CLASS 7 SCIENCE FORMULAS HANDBOOK

Class 7 Science Formulas Handbook (Chapter-wise)

A chapter-wise handbook of key facts, definitions and concepts from the Class 7 NCERT Science textbook (Curiosity, 2026-27 edition). This handbook is now complete, covering all 12 chapters of the book, added as each chapter's Solutions/Extra Questions/Revision Notes were published.

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See also: Class 7 Science NCERT Book

Chapter 1: The Ever-Evolving World of Science

Core idea: science is an ongoing process of curiosity, questioning and exploration — not a fixed set of facts.

Cause and effect: recognising patterns/causes lets us explain and predict events (e.g. rain → wet ground).

Sour fruits: sourness comes from natural acids (e.g. citric acid); acid content and ripeness both affect taste.

Haldi + soap: soap is basic/alkaline and reacts with turmeric's pigment, turning a stain reddish — a preview of acid-base chemistry.

Themes previewed for later chapters: conductors/insulators, reversible vs permanent changes, heat speeding up changes, animal life processes, photosynthesis, light/shadows/eclipses.

See full Chapter 1 Solutions.

Chapter 2: Exploring Substances – Acidic, Basic and Neutral

Litmus paper (from lichen extract): acids turn blue litmus red; bases turn red litmus blue; neutral substances cause no change.

Natural indicators: turmeric (red in base, no change in acid/neutral); red rose extract (red in acid, green in base).

Olfactory indicators: onion, vanilla — change smell with acid/base exposure.

Acidic examples: lemon (citric acid), tamarind (tartaric acid), vinegar (acetic acid). Basic examples: soap, baking soda, lime water, washing powder. Neutral: tap water, sugar solution, salt solution.

Neutralisation: mixing acid + base cancels out each other's character, moving toward neutral (used for acidic soil, industrial waste, antacids).

See full Chapter 2 Solutions.

Chapter 3: Electricity – Circuits and their Components

A circuit is a closed path for electric current; it must be complete for a lamp/device to work.

A cell has two terminals; connecting multiple cells in series (correct polarity) adds their voltages (e.g., 1.5V times 3 = 4.5V).

A switch is a device that opens or closes a circuit; ON = closed circuit, OFF = open circuit.

Conductors (allow current to flow): metals like copper, aluminium, iron; also graphite (a non-metal conductor).

Insulators (block current flow): wood, plastic, glass, paper, wax, rubber.

Wires are insulated with plastic/rubber coating for safety, to prevent short circuits and electric shocks.

LEDs only light up when connected with correct polarity (unlike incandescent lamps, which work either way).

Common circuit symbols: cell (long and short parallel lines), battery (multiple cells), switch, bulb/LED, connecting wire.

Chapter 4: The World of Metals and Non-metals

Metals are generally lustrous, malleable, ductile, sonorous, and good conductors of heat and electricity (e.g. copper, aluminium, iron, gold, sodium).

Non-metals are generally non-lustrous, brittle, poor conductors, and often gaseous (e.g. sulphur, oxygen, nitrogen, carbon); graphite is an exception, being a non-metal that conducts electricity.

Metal oxides are generally basic (turn red litmus blue); non-metal oxides are generally acidic (turn blue litmus red).

Rusting of iron requires both air and water together; removing either prevents rusting.

Sodium is highly reactive and is stored in kerosene oil for safety.

Copper is preferred for boiling-water vessels since it conducts heat well and resists corrosion better than iron.

Protective coatings like zinc (galvanisation) prevent iron from rusting by blocking air and moisture.

Chapter 5: Changes Around Us – Physical and Chemical

A physical change only alters shape, size, or state; no new substance is formed, and it is often reversible.

A chemical change forms new substance(s) with different properties and is generally irreversible.

Reversible changes (melting ice, dissolving sugar) can be undone; irreversible changes (rusting, burning, ripening) cannot.

Combustion requires three things: a combustible substance (fuel), oxygen, and reaching the ignition temperature.

Ignition temperature is the minimum temperature at which a substance catches fire.

Some processes, like burning a candle, involve both physical change (melting/evaporating wax) and chemical change (burning wax vapour) together.

Lime water turns milky when carbon dioxide gas passes through it (forms calcium carbonate) – a standard test for CO_2.

Rusting of iron and curdling of milk are classic chemical changes; magnesium oxide (from burning magnesium) is basic in nature.

Chapter 6: Adolescence – A Stage of Growth and Change

Adolescence is the transitional stage between childhood and adulthood (roughly ages 10-19), marked by the onset of puberty.

Hormones (estrogen in girls, testosterone in boys) drive physical changes (secondary sexual characteristics) and also influence emotions.

Physical changes only in boys: voice change, moustache/facial hair growth. Only in girls: breast development, menstruation. Common to both: pimples, pubic and armpit hair growth.

Adolescence also brings emotional and behavioural changes: mood swings, desire for independence, peer pressure, identity exploration.

A balanced diet with iron and calcium is essential during adolescence; iron deficiency can cause anaemia, especially in girls due to menstrual blood loss.

