FINALS REVIEW · GRADE 7

7th Grade Science Final Exam Review

Everything on a typical 7th 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 7th Grade Science final

Many schools teach matter, motion, forces and thermal energy in the first semester, then the solar system, Earth’s history, water, ecosystems and the human body in the second. Life science courses often start with cells and body systems instead, 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. Atoms, elements and compounds	Semester 1	Grade 7 Science: Elements, Compounds and Solutions, Matter & Atoms
2. Chemical changes and solutions	Semester 1	Grade 7 Science: Elements, Compounds and Solutions
3. Speed, velocity and motion graphs	Semester 1	Grade 7 Science: Motion, Forces and Thermal Energy
4. Forces and Newton’s first law	Semester 1	Grade 7 Science: Motion, Forces and Thermal Energy, Forces & Motion
5. Thermal energy and heat transfer	Semester 1	Grade 7 Science: Motion, Forces and Thermal Energy, Matter & Atoms
6. The solar system and gravity	Semester 2	Grade 7 Science: Solar System, Earth’s History and Water
7. Earth’s history, plates and water	Semester 2	Grade 7 Science: Solar System, Earth’s History and Water, Plate Tectonics

Unit	Usually on	Lessons
8. Ecosystems, energy flow and classifying life	Semester 2	Grade 7 Science: Ecosystems, Body Systems and the Diversity of Life, Grade 6 Science: Organisms and Environments
9. Body systems, reproduction and selection	Semester 2	Grade 7 Science: Ecosystems, Body Systems and the Diversity of Life, 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

Atoms, elements and compounds

MUST KNOW

- An atom has a nucleus of protons (positive) and neutrons (no charge), with electrons (negative) around it. The number of protons, the atomic number, decides which element it is.
- An element is made of only one kind of atom. Its chemical symbol is one or two letters, and only the first letter is a capital: Co is cobalt, but CO is carbon monoxide.
- A molecule is two or more atoms bonded together, like $\mathrm{O_2}$. A compound is two or more different elements chemically combined in a fixed ratio, like water, $\mathrm{H_2O}$.
- A compound has different properties from its elements: sodium (a reactive metal) and chlorine (a poisonous gas) combine to make table salt.
- In a chemical formula, a subscript counts the atoms of the element just before it. $\mathrm{CO_2}$ has 1 carbon atom and 2 oxygen atoms.
- A coefficient in front counts whole molecules: $\mathrm{2H_2O}$ is two water molecules, with 4 hydrogen atoms and 2 oxygen atoms.

COMMON MISTAKES

- Applying a subscript to every element in the formula. In $\mathrm{H_2O}$ the 2 belongs only to hydrogen.
- Saying every molecule is a compound. $\mathrm{O_2}$ is a molecule but not a compound, because it has only one element.

QUICK CHECK

1.1 How many atoms of each element are in $\mathrm{C_6H_{12}O_6}$ (glucose)?

1.2 An atom has 8 protons. Which element is it?

1.3 Is NaCl an element or a compound?

UNIT 2 · SEMESTER 1

Chemical changes and solutions

MUST KNOW

- A chemical change makes a new substance. Evidence includes gas bubbles, an unexpected color change, a temperature change, light, a new odor or a precipitate.
- A physical change alters size, shape or state but not the substance. Dissolving and changes of state are physical.
- In a solution, the solute (the substance that dissolves) spreads evenly through the solvent (the substance it dissolves in). Water dissolves so many substances that it is called the universal solvent.
- Concentration is how much solute is in a given amount of solution. Adding more solvent makes a solution more dilute; adding more solute makes it more concentrated.
- A solid dissolves faster when you stir, heat the solvent or break the solid into smaller pieces, which gives it more surface area.

COMMON MISTAKES

- Mixing up solute and solvent. In salt water, salt is the solute and water is the solvent.
- Thinking a dilute solution has less solute because you added water. Adding water keeps the solute the same; only the amount of solution grows.

