

By the end of Autumn 1 you will know:

Classification

1. What does classification mean?
2. What is the Linnaean system?
3. Where did new evidence come from which supported the development of more modern classification systems?
4. What is the "Three-domain system"?
5. What are the categories in the three-domain system?
6. What are evolutionary trees?
7. What evidence is used to enable extinct organisms to be included in evolutionary trees?

Evolution, evidence and extinction

1. What is evolution?
2. What is the theory of Natural Selection?
3. What are the two pieces of evidence that support the theory of evolution by natural selection?
4. What are fossils?
5. What is a fossil record?
6. What are the three ways fossils can be formed?
7. Why are some organisms not left behind as fossils?
8. What do fossils show?
9. What is extinction?
10. What are the different factors that may cause a species to become extinct?
11. What do antibiotics do?
12. What is the evidence to show that resistance to antibiotics evolves in bacteria?
13. Why can bacteria evolve rapidly?
14. What causes new strains of bacteria?
15. How do new strains of bacteria produce a population of bacteria that are resistant to antibiotics?
16. What is MRSA?
17. What three precautions can we take to reduce the rate of development of antibiotic resistant strains of bacteria?
18. What are the problems associated with the development of new antibiotics?

Feeding and communities

1. What is an ecosystem?

2. What is a species?
3. What is a community?
4. What is a population?
5. What is an organism?
6. What is interdependence?
7. What is competition?
8. What do animals need to survive?
9. What do plants need to survive?
10. What do bacteria need to survive?
11. What is a habitat?
12. What do organisms compete for in a desert habitat?
13. What do organisms compete for in a rainforest?
14. What is a stable community?

Competition

1. What is an abiotic factor?
2. What are the seven abiotic factors?
3. What is a biotic factor?
4. What are the four biotic factors?

Adaptations

1. What are adaptations?
2. What are the three types of adaptations?
3. What are organisms that live in extreme conditions called?
4. What are the features of organisms living in high temperatures?
5. What are the features of organisms living in high pressure?
6. What are the features of organisms living in a concentrated salt environment?

Sampling

1. What is a population?
2. What is a community?
3. What is a species?
4. What is a quadrat?
5. What is a transect?
6. How can a quadrat be used to work out percentage cover of a species?
7. How do you calculate an average mean?
8. How you calculate the range in results?
9. How do you make results more reproducible?

10. How do you make results more reliable?
11. How do you make results more accurate?
12. How do you make results more precise?

Cycles

1. What is a cycle?
2. What are the main stages in the water cycle?
3. What is it called when water turns into a vapour?
4. What is it called when water vapour turns into droplets?
5. What is it called when water droplets fall as rain?
6. What are the main stages in the carbon cycle?
7. Which processes release carbon in the carbon cycle?
8. Which processes take in carbon in the carbon cycle?
9. What is the role of microorganisms in cycling carbon?
10. Give an advantage of 2 microorganism.
11. What do microorganisms return to the soil when cycling carbon?

Biodiversity

1. What is biodiversity?
2. What does biodiversity depend on?
3. What are 2 reasons maintaining biodiversity is important to the human race?
4. What are the ways humans are reducing biodiversity on the planet?
5. What are some measures that have been taken to reduce human effect on biodiversity?
6. What are the positive interactions humans have on biodiversity?
7. How do breeding programs increase biodiversity?
8. How does protection and regeneration of rare habitats increase biodiversity?
9. How does reintroduction of field margins and hedgerows increase biodiversity?
10. How does reduction of deforestation and carbon dioxide emissions by some governments increase biodiversity?
11. How does recycling and reducing waste that goes into landfill increase biodiversity?

Human impact

1. What is happening to the human population across the world?

2. What is happening to the standard of living across the world (on average)?
3. What is happening to the amount of resources humans use to live?
4. What is happening to the amount of waste produced by humans?
5. What are the places pollution can occur?
6. How can pollution affect air?
7. How can pollution affect land?
8. How can pollution affect water?
9. How could pollution potentially affect biodiversity?
10. What are three ways humans reduce the amount of land available?
11. What are peat bogs?
12. For what purpose do humans destroy peat bogs?
13. What effect does destroying peat bogs have on biodiversity?
14. What effect does the decay or burning of peat bogs have on the planet?
15. What is deforestation?
16. What are the two reasons large scale deforestation has happened?

Global warming

1. What is global warming?
2. What are the three greenhouse gases?
3. What is happening to the levels of greenhouse gases in the atmosphere?
4. What is climate?
5. What is weather?
6. What can we use to measure climate?
7. Why is there some uncertainty about climate data?
8. What is peer review?