Goitre (thyroid enlargement from iodine deficiency) is different from the normal growth of the voice box (Adams apple) in boys during puberty.

Proper menstrual hygiene and responsible social media habits are important health and safety practices during adolescence.

Chapter 7: Heat Transfer in Nature

Three modes of heat transfer: conduction (in solids, particle-to-particle, no particle movement), convection (in liquids/gases, heated particles physically move), and radiation (no medium needed, e.g. heat from the Sun or fire).

Good conductors: metals like steel and aluminium. Poor conductors (insulators): wood, plastic, bakelite, air.

Hot air/liquid becomes lighter and rises; cooler, denser air/liquid sinks – this circulating movement is convection.

Sea breeze (day): cooler air flows from sea to land. Land breeze (night): cooler air flows from land to sea. Water bodies moderate nearby temperatures since water heats and cools more slowly than land.

Infiltration: water seeps through soil/rock into the ground and gets stored in aquifers. Seepage rate: gravel (fastest) greater than sand greater than clay (slowest), based on particle/pore size.

The water cycle (evaporation, condensation, precipitation) continuously redistributes and replenishes water on Earth.

Chapter 8: Measurement of Time and Motion

Before mechanical clocks, time was measured using sundials, water clocks, hourglasses, and candle clocks.

Speed = Distance divided by Time. To convert km/h to m/s, multiply by 5/18; to convert m/s to km/h, multiply by 18/5.

Uniform motion: equal distances covered in equal time intervals (constant speed). Non-uniform motion: unequal distances in equal time intervals (changing speed) – the more common type in daily life.

Average speed = Total distance divided by Total time taken, applicable even for non-uniform motion.

Chapter 9: Life Processes in Animals

Digestion begins in the mouth with salivary amylase breaking down starch; iodine test detects starch (blue-black colour).

Rumination: cud-chewing in cows and other ruminants, aided by a multi-chambered stomach and gut microbes, for efficient digestion of fibrous plant matter.

Breathing (mechanical inhale/exhale) vs **respiration** (cellular energy release using oxygen) are distinct processes.

Air pathway: nostrils → nasal passages → windpipe → alveoli (gas exchange); ribcage protects lungs; diaphragm drives inhalation/exhalation.

Inhaled air is oxygen-rich; exhaled air is carbon-dioxide-rich. Lime water turns milky in presence of CO_2 — used to test exhaled air.

Chapter 10: Life Processes in Plants

Photosynthesis: CO_2 + Water –(sunlight+chlorophyll)–> Glucose + Oxygen; occurs in green parts of the plant, needs light.

Glucose is stored as **starch**; iodine test (blue-black) confirms starch.

Stomata (leaf pores) allow gas exchange; **xylem** transports water/minerals from roots upward.

Respiration: Glucose + Oxygen → CO_2 + Water + Energy; occurs in all living cells, all the time.

Lime water turns milky with CO_2 — used to show plants/seeds respire.

Chapter 11: Light: Shadows and Reflections

Luminous objects produce their own light (Sun, stars); non-luminous objects (Moon, planets) are seen only by reflecting light.

Light travels in a straight line (rectilinear propagation) and cannot bend around obstacles.

Materials: transparent (clear view, nearly all light passes — glass, water), translucent (blurred view, partial light — butter paper), opaque (no view, blocks all light — wood, metal).

Shadow formation needs a light source, an opaque object, and a screen; shadow is larger/blurrier when the object is closer to the source, smaller/sharper when closer to the screen.

Shadow length is shortest around noon (Sun overhead) and longest in early morning/late evening (Sun near horizon).

Reflection: smooth surfaces give regular (clear) reflection; rough surfaces give diffuse reflection/scattering.

Plane mirror image: virtual, erect, same size as object, laterally inverted (left-right reversed, not up-down); image distance behind mirror = object distance in front.

Pinhole camera forms a small, real, inverted image because light rays cross over at the pinhole.

Periscope: two plane mirrors at 45° to the tube redirect light through two 90° turns, used to see over/around obstacles.

Chapter 12: Earth, Moon and the Sun

Rotation (Earth spinning on its axis, ~24 hours) causes day and night and the apparent east-to-west motion of the Sun and stars; revolution (Earth orbiting the Sun, ~365 days) combined with the ~23.5° axial tilt causes the seasons, not distance from the Sun.

Pole Star appears nearly fixed since it lies near Earth's rotational axis; other stars appear to rise about 4 minutes earlier each night, shifting by a full day over a year.

Equinoxes (~21 March, ~22/23 September): day and night close to equal everywhere; solstices: maximum tilt effect, extreme day/night lengths especially near the poles.

Solar eclipse: Moon between Sun and Earth (new Moon), small shadow (umbra), narrow visibility, needs eye protection. Lunar eclipse: Earth between Sun and Moon (full Moon), large shadow, wide visibility, safe to view; Moon often looks reddish ("blood moon").

Moon appears to match the Sun's size in the sky because apparent size depends on both actual size and distance — the Sun is roughly 400 times wider than the Moon but also roughly 400 times farther away.

See full Chapter 12 Solutions.