

## Science

Ř.	Ročník / Year	Předmět / Subject	Cambridge International Standards - CORE	Cambridge International Standards - EXTENDED (N/A if not applicable)	Učivo (pojmy) / Subject Matter
1	4G1	Science		<p>Demonstrate an understanding of the difference between scalars and vectors and give common examples</p> <p>Add vectors by graphical representation to determine a resultant</p> <p>Determine graphically the resultant of two vectors</p>	<p>Physical quantities and units, the system of physical quantities and units, unit conversions</p>
2	4G1	Science	<p>Define speed and calculate speed from total time, total distance</p> <p>Plot and interpret a speed/time graph or a distance/ time graph</p> <p>Recognise from the shape of a speed/time graph, when a body is</p> <ul style="list-style-type: none"> <li>– at rest</li> <li>– moving with constant speed</li> <li>– moving with changing speed</li> </ul> <p>Calculate the area under a speed/time graph to work out the distance travelled for motion with constant acceleration</p> <p>Demonstrate some understanding that acceleration is related to changing speed</p> <p>Supplement</p> <p>State that the acceleration of free fall for a body near to the Earth is constant</p>	<p>Distinguish between speed and velocity</p> <p>Recognise linear motion for which the acceleration is constant and calculate the acceleration</p> <p>Recognise motion for which the acceleration is not constant</p>	<p>Kinematics of motion - frame of reference; position and change body position, speed and acceleration</p>



<i>Průřezová témata / Cross-curricular Subjects</i>	<i>Mezipředmět. Vazby / Connections to Other Subjects</i>	<i>Poznámka / Notes</i>
	Fy	Physics
	Tv ICT Fy	Physics

3	4G1	Science	<p>Know that a force is measured in newtons (N).</p> <p>Describe how forces may change the size, shape and motion of a body.</p> <p>Plot and interpret extension-load graphs and describe the associated experimental procedure.</p> <p>State that a force may produce a change in size and shape of a body.</p> <p>Plot extension/load graphs and describe the associated experimental procedure.</p> <p>Describe the ways in which a force may change the motion of a body.</p> <p>Find the resultant of two or more forces acting along the same line.</p>	<p>Interpret extension/load graphs</p> <p>State Hooke's Law and recall and use the expression <math>F = kx</math></p> <p>Recognise the significance of the term 'limit of proportionality' for an extension/load graph</p>	<p>Momentum - mass and strength; first, second and third law of motion, an inertial system; momentum of an object</p>
4	4G1	Science	<p>Describe the moment of a force as a measure of its turning effect and give everyday examples</p> <p>Describe qualitatively the balancing of a beam about a pivot</p>	<p>Perform and describe an experiment (involving vertical forces) to show that there is no net moment on a body in equilibrium</p> <p>Apply the idea of opposing moments to simple systems in equilibrium</p>	<p>Compressive force, the pressure; friction force; elastic force; Gravitational force; gravitational field; torque</p>
5	4G1	Science	<p>State that, when there is no resultant force and no resultant turning effect, a system is in equilibrium</p>		<p>Work performance; relationship changes mechanical energy and work; laws of conservation of mass, momentum and energy</p>
6	4G1	Science	<p>Describe an experiment to determine the density of a liquid and of a regularly shaped solid, and make the necessary calculation using the equation:</p> <p style="text-align: center;">density = mass / volume or <math>d = m / V</math></p> <p>Describe the determination of the density of an irregularly shaped solid by the method of displacement, and make the necessary calculation.</p>		<p>Structure and properties of substances; kinetic theory of matter - the nature of the movement and interactions of particles in various states of matter</p>

	Fy	Physics
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7	4G1	Science	<p>Know that energy and work are measured in joules (J), and power in watts (W). Demonstrate understanding that an object may have energy due to its motion (kinetic energy, K.E.) or its position (potential energy, P.E.), and that energy may be transferred and stored.</p> <p>Give and identify examples of energy in different forms, including kinetic, gravitational, chemical, nuclear, thermal (heat), electrical, light and sound.</p> <p>Give and identify examples of the conversion of energy from one form to another, and of its transfer from one place to another.</p>	<p>Recall and use the expressions  <math>K.E. = \frac{1}{2}mv^2</math> and <math>P.E. = mgh</math>  Apply the principle of energy conservation to simple examples.</p>	<p>Surface tension, capillary phenomena;  coefficient of thermal expansion of solids and liquids; latent heat and specific latent heat</p>
8	4G1	Science	<p>Distinguish between renewable and non-renewable sources of energy.</p> <p>Know that the Sun is the source of energy for all our energy resources except geothermal and nuclear.</p> <p>Describe how electricity or other useful forms of energy may be obtained from:  chemical energy stored in fuel  water, including the energy stored in waves, in tides, and in water behind hydroelectric dams  geothermal resources  heat and light from the Sun (solar cells and panels)  wind.</p> <p>Give advantages and disadvantages of each method in terms of reliability, scale and environmental impact.</p> <p>Demonstrate a qualitative understanding of efficiency.</p>	<p>Recall and use the equation:  <math display="block">\text{efficiency} = \frac{\text{useful energy output}}{\text{energy input}} \times 100\%</math></p>	<p>Efficiency in power and energy usage.  Renewable and non-renewable resources</p>