Rates of reaction

1. How can the rate of chemical reaction be found?
2. What two equations could be used to calculate rate of reaction?
3. How can the quantity of reactant or product be measured?
4. What are the units of rate of reaction?
5. **HT:** What is the units for rate of reaction is the quantity of reactants is in moles?

Collision theory and surface area

1. What factors affect the rate of chemical reaction?
2. What is collision theory?
3. What is the activation energy?
4. What happens to the rate of reaction as the surface area increases?

Collision theory and temperature

1. What does increasing the temperature do to the collisions of particles in the reactants?
2. What does increasing the temperature do to the rate of reaction?

Collision theory, concentration and pressure

1. What does increasing the concentration do to the collisions of particles in the reactants?
2. What does increasing the concentration do to the rate of reaction?
3. What does increasing the pressure do to the collisions of particles in the reactants?
4. What does increasing the pressure do to the rate of reaction?

Collision theory and catalysts

1. What effect does a catalyst have on the rate of reaction?
2. Are catalysts used up during the reaction?
3. Can the same catalyst be used on any reaction?
4. What acts as a catalyst in biological systems?
5. What does a catalyst do the activation energy?

Reversible reactions and energy

1. What do we call a chemical reaction where the products can react to produce the original reactants?
2. If a reaction is exothermic in one direction what is it in the other direction?
3. If 100J of energy is transferred in the forwards reaction, how many Joules is transferred in the reverse reaction?

Dynamic equilibrium and altering conditions

1. What is a closed system?
2. What is equilibrium?
3. **HT:** What does the system do if a change is made to the conditions if it was at equilibrium?

4. **HT:** What principle can be used to predict the effects of changing conditions on a system?
5. **HT:** What happens if the concentration of a reactant is increased?
6. **HT:** What happens if the temperature of a system at equilibrium is increased for an endothermic forward reaction?
7. **HT:** What happens if the temperature of a system at equilibrium is increased for an exothermic forward reaction?
8. **HT:** What happens if there is an increase in pressure for gaseous reactions at equilibrium?

Hydrocarbons and fractional distillation

1. What does finite resource mean?
2. Where is crude oil found?
3. How was crude oil formed?
4. What does crude oil consist of?
5. What is a hydrocarbon?
6. What is the general formula for an alkane?
7. What is the name of the first four alkanes and their formulae?
8. How can crude oil be separated?
9. Name the main fractions of crude oil.
10. What useful materials from crude oil?
11. How does boiling point change with increasing molecular size?
12. How does viscosity change with increasing molecular size?
13. How does flammability change with increasing molecular size?

Burning and cracking hydrocarbons

1. What does combustion of hydrocarbons release?
2. What two things are oxidised during combustion?
3. What are the two products of complete combustion of a hydrocarbon?
4. What is cracking?
5. What are the products of cracking?
6. What is an alkene?
7. What is the colour change when bromine water reacts with an alkene?
8. What are the two types of cracking?
9. Why is cracking important?
10. What are alkenes used to produce?

By the end of Autumn 1, the skills you will know are:

Sampling

1. Why can plants be sampled easier than animals?
2. Define habitat.
3. Define biotic and abiotic.
4. Define mean, mode and median.
5. What is the difference between quantitative and qualitative?
6. Why must a sample be random when quadrating?
7. What are the key differences between transects and quadrats.
8. Why is it better to complete a larger sample?
9. Convert 1m^2 to cm^2

Key Maths skills:

1. Find arithmetic means.
2. Estimated population size = mean population per m^2 x total area (m^2)

Rates of reaction

1. What piece of equipment would you use to measure temperature?
2. What piece of equipment would you use to measure mass?
3. What piece of equipment would you use to measure volume of a liquid?
4. What piece of equipment is used to collect gaseous products?
5. How do you calculate temperature change?
6. What safety precautions should be taken when handling chemicals of different states of matter?

Key Maths skills:

7. Plot a graph using two variables from experimental data.

By the end of Autumn 2, you will know:

Chromatography

1. What can chromatography be used for?
2. What two phases does chromatography involve?
3. What does the separation depend on?
4. What is R_f value and what equation can be used to calculate it?
5. How can different compounds be identified in a mixture?
6. How many spots on a chromatogram would a pure compound produce?

Testing for gases

1. What is the test and positive result for hydrogen gas?
2. What is the test and positive result for oxygen gas?
3. What is the test and positive result for carbon dioxide gas?
4. What is the test and positive result for chlorine gas?

