

Middle School Science Emergency Sub Binder

Emergency sub plans for middle school science, grades 6 to 8. The sub needs no science background: every step is on the page.

PREVIEW

What is included

- 7 front pages: binder cover, important information, note to the sub, the filled-in lesson plan, schedule, class list, how it went
- 9 activities with sub scripts and student pages (31 pages): 3 individual, 6 with a partner, a team or the whole class
- A Say this to the class script for every activity, star challenges for fast finishers, every answer in a key
- 7 of the 9 activities list their NGSS standards (not the puzzles or the optional quiz game)
- Color and ink-saver B&W, US Letter and A4

How it works

1. Leave the binder out. The lesson plan lists every activity with its page and minutes.
2. The sub reads the Say this to the class box word for word.
3. Students work from their own pages, with the steps on the page. The sub needs no science background: every answer is in the key.
4. No prep and no tech: print and go.

The 9 activities, 35 to 45 minutes each

1. **Quiet Reading**, 45 min SOLO: using evidence from two articles: traits that help plants and animals reproduce, and earthquake forecasts and warnings
2. **The Fact-Check Desk**, 40 min SOLO: finding and fixing common science mix-ups about mass, sound, heat, forces, climate, Earth, plants and traits
3. **Writing Menu**, 45 min SOLO: writing science: a claim with evidence from plant data, a third law design memo, or a paragraph on climate data
4. **Partner Check**, 40 min PAIRS: mixed review: energy transfer, changes in matter, collisions, speed, Earth systems, traits, signals and waves
5. **The Wildlife Crossing Review**, 40 min PAIRS OR THREES: engineering design: criteria and constraints, reading test data, and combining the best features of designs
6. **Science Puzzle Tournament**, 41 min TEAMS: science word parts and vocabulary, naming terms from their meaning, analogies, anagrams and other science logic
7. **The Science Week Mix-Up**, 40 min TEAMS: matching science fair projects to ideas: weathering, the third law, growth factors, conduction and wave absorption
8. **Which Claim Wins? Stand-Off**, 40 min WHOLE CLASS: judging scientific claims: data, fair tests, sample size, conclusions that fit the evidence, causes and units
9. **Whiteboard Quiz Game**, 35 min WHOLE CLASS: a review of this binder: the two articles, the fact checks, evidence, partner rows and engineering design

What this preview shows: the note to the substitute, the lesson plan, the other front pages, one page of every activity, a sub script, four more student pages and one ink-saver page. Every product page is watermarked. Answer keys are not shown, only one warm-up answer. The full binder has 38 pages.



Note to the Substitute

Middle school science, grades 6 to 8 · 9 one-period activities · no prep, no science background needed

Thank you for covering my class

The front pages (important information, lesson plan, schedule, class list) are filled in for today. After them come 9 science activities: the first 3 are individual work, the other 6 are for partners, teams or the whole class. Each one fills most or all of a period of 40 to 55 minutes, runs from the printout alone, and carries its own facts and answer key, so you never teach anything new. Everything reviews middle school science (life, physical and Earth science and engineering), all on paper. Print this binder one-sided, because the keys sit behind student pages when it is two-sided.

Science and talk: Everything here is paper and pencil: no lab supplies, no heat, no chemicals. Climate and evolution are stated plainly as science; a student with a question writes it down for me. Discussion stays on the science, and a student who is upset goes to the school counselor or another trusted adult.

Every activity except the puzzle tournament and the review game names the Next Generation Science Standards (NGSS) middle school performance expectations it practices, on a small line under its focus line (for you, not the students). An activity practices part of a performance expectation; it is review and practice, not a full assessment of it.

The first page of every activity is your script. The box marked **Say this to the class** is written to be read aloud word for word. Every answer is in a key on the script page or on the page right after it. Keep those pages with you and hand out only the student pages. Every student sheet except the quiz board has core work for everyone and one **Challenge** box, with its own answer space, for early finishers.

The 9 activities

- **Quiet Reading** quiet single · 45 min · p. 7
- **The Fact-Check Desk** quiet single · 40 min · p. 13
- **Writing Menu** quiet single, choose · 45 min · p. 16
- **Partner Check** pairs · 40 min · p. 20
- **The Wildlife Crossing Review** pairs or threes · 40 min · p. 23
- **Science Puzzle Tournament** teams, puzzles · 41 min · p. 26
- **The Science Week Mix-Up** team logic · 40 min · p. 29
- **Which Claim Wins? Stand-Off** whole class · 40 min · p. 33
- **Whiteboard Quiz Game** whole class, teams · 35 min · p. 36

If the class is loud

- Switch to a quiet single activity: Quiet Reading, The Fact-Check Desk or Writing Menu. Nobody needs to move.
- In the scored games (Science Puzzle Tournament, Which Claim Wins? Stand-Off and Whiteboard Quiz Game), the scoring keeps the class honest.
- If an activity is not working, stop it and switch. Every activity can start at any point in the period.
- The games are optional: a fun way to end the class or to use extra time.

Which activity when?



- A student says the class never learned this? Every activity reviews earlier work. Ask them to try the first problem with a partner, and leave me a note.
- The same activity in every period is fine: each class sees it once. The lesson plan (next page) lists all 9.
- A class that needs to settle: start with a quiet single activity. A restless class: a group activity uses the energy.
- Short period? These fit: Whiteboard Quiz Game (35 min) and one reading of Quiet Reading (about 20 min).

Before you leave

Please fill in the How It Went page at the back. It takes two minutes and I read every word. Thank you!

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Lesson Plan

Filled in for today: 9 activities, 35 to 45 minutes each. Write the time of each period you use.

ACTIVITY	PLAN	PAGE
Quiet Reading Quiet single · about 45 min Time ____ : ____ to ____ : ____	• One article and its question sheet per student; fast finishers take the other • Silent reading and questions, about 20 minutes per article • Read the answers out from the key, or collect for me	p. 7
The Fact-Check Desk Quiet single · about 40 min Time ____ : ____ to ____ : ____	• Hand out both sheets; pencils only • Students find the one wrong sentence in each note, name the fact and fix it • Read the key out at the end, or collect for me	p. 13
Writing Menu Quiet single, choose · about 45 min Time ____ : ____ to ____ : ____	• Three stacks: A Tall or Healthy?, B The Bumper Memo, C What the Numbers Show • Students choose one, write alone in silence, then use the checklist • Compare with the models on the script, or collect for me	p. 16
Partner Check Pairs · about 40 min Time ____ : ____ to ____ : ____	• Pairs: one Partner A sheet and one Partner B sheet • Both do row 1, then compare: the answers must match • Different answers? Talk it through together. The key is on the script	p. 20
The Wildlife Crossing Review Pairs or threes · about 40 min Time ____ : ____ to ____ : ____	• Pairs or threes, each student with both sheets • Part 1: review three designs against the limits (keyed) • Part 2: improve the best design within the budget, then share the plans	p. 23
Science Puzzle Tournament Teams, puzzles · about 41 min Time ____ : ____ to ____ : ____	• Teams of 3 or 4, one puzzle sheet and one answer sheet per team • One round at a time, 1, 2 or 3 points per puzzle • Every answer is on the key. The key settles arguments	p. 26
The Science Week Mix-Up Team logic · about 40 min Time ____ : ____ to ____ : ____	• Teams of 3 or 4, one case file and one grid sheet per team • Warm-up together on the board, then the case on their own • Teams hand in both sheets; check the slip against the key and reveal	p. 29
Which Claim Wins? Stand-Off Whole class · about 40 min Time ____ : ____ to ____ : ____	• Both sheets to every student; everyone stays seated • Read a round, 20-second guess, count hands, then 60 seconds to decide and give a reason • One speaker per side, then read the answer from the key	p. 33
Whiteboard Quiz Game Whole class, teams · about 35 min Time ____ : ____ to ____ : ____	• Draw the 5 by 5 board or use the board page; 3 to 5 teams • Teams take turns picking a category and value; you read the question • Right answer: points on the scoreboard. Optional, for the end of class	p. 36

Fast finishers

Any quiet single activity can follow any other activity: Quiet Reading (p. 7), The Fact-Check Desk (p. 13) and Writing Menu (p. 16).