	Fy	Physics
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9	4G1	Science	<p>Relate (without calculation) work done to the magnitude of a force and the distance moved.</p> <p>Relate (without calculation) power to work done and time taken, using appropriate examples.</p>	<p>Describe energy changes in terms of work done.</p> <p>Recall and use <math>W = F \times d</math></p> <p>Recall and use the equation <math>P = E / t</math> in simple systems.</p>	Work and power.
10	4G1	Science	<p>State the distinguishing properties of solids, liquids and gases.</p> <p>Describe qualitatively the molecular structure of solids, liquids and gases.</p> <p>Describe evaporation in terms of the escape of more energetic molecules from the surface of a liquid.</p> <p>Relate evaporation to the consequent cooling.</p>	<p>Relate the properties of solids, liquids and gases to the forces and distances between molecules and to the motion of the molecules.</p> <p>Interpret the temperature of a gas in terms of the motion of its molecules.</p>	Particle theory of states of matter.
11	4G1	Science	<p>Describe qualitatively the thermal expansion of solids, liquids and gases.</p> <p>Identify and explain some of the everyday applications and consequences of thermal expansion.</p> <p>State the meaning of melting point and boiling point.</p> <p>Describe experiments to demonstrate the properties of good and bad conductors of heat.</p> <p>Recognise convection as the main method of heat transfer in liquids and gases.</p> <p>Describe experiments to illustrate convection in liquids and gases.</p> <p>Recognise radiation as the method of heat transfer that does not require a medium to travel through.</p> <p>Identify infra-red radiation as the part of the electromagnetic spectrum often involved in heat transfer by radiation.</p> <p>Identify and explain some of the everyday applications and consequences of conduction, convection and radiation.</p>	<p>Explain heat transfer in solids in terms of molecular motion.</p> <p>Relate convection in fluids to density changes.</p> <p>Describe experiments to show the properties of good and bad emitters and good and bad absorbers of infra-red radiation.</p>	The movement of heat through different materials