QUICK CHECK

2.1 In lemonade made from powder and water, what is the solute and what is the solvent?

2.2 Give two ways to make a sugar cube dissolve faster in water.

2.3 Two liquids are mixed and a cloudy solid appears. What kind of change is this, and what is the solid called?

UNIT 3 · SEMESTER 1

Speed, velocity and motion graphs

MUST KNOW

- Average speed is total distance divided by total time: $s = \frac{d}{t}$. Units include meters per second (m/s) and kilometers per hour (km/h).
- Velocity is speed in a given direction, such as 20 m/s north. Two cars with the same speed have different velocities if they travel in different directions.
- On a distance-time graph, a steeper line means a faster speed, a horizontal line means the object is stopped, and a straight sloped line means a constant speed.
- A curved line on a distance-time graph means the speed is changing: the object is speeding up or slowing down.

COMMON MISTAKES

- Reading a flat line on a distance-time graph as moving at a steady speed. Flat means the distance is not changing, so the object is stopped.
- Averaging two speeds instead of dividing total distance by total time. If the times differ, the simple average is wrong.

QUICK CHECK

3.1 A cyclist rides 30 km in 2 hours. What is the average speed?

3.2 A runner keeps a speed of 5 m/s for 40 seconds. How far does she run?

3.3 On a distance-time graph, line A is steeper than line B. Which object is faster?

UNIT 4 · SEMESTER 1

Forces and Newton’s first law

MUST KNOW

- Newton’s first law: an object at rest stays at rest, and an object in motion keeps moving at the same speed and direction, unless an unbalanced force acts on it.
- Inertia is an object’s resistance to a change in motion. The more mass an object has, the more inertia it has.
- Balanced forces (net force of zero) do not change motion. Unbalanced forces make an object speed up, slow down or change direction.
- Friction is a force that opposes motion between surfaces. It is why a rolling ball eventually stops on the ground.
- Seat belts work because of inertia: when a car stops suddenly, your body keeps moving forward until the belt applies a force.

COMMON MISTAKES

- Thinking a moving object needs a constant force to keep moving. Without friction or another unbalanced force, it would keep going forever.
- Saying inertia is a force. It is a property of matter that depends on mass.

QUICK CHECK

4.1 A hockey puck slides across ice and slowly stops. Which force stopped it?

4.2 Which is harder to push into motion: an empty shopping cart or a full one? Why?

4.3 A car moves at a constant 60 km/h on a straight road. Are the forces on it balanced?

UNIT 5 · SEMESTER 1

Thermal energy and heat transfer

MUST KNOW

- Temperature measures the average kinetic energy of an object's particles. Thermal energy is the total kinetic energy of all its particles.
- Heat is thermal energy moving from a warmer object to a cooler one. It keeps flowing until both reach the same temperature, called thermal equilibrium.
- Conduction is transfer by direct contact, such as a metal spoon heating up in hot soup. Metals are good conductors; wood, plastic and air are insulators.
- Convection is transfer by currents in liquids and gases: warmer, less dense fluid rises and cooler, denser fluid sinks.
- Radiation is transfer by electromagnetic waves, which need no matter. It is how the Sun warms Earth across space.

COMMON MISTAKES

- Saying cold flows into something. Only thermal energy moves, and always from warmer to cooler: your hand feels cold because heat leaves it.
- Thinking an object with a higher temperature always has more thermal energy. A bathtub of warm water has more thermal energy than a cup of hot cocoa because it has far more particles.