Collect / leave for me

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SUBSTITUTE BINDER

Science · One Day · Grades 6 to 8

Teacher _____

Room _____

Grade and subject _____

School year _____

Everything a sub needs for today's science class is in this binder: the schedule, the class list, a filled-in lesson plan, and 9 one-period classroom activities that run from the printout alone, 3 for individual work and 6 for partners, teams or the whole class. Each one has a script, a Say This to the Class box and its own answer key, so the sub needs no science background and no technology. Paper and pencil only.

Individual work

- Quiet Reading
- The Fact-Check Desk
- Writing Menu

Partner, team and whole-class activities

- Partner Check
- The Wildlife Crossing Review
- Science Puzzle Tournament
- The Science Week Mix-Up
- Which Claim Wins? Stand-Off
- Whiteboard Quiz Game



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Middle School Science Emergency Sub Binder

Important Information

The page the sub reads first. Fill it in once and keep it current. Print this binder one-sided.

People to call

Office _____

Teacher next door _____

Nurse _____

Principal / admin _____

Tech help _____

Emergency procedures

Fire: exit and meeting point _____

Lockdown _____

Severe weather _____

Medical _____

Where the first aid kit is _____

Helpful students

_____

_____

_____

Students who need extra support

_____

_____

_____

Where things are

Attendance / how to take it _____

Paper, pencils, supplies _____

Hall passes _____

Copier, if the sub may use it _____

Class routines

Start of class _____

Bathroom _____

Phones _____

End of class _____

Seating and groups

Seating chart is _____

Groups for group work _____

Students who should not sit together _____

Technology and passes

Classroom or other room for today _____

Laptops or tablets: allowed when _____

Computer or board login _____

Students who leave the room (time, why) _____

Anything else today

_____

_____

_____

For the teacher who bought this binder: if it worked well for your class, leaving a review on TpT helps other teachers find it and gives you credits toward future purchases. Thank you!

Schedule of the Day

Write the times in. Cross out or rename any period to match the school's day, then write the activity for each class.

TIME	PERIOD	CLASS / ROOM	ACTIVITY AND PAGE
___ : ___ to ___ : ___	Homeroom / attendance		
___ : ___ to ___ : ___	Period 1		
___ : ___ to ___ : ___	Period 2		
___ : ___ to ___ : ___	*Break*		
___ : ___ to ___ : ___	Period 3		
___ : ___ to ___ : ___	Period 4		
___ : ___ to ___ : ___	*Lunch*		
___ : ___ to ___ : ___	Period 5		
___ : ___ to ___ : ___	Period 6		
___ : ___ to ___ : ___	Period 7		
___ : ___ to ___ : ___	Dismissal		
___ : ___ to ___ : ___			

The activities

ACTIVITY	WHAT IT PRACTICES	STYLE	TIME	PAGE
Quiet Reading	using evidence from two articles: traits that help plants and animals reproduce, and earthquake forecasts and warnings	Quiet single	45 min	p. 7
The Fact-Check Desk	finding and fixing common science mix-ups about mass, sound, heat, forces, climate, Earth, plants and traits	Quiet single	40 min	p. 13
Writing Menu	writing science: a claim with evidence from plant data, a third law design memo, or a paragraph on climate data	Quiet single, choose	45 min	p. 16
Partner Check	mixed review: energy transfer, changes in matter, collisions, speed, Earth systems, traits, signals and waves	Pairs	40 min	p. 20
The Wildlife Crossing Review	engineering design: criteria and constraints, reading test data, and combining the best features of designs	Pairs or threes	40 min	p. 23
Science Puzzle Tournament	science word parts and vocabulary, naming terms from their meaning, analogies, anagrams and other science logic	Teams, puzzles	41 min	p. 26
The Science Week Mix-Up	matching science fair projects to ideas: weathering, the third law, growth factors, conduction and wave absorption	Team logic	40 min	p. 29
Which Claim Wins? Stand-Off	judging scientific claims: data, fair tests, sample size, conclusions that fit the evidence, causes and units	Whole class	40 min	p. 33
Whiteboard Quiz Game	a review of this binder: the two articles, the fact checks, evidence, partner rows and engineering design	Whole class, teams	35 min	p. 36

Class List and Dismissal

Names, what a sub must know, and how every student goes home. Check Here at the start and Gone at the end.

(B) bus (write the number) (W) walks (P) picked up (write who) (A) after-school program (O) other

#	STUDENT NAME	NOTES (ALLERGIES, NEEDS, HELPFUL, LEAVES EARLY)	HOME	BUS # / PICKED UP BY / PROGRAM	HERE	GONE
1					☐	☐
2					☐	☐
3					☐	☐
4					☐	☐
5					☐	☐
6					☐	☐
7					☐	☐
8					☐	☐
9					☐	☐
10					☐	☐
11					☐	☐
12					☐	☐
13					☐	☐
14					☐	☐
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16					☐	☐
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21					☐	☐
22					☐	☐
23					☐	☐
24					☐	☐
25					☐	☐
26					☐	☐
27					☐	☐
28					☐	☐
29					☐	☐
30					☐	☐

How It Went

For you to leave for me. Two minutes: check the boxes and go.

Today

Date _____ Period(s) _____

Activities used _____

Sub name _____

The class

- ☐ Great, no problems
- ☐ Fine, a little loud
- ☐ A difficult day, see notes
- ☐ Finished the activity
- ☐ Stopped early (time)
- ☐ Used a second activity

Stars of the day

Students who helped, led a group well, or were a good sport:

_____

_____

_____

Work collected

_____

_____

Notes

_____

_____

_____

_____

_____

_____

_____

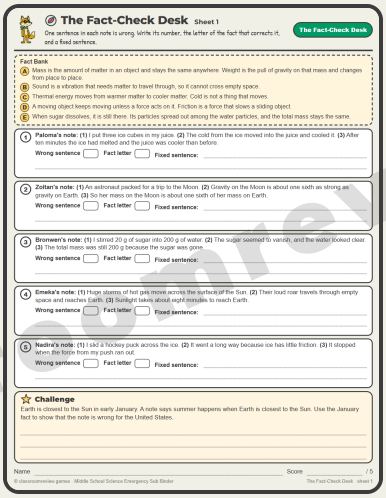
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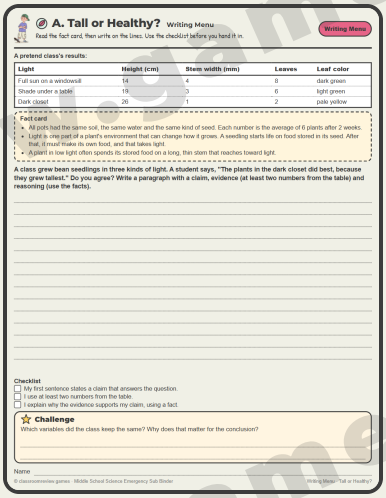
ONE PAGE OF EVERY ACTIVITY