	Fy	Physics
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12	4G1	Science	<p>List and describe the characteristics of living organisms.          State that living organisms are made of cells.          Identify and describe the structure of a plant cell (palisade cell) and an animal cell (liver cell), as seen under a light microscope.          Describe the differences in structure between typical animal and plant cells.          Calculate magnification and size of biological specimens using millimetres as units.          Define diffusion as the net movement of molecules from a region of their higher concentration to a region of their lower concentration down a concentration gradient, as a result of their random movement.          Describe the importance of diffusion of gases and solutes and of water as a solvent.          Define enzymes as proteins that function as biological catalysts.          Investigate and describe the effect of changes in temperature and pH on enzyme activity.</p>	<p>Relate the structures seen under the light microscope in the plant cell and in the animal cell to their functions.</p> <p>Explain the effect of changes in temperature and pH on enzyme activity.</p>	<p>General properties of living systems, the emergence and evolution of living systems. Taxonomy organisms Overview of the natural system of wildlife</p>
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	Bi	Biology
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13	4G1	Science	<p>List the chemical elements that make up: carbohydrates, fats, proteins.</p> <p>Describe the structure of large molecules made from smaller basic units, i.e.</p> <ul style="list-style-type: none"> <li>• simple sugars to starch and glycogen</li> <li>• amino acids to proteins</li> <li>• fatty acids and glycerol to fats and oils.</li> </ul> <p>Describe tests for:</p> <ul style="list-style-type: none"> <li>• starch (iodine solution)</li> <li>• reducing sugars (Benedict's solution)</li> <li>• protein (biuret test)</li> <li>• fats (ethanol).</li> </ul> <p>List the principal sources of, and describe the importance of: carbohydrates, fats, protein, vitamins (C and D only)</p> <ul style="list-style-type: none"> <li>• mineral salts (calcium and iron only)</li> <li>• fibre (roughage)</li> <li>• water.</li> </ul> <p>Describe the deficiency symptoms for:</p> <ul style="list-style-type: none"> <li>• vitamins (C and D only)</li> <li>• mineral salts (calcium and iron only)</li> </ul>	<p>Describe the use of microorganisms in the manufacture of yoghurt.</p>	<p>General properties of living systems, the emergence and evolution of living systems. Taxonomy organisms Overview of the natural system of wildlife</p>
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14	4G1	Science	<p>State what is meant by the term balanced diet and describe a balanced diet related to age, sex and activity of an individual.</p> <p>Identify the main regions of the alimentary canal and associated organs, including mouth, salivary glands, oesophagus, stomach, small intestine: duodenum and ileum, pancreas, liver, gall bladder, large intestine: colon and rectum, anus.</p> <p>Describe the functions of the regions of the alimentary canal listed above, in relation to ingestion, digestion, absorption, assimilation and egestion of food.</p> <p>Define digestion as the break down of large, insoluble food molecules into small, water-soluble molecules using mechanical and chemical processes.</p> <p>Identify the types of human teeth and describe their structure and functions.</p> <p>State the causes of dental decay and describe the proper care of teeth.</p> <p>State the significance of chemical digestion in the alimentary canal in producing small, soluble molecules that can be absorbed.</p> <p>Define absorption as movement of digested food molecules through the wall of the intestine into the blood.</p> <p>10 Identify the small intestine as the region for the absorption of digested food.</p>	<p>Describe the effects of malnutrition in relation to starvation, coronary heart disease, constipation and obesity.</p>	<p>General properties of living systems, the emergence and evolution of living systems. Taxonomy organisms Overview of the natural system of wildlife</p>
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15	4G1	Science	<p>Define photosynthesis as the fundamental process by which plants manufacture carbohydrates from raw materials using energy from light.</p> <p>State the word equation for the production of simple sugars and oxygen.</p> <p>Investigate the necessity for chlorophyll, light and carbon dioxide for photosynthesis, using appropriate controls.</p> <p>Describe the intake of carbon dioxide and water by plants.</p> <p>Identify and label the cuticle, cellular and tissue structure of a dicotyledonous leaf, as seen in cross-section under the light microscope.</p>	<p>Explain that chlorophyll traps light energy and converts it into chemical energy for the formation of carbohydrates and their subsequent storage.</p> <p>State the balanced equation for photosynthesis in symbols  <math>6\text{CO}_2 + 6\text{H}_2\text{O} \xrightarrow{\text{light}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2</math></p> <p>Investigate and state the effect of varying light intensity on the rate of photosynthesis (e.g. in submerged aquatic plants).</p>	<p>System of the plant kingdom, lower plants, higher plants, fungi</p>
16	4G1	Science	<p>State the functions of xylem and phloem.</p> <p>Identify the positions of xylem tissues as seen in transverse sections of unthickened, herbaceous, dicotyledonous roots, stems and leaves.</p> <p>Identify root hair cells, as seen under the light microscope, and state their functions.</p> <p>Investigate, using a suitable stain, the pathway of water through the above-ground parts of a plant.</p> <p>Define transpiration as evaporation of water at the surfaces of the mesophyll cells followed by loss of water vapour from plant leaves, through the stomata.</p> <p>Describe the effects of variation of temperature, humidity and light intensity on transpiration rate.</p>	<p>Relate the structure and functions of root hairs to their surface area and to water and ion uptake.</p>	<p>System of the plant kingdom, lower plants, higher plants, fungi</p>

	Bi	Biology
	Bi	Biology



17	4G1	Science	<p>Describe the circulatory system as a system of tubes with a pump and valves to ensure one-way flow of blood.</p> <p>Describe the structure of the heart, including the muscular wall and septum, atria, ventricles, valves and associated blood vessels.</p> <p>Describe the function of the heart in terms of muscular contraction and the working of the valves.</p> <p>Investigate the effect of physical activity on pulse rate.</p> <p>Identify red and white blood cells as seen under the light microscope on prepared slides, and in diagrams and photomicrographs.</p> <p>Describe the structure and functions of arteries, veins and capillaries.</p> <p>List the components of blood as red blood cells, white blood cells, platelets and plasma.</p> <p>State the functions of blood:</p> <ul style="list-style-type: none"> <li>• red blood cells – haemoglobin and oxygen transport</li> <li>• white blood cells – phagocytosis and antibody formation</li> <li>• platelets – causing clotting (no details)</li> <li>• plasma – transport of blood cells, ions, soluble nutrients, hormones and carbon dioxide.</li> </ul>	<p>Describe the double circulation in terms of a low-pressure circulation to the lungs and a high-pressure circulation to the body tissues, and relate these differences to the different functions of the two circuits.</p> <p>Describe coronary heart disease in terms of the blockage of coronary arteries and state the possible causes (diet, stress and smoking) and preventive measures.</p> <p>Investigate, state and explain the effect of physical activity on pulse rate.</p> <p>Explain how structure and function are related in arteries, veins and capillaries.</p>	<p>The transport system in animals.</p>
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18	4G1	Science	<p>Define respiration as the chemical reactions that break down nutrient molecules in living cells to release energy.</p> <p>2 State the uses of energy in the body of humans: muscle contraction, protein synthesis, cell division, growth, the passage of nerve impulses and the maintenance of a constant body temperature.</p> <p>3 State the word equation for aerobic respiration.</p> <p>Identify on diagrams and name the larynx, trachea, bronchi, bronchioles, alveoli and associated capillaries.</p> <p>State the differences in composition between inspired and expired air.</p> <p>Use limewater as a test for carbon dioxide to investigate the differences in composition between inspired and expired air.</p> <p>Investigate and describe the effects of physical activity on rate and depth of breathing.</p>	<p>Define aerobic respiration as the release of a relatively large amount of energy in cells by the breakdown of food substances in the presence of oxygen. State the equation for aerobic respiration using symbols (<math>C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O</math>).</p> <p>List the features of gas exchange surfaces in animals.</p> <p>Explain the role of mucus and cilia in protecting the gas exchange system from pathogens and particles.</p> <p>Describe the effects of tobacco smoke and its major toxic components (tar, nicotine, carbon monoxide, smoke particles) on the gas exchange system.</p> <p>Explain the effects of physical activity on rate and depth of breathing.</p>	The respiration system
19	4G1	Science	Demonstrate understanding of the terms atom and molecule.		The particulate nature of matter
20	4G1	Science	<p>Describe paper chromatography.</p> <p>Interpret simple chromatograms.</p> <p>Describe methods of separation and purification: filtration, crystallisation, distillation, fractional distillation.</p> <p>Suggest suitable purification techniques, given</p>		Experimental techniques