History of the atmosphere and our evolving atmosphere

1. What is the composition of the atmosphere and their respective percentages?
2. Approximately for how many years has the atmosphere been at these percentages?
3. Why is evidence for the early atmosphere limited?
4. What is the main theory for the formation of the Earth's early atmosphere?
5. What 2 planets was the early atmosphere like and why?
6. What gases were produced by volcanoes?
7. How was the amount of carbon dioxide in the atmosphere reduced?
8. Why did the oxygen levels increase and carbon dioxide levels decrease?
9. What equation represents this?
10. When did algae first produce oxygen?
11. How long did it take for there to be enough oxygen in the atmosphere to enable animals to evolve?

Greenhouse gases and global climate change

1. Why are greenhouse gases important to life on Earth?
2. What are the three greenhouse gases?
3. Name 2 human activities that increase the amounts of carbon dioxide in the atmosphere.
4. Name 2 human activities that increase the amounts of carbon dioxide in the atmosphere.
5. Before scientific evidence is published what must happen to it?
6. What does the evidence suggest will happen to the Earth's atmosphere?
7. What consequences will this have?
8. Why is it difficult to model global climate change?
9. Why should the public be careful of the opinions presented in the media?
10. What are the 4 potential effects of global climate change?
11. What is the carbon footprint?
12. How can the carbon footprint be reduced?

Atmospheric pollutants

1. What is a major source of atmospheric pollutants?
2. What do most fuels, including coal contain?
3. When a fuel is burned what gases are released into the atmosphere?
4. What solids can be released in the atmosphere when fuels are burned?
5. What is carbon monoxide and why is hard to detect?
6. What are the 2 issues with sulfur dioxide and oxides of nitrogen?
7. What are the 2 issues with particulates?

Finite and renewable resources

1. What do humans use the Earth's resources for?
2. What do natural resources provide?
3. What is a finite resource?
4. What are finite resources used for?
5. What role does Chemistry play in the development of products for the needs of current generations?

Water safe to drink

1. What properties should water have for drinking?
2. What is potable water?
3. In terms of chemistry, is potable water pure?

4. In the UK what 3 stages is most potable water produced by?
5. What are the three sterilising agents used for potable water?
6. What is desalination?
7. What is the key drawback to desalination?

Treating waste water

1. Give two ways that waste water is produced.
2. What must happen to waste water before it is released into environment?
3. What are the 4 stages of sewage treatment?

Extracting metals from ores HT

1. HT: What can be said of the Earth's resources of metal ores?
2. HT: Name the 2 processes which copper can be extracted from low-grade ores.
3. HT: How does each of these processes work?
4. HT: Name 2 other processes to obtain copper

Life cycle assessments

1. What is the purpose of a life cycle assessment (LCA)?
2. What are the 4 stages of an LCA?

Reduce, reuse recycle

1. What does reducing the use and reusing and recycling of materials do?
2. Give 5 things that come from limited raw materials?
3. Where are raw materials obtained from?
4. How can glass bottle be reused?
5. How can metals be recycled?

By the end of Autumn 2, the skills you will know are:

Chromatography

1. What equipment is needed to carry out chromatography?
2. Why is the sample line drawn in pencil and not ink?
3. Draw a diagram of the practical and add the following labels; solvent front, sample line, filter paper, sample(s), results
4. What two chemicals could the solvent be?

5. Does chromatography separate compounds or mixtures?
6. If two samples contained the same substance, how would the results show this?
7. If a sample contained three substances, how many spots would there be?

Key Maths skills:

1. Calculate R_f value using $R_f = \text{distance moved by substance} / \text{distance moved by solvent}$
2. Use ratios, fractions and percentages
3. Substitute numerical values into algebraic equations
4. Use appropriate units for physical quantities

Water purification

1. What are the safety precautions for this experiment?
2. How do you measure pH of a solid and of a liquid?
3. How can evaporation of a substance be carried out?
4. How can distillation of a substance be carried out?

Key Maths skills:

5. Estimate of volumes
6. Calculate mass

By the end of Spring 1, you will know:

Vectors and scalars

1. What is a scalar?
2. What are some examples of scalar quantities?
3. What is a vector?
4. What are some examples of vector quantities?
5. How can a vector be represented?
6. What is displacement?

Forces between objects & resultant forces

1. What is a force?
2. What can a force do to an object?
3. What are the units of force?
4. What is meant by a contact force?
5. Give an example of a contact force.
6. What is meant by non-contact force?
7. Give an example of a non-contact force.
8. When two objects interact what can be said about the forces on each other?