1. Quiet Reading, 45 min (solo)



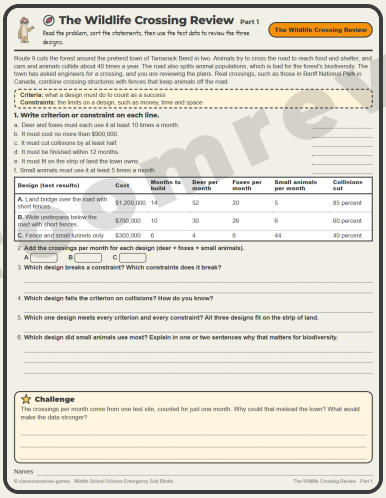
2. The Fact-Check Desk, 40 min (solo)



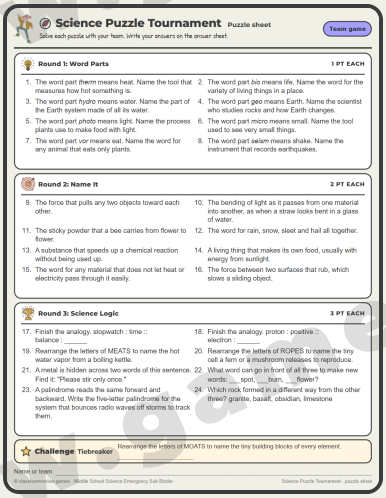
3. Writing Menu, 45 min (solo)



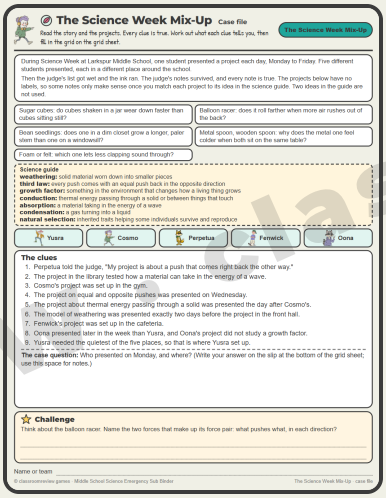
4. Partner Check, 40 min (pairs)



5. The Wildlife Crossing Review, 40 min (pairs or threes)



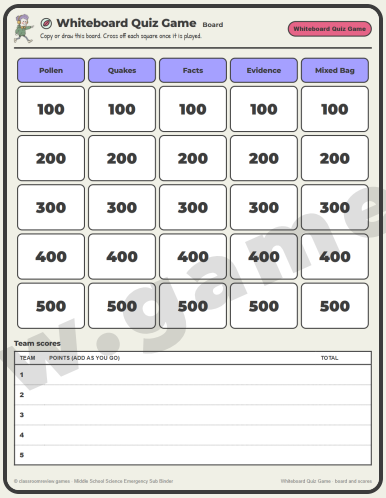
6. Science Puzzle Tournament, 41 min (teams)



7. The Science Week Mix-Up, 40 min (teams)



8. Which Claim Wins? Stand-Off, 40 min (whole class)



9. Whiteboard Quiz Game, 35 min (whole class)

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Every activity also has a sub script with a Say this to the class box



The Science Week Mix-Up

Sub script: a team logic mystery with science clues

One period · teams of 3 or 4

This activity practices: matching science fair projects to ideas: weathering, the third law, growth factors, conduction and wave absorption
NGSS: MS-LS1-5 (growth factors), MS-PS4-2 (reflect, absorb, transmit)
You need: the printed sheets and pencils; optional: the classroom board (for the warm-up; no board, hold up a grid sheet and talk it through)

SAY THIS TO THE CLASS

"The judge's list from Science Week got wet, and your team rebuilds it from the judge's notes. Read the five projects carefully first, because some clues only make sense once you know each project's science idea. First I show you a short warm-up."

Materials

- **Copy the case file and the grid sheet one-sided. If they came out two-sided, give each team two copies.** Teams of 3 or 4. Each team gets one case file and one grid sheet (the grid sheet has the answer slip).
- Pencils and the board for the warm-up. No board? Hold up a grid sheet and talk it through.
- Jobs: **reader** (reads the clues out), **science expert** (matches each project to its idea with the science guide), **marker** (the only one who writes in the grid) and **recorder** (fills in the slip).
- Keep this page and the next one: together they are your key.

Run it (40 minutes)

1. **Set up.** Make the teams, hand out the sheets. 3 min
2. **Read the story and the five projects.** A volunteer reads them out loud. 4 min
3. **Warm-up together** on the board, as shown below. 6 min
4. **Teams solve the case.** Walk around. After about 10 minutes, give a hint from the next page to any team that is stuck. Fast teams do the Challenges. 22 min
5. **Reveal.** Collect both sheets from each team, then read the answer and the full solution from the key. 5 min

The warm-up: teach the grid (6 minutes)

Draw this grid on the board. Students have the same one on their grid sheet. Anselm, Beatriz and Corin each measured something with one tool: a ruler, a thermometer or a balance. Read the two clues:

1. Beatriz's tool reads in degrees.

2. Anselm never measured a length.

Then show it step by step:

1. Clue 1 first: a tool that reads in degrees is a thermometer. Circle Beatriz under thermometer. A circle means the rest of that row and that column get an X.
2. Clue 2: a ruler measures length, so Anselm did not use the ruler. Only the ruler and the balance are left, so Anselm has the balance and Corin the ruler. Circle both.
3. Check it against both clues out loud.

	ruler	thermometer	balance
Anselm			
Beatriz			
Corin			

Answer: Anselm, balance; Beatriz, thermometer; Corin, ruler.

The two rules to say out loud: one circle in every row and every column of each small grid; and in this case, decide what a clue really tells you (which project, which place) before you mark the grid. An X means no, a circle means yes.

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The Fact-Check Desk Sheet 1

One sentence in each note is wrong. Write its number, the letter of the fact that corrects it, and a fixed sentence.

The Fact-Check Desk

Fact Bank

- **A** Mass is the amount of matter in an object and stays the same anywhere. Weight is the pull of gravity on that mass and changes from place to place.
- **B** Sound is a vibration that needs matter to travel through, so it cannot cross empty space.
- **C** Thermal energy moves from warmer matter to cooler matter. Cold is not a thing that moves.
- **D** A moving object keeps moving unless a force acts on it. Friction is a force that slows a sliding object.
- **E** When sugar dissolves, it is still there. Its particles spread out among the water particles, and the total mass stays the same.

1 **Paloma's note:** **(1)** I put three ice cubes in my juice. **(2)** The cold from the ice moved into the juice and cooled it. **(3)** After ten minutes the ice had melted and the juice was cooler than before.

Wrong sentence ☐ **Fact letter** ☐ **Fixed sentence:** .....

.....

2 **Zoltan's note:** **(1)** An astronaut packed for a trip to the Moon. **(2)** Gravity on the Moon is about one sixth as strong as gravity on Earth. **(3)** So her mass on the Moon is about one sixth of her mass on Earth.

Wrong sentence ☐ **Fact letter** ☐ **Fixed sentence:** .....

.....

3 **Bronwen's note:** **(1)** I stirred 20 g of sugar into 200 g of water. **(2)** The sugar seemed to vanish, and the water looked clear. **(3)** The total mass was still 200 g because the sugar was gone.

Wrong sentence ☐ **Fact letter** ☐ **Fixed sentence:** .....

.....

4 **Emeka's note:** **(1)** Huge storms of hot gas move across the surface of the Sun. **(2)** Their loud roar travels through empty space and reaches Earth. **(3)** Sunlight takes about eight minutes to reach Earth.

Wrong sentence ☐ **Fact letter** ☐ **Fixed sentence:** .....

.....

5 **Nadira's note:** **(1)** I slid a hockey puck across the ice. **(2)** It went a long way because ice has little friction. **(3)** It stopped when the force from my push ran out.

Wrong sentence ☐ **Fact letter** ☐ **Fixed sentence:** .....

.....

☆ Challenge

Earth is closest to the Sun in early January. A note says summer happens when Earth is closest to the Sun. Use the January fact to show that the note is wrong for the United States.