	Bi	Biology
	Ch	Chemistry
	Ch	Chemistry

21	4G1	Science	<p>Identify physical and chemical changes, and understand the differences between them. Describe the differences between elements, compounds and mixtures.</p> <p>Describe the structure of an atom in terms of electrons and a nucleus containing protons and neutrons.</p> <p>State the relative charges and approximate relative masses of protons, neutrons and electrons.</p> <p>Define atomic (proton) number and mass (nucleon) number.</p> <p>Use proton number and the simple structure of atoms to explain the basis of the Periodic Table, with special reference to the elements with proton numbers 1 to 20.</p> <p>Describe the formation of ions by electron loss or gain.</p> <p>Describe the formation of ionic bonds between elements from Groups I and VII.</p> <p>State that non-metallic elements form nonionic compounds using a different type of bonding called covalent bonding involving shared pairs of electrons.</p>	<p>Demonstrate understanding of the concepts of element, compound and mixture.</p> <p>Describe the build-up of electrons in 'shells' and understand the significance of the noble gas electronic structures and of valency electrons (the ideas of the distribution of electrons in s and p orbitals and in d block elements are not required).</p> <p>Explain the formation of ionic bonds between metallic and non-metallic elements.</p> <p>Draw dot-and-cross diagrams to represent the sharing of electron pairs to form single covalent bonds in simple molecules, exemplified by H<sub>2</sub>, Cl<sub>2</sub>, H<sub>2</sub>O, CH<sub>4</sub> and HCl.</p> <p>Draw dot-and-cross diagrams to represent the multiple bonding in N<sub>2</sub>, C<sub>2</sub>H<sub>4</sub> and CO<sub>2</sub>.</p>	Atoms, elements and compounds
22	4G1	Science	<p>Relate the terms exothermic and endothermic to the temperature changes observed during chemical reactions.</p>	<p>Demonstrate understanding that exothermic and endothermic changes relate to the transformation of chemical energy to heat (thermal energy), and vice versa.</p>	Energy changes in chemical reactions
23	4G1	Science	<p>Describe the effect of concentration, particle size, catalysis and temperature on the rate of reaction.</p> <p>Describe a practical method for investigating the rate of a reaction involving gas evolution.</p> <p>Define catalyst as an agent which increases rate of reaction but which remains unchanged.</p>	<p>Interpret data obtained from experiments concerned with rate of reaction.</p> <p>Describe and explain the effects of temperature and concentration in terms of collisions between reacting particles (the concept of activation energy will not be examined).</p>	Chemical reactions
24	4G1	Science	<p>Define oxidation and reduction in terms of oxygen loss / gain, and identify such reactions from given information.</p>		Redox