QUICK CHECK

5.1 Which type of heat transfer warms the air near the ceiling of a room first?

5.2 An ice cube sits in a glass of juice. Which way does thermal energy move?

5.3 Why do cooking pans often have plastic or wooden handles?

UNIT 6 · SEMESTER 2

The solar system and gravity

MUST KNOW

- The solar system has the Sun (a star holding almost all of the system’s mass), eight planets, dwarf planets such as Pluto, moons, asteroids and comets.
- The inner planets (Mercury, Venus, Earth, Mars) are small and rocky. The outer planets (Jupiter, Saturn, Uranus, Neptune) are giants made mostly of gas and ice. The asteroid belt lies between Mars and Jupiter.
- Gravity keeps the planets in orbit around the Sun and the Moon in orbit around Earth. The pull is stronger between objects with more mass and weaker the farther apart they are.
- Earth can support life because it has liquid water, an atmosphere with oxygen and an ozone layer that blocks harmful ultraviolet light, a magnetic field that deflects solar wind, and a distance from the Sun that keeps temperatures moderate.

COMMON MISTAKES

- Saying there is no gravity in space. Gravity reaches across space; astronauts float because they are falling around Earth in orbit.
- Mixing up mass and weight. Mass stays the same everywhere; weight is the pull of gravity, so you would weigh less on the Moon.

QUICK CHECK

6.1 What keeps Earth in orbit around the Sun?

6.2 Name the four inner planets in order from the Sun.

6.3 Give two features that make Earth able to support life.

UNIT 7 · SEMESTER 2

Earth’s history, plates and water

MUST KNOW

- Law of superposition: in undisturbed rock layers, the oldest layers are at the bottom and the youngest are on top.
- Fossils show past life and environments: fossil seashells high on a mountain mean that rock formed under an ocean.
- Earth’s lithosphere is broken into plates that move a few centimeters a year. Evidence includes matching fossils and rocks on different continents and seafloor spreading at mid-ocean ridges.
- At convergent boundaries plates collide (mountains, trenches, volcanoes). At divergent boundaries they move apart (mid-ocean ridges, rift valleys). At transform boundaries they slide past each other (earthquakes, like on the San Andreas Fault).
- A watershed is all the land that drains into one river, lake or ocean. Pollution anywhere upstream can travel to everyone downstream.
- Groundwater fills spaces in permeable rock and soil; an aquifer stores it, and the water table is the top of the saturated layer.

COMMON MISTAKES

- Assuming the top rock layer is always the oldest because it has been there longest. Layers pile up over time, so the top is youngest unless the rock was folded or overturned.
- Mixing up convergent and divergent. Convergent means coming together; divergent means moving apart.

QUICK CHECK

7.1 A fossil is found in layer C, which lies below layers A and B. Which layer is oldest?

7.2 What kind of plate boundary formed the Himalayas?

7.3 A factory dumps chemicals into a creek far upstream. Why might a town downstream care?

UNIT 8 · SEMESTER 2

Ecosystems, energy flow and classifying life

MUST KNOW

- Producers (plants and algae) capture the Sun’s energy. Consumers eat other organisms, and decomposers break down dead matter and return nutrients to the soil.
- In an energy pyramid only about 10% of the energy at one level passes to the next; the rest is used for life processes or given off as heat. That is why there are fewer top predators.
- Energy flows one way through an ecosystem, but matter cycles: carbon, water and nitrogen are used again and again.
- In a food chain or food web, arrows point in the direction energy flows, from the organism eaten to the organism that eats it.
- Scientists classify life from broad to specific: domain, kingdom, phylum, class, order, family, genus, species. A scientific name uses genus and species, such as Homo sapiens.
- The kingdoms include bacteria, archaea, protists, fungi, plants and animals. Fungi are decomposers that absorb their food; they are not plants.

COMMON MISTAKES

- Drawing food-chain arrows from the eater to the food. The arrow points from grass to rabbit, because energy moves from the grass into the rabbit.
- Saying energy is recycled in an ecosystem. Matter is recycled; energy flows through and leaves as heat, so the Sun must keep supplying it.

