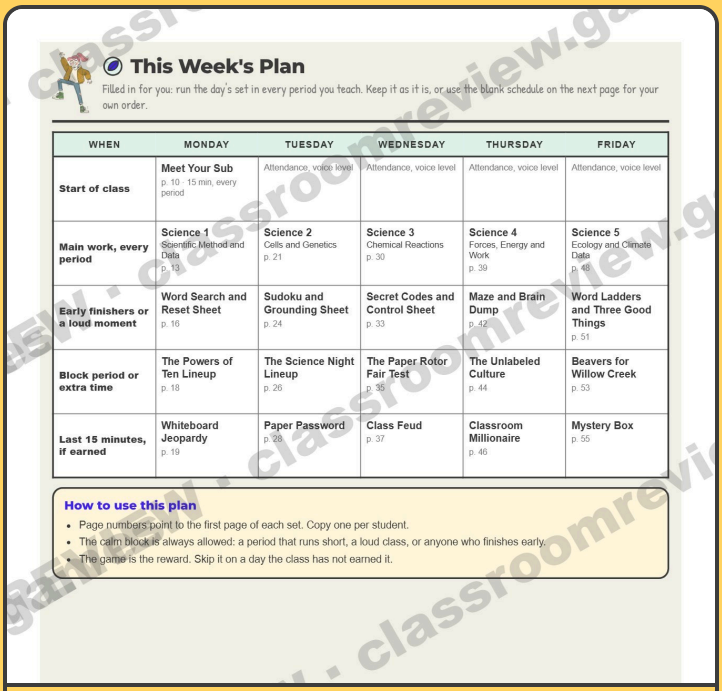
Right: add the wager. Wrong: subtract it. That is the final score.

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KIT 4 OF 4 · 68 pages · week plan pre-filled · grades 9 to 12

High School Science (general)



This Week's Plan

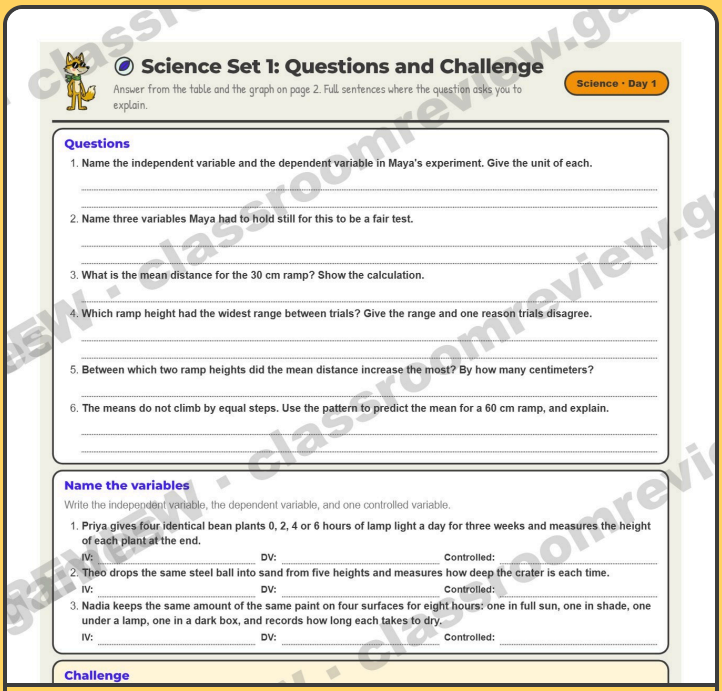
Filled in for you: run the day's set in every period you teach. Keep it as it is, or use the blank schedule on the next page for your own order.