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25	4G1	Science	<p>Describe the way the Periodic Table classifies elements in order of atomic (proton) number.</p> <p>Describe the change from metallic to non-metallic character across a period.</p> <p>Describe lithium, sodium and potassium in Group I as a collection of relatively soft metals showing a trend in melting point and reaction with water.</p> <p>Describe the trends in properties of chlorine, bromine and iodine in Group VII, including colour, physical state and reactions with other halide ions.</p> <p>Describe the transition elements as a collection of metals having high densities, high melting points and forming coloured compounds, and which, as elements and compounds, often act as catalysts.</p> <p>Describe the noble gases as being unreactive.</p>	<p>Use the Periodic Table to predict properties of elements by means of groups and periods.</p> <p>Describe the relationship between Group number, number of outer-shell (valency) electrons and metallic/non-metallic character.</p> <p>Predict the properties of other elements in Group I, given data where appropriate.</p> <p>Predict the properties of other elements in Group VII, given data where appropriate.</p> <p>State the uses of the noble gases in providing an inert atmosphere, i.e. argon in lamps, helium for filling balloons.</p>	The Periodic Table
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	Ch	Chemistry
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26	4G2	Science	<p>Describe what is meant by wave motion as illustrated by vibration in ropes and springs and by experiments using water waves. State the meaning of and use the terms speed, frequency, wavelength and amplitude.</p> <p>Describe the formation and give the characteristics of an optical image formed by a plane mirror.</p> <p>Use the law:  angle of incidence, <math>i</math> = angle of reflection, <math>r</math>.</p> <p>Describe an experimental demonstration of the refraction of light.</p> <p>Identify and describe internal and total internal reflection using ray diagrams.</p> <p>Describe, using ray diagrams, the passage of light through parallel-sided transparent material, indicating the angle of incidence <math>i</math> and angle of refraction <math>r</math>.</p> <p>State the meaning of critical angle.</p> <p>Describe the action of a thin converging lens on a beam of light, using ray diagrams.</p> <p>Use the terms principal focus and focal length.</p>	<p>Distinguish between transverse and longitudinal waves and give suitable examples.</p> <p>Recall and use the equation <math>v = f \lambda</math></p> <p>Identify how a wave can be reflected off a plane barrier and can change direction as its speed changes.</p> <p>Perform simple constructions, measurements and calculations based on reflections in plane mirrors.</p> <p>Describe the action of optical fibres, particularly in medicine and communications technology.</p>	<p>Waves. The reflection and refraction of sound and light.</p>
28	4G2	Science	<p>Describe the main features of the electromagnetic spectrum.</p> <p>Describe the role of electromagnetic waves in:  radio and television communications (radio waves)  satellite television and telephones (microwaves)  electrical appliances, remote controllers for televisions and intruder alarms (infra-red)  medicine and security (X-rays).</p> <p>Demonstrate an awareness of safety issues regarding the use of microwaves and X-rays.</p>	<p>State that all electromagnetic waves travel with the same high speed in vacuo.</p>	<p>The electromagnetic spectrum.</p>

	Fy	Physics
	Fy	Physics

29	4G2	Science	<p>Describe the production of sound by vibrating sources.          State the approximate human range of audible frequencies.          Demonstrate understanding that a medium is needed to transmit sound waves.          Describe an experiment to determine the speed of sound in air.          Relate the loudness and pitch of sound waves to amplitude and frequency.          Describe how the reflection of sound may produce an echo.</p>	<p>Describe transmission of sound in air in terms of compressions and rarefactions.          State the order of magnitude of the</p>	<p>Sound waves and sound</p>
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	Fy	Physics
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30	4G2	Science	<p>Demonstrate understanding of current, potential difference and resistance, and use with their appropriate units.</p> <p>Use and describe the use of an ammeter and a voltmeter.</p> <p>Describe simple experiments to show the production and detection of electrostatic charges.</p> <p>State that there are positive and negative charges.</p> <p>State that unlike charges attract and that like charges repel.</p> <p>Distinguish between electrical conductors and insulators and give typical examples.</p> <p>State that current is related to the flow of charge.</p> <p>State that the current in metals is due to a flow of electrons.</p> <p>Use the term potential difference (p.d.) to describe what drives the current between two points in a circuit.</p> <p>State that resistance = p.d. / current and understand qualitatively how changes in p.d. or resistance affect current.</p> <p>Recall and use the equation <math>R = V / I</math>.</p> <p>Describe an experiment to determine resistance using a voltmeter and an ammeter.</p> <p>Identify electrical hazards including:  damaged insulation  overheating of cables  damp conditions.</p> <p>Demonstrate understanding of the use of fuses.</p>	<p>Describe an electric field as a region in which an electric charge experiences a force.</p> <p>Relate (without calculation) the resistance of a wire to its length and to its diameter.</p> <p>Recall and use the equations  <math>P = IV</math> and <math>E = IVt</math></p>	Electricity and electrical circuits
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	Fy	Physics
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31	4G2	Science	<p>Draw and interpret circuit diagrams containing sources, switches, resistors (fixed and variable), lamps, ammeters, voltmeters and fuses.</p> <p>Demonstrate understanding that the current at every point in a series circuit is the same.</p> <p>Calculate the combined resistance of two or more resistors in series.</p> <p>State that, for a parallel circuit, the current from the source is larger than the current in each branch.</p> <p>State that the combined resistance of two resistors in parallel is less than that of either resistor by itself.</p> <p>State the advantages of connecting lamps in parallel in a lighting circuit.</p>	<p>Recall and use the fact that the sum of the p.d.s across the components in a series circuit is equal to the total p.d. across the supply.</p> <p>Recall and use the fact that the current from the source is the sum of the currents in the separate branches of a parallel circuit.</p>	Electricity and electrical circuits
32	4G2	Science		<p>Velocity and time graphs; distance and time graphs.</p> <p>Calculating the gradient and using this knowledge to answer IGCSE questions</p>	Motion
33	4G2	Science		<p>Mass and weight</p> <p>Density</p> <p>Effects of forces</p>	Matter and forces
34	4G2	Science		<p>Energy</p> <p>Energy resources</p> <p>Work</p> <p>Power</p>	Energy, work and power
35	4G2	Science		<p>States of matter</p> <p>Molecular model</p> <p>Evaporation</p>	Simple kinetic molecular model of matter
36	4G2	Science		<p>The characteristics of materials when subjected to thermal energy.</p>	Matter and thermal properties
37	4G2	Science		<p>Conduction</p> <p>Convection</p> <p>Radiation</p> <p>Consequences of energy transfer</p>	Transfer of thermal energy
38	4G2	Science		<p>General wave properties</p>	Waves