QUICK CHECK

8.1 Producers in a pyramid hold 10,000 units of energy. About how much reaches the primary consumers?

8.2 What is the job of decomposers such as mushrooms and bacteria?

8.3 Which two levels make up an organism’s scientific name?

UNIT 9 · SEMESTER 2

Body systems, reproduction and selection

MUST KNOW

- Levels of organization: cells form tissues, tissues form organs, organs form organ systems, and organ systems form an organism.
- The circulatory system moves blood, oxygen and nutrients; the respiratory system takes in oxygen and gets rid of carbon dioxide; the digestive system breaks food into nutrients; the nervous system controls the body with signals from the brain.
- Body systems work together: the respiratory system brings in oxygen, and the circulatory system carries it to every cell.
- Asexual reproduction has one parent and makes offspring identical to it, such as bacteria dividing or a plant growing from a runner. Sexual reproduction has two parents and makes offspring with a mix of traits.
- Natural selection: organisms with traits better suited to their environment survive and reproduce more, so those traits become more common over generations.
- Artificial selection: people choose which organisms breed to get traits they want, as with dog breeds and crops like corn.

COMMON MISTAKES

- Saying individual organisms evolve or adapt by choice during their lives. Populations change over many generations as helpful traits are passed on.
- Calling asexual reproduction better because it is faster. It produces no variation, so a disease or a change in the environment can wipe out the whole population.

QUICK CHECK

9.1 Put these in order from smallest to largest: organ, cell, organ system, tissue.

9.2 Which two body systems work together to deliver oxygen to your cells?

9.3 Farmers keep seeds only from the sweetest strawberry plants each year. Is this natural or artificial selection?

Answer key

Unit 1: Atoms, elements and compounds

1.1 6 carbon, 12 hydrogen and 6 oxygen atoms, 24 atoms in all.

1.2 Oxygen. The atomic number, the number of protons, identifies the element, and oxygen's is 8.

1.3 A compound. It is made of two different elements, sodium and chlorine, chemically combined.

Unit 2: Chemical changes and solutions

2.1 The powder is the solute and the water is the solvent.

2.2 Any two of: stir the water, heat the water, or crush the cube into smaller pieces to increase its surface area.

2.3 A chemical change. The solid that forms is called a precipitate, a new substance.

Unit 3: Speed, velocity and motion graphs

3.1 15 km/h, because $30 \div 2 = 15$.

3.2 200 m. Distance equals speed times time: $5 \times 40 = 200$.

3.3 Object A. A steeper line covers more distance in the same time.

Unit 4: Forces and Newton's first law

4.1 Friction between the puck and the ice, an unbalanced force opposite its motion.

4.2 The full one. It has more mass, so it has more inertia.

4.3 Yes. Its speed and direction are not changing, so the net force is zero.

Unit 5: Thermal energy and heat transfer

5.1 Convection. Air warmed by the heater becomes less dense and rises.

5.2 From the warmer juice into the ice, until they reach the same temperature.

5.3 Plastic and wood are insulators, so they conduct little heat to your hand.

Unit 6: The solar system and gravity

6.1 The Sun's gravity, which constantly pulls Earth toward it while Earth moves forward.

6.2 Mercury, Venus, Earth, Mars.

6.3 Any two of: liquid water, an atmosphere with oxygen, an ozone layer, a magnetic field, or a distance from the Sun that keeps temperatures moderate.

Unit 7: Earth's history, plates and water

7.1 Layer C, assuming the layers have not been overturned. Lower layers formed first.

7.2 A convergent boundary, where the Indian Plate collides with the Eurasian Plate.

7.3 They share the same watershed, so the pollution flows downstream into the town’s water.

Unit 8: Ecosystems, energy flow and classifying life

8.1 About 1,000 units, roughly 10%.

8.2 They break down dead organisms and wastes and return nutrients to the soil for producers to use.

8.3 Genus and species, as in Homo sapiens.

Unit 9: Body systems, reproduction and selection

9.1 Cell, tissue, organ, organ system.

9.2 The respiratory system brings oxygen into the lungs, and the circulatory system carries it in the blood to every cell.

9.3 Artificial selection, because people are choosing which plants reproduce.