9. What is a resultant force?
10. What happens if the resultant force on an object is zero?
11. What happens if the resultant force on an object is greater than zero?
12. How do you calculate the resultant force if the forces are acting in the same direction?
13. How do you calculate the resultant force if the forces are acting in different directions?
14. What is a free-body diagram? (H)

Force and elasticity

1. What is meant when an object is called elastic?
2. How do you measure the extension of a stretched object?
3. How does the extension of a spring change when a force is applied to it?
4. What is meant by the limit of proportionality of a spring?
5. What equation links force, spring constant and extension?
6. What are the units of the spring constant?
7. What are the units of extension?

Centre of mass

1. What is meant by centre of mass?
2. Where is the centre of mass of a meter ruler located?
3. Where is the centre of mass of a freely suspended object located?
4. How do you find the centre of mass of a symmetrical object?

Parallelogram of forces (H)

1. What is meant by the parallelogram of forces?
2. What can the parallelogram of forces be used for?
3. What is the resultant force on a scale diagram of parallelogram of forces?

Resolution of forces (H)

1. What is meant by resolution of a force?
2. How do you resolve a force?
3. What can be said about the resultant force if an object is in equilibrium?

Speed, velocity, acceleration and Distance-Time Graphs

1. What is the equation to calculate speed?
2. What are the units of speed?
3. What is the difference between speed and velocity?
4. What is the equation to calculate acceleration?
5. What are the units of acceleration?
6. What is the difference between acceleration and deceleration?
7. How does a distance-time graph show if an object is stationary?
8. How does a distance-time graph show if an object is moving at a constant speed?
9. What does the gradient of a distance-time graph represent?

Velocity-Time Graphs and analysing motion graphs

1. How can a change in velocity be measured?
2. What does the gradient of the line on a V-T graph represent?
3. What does a horizontal line on a V-T graph represent?
4. What does a negative gradient on a V-T graph represent?
5. What does the area under the line on a V-T graph represent? (H)
6. How can the speed be calculated from a D-T graph when the speed is constant? (H)
7. How can the speed be calculated from a D-T graph when the speed is changing? (H)
8. What equation links initial velocity, final velocity, acceleration and distance? (H)

Force and acceleration

1. What equation links force, mass and acceleration?
2. What are the standard units of mass?
3. What effect does a greater resultant force have on the acceleration of an object?
4. What effect does a greater mass have on the acceleration of an object?
5. What is meant by the inertia of an object? (H)

Weight and terminal velocity

1. What is the difference between mass and weight?
2. What is the value for acceleration when an object is acted on only by gravity?
3. What equation links weight, mass and gravitational field strength?

4. What are the units of gravitational field strength?
5. What does terminal velocity mean?
6. What can be said about an objects resultant force if it is at terminal velocity?

Forces and braking

1. What forces oppose the driving force of a vehicle?
2. What two components does the stopping distance of a vehicle depend on?
3. What factors affect thinking distance?
4. What factors affect braking distance?

Momentum and using conservation of momentum (H)

1. What is the equation to calculate momentum?
2. What is the unit of momentum?
3. What is meant by conservation of momentum

By the end of Spring 1, the skills you will know are:

Force and extension

1. Name the dependent variable in this experiment.
2. What is the relationship between weight and spring extension?
3. What is the equation for spring constant?
4. Why is it important safety glasses were worn?
5. What is the function of the "pointer" in the experiment?
6. Which parts of the spring should be measured in the experiment?
7. How do you work out change in length?

Key Maths Skills

8. Rearrange equation
9. Measuring using a ruler
10. Gradient of a line (H)

Acceleration

1. What is Newton's second law?
2. What is the equation linking force, mass and acceleration?
3. Why is it an advantage to use light gates?

4. What is the potential source of error in this investigation?
5. Draw a free body diagram to show the forces acting on the trolley during the experiment.
6. List all the contact forces.
7. List all the non-contact forces.
8. What is the difference between speed and velocity?

Key Maths Skills

1. Rearrange equation
2. Gradient of a line (H)

By the end of Spring 2, you will know:

The nature and properties of waves

1. What are the two types of waves?
2. What two things can be transferred by waves?
3. What is the direction of oscillation in a transverse wave?
4. What is the direction of energy transfer in a longitudinal wave?
5. Give an example if a transverse wave.
6. Give an example of a longitudinal wave.
7. What do mechanical waves need to transfer.
8. What type of wave travel through air?
9. Define amplitude
10. Define wavelength
11. Define frequency
12. Define period
13. Give the equation to calculate period.
14. What are the units of period
15. What are the units of frequency.
16. Draw and label a transverse wave.
17. Draