Hampshire County Council
Improvement and Advisory Service

HIAS MOODLE OPEN RESOURCE

Quick wins

20 facts for each paper

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Final version

🧬 BIOLOGY PAPER 1 – 20 MUST-KNOW FACTS

Cell Biology

1. Prokaryotic cells have **no nucleus**; DNA is in a loop.
2. Mitochondria = site of **aerobic respiration**.
3. Ribosomes = site of **protein synthesis**.
4. Diffusion is movement from **high → low concentration**.
5. Osmosis = diffusion of **water through a partially permeable membrane**.

Organisation

1. Enzymes have an **optimum temperature and pH**; extremes denature them.
2. Bile neutralises acid + **emulsifies fat**, increasing surface area.
3. Arteries have **thick, elastic walls**; veins have valves.
4. The alveoli are adapted for gas exchange via **large surface area and thin walls**.
5. Coronary heart disease is caused by **fatty deposits blocking coronary arteries**.

Infection and Response

1. White blood cells defend by: phagocytosis, antibodies, antitoxins.
2. Vaccines introduce **dead or weakened pathogens** to stimulate immunity.
3. Antibiotics kill **bacteria**, not viruses.
4. Painkillers reduce symptoms but **don't kill pathogens**.
5. Pathogens may be spread by air, water, or direct contact.

Bioenergetics

1. Photosynthesis occurs in **chloroplasts** and needs light.
2. Photosynthesis equation: **CO_2 + H_2O → glucose + O_2** (light).
3. Limiting factors: light, temperature, CO_2.
4. Aerobic respiration releases **more energy** than anaerobic.
5. Anaerobic respiration in muscles produces **lactic acid**.

🧬 BIOLOGY PAPER 2 – 20 MUST-KNOW FACTS

Homeostasis

1. Homeostasis maintains **constant internal conditions**.
2. Reflex arcs are **automatic and rapid**, protecting the body.
3. Insulin lowers blood glucose by converting it to **glycogen**.
4. Glucagon raises blood glucose by converting **glycogen → glucose**.
5. ADH controls water balance by acting on the **kidney tubules**.

Reproduction and Genetics

1. Mitosis → **2 identical cells**; meiosis → **4 genetically different gametes**.
2. Sexual reproduction leads to **variation**; asexual does not.
3. DNA is a **polymer** made of nucleotides forming a double helix.
4. Genes code for **proteins**.
5. Dominant alleles are expressed with only **one copy**.

Variation and Evolution

1. Variation is caused by **genes and environment**.
2. Natural selection: organisms best adapted are **more likely to survive & reproduce**.
3. Selective breeding chooses parents with **desired characteristics**.
4. Genetic engineering transfers genes between organisms.
5. Fossils provide evidence for **evolution**.

Ecology

1. Producers begin food chains by **photosynthesis**.
2. Biomass decreases at each trophic level due to energy losses.
3. The carbon cycle involves **photosynthesis, respiration, combustion, decay**.
4. Deforestation increases **carbon dioxide levels**.
5. Pollution affects air, water, and land – damaging biodiversity.

⚗️ CHEMISTRY PAPER 1 – 20 MUST-KNOW FACTS

Atomic Structure and Periodic Table

1. Atoms contain protons (+), neutrons (0), electrons (–).
2. Atomic number = **protons**; mass number = **protons + neutrons**.
3. Group 1 metals become **more reactive down the group**.
4. Group 7 halogens become **less reactive down the group**.
5. Noble gases are **unreactive** due to full outer shells.

Bonding

1. Ionic bonding: **metal + non-metal** → transfer of electrons.
2. Covalent bonding: **non-metals share electrons**.
3. Giant ionic lattices have **high melting points** due to strong attractions.
4. Simple covalent molecules have **low melting points**.
5. Metals conduct electricity due to **delocalised electrons**.

Quantitative Chemistry

1. One mole = **Avogadro's number of particles**.
2. Mass is conserved in chemical reactions.
3. Percentage yield = **(actual ÷ theoretical) × 100**.
4. Concentration = **mass ÷ volume**.
5. Balancing equations ensures equal atoms on both sides.