.....

.....

.....

Name ..... Score ..... / 5

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A. Tall or Healthy? Writing Menu

Read the fact card, then write on the lines. Use the checklist before you hand it in.

Writing Menu

A pretend class's results:

Light	Height (cm)	Stem width (mm)	Leaves	Leaf color
Full sun on a windowsill	14	4	8	dark green
Shade under a table	19	3	6	light green
Dark closet	26	1	2	pale yellow

Fact card

- All pots had the same soil, the same water and the same kind of seed. Each number is the average of 6 plants after 2 weeks.
- Light is one part of a plant's environment that can change how it grows. A seedling starts life on food stored in its seed. After that, it must make its own food, and that takes light.
- A plant in low light often spends its stored food on a long, thin stem that reaches toward light.

A class grew bean seedlings in three kinds of light. A student says, "The plants in the dark closet did best, because they grew tallest." Do you agree? Write a paragraph with a claim, evidence (at least two numbers from the table) and reasoning (use the facts).

Checklist

- [ ] My first sentence states a claim that answers the question.
- [ ] I use at least two numbers from the table.
- [ ] I explain why the evidence supports my claim, using a fact.

Challenge

Which variables did the class keep the same? Why does that matter for the conclusion?

Name _____

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A. Tall or Healthy?, Writing Menu



Partner Check Partner A

Circle one choice in each row, then compare with your partner. The answers should be the same. If not, talk it through.

Partner Check

1 **How does the thermal energy move?**
The handle of a metal spoon gets warm while the spoon sits in hot soup.
conduction (by touch) · convection (moving liquid or gas) · radiation (waves, no touching)
Why? (a few words) .....
☐ Same as partner

2 **What kind of change is it?**
An iron gate slowly turns into flaky orange rust.
physical change (same substance) · chemical change (new substance forms)
Why? (a few words) .....
☐ Same as partner

3 **Compare the two forces in the collision.**
A loaded truck hits a small car: the truck's force on the car and the car's force on the truck.
same size · bigger on the lighter object · bigger on the faster object
Why? (a few words) .....
☐ Same as partner

4 **Find the speed (distance ÷ time).**
A cyclist rides 60 m in 12 s.
2 m/s · 5 m/s · 8 m/s · 20 m/s
Why? (a few words) .....
☐ Same as partner

5 **What is the total mass after the reaction in a sealed jar?**
10 g of one substance reacts with 6 g of another.
4 g · 8 g · 16 g · 32 g
Why? (a few words) .....
☐ Same as partner

6 **Which part of the Earth system is it?**
A deep ocean current carries cold water south.
geosphere (rock) · hydrosphere (water) · atmosphere (air) · biosphere (living things)
Why? (a few words) .....
☐ Same as partner

7 **Where did this trait come from?**
A runner's legs get stronger after a season of training.
inherited (from parents' genes) · acquired (during life)
Why? (a few words) .....
☐ Same as partner

8 **Which kind of selection is it?**
Farmers save seeds from the sweetest corn plants every year.
natural selection (survival in the wild) · artificial selection (people choose)
Why? (a few words) .....
☐ Same as partner

9 **Which kind of signal is it?**
A song stored as a long string of 0s and 1s.
analog (changes smoothly) · digital (on and off pulses)
Why? (a few words) .....
☐ Same as partner

10 **What happens to the wave?**
Your shout comes back as an echo from a canyon wall.
reflected (bounces back) · absorbed (taken in) · transmitted (passes through)
Why? (a few words) .....
☐ Same as partner

☆ Challenge

How does the pull of gravity change? Gravity depends on mass and distance. A moon's mass doubles, and its distance from the planet stays the same.

it doubles · it halves · it stays the same

Compare again. Together, write a new item with the same answer:

.....

My name ..... Partner .....

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Science Puzzle Tournament

Puzzle sheet

Solve each puzzle with your team. Write your answers on the answer sheet.

