FINALS REVIEW · GRADE 6

6th Grade Science Final Exam Review

Everything on a typical 6th grade science final, one unit at a time: the facts you need, the mistakes that cost the most points, and three practice questions per unit with answers. Start with the quick checks to find your weak units, then use the linked lessons to fix them.

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What’s on the 6th Grade Science final

Many schools start with matter (states, mixtures, density and chemical changes) and then forces and energy in the first semester, and finish with Earth and space and with organisms and ecosystems in the second. Other courses open with Earth science or with cells, so the order varies by school. If your final is in December, focus on the Semester 1 units and check your review sheet for the rest.

Unit	Usually on	Lessons
1. Solids, liquids and gases	Semester 1	Grade 6 Science: Matter and Its Properties
2. Pure substances, mixtures and the periodic table	Semester 1	Grade 6 Science: Matter and Its Properties
3. Density and physical properties	Semester 1	Grade 6 Science: Matter and Its Properties
4. Physical and chemical changes	Semester 1	Grade 6 Science: Matter and Its Properties
5. Forces, net force and Newton’s third law	Semester 1	Grade 6 Science: Force, Motion and Energy, Forces & Motion
6. Energy, energy changes and waves	Semester 1	Grade 6 Science: Force, Motion and Energy
7. Earth’s layers, spheres and the rock cycle	Semester 2	Grade 6 Science: Earth and Space, Plate Tectonics
8. Seasons and tides	Semester 2	Grade 6 Science: Earth and Space

Unit	Usually on	Lessons
9. Organisms, cells and ecosystems	Semester 2	Grade 6 Science: Organisms and Environments, Introduction to Biology

A two-week study plan

> DAY 14
>
> **Find your weak units**
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> Do the quick checks for all 9 units without notes. Mark each unit solid, shaky or lost. This tells you where your study time goes.

> DAYS 13–6
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> **Fix the lost and shaky units, one a day**
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> Start with the units you marked lost, then shaky. For each one, read the must-know list, work through the linked lesson, and redo that unit's quick checks until you get all three right.

> DAYS 5–3
>
> **Mixed practice**
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> Finals mix units together, so practice that way: answer quick checks from different units in random order, and explain each answer in a full sentence with the science word that fits.

> DAY 2
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> **Vocabulary and mistakes**
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> Review every "common mistakes" list, and quiz yourself on the word pairs that are easy to mix up. Write any formulas, like density or speed, from memory with their units.

> DAY 1
>
> **Light review and sleep**
>
> Redo only the questions you missed before. Then stop: a full night of sleep helps your memory more than a late cram session.

UNIT 1 · SEMESTER 1

Solids, liquids and gases

MUST KNOW

- All matter is made of tiny particles that are always moving. How close they are and how fast they move decides the state.
- A solid has a definite shape and a definite volume: its particles are packed tightly and vibrate in place.
- A liquid has a definite volume but takes the shape of its container: its particles are close together but slide past each other.
- A gas has no definite shape or volume and spreads to fill its container: its particles are far apart and move fast.
- Adding thermal energy makes particles move faster: melting (solid to liquid) and boiling or evaporation (liquid to gas). Removing it causes condensation (gas to liquid) and freezing (liquid to solid).
- A change of state does not change the substance or its mass. Ice, liquid water and steam are all water.

COMMON MISTAKES

- Saying the particles in a solid do not move. They do move: they vibrate in place.
- Thinking water droplets on a cold glass leaked through it. They are water vapor from the air that condensed on the cold surface.

QUICK CHECK

1.1 Which state of matter has a definite volume but no definite shape?

1.2 What happens to the particles of a substance when it melts?

1.3 A 50 g ice cube melts completely. What is the mass of the water?

UNIT 2 · SEMESTER 1

Pure substances, mixtures and the periodic table

MUST KNOW

- A pure substance has the same makeup all the way through. It is either an element (one kind of atom, like gold or oxygen) or a compound (elements chemically joined in a fixed ratio, like water).
- A mixture is two or more substances mixed together but not chemically joined, like trail mix, salad, salt water or air.
- In a heterogeneous mixture you can see the different parts (sand and water). A homogeneous mixture, also called a solution, looks the same throughout (salt water).
- Mixtures can be separated by physical means: picking out by hand, a magnet, a filter or evaporation. Separating a compound takes a chemical reaction.
- Metals (the left side and middle of the periodic table) are shiny, malleable and ductile, and conduct heat and electricity well. Nonmetals (upper right) are usually dull and brittle as solids and are poor conductors.
- Metalloids sit along the staircase line and have properties of both. Silicon, a metalloid, is a semiconductor used in computer chips.