WHEN	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Start of class	Meet Your Sub p. 10 · 15 min, every period	Attendance, voice level	Attendance, voice level	Attendance, voice level	Attendance, voice level
Main work, every period	Science 1 Scientific Method and Data p. 13	Science 2 Cells and Genetics p. 21	Science 3 Chemical Reactions p. 30	Science 4 Forces, Energy and Work p. 39	Science 5 Ecology and Climate Data p. 48
Early finishers or a loud moment	Word Search and Reset Sheet p. 16	Sudoku and Grounding Sheet p. 24	Secret Codes and Control Sheet p. 33	Maze and Brain Dump p. 42	Word Ladders and Three Good Things p. 51
Block period or extra time	The Powers of Ten Lineup p. 18	The Science Night Lineup p. 26	The Paper Rotor Fair Test p. 35	The Unlabeled Culture p. 44	Beavers for Willow Creek p. 53
Last 15 minutes, if earned	Whiteboard Jeopardy p. 19	Paper Password p. 28	Class Feud p. 37	Classroom Millionaire p. 46	Mystery Box p. 55

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 the reward. Skip it on a day the class has not earned it.

Week plan, pre-filled



Science Set 1: Questions and Challenge

Science · Day 1

Answer from the table and the graph on page 2. Full sentences where the question asks you to explain.

Questions

1. Name the independent variable and the dependent variable in Maya's experiment. Give the unit of each.
2. Name three variables Maya had to hold still for this to be a fair test.
3. What is the mean distance for the 30 cm ramp? Show the calculation.
4. Which ramp height had the widest range between trials? Give the range and one reason trials disagree.
5. Between which two ramp heights did the mean distance increase the most? By how many centimeters?
6. The means do not climb by equal steps. Use the pattern to predict the mean for a 60 cm ramp, and explain.

Name the variables

Write the independent variable, the dependent variable, and one controlled variable.

1. Priya gives four identical bean plants 0, 2, 4 or 6 hours of lamp light a day for three weeks and measures the height of each plant at the end.
   IV: _____ DV: _____ Controlled: _____
2. Theo drops the same steel ball into sand from five heights and measures how deep the crater is each time.
   IV: _____ DV: _____ Controlled: _____
3. Nadia keeps the same amount of the same paint on four surfaces for eight hours: one in full sun, one in shade, one under a lamp, one in a dark box, and records how long each takes to dry.
   IV: _____ DV: _____ Controlled: _____

Challenge

A daily set



Team Task, Day 1: The Powers of Ten Lineup

Team · Day 1

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

The situation

A science museum hallway called **The Powers of Ten** shows twelve displays, smallest on the left to largest on the right, but the installer mixed up the labels. Nobody may look anything up.

Your job: rank the twelve things from **1 (smallest)** to **12 (largest)**, using the size named on each row. Work alone for five minutes in "My rank", then agree on one set of group ranks, each rank used once. Then the sub reads out the science department's order and you score the difference.

Group of three: one person both writes and keeps time. Group of five: the fifth person asks "how do you know?" before every rank is written.

WHAT IS ON DISPLAY	MY RANK	GROUP RANK	EXPERT	DIFFERENCE
The Sun, measured across its diameter				
An adult blue whale, nose to tail				
A single flu virus particle, measured across				
One human hair, measured across its width				
The Milky Way galaxy, measured across				
A hydrogen atom, measured across				
A honeybee worker, head to tail				
Earth, measured across its diameter				
A human red blood cell, measured across				
Mount Everest, height above sea level				
An E. coli bacterium, end to end				
The distance from Earth to the Sun				
Total difference (lower is better)				

Units you may need

- **1 kilometer (km)** = 1,000 meters
- **1 centimeter (cm)** = one hundredth of a meter
- **1 micrometer (µm)** = one millionth of a meter
- **1 nanometer (nm)** = one billionth of a meter

Scoring

For each row, group rank minus expert rank, and drop the minus sign. Add the twelve numbers up.