Chemical Changes

1. Acids + metals → **salt + hydrogen**.
2. Acids + bases → **salt + water**.
3. Electrolysis uses electricity to break down **ionic compounds**.
4. Reactive metals form **positive ions**.
5. Neutralisation involves **H^+ ions reacting with OH^- ions**.

⚗️ CHEMISTRY PAPER 2 – 20 MUST-KNOW FACTS

(This is the list you already have — included here for completeness.)

Rates and Equilibrium

1. Higher temperature increases rate via faster collisions.
2. Higher concentration/pressure increases collisions.
3. Catalysts lower activation energy.
4. Reversible reactions reach **dynamic equilibrium**.
5. Increasing temperature favours the **endothermic** direction.

Organic Chemistry

1. Crude oil is separated by fractional distillation due to **boiling point differences**.
2. Alkenes decolourise **bromine water**.
3. Cracking produces alkenes + alkanes.
4. Alkanes are **saturated**; alkenes are **unsaturated**.
5. Combustion of hydrocarbons produces **CO_2 and H_2O**.

Chemical Analysis

1. Chromatography separates mixtures by solubility.
2. Rf values allow identification of substances.
3. Flame tests identify metal ions.
4. Gas tests:
   • Oxygen → relights splint
   • Hydrogen → squeaky pop
   • CO_2 → cloudy limewater
5. Instrumental analysis is **fast, accurate, sensitive**.

Atmosphere & Resources

1. Early atmosphere mostly CO_2; now mostly **nitrogen & oxygen**.
2. Greenhouse gases absorb **infrared radiation**.
3. Pollution causes acid rain, global warming, health problems.
4. Life cycle assessments compare environmental impact.
5. Potable water requires **filtration & sterilisation**.

PHYSICS PAPER 1 – 20 MUST-KNOW FACTS

Energy

1. Energy cannot be created or destroyed — **conservation of energy**.
2. Gravitational potential energy = **mgh**.
3. Kinetic energy = **½mv²**.
4. Efficiency = **useful ÷ total**.
5. Power = **energy ÷ time**.

Electricity

1. Current is the **flow of charge**.
2. Voltage = **current × resistance**.
3. Series circuits share voltage; parallel circuits share current.
4. AC mains in UK = **230 V**.
5. Resistance increases with temperature in a **filament lamp**.

Particle Model

1. Density = **mass ÷ volume**.
2. Heating increases internal energy.
3. Specific heat capacity = energy needed to heat **1 kg by 1°C**.
4. Specific latent heat = energy for **state change** without temperature change.
5. Gas pressure increases when temperature increases.

Atomic Structure

1. Ionising radiation includes alpha, beta, gamma.
2. Alpha is **most ionising**, gamma least.
3. Half-life = time for activity to halve.
4. Nuclear fission splits nuclei to release energy.
5. Background radiation comes from **rocks, radon gas, cosmic rays, medical** sources.

PHYSICS PAPER 2 — 20 MUST-KNOW FACTS

(Also previously given — included for completeness.)

Forces

1. Force = mass × acceleration.
2. Weight = mass × gravitational field strength.
3. Momentum = mass × velocity.
4. Momentum is conserved in closed systems.
5. Hooke's law: **F = kx**.

Waves

1. Wave speed = **frequency × wavelength**.
2. EM waves all travel at **3×10^8 m/s** in vacuum.
3. Transverse vs longitudinal waves differ in oscillation direction.
4. Ultrasound reflects at boundaries.
5. Diffuse vs specular reflection.

Electromagnetism

1. Magnetic fields strongest at **poles**.
2. Motor effect uses **Fleming's left-hand rule**.
3. Transformers change voltage using **coils ratio**.
4. Transformers only work with **AC**.
5. The National Grid uses step-up/step-down transformers.

Space (Trilogy simplified version)

1. The solar system formed from a **nebula**.
2. Stars fuse hydrogen into helium.
3. Red-shift suggests galaxies moving away.
4. Bigger shift = faster recession.
5. Evidence supports the **Big Bang theory**.

Science

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