COMMON MISTAKES

- Calling salt water a pure substance because it looks the same throughout. It is a mixture: you can boil off the water and get the salt back.
- Mixing up malleable and ductile. Malleable means it can be hammered into sheets; ductile means it can be drawn into wire.

QUICK CHECK

2.1 Is sugar dissolved in water an element, a compound or a mixture?

2.2 How could you separate a mixture of iron filings and sand?

2.3 An element is shiny, bends without breaking and conducts electricity. Where is it on the periodic table?

UNIT 3 · SEMESTER 1

Density and physical properties

MUST KNOW

- Physical properties can be observed without changing the substance: color, luster, hardness, magnetism, conductivity, boiling point and density.
- Density is mass per unit of volume: $D = \frac{m}{V}$. It is measured in $\mathrm{g/cm^3}$ for solids and $\mathrm{g/mL}$ for liquids.
- Water has a density of about $1\ \mathrm{g/mL}$. An object less dense than water floats; an object more dense sinks.
- Density is a property of the substance, not the sample size. Cut a block in half and each half has the same density as the whole.
- Measure the volume of an irregular object by water displacement: the rise in water level in a graduated cylinder is its volume.

COMMON MISTAKES

- Saying heavy objects sink and light ones float. A huge log floats and a tiny pebble sinks: density, not weight, decides.
- Dividing volume by mass. Density is mass divided by volume.
- Forgetting units. A density answer needs units such as $\mathrm{g/cm^3}$.

QUICK CHECK

3.1 A rock has a mass of 30 g and a volume of 10 $\mathrm{cm^3}$. What is its density?

3.2 A block with a density of $0.6\ \mathrm{g/cm^3}$ is cut in half. What is the density of each half?

3.3 Water in a graduated cylinder rises from 40 mL to 55 mL when a toy is dropped in. What is the volume of the toy?

UNIT 4 · SEMESTER 1

Physical and chemical changes

MUST KNOW

- A physical change alters shape, size or state but not the substance: cutting paper, melting ice, dissolving sugar.
- A chemical change makes one or more new substances with new properties: burning wood, rusting iron, baking a cake.
- Signs of a chemical change: a gas forms (bubbles when nothing is boiling), an unexpected color change, a temperature change, light, a new smell, or a solid (precipitate) forming when two liquids mix.
- In any change, physical or chemical, matter is not created or destroyed, so the total mass stays the same in a closed container.

COMMON MISTAKES

- Calling boiling water a chemical change because it bubbles. Boiling is a change of state; the bubbles are still water.
- Calling dissolving a chemical change. Dissolved sugar is still sugar, and you can get it back by evaporating the water.

QUICK CHECK

4.1 Is rusting a physical or a chemical change? Explain.

4.2 Vinegar is poured on baking soda and it fizzes. What is the evidence of a chemical change?

4.3 Name two physical changes you could do to a piece of paper.

UNIT 5 · SEMESTER 1

Forces, net force and Newton’s third law

MUST KNOW

- A force is a push or a pull, measured in newtons (N). Common forces include gravity, friction, magnetic force, tension and the normal force of a surface.
- Net force is the combined force on an object. Forces in the same direction add; forces in opposite directions subtract.
- Balanced forces have a net force of zero, so motion does not change: the object stays at rest or keeps moving at the same speed and direction.
- Unbalanced forces change motion: the object speeds up, slows down or changes direction.
- Newton’s third law: forces come in pairs. When one object pushes on another, the second pushes back with an equal force in the opposite direction.

COMMON MISTAKES

- Thinking a third-law pair cancels out. The two forces act on different objects, so they do not cancel.
- Saying a moving object must have an unbalanced force on it. An object moving at a steady speed in a straight line has balanced forces.

QUICK CHECK

5.1 Two students push a box: one pushes right with 30 N, the other pushes left with 20 N. What is the net force?

5.2 A book rests on a table. Are the forces on it balanced or unbalanced?

5.3 A swimmer pushes the water backward. Which way does the water push the swimmer?

UNIT 6 · SEMESTER 1

Energy, energy changes and waves

MUST KNOW

- Kinetic energy is the energy of motion; it increases with mass and speed. Potential energy is stored energy, such as gravitational potential energy, which increases with mass and height.
- On a roller coaster or a swing, energy changes back and forth: potential energy is greatest at the highest point and kinetic energy is greatest at the lowest point.
- Energy is conserved: it changes form but is never created or destroyed. Some always becomes thermal energy through friction, which is why a swing slowly stops.
- Energy transformations: a battery changes chemical energy to electrical energy, and a light bulb changes electrical energy to light and thermal energy. A circuit must be a closed loop for current to flow.
- Plants change light energy into chemical energy in food (photosynthesis); animals get chemical energy by eating.
- Waves carry energy, not matter. A bigger amplitude carries more energy. Sound needs a medium; light can travel through empty space.

COMMON MISTAKES

- Saying energy is "used up" or "lost." It changes into other forms, often thermal energy that spreads out.
- Thinking water moves along with an ocean wave. The water mostly moves up and down in place while the energy moves forward.

QUICK CHECK

6.1 Where does a pendulum have the most kinetic energy?

6.2 What energy changes happen in a flashlight?

6.3 Why can you see light from the Sun but not hear sounds from it?

UNIT 7 · SEMESTER 2

Earth’s layers, spheres and the rock cycle

MUST KNOW

- Earth’s layers from outside in: crust, mantle, outer core (liquid iron and nickel) and inner core (solid iron and nickel, kept solid by enormous pressure).
- The crust and the rigid top of the mantle form the lithosphere, which is broken into tectonic plates.
- Earth’s four spheres interact: the geosphere (rock), hydrosphere (water), atmosphere (air) and biosphere (living things). Rain wearing down a mountain is the hydrosphere and atmosphere acting on the geosphere.
- Igneous rock forms when magma or lava cools. Sedimentary rock forms when sediments are compacted and cemented in layers. Metamorphic rock forms when heat and pressure change a rock without melting it.
- In the rock cycle any rock type can become any other, through weathering and erosion, melting, or heat and pressure.
- Renewable resources (sunlight, wind, water, trees) can be replaced in a human lifetime; nonrenewable resources (coal, oil, natural gas, minerals) cannot. Conservation and efficiency make resources last longer.

COMMON MISTAKES

- Saying the inner core is liquid because it is the hottest layer. The pressure is so great that it stays solid; the outer core is the liquid layer.
- Thinking the rock cycle goes in one fixed order. Rocks can take many paths, such as igneous rock becoming metamorphic without ever being sediment.

QUICK CHECK

7.1 Which rock type forms from layers of sediment pressed and cemented together?

7.2 Which layer of Earth is liquid?

7.3 Is natural gas a renewable or a nonrenewable resource? Why?

UNIT 8 · SEMESTER 2

Seasons and tides

MUST KNOW

- Seasons are caused by the tilt of Earth’s axis (about 23.5 degrees) as Earth orbits the Sun, not by changing distance from the Sun.
- When a hemisphere tilts toward the Sun, it gets more direct sunlight and longer days: summer. When it tilts away, sunlight is spread out and days are shorter: winter.
- The Northern and Southern Hemispheres have opposite seasons at the same time.
- Tides are caused mainly by the Moon’s gravity pulling on Earth’s oceans. Most coasts get two high tides and two low tides about every 24 hours and 50 minutes.
- Spring tides (the biggest range) happen at new and full moon, when the Sun, Earth and Moon line up. Neap tides (the smallest range) happen at the quarter moons, when they form a right angle.

COMMON MISTAKES

- Saying summer happens because Earth is closer to the Sun. Earth is actually closest to the Sun in early January, during the Northern Hemisphere’s winter.
- Thinking spring tides only happen in spring. They happen twice a month, at every new moon and full moon.