		Physics
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39	4G2	Science		Reflection of light Refraction of light	Light
40	4G2	Science		Stating the 7 electromagnetic waves; radio; micro; infra red; visible; ultra violet; x-rays; gamma rays	Electromagnetic spectrum
41	4G2	Science		Drawing and interpreting the sound waves and its characteristics.	Sound
42	4G2	Science		Electrical quantities Electric charge Current and potential difference	Electricity
18	4G2	Science	<p>Define respiration as the chemical reactions that break down nutrient molecules in living cells to release energy.</p> <p>2 State the uses of energy in the body of humans: muscle contraction, protein synthesis, cell division, growth, the passage of nerve impulses and the maintenance of a constant body temperature.</p> <p>3 State the word equation for aerobic respiration.</p> <p>Identify on diagrams and name the larynx, trachea, bronchi, bronchioles, alveoli and associated capillaries.</p> <p>State the differences in composition between inspired and expired air.</p> <p>Use limewater as a test for carbon dioxide to investigate the differences in composition between inspired and expired air.</p> <p>Investigate and describe the effects of physical activity on rate and depth of breathing.</p>	<p>Define aerobic respiration as the release of a relatively large amount of energy in cells by the breakdown of food substances in the presence of oxygen. State the equation for aerobic respiration using symbols (<math>C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O</math>).</p> <p>List the features of gas exchange surfaces in animals.</p> <p>Explain the role of mucus and cilia in protecting the gas exchange system from pathogens and particles.</p> <p>Describe the effects of tobacco smoke and its major toxic components (tar, nicotine, carbon monoxide, smoke particles) on the gas exchange system.</p> <p>Explain the effects of physical activity on rate and depth of breathing.</p>	The respiration system

	Fy	IGCSE EXAM QUESTION PRACTICE Fy
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	Fy	IGCSE EXAM QUESTION PRACTICE Fy
	Bi	Biology

43	4G2	Science	<p>Define asexual reproduction as the process resulting in the production of genetically identical offspring from one parent.</p> <p>Define sexual reproduction as the process involving the fusion of haploid nuclei to form a diploid zygote and the production of genetically dissimilar offspring.</p> <p>Identify and draw, using a hand lens if necessary, the sepals, petals, stamens, anthers, carpels, ovaries and stigmas of one locally available, named, insect-pollinated, dicotyledonous flower, and examine the pollen grains under a light microscope or in photomicrographs.</p> <p>State the functions of the sepals, petals, anthers, stigmas and ovaries.</p> <p>Candidates should expect to apply their understanding of the flowers they have studied to unfamiliar flowers.</p> <p>Define pollination as the transfer of pollen grains from the male part of the plant (anther or stamen) to the female part of the plant (stigma)</p> <p>Name the agents of pollination.</p> <p>Investigate and state the environmental conditions that affect germination of seeds: requirement for water and oxygen, suitable temperature.</p> <p>Identify on diagrams of the male reproductive system: the testes, scrotum, sperm ducts, prostate gland, urethra and penis, and state the functions of these parts.</p> <p>Identify on diagrams of the female reproductive system: the ovaries, oviducts.</p>	<p>Use a hand lens to identify and describe the anthers and stigmas of one locally available, named, wind-pollinated flower.</p> <p>Compare the different structural adaptations of insect-pollinated and wind-pollinated flowers.</p> <p>Compare male and female gametes in terms of size, numbers and mobility.</p> <p>Indicate the functions of the amniotic sac and amniotic fluid.</p> <p>Describe the function of the placenta and umbilical cord in relation to exchange of dissolved nutrients, gases and excretory products (no structural details are required).</p> <p>Describe the advantages and disadvantages of breast-feeding compared with bottle-feeding using formula milk.</p> <p>Outline how HIV affects the immune system in a person with HIV / AIDS.</p>	<p>Reproduction: Sexual reproduction in plants; Sexual reproduction in humans</p>
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44	4G2	Science	<p>State that the Sun is the principal source of energy input to biological systems.</p> <p>Define the terms:</p> <p>food chain as showing the flow of energy (food) from one organism to the next, beginning with a producer (e.g. mahogany tree → caterpillar → song bird → hawk)</p> <p>food web as a network of interconnected food chains showing the energy flow through part of an ecosystem</p> <p>producer as an organism that makes its own organic nutrients, usually using energy from sunlight, through photosynthesis</p> <p>consumer as an organism that gets its energy by feeding on other organisms</p> <p>herbivore as an animal that gets its energy by eating plants</p> <p>carnivore as an animal that gets its energy by eating other animals.</p> <p>Describe the carbon cycle.</p>	<p>Describe energy losses between trophic levels.</p> <p>Define the terms:</p> <p>decomposer as an organism that gets its energy from dead or waste organic matter</p> <p>ecosystem as a unit containing all of the organisms and their environment, interacting together, in a given area, e.g. decomposing log or a lake</p> <p>trophic level as the position of an organism in a food chain or food web.</p> <p>Explain why food chains usually have fewer than five trophic levels.</p> <p>Discuss the effects of the combustion of fossil fuels and the cutting down of forests on the oxygen and carbon dioxide concentrations in the atmosphere.</p>	Energy flow in ecosystems
45	4G2	Science	<p>List the undesirable effects of deforestation (to include extinction, loss of soil, flooding, carbon dioxide build-up).</p> <p>Describe the undesirable effects of pollution to include:</p> <p>water pollution by sewage and chemical waste</p> <p>air pollution by greenhouse gases (carbon dioxide and methane) contributing to global warming.</p> <p>Describe the need for conservation of: species and their habitats</p> <p>natural resources (limited to water and non-renewable materials including fossil fuels).</p>	<p>Describe the undesirable effects of overuse of fertilisers (to include eutrophication of lakes and rivers).</p> <p>Discuss the causes and effects on the environment of acid rain, and the measures that might be taken to reduce its incidence.</p> <p>Explain how increases in greenhouse gases (carbon dioxide and methane</p>	Human influences on the ecosystem