- **10 or less:** excellent
- **11 to 20:** good

Solo and team tasks



Answer keys

classroomreview.games · PREVIEW

Science 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)
- Science sets for five days (15 pages)
- Calm puzzles and reset sheets (10 pages)
- Science team tasks (9 pages)
- Science games (10 pages)
- Answer keys (12 pages)

How it works

1. Open the week plan. Every set already has its day and page number.
2. Each day: one science set per period (a lesson with worked examples, practice and a challenge), a calm puzzle, a team task and a game for the last 15 minutes.
3. The sub needs no subject knowledge. Every answer is in the key.
4. Print in color or ink-saver black and white, US Letter or A4.

What this preview shows: the filled-in week plan, the note to the substitute, the Monday opener, and all of Day 1 (the science 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 68 pages.







Science Set 1: Scientific Method and Data

Read the four paragraphs, then work through the example and answer the two questions under it. Pencil and paper only.

Science · Day 1

An experiment is a question asked carefully enough that the answer cannot be argued with. It begins with a hypothesis: a testable prediction, usually written as an if and then statement. "If the ramp is steeper, then the car will roll farther" is a hypothesis, because you can set up a ramp and find out. "Steep ramps are better" is not, because nothing about it can be measured.

Every experiment has three kinds of variables. The independent variable is the one thing you deliberately change. The dependent variable is what you measure, and its value depends on what you changed. Controlled variables are everything else you deliberately hold still: the same car, the same floor, the same way of releasing it. If two things change at once, the data cannot tell you which one caused the result. That is why a study with a control group, a group that gets no treatment at all, is so useful: it shows what happens when the independent variable is left alone.

One measurement is never enough. Repeat each condition several times and report the mean, the sum of the trials divided by the number of trials. The range, the highest trial minus the lowest, tells you how tightly the trials agree. A wide range is a warning: something you were not controlling, a nudge on release or a change in surface, was moving your results around. Scientists also expect other people to repeat the whole study, which is called replication.

Data is easier to judge as a picture than as a list. By convention the independent variable goes on the horizontal axis and the dependent variable on the vertical axis, each axis labeled with its unit and scaled in even steps. A graph shows the shape of a relationship: whether the line rises steadily, levels off, or bends. Reading that shape is the point of the graph, so look at it before you write a conclusion.

Worked example

Jonah wants to know whether water temperature changes how fast sugar dissolves. He stirs one sugar cube into 200 mL of water at 20, 40, 60 and 80 degrees Celsius and times how long it takes to disappear. He repeats each temperature three times.

Independent variable: water temperature, in degrees Celsius. Dependent variable: the time for the cube to dissolve, in seconds.

Controlled: the same size sugar cube, 200 mL of water every time, the same stirring speed, the same container. Three trials at each temperature let him report a mean and spot a trial that disagrees with the others.

Try it

Write Jonah's hypothesis as an if and then statement.

Jonah times one trial at 80 degrees and gets a result far from the other two. What should he do, and why?

REVIEW · classroomreview.games



Calm Block, Day 1: Word Search

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

Calm · Day 1

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

CATALYST · VELOCITY · GENOTYPE · NUCLEUS · PROTEIN · ISOTOPE · NEUTRON · OSMOSIS · MITOSIS · DENSITY · ENZYME · PHOTON

Faster than reading every square

- Hunt the rare letters first. Only one word in the list has a Z in it, so every Z 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.

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Team Task, Day 1: The Powers of Ten Lineup

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

Team · Day 1

The situation

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A honeybee worker, head to tail				
Earth, measured across its diameter				
A human red blood cell, measured across				
Mount Everest, height above sea level				
An E. coli bacterium, end to end				
The distance from Earth to the Sun				
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- **1 micrometer (µm)** = one millionth of a meter
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Scoring

For each row: group rank minus expert rank, and drop the minus sign. Add the twelve numbers up.

- **10 or less:** excellent
- **11 to 20:** good
- **21 to 32:** fair

Defend one choice

Pick the row with your biggest difference. What size did your group guess, and what must it really be?

Challenge

After the reveal: about how many E. coli end to end span one hair? How many Earths span the Sun?

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