KEY STAGE 3
YEAR 7-9
BIOLOGY

Structure And Function Of Living Organisms

1. **Cells and Organisation**

- 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 role of diffusion in the movement of materials in and between cells
- The structural adaptations of some unicellular organisms
- The hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms

2. **A Word Summary For Aerobic Respiration**

- The process of anaerobic respiration in humans and micro-organisms, including fermentation, and a word summary for anaerobic respiration
- The differences between aerobic and anaerobic respiration in terms of the reactants, the products formed and the implications for the organism
- Interactions and interdependencies

3. **Relationships In An Ecosystem**

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

4. **For Photosynthesis**

The dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build

organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere
the adaptations of leaves for photosynthesis

5. **Cellular Respiration**
   Aerobic and anaerobic 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
   the process of anaerobic respiration in humans and micro-organisms, including fermentation, and a word summary for anaerobic respiration
   the differences between aerobic and anaerobic respiration in terms of the reactants, the products formed and the implications for the organism
   Interactions and interdependencies
6. **Relationships in an Ecosystem**
   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
   how organisms affect, and are affected by, their environment, including the accumulation of toxic materials

7. **Genetics and Evolution**

Inheritance, chromosomes, DNA and genes

- Heredity as the process by which genetic information is transmitted from one generation to the next
- A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model
- 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 meaning some organisms compete more successfully, which can drive natural selection
- Changes in the environment which may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction

8. T**he skeletal and muscular Systems**

- 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

9. Nutrition and Digestion

- The 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 consequences of imbalances in the diet, including obesity, starvation and deficiency diseases
- 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 importance of bacteria in the human digestive system
- Plants making carbohydrates in their leaves by photosynthesis and gaining mineral nutrients and water from the soil via their roots

10. Gas Exchange Systems

- The structure and functions of the gas exchange system in humans, including adaptations to function
- The mechanism of breathing to move air in and out of the lungs, using a pressure model to explain the movement of gases, including simple measurements of lung volume
- The impact of exercise, asthma and smoking on the human gas exchange system
- The role of leaf stomata in gas exchange in plants

11. Reproduction

- 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

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

Health

the effects of recreational drugs (including substance misuse) on behaviour, health and life process

CHEMISTRY

Pupils should be taught about:

1. **The particulate nature of matter**

- **The properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure**
- **Changes of state in terms of the particle model**
- **Atoms, elements and compounds**
- **A simple (Dalton) atomic model**
- **Differences between atoms, elements and compounds**
- **Chemical symbols and formulae for elements and compounds**
- **Conservation of mass changes of state and chemical reactions**

2. **Pure and impure substances**

- **The concept of a pure substance**
- **Mixtures, including dissolving**
- **Diffusion in terms of the particle model**

- **Simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography**

the identification of pure substances

3. **Chemical reactions**
- **Chemical reactions as the rearrangement of atoms**
- **Representing chemical reactions using formulae and using equations**
- **Combustion, thermal decomposition, oxidation and displacement reactions**
4. **Defining acids and alkalis in terms of neutralisation reactions**
- **The pH scale for measuring acidity/alkalinity; and indicators**
- **Reactions of acids with metals to produce a salt plus hydrogen**
- **Reactions of acids with alkalis to produce a salt plus water**
5. **What catalysts do**
- **Energetics**
- **Energy changes on changes of state (qualitative)**
- **Exothermic and endothermic chemical reactions (qualitative)**

6. **The periodic table**
- **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**

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

Materials

- **The order of metals and carbon in the reactivity series**

- **The use of carbon in obtaining metals from metal oxides**
- **Properties of ceramics, polymers and composites (qualitative)**

8. **Earth and atmosphere**

- **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**
- **The composition of the atmosphere**
- **The production of carbon dioxide by human activity and the impact on climate**

PHYSICS

components (quantitative)

1. **Static electricity**

- **Separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects**
- **The idea of electric field, forces acting across the space between objects not in contact**

2. **Magnetism**

- **Magnetic poles, attraction and repulsion**
- **Magnetic fields by plotting with compass, representation by field lines**
- **Earth's magnetism, compass and navigation**

the magnetic effect of a current, electromagnets, DC motors (principles only)

3. **Matter**

- **Physical changes**
- **Conservation of material and of mass, and reversibility, in melting, freezing, evaporation, sublimation, condensation, dissolving**
- **Similarities and differences, including density differences, between solids, liquids and gases**

4. **Brownian motion in gases**

- **Diffusion in liquids and gases driven by differences in concentration**
- **The difference between chemical and physical changes**

Particle model

the differences in arrangements, in motion and in closeness of particles explaining changes of state, shape and density; the anomaly of ice-water transition

atoms and molecules as particles

5. **Energy in matter**

- **Changes with temperature in motion and spacing of particles**
- **Internal energy stored in materials**

Space physics

gravity force, weight = mass x gravitational field strength (g), on Earth g=10 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

ROYALE
TUTORS