

YEAR 7

INTRODUCTION

BLOCK 1: 7A 7G 7I

7A Cells, Tissues, Organs and Systems

Cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope

The functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts

The similarities and differences between plant and animal cells

The hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms.

Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety (using a light microscope and preparing light microscope slides).

7G The Particle Model

The properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure (Chemistry)

Similarities and differences between solids, liquids and gases (Physics)

Brownian motion in gases (Physics)

Differences in arrangements, in motion and in closeness of particles (Physics)

Understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review

Make predictions using scientific knowledge and understanding

Present observations and data using appropriate methods, including tables and graphs.

7I Energy

Comparing energy values of different foods (from labels) (kJ)

Comparing amounts of energy transferred (J, kJ, kW hour)

Fuels and energy resources

Other processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels

Energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change.

Using ratios to compare experimental results.

BLOCK 2: 7B 7H 7J

7B Sexual Reproduction in Animals

Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta.

Understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review

Ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience

Make predictions using scientific knowledge and understanding

Select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate.

7H Atoms, Elements and Compounds

The concept of a pure substance

Mixtures, including dissolving

Differences between atoms, elements and compounds

Chemical symbols and formulae for elements and compounds

Combustion, thermal decomposition, oxidation and displacement reactions

The varying physical and chemical properties of different elements

The composition of the Earth

The difference between chemical and physical changes (physics)

Atoms and molecules as particles (physics).

Present observations and data using appropriate methods, including tables and graphs

Understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature.

7J Current Electricity

Electric current, measured in amperes, in circuits, series and parallel circuits and the domestic ring main

Current as flow of charge

Potential difference, measured in volts, battery ratings; resistance as the ratio of potential difference (p.d.) to current measured in ohms

Differences in resistance between conducting and insulating components.

Using physical models to help to explain phenomena

Explaining why models are used

Planning a fair test.

BLOCK 3: 7C 7F 7K

7C Muscles and Bones

The structure and functions of the gas exchange system in humans

The mechanism of breathing to move air in and out of the lungs including simple measurements of lung volume

The structure and functions of the human skeleton, to include support, protection, movement and making blood cells

Biomechanics – the interaction between skeleton and muscles, including the measurement of force exerted by different muscles

The function of muscles and examples of antagonistic muscles

The impact of exercise on the human gas exchange system

The effects of recreational drugs (including substance misuse) on behaviour, health and life processes.

Understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review

Ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience.

7F Acids and Alkalis

Chemical reactions as the rearrangement of atoms

Representing chemical reactions using formulae and using equations

Defining acids and alkalis in terms of neutralisation reactions

The pH scale for measuring acidity/alkalinity; and indicators

Reactions of acids with alkalis to produce a salt plus water.

Evaluate risks

7K Forces

Forces as pushes or pulls, arising from the interaction between two objects

Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces

Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water

Forces measured in newtons, measurements of stretch or compression as force is changed

Force–extension linear relation; Hooke’s Law as a special case

Pressure measured by ratio of force over area – acting normal to any surface

Opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface

Forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion

Change depending on direction of force and its size.

(Note that air resistance and water resistance are only briefly mentioned in this unit and will be covered in more detail in Unit 8I.)

The need for using standard units of measurement (including the SI system, its basic units and prefixes).

BLOCK 4: REVISION / END OF YEAR EXAM

BLOCK 5: 7D 8E

7D Ecosystems

The interdependence of organisms in an ecosystem, including food webs and insect pollinated crops

How organisms affect, and are affected by, their environment, including the accumulation of toxic materials

Differences between species

The variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation

The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection

The importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.

Present observations and data using appropriate methods, including tables and graphs

Interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions.

8E Combustion

The properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure

Differences between atoms, elements and compounds

Chemical symbols for elements

Conservation of mass changes of state and chemical reactions

Chemical reactions as the rearrangement of atoms

Representing chemical reactions using equations

Combustion and oxidation reactions

What catalysts do

Exothermic chemical reactions (qualitative)

The carbon cycle

The composition of the atmosphere

The production of carbon dioxide by human activity and the impact on climate

Select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate.

YEAR 8

BLOCK 1: 8A 8F

8A Food and Nutrition

Content of a healthy human diet: carbohydrates, lipids (fats and oils), proteins, vitamins, minerals, dietary fibre and water, and why each is needed

Calculations of energy requirements in a healthy daily diet

The tissues and organs of the human digestive system, including adaptations to function and how the digestive system digests food (enzymes simply as biological catalysts)

The role of diffusion in the movement of materials in and between cells.