QUICK CHECK

8.1 It is summer in the United States. What season is it in Australia, and why?

8.2 Why are summer days hotter than winter days?

8.3 Which moon phases bring spring tides?

UNIT 9 · SEMESTER 2

Organisms, cells and ecosystems

MUST KNOW

- Cell theory: all living things are made of cells, the cell is the basic unit of life, and all cells come from existing cells.
- Prokaryotes (bacteria and archaea) are single cells with no nucleus. Eukaryotes (protists, fungi, plants and animals) have cells with a nucleus. Autotrophs make their own food; heterotrophs eat other organisms.
- An ecosystem has biotic (living) parts, like plants and animals, and abiotic (nonliving) parts, like sunlight, water, soil and temperature.
- Levels of organization: organism, population (one species in an area), community (all the populations in an area), ecosystem (the community plus its abiotic factors).
- Relationships: predator and prey, competition for the same resources, and symbiosis: mutualism (both benefit), commensalism (one benefits, the other is unaffected) and parasitism (one benefits, the host is harmed).
- Individuals in a population vary. Those with traits that suit the environment are more likely to survive and reproduce, so those traits become more common.

COMMON MISTAKES

- Mixing up population and community. A population is one species; a community is every species living in the area.
- Calling every relationship where one organism benefits parasitism. If the other organism is not harmed, it is commensalism.
- Listing fungi as plants. Fungi cannot make their own food; they absorb it, often as decomposers.

QUICK CHECK

9.1 Bees get nectar from flowers and carry pollen between them. What kind of relationship is this?

9.2 Name two abiotic factors in a pond ecosystem.

9.3 A cell has no nucleus. Is it a prokaryote or a eukaryote?

Answer key

Unit 1: Solids, liquids and gases

1.1 A liquid. It keeps the same volume but takes the shape of whatever container it is in.

1.2 They gain energy, move faster and slide past each other instead of vibrating in fixed places.

1.3 50 g. Changing state does not add or remove matter, so the mass stays the same.

Unit 2: Pure substances, mixtures and the periodic table

2.1 A mixture, a homogeneous one called a solution. The sugar and water are not chemically joined, and evaporating the water leaves the sugar behind.

2.2 Use a magnet. It pulls out the iron filings and leaves the sand.

2.3 With the metals, on the left side and middle of the table. Luster, malleability and conductivity are metal properties.

Unit 3: Density and physical properties

3.1 $3\ \mathrm{g/cm^3}$, because $30 \div 10 = 3$. It is denser than water, so it sinks.

3.2 $0.6\ \mathrm{g/cm^3}$. The mass and volume are both halved, so their ratio does not change.

3.3 15 mL, the amount of water it pushed aside: $55 - 40 = 15$.

Unit 4: Physical and chemical changes

4.1 Chemical. Iron combines with oxygen to make rust, a new substance with a different color and properties.

4.2 Gas bubbles form without boiling. The reaction makes a new substance, carbon dioxide gas.

4.3 Any two of: tearing, folding, cutting, crumpling or getting it wet. Burning it would be a chemical change.

Unit 5: Forces, net force and Newton's third law

5.1 10 N to the right, because $30 - 20 = 10$. The forces are unbalanced, so the box speeds up to the right.

5.2 Balanced. Gravity pulls down and the table pushes up with an equal force, so the book stays at rest.

5.3 Forward, with an equal force. That is Newton's third law.

Unit 6: Energy, energy changes and waves

6.1 At the bottom of its swing, where it moves fastest. It has the most potential energy at the top of each swing.

6.2 Chemical energy in the battery becomes electrical energy, which the bulb changes into light and thermal energy.

6.3 Light can travel through the vacuum of space. Sound needs a medium such as air or water, and space has almost none.

Unit 7: Earth's layers, spheres and the rock cycle

7.1 Sedimentary rock, such as sandstone or limestone. It often contains fossils.

7.2 The outer core, made mostly of liquid iron and nickel.

7.3 Nonrenewable. It took millions of years to form, so it cannot be replaced as fast as people use it.

Unit 8: Seasons and tides

8.1 Winter. The Southern Hemisphere is tilted away from the Sun when the Northern Hemisphere is tilted toward it.

8.2 Sunlight hits the ground more directly, concentrating its energy, and the days are longer, so there is more time to heat up.

8.3 New moon and full moon, when the Sun, Earth and Moon are lined up and their pulls on the oceans combine.

Unit 9: Organisms, cells and ecosystems

9.1 Mutualism. Both benefit: the bee gets food and the flower gets pollinated.

9.2 Any two nonliving parts, such as water, sunlight, temperature, rocks or dissolved oxygen.

9.3 A prokaryote, such as a bacterium. Eukaryotic cells have a nucleus.