Team game

Round 1: Word Parts — 1 PT EACH

1. The word part *therm* means heat. Name the tool that measures how hot something is.
2. The word part *bio* means life. Name the word for the variety of living things in a place.
3. The word part *hydro* means water. Name the part of the Earth system made of all its water.
4. The word part *geo* means Earth. Name the scientist who studies rocks and how Earth changes.
5. The word part *photo* means light. Name the process plants use to make food with light.
6. The word part *micro* means small. Name the tool used to see very small things.
7. The word part *vor* means eat. Name the word for any animal that eats only plants.
8. The word part *seism* means shake. Name the instrument that records earthquakes.

Round 2: Name It — 2 PT EACH

9. The force that pulls any two objects toward each other.
10. The bending of light as it passes from one material into another, as when a straw looks bent in a glass of water.
11. The sticky powder that a bee carries from flower to flower.
12. The word for rain, snow, sleet and hail all together.
13. A substance that speeds up a chemical reaction without being used up.
14. A living thing that makes its own food, usually with energy from sunlight.
15. The word for any material that does not let heat or electricity pass through it easily.
16. The force between two surfaces that rub, which slows a sliding object.

Round 3: Science Logic — 3 PT EACH

17. Finish the analogy. stopwatch : time :: balance : _____
18. Finish the analogy. proton : positive :: electron : _____
19. Rearrange the letters of MEATS to name the hot water vapor from a boiling kettle.
20. Rearrange the letters of ROPES to name the tiny cell a fern or a mushroom releases to reproduce.
21. A metal is hidden across two words of this sentence. Find it: "Please stir only once."
22. What word can go in front of all three to make new words: ___spot, ___burn, ___flower?
23. A palindrome reads the same forward and backward. Write the five-letter palindrome for the system that bounces radio waves off storms to track them.
24. Which rock formed in a different way from the other three? granite, basalt, obsidian, limestone

Challenge Tiebreaker — Rearrange the letters of MOATS to name the tiny building blocks of every element.

Name or team .....

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The Flower's Couriers Article

Read the whole article before you look at the questions.

Quiet Reading

A flowering plant cannot walk across a field to find a partner. To make most seeds, pollen from the male part of one flower has to reach the female part of a flower, often on a different plant of the same kind. That trip is called pollination, and many plants get animals to make the delivery.

The plants pay for the service with food. Nectar is a sugary liquid, and pollen itself is rich in protein. A bee that pushes into a flower for a meal picks up sticky pollen on its hairy body, then brushes some of it off at the next flower. The bee is only looking for food, but the plant's pollen travels too.

Flowers also advertise, and different flowers appeal to different animals. Bees can see ultraviolet light, which human eyes cannot, and many bee flowers have ultraviolet patterns that guide the bee to the nectar. Bees see red poorly, while hummingbirds see it well, so many flowers that hummingbirds visit are red tubes that fit a long bill. Most moths fly at night, so the flowers they visit are often pale, open in the evening and give off a strong scent.

Some plants do without animals altogether. Grasses and oak trees let the wind carry their pollen. Wind cannot aim, so most of that pollen lands in the wrong place. These plants make huge amounts of it and spend little energy on bright petals or nectar.

Animals have behaviors that raise their own chances of reproducing, too. Many male bowerbirds of Australia and New Guinea build a structure of sticks and decorate it with colorful objects, and females visit several of these displays before choosing. Many birds also guard their nests, which gives more of their eggs a chance to hatch.

How do scientists know these traits matter? They test them. In one common experiment, a scientist covers some flowers with fine mesh bags that keep insects out, leaves other flowers on the same plants uncovered, and counts the seeds later. In many plants that depend on insects, the uncovered flowers make far more seeds.

☆ Challenge

Many bee flowers have ultraviolet patterns. Why could a photo from an ordinary camera miss something a bee notices?

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Name .....

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