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46	4G2	Science	<p>Define a hormone as a chemical substance, produced by a gland, carried by the blood, which alters the activity of one or more specific target organs and is then destroyed by the liver.</p> <p>State the role of the hormone adrenaline in chemical control of metabolic activity, including increasing the blood glucose concentration and pulse rate.</p> <p>Give examples of situations in which adrenaline secretion increases.</p> <p>Define and investigate geotropism (as a response in which a plant grows towards or away from gravity) and phototropism (as a response in which a plant grows towards or away from the direction from which light is coming).</p>	<p>Explain the chemical control of plant growth by auxins including geotropism and phototropism in terms of auxins regulating differential growth.</p>	<p>Co-ordination and response and tropisms in plants</p>
54	4G2	Science		<p>Cell structure and organisation Movement in and out of cells</p>	<p>Characteristics of living organisms</p>
55	4G2	Science		<p>Nutrients Plant nutrition Animal nutrition</p>	<p>Nutrition</p>
56	4G2	Science		<p>Transport in plants Transport in humans</p>	<p>Transportation</p>
57	4G2	Science		<p>Respiration and energy Gas exchange</p>	<p>Respiration</p>
58	4G2	Science		<p>Hormones Tropic responses</p>	<p>Co-ordination and response</p>
59	4G2	Science		<p>Asexual and sexual reproduction Sexual reproduction in plants Sexual reproduction in humans</p>	<p>Reproduction</p>
60	4G2	Science		<p><b>Describe the differences between food chains and food webs.</b></p>	<p>Energy flow in ecosystems</p>
61	4G2	Science		<p>Describe the advantages and disadvantages that humans have on all ecosystems.</p>	<p>Human influences on the ecosystem</p>

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62	4G2	Science	<p>Use the symbols of the elements to write the formulae of simple compounds.</p> <p>Deduce the formula of a simple compound from the relative numbers of atoms present.</p> <p>Deduce the formula of a simple compound from a model or a diagrammatic representation.</p> <p>Construct and use word equations.</p>	<p>Determine the formula of an ionic compound from the charges on the ions present.</p> <p>Construct and use symbolic equations with state symbols.</p> <p>Deduce the balanced equation for a chemical reaction, given relevant information.</p>	Stoichiometry
63	4G2	Science	<p>State that electrolysis is the chemical effect of electricity on ionic compounds, causing them to break up into simpler substances, usually elements.</p> <p>2 Use the terms electrode, electrolyte, anode and cathode.</p> <p>4 Describe the electrode products, using inert electrodes, in the electrolysis of: molten lead(II) bromide aqueous copper chloride.</p>	<p>Describe electrolysis in terms of the ions present and the reactions at the electrodes.</p> <p>5 Predict the products of the electrolysis of a specified binary compound in the molten state.</p>	Electricity and chemistry
64	4G2	Science	<p>Describe neutrality and relative acidity and alkalinity in terms of pH (whole numbers only) measured using full-range indicator and litmus.</p> <p>Describe the characteristic reactions of acids with metals, bases (including alkalis) and carbonates.</p> <p>Describe and explain the importance of controlling acidity in the environment (air, water and soil).</p> <p>Describe the preparation, separation and purification of salts.</p>	<p>Suggest a method of making a given salt from suitable starting material, given appropriate information.</p>	The characteristic properties of acids and bases

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65	4G2	Science	<p>Use the following tests to identify:</p> <p>aqueous cations:  ammonium, copper(II), iron(II), iron(III)  and zinc by means of aqueous sodium  hydroxide and aqueous ammonia as  appropriate (formulae of complex ions  are not required)</p> <p>anions:  carbonate by means of dilute acid and  then limewater  chloride by means of aqueous silver  nitrate under acidic conditions  nitrate by reduction with aluminium  sulfate by means of aqueous barium ions  under acidic conditions</p> <p>gases:  ammonia by means of damp red litmus  paper  carbon dioxide by means of limewater  chlorine by means of damp litmus paper  hydrogen by means of a lighted splint  oxygen by means of a glowing splint.</p>	<p>Use knowledge of testing for cations and anions to name an unknown compound.</p>	<p>Identification of ions and gases</p>
66	4G2	Science	<p>Distinguish between metals and non-metals by their general physical and chemical properties.</p> <p>Explain why metals are often used in the form of alloys.</p> <p>Place in order of reactivity: potassium, sodium, calcium, magnesium, zinc, iron, hydrogen and copper, by reference to the reactions, if any, of the elements with:  water or steam  dilute hydrochloric acid (except for alkali metals).</p> <p>Describe the use of carbon in the extraction of copper from copper oxide.</p>	<p>Identify and interpret diagrams that represent the structure of an alloy.</p> <p>Describe the reactivity series to the tendency of a metal to form its positive ion, illustrated by its reaction, if any, with:  the aqueous ions of other listed metals  the oxides of the other listed metals.</p> <p>Deduce an order of reactivity from a given set of experimental results.</p> <p>Describe the essential reactions in the extraction of iron in the blast furnace.</p> <p>Relate the method of extraction of a metal from its ore to its position in the reactivity series, limited to Group I and II metals, aluminium, iron and copper.</p>	<p>Properties of metals</p>

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67	4G2	Science	<p>State a chemical test for water.</p> <p>Describe and explain, in outline, the purification of the water supply by filtration and chlorination.</p> <p>Describe the composition of clean air as being a mixture of 78% nitrogen, 21% oxygen and small quantities of noble gases, water vapour and carbon dioxide.</p> <p>State the formation of carbon dioxide:  as a product of complete combustion of carbon-containing substances  as a product of respiration  as a product of the reaction between an acid and a carbonate  as a product of thermal decomposition.</p> <p>Describe the rusting of iron in terms of a reaction involving oxygen and water, and simple methods of rust prevention, including paint and other coatings to exclude oxygen.</p>	<p>Explain why the proportion of carbon dioxide in air is increasing, and why this is important.</p>	Air and water
68	4G2	Science	<p>Recall coal, natural gas and petroleum as fossil fuels that produce carbon dioxide on combustion.</p> <p>Name methane as the main constituent of natural gas.</p> <p>Describe petroleum as a mixture of hydrocarbons and its separation into useful fractions by fractional distillation.</p> <p>State the use of:  refinery gas for bottled gas for heating and cooking  gasoline fraction for fuel (petrol) in cars  diesel oil/gas oil for fuel in diesel engines.</p> <p>Describe the properties of alkanes (exemplified by methane) as being generally unreactive, except in terms of burning.</p> <p>State that the products of complete combustion of hydrocarbons, exemplified by methane, are carbon dioxide and water.</p> <p>Name, identify and draw the structures of methane, ethane, ethene and ethanol.</p>	<p>Understand the essential principle of fractional distillation in terms of differing boiling points (ranges) of fractions related to molecular size and intermolecular attractive forces.</p> <p>Recognise alkanes and alkenes from their chemical names or from molecular structures.</p> <p>Describe the manufacture of alkenes by cracking.</p> <p>Distinguish between alkanes and alkenes by the addition reaction of alkenes with bromine.</p>	Organic chemistry

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69	4G2	Science		Understanding the rules of the lab and how to follow a procedure to an end-point. Knowing the name of laboratory equipment.	Experimental techniques
70	4G2	Science		Physical and chemical changes Elements, compounds and mixtures Atomic structure and the Periodic Table Ions and ionic bonds Molecules and covalent bonds	Atoms, elements and compounds
71	4G2	Science		Use the symbols of the elements to write the formulae of simple compounds. Deduce the balanced equation for a chemical reaction, given relevant information.	Stoichiometry
72	4G2	Science		Energy changes in chemical reactions	Electricity and chemistry
73	4G2	Science		Rate of reaction Redox	Chemical reactions
74	4G2	Science		The characteristic properties of acids and bases Preparation of salts Preparation of salts	Acids, bases and salts
75	4G2	Science		Periodic trends Group properties Transition elements Noble gases	The Periodic Table
76	4G2	Science		Properties of metals Reactivity series Extraction of metals	Metals
77	4G2	Science		Describe the rusting of iron in terms of a reaction involving oxygen and water, and simple methods of rust prevention, including paint and other coatings to exclude oxygen.	Air and water
78	4G2	Science		Fuels Hydrocarbons	Organic chemistry

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