

SEE Science: Quick Revision of Physics, Chemistry and Biology

SEE science is part definitions, part formulas and part diagrams. This note collects the core of each so you can revise a whole subject area in one evening. Use it beside your textbook, then close it and test yourself.

The textbook and syllabus decide what is examined. Use this note for revision and to find weak spots, not instead of the book.

Physics

Motion and force

- Speed = distance / time; velocity = displacement / time; acceleration = change in velocity / time.
- Equations of motion: $v = u + at$; $s = ut + \frac{1}{2}at^2$; $v^2 = u^2 + 2as$.
- Newton's second law: $F = ma$. Weight $W = mg$ (g is about 9.8 m/s^2).
- Work = force x distance; power = work / time; kinetic energy = $\frac{1}{2}mv^2$; potential energy = mgh .
- Pressure = force / area; density = mass / volume.

Electricity

- Ohm's law: $V = IR$ (at constant temperature).
- Resistors in series: $R = R_1 + R_2$; in parallel: $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$.
- Electric power $P = VI = I^2R$; energy = power x time (kilowatt-hour is the unit on your electricity bill).

Light

- Reflection: angle of incidence equals the angle of reflection. Refraction: light bends when it changes medium; refractive index = $\sin i / \sin r$.
- Lens formula: $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$. A convex lens converges light; a concave lens diverges it.

Chemistry

- **Atom:** protons (+) and neutrons in the nucleus, electrons (-) in shells. Atomic number = number of protons.

- **Periodic table:** elements are arranged by increasing atomic number. Groups are vertical columns, periods are horizontal rows. Elements in a group share properties.
- **Acids and bases:** acids turn blue litmus red and have pH below 7; bases turn red litmus blue and have pH above 7; pH 7 is neutral. Acid + base gives salt + water (neutralisation).
- **Reactivity of metals (high to low):** potassium, sodium, calcium, magnesium, aluminium, zinc, iron, lead, copper, silver, gold. A more reactive metal displaces a less reactive one from its salt.
- **Balancing equations:** the number of each kind of atom must be the same on both sides.
Example: $2\text{H}_2 + \text{O}_2$ gives $2\text{H}_2\text{O}$.
- **Carbon compounds:** carbon forms long chains and covalent bonds; hydrocarbons burn to give carbon dioxide and water.

Biology

- **Cell:** the basic unit of life. Plant cells have a cell wall, chloroplasts and a large vacuole; animal cells do not.
- **Photosynthesis:** carbon dioxide + water, in light and with chlorophyll, gives glucose + oxygen.
- **Respiration:** glucose + oxygen gives carbon dioxide + water + energy.
- **Digestion:** mouth, oesophagus, stomach, small intestine (most absorption), large intestine; the liver and pancreas help.
- **Circulation:** the heart pumps blood through arteries (away from the heart), veins (towards it) and capillaries (where exchange happens).
- **Heredity:** traits pass through genes on chromosomes; a dominant allele shows when present, a recessive allele only when paired.
- **Environment:** food chains start with producers, then consumers, then decomposers; energy falls at each level.

Diagrams worth practising

1. Ray diagrams for a convex lens (object at different positions).
2. A simple circuit with a cell, switch, bulb, ammeter and voltmeter.
3. The human heart, the digestive system and a plant cell, with clear labels.

Practice questions

1. A car goes from rest to 20 m/s in 5 s. Find the acceleration.
2. Two 6 ohm resistors are in parallel. What is the total resistance?
3. What is the pH range of acids?

4. Write the word equation for photosynthesis.

Answers: 1) $a = (20 - 0) / 5 = 4 \text{ m/s}^2$. 2) $1/R = 1/6 + 1/6 = 1/3$, so $R = 3 \text{ ohm}$. 3) Below 7. 4) Carbon dioxide + water, with light and chlorophyll, gives glucose + oxygen.

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