Apply mathematical concepts and calculate results

8F The Periodic Table

A simple (Dalton) atomic model

Differences between atoms, elements and compounds

Chemical symbols and formulae for elements and compounds

Chemical reactions as the rearrangement of atoms

Representing chemical reactions using formulae and using equations

The varying physical and chemical properties of different elements

The principles underpinning the Mendeleev periodic table

The periodic table: periods and groups; metals and non-metals

How patterns in reactions can be predicted with reference to the periodic table

The properties of metals and non-metals

The chemical properties of metal and non-metal oxides with respect to acidity.

Interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions

Present reasoned explanations, including explaining data in relation to predictions and hypotheses

Evaluate data, showing awareness of potential sources of random and systematic error.

BLOCK 2: 7L 8B 8G 8J

7L Sound

Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition

Frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound

Sound needs a medium to travel, the speed of sound in air, in water, in solids

Sound produced by vibrations of objects, in loud-speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal

Auditory range of humans and animals

Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound; waves transferring information for conversion to electrical signals by microphone.

Present observations and data using appropriate methods, including tables and graphs

Interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions.

8B Plants and their Reproduction

Plants making carbohydrates in their leaves by photosynthesis and gaining mineral nutrients and water from the soil via their roots

Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms

The interdependence of organisms in an ecosystem, including food webs and insect pollinated crops

The importance of plant reproduction through insect pollination in human food security • heredity as the process by which genetic information is transmitted from one generation to the next

Differences between species

The variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation

The importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.

Make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements

Apply sampling techniques

8G Metals and their Uses

Chemical symbols and formulae for elements and compounds

The concept of a pure substance

Mixtures, including dissolving

The identification of pure substances

Representing chemical reactions using formulae and using equations

Combustion, thermal decomposition, oxidation and displacement reactions

Reactions of acids with metals to produce a salt plus hydrogen
The varying physical and chemical properties of different elements
The properties of metals and non-metals
The order of metals and carbon in the reactivity series.

Make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements.

8J Light

The similarities and differences between light waves and waves in matter
Light waves travelling through a vacuum; speed of light
The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface
Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye
Light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras
Colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection.

The use of conventions in scientific communication.

BLOCK 3: 7L 8H 8K 9B (7L only in 2019-20)

7F Acids and Alkalis (only in 2019-20)

Chemical reactions as the rearrangement of atoms
Representing chemical reactions using formulae and using equations
Defining acids and alkalis in terms of neutralisation reactions
The pH scale for measuring acidity/alkalinity; and indicators
Reactions of acids with alkalis to produce a salt plus water.

Evaluate risks

8H Rocks

The composition of the Earth
The structure of the Earth
The rock cycle and the formation of igneous, sedimentary and metamorphic rocks
Earth as a source of limited resources and the efficacy of recycling.

How the scientific method is adapted for mainly observational sciences, such as geology.

8K Energy Transfers

Comparing power ratings of appliances in watts (W, kW)

Comparing amounts of energy transferred (J, kJ, kWh)

Domestic fuel bills, fuel use and costs

Heating and thermal equilibrium: temperature difference between two objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference: use of insulators

Energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change

Comparing the starting with the final conditions of a system and describing increases and decreases in the amounts of energy associated with temperatures,

Using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes.

Pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility

9B Plant Growth

The functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, chloroplasts etc

The role of diffusion in the movement of materials in and between cells

Plants making carbohydrates in their leaves by photosynthesis and gaining mineral nutrients and water from the soil via their roots

The role of leaf stomata in gas exchange in plants

Reproduction in plants, including ... insect pollination, ... seed and fruit formation ...

The adaptations of leaves for photosynthesis

Aerobic respiration in living organisms, including the breakdown of organic molecules to enable all the other chemical processes necessary for life

A word summary for aerobic respiration

Evaluate data, showing awareness of potential sources of random and systematic error (bias and validity)

BLOCK 4: REVISION / END OF YEAR EXAMS

BLOCK 5: PROJECT

8L Earth and Space

Non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets

Magnetic poles, attraction and repulsion

Magnetic fields by plotting with compass, representation by field lines

Earth's magnetism, compass and navigation

Gravity force, weight = mass \times gravitational field strength (g), on Earth $g = 10 \text{ N/kg}$, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only)

Our Sun as a star, other stars in our galaxy, other galaxies

The seasons and the Earth's tilt, day length at different times of year, in different hemispheres

The light year as a unit of astronomical distance.

Apply mathematical concepts and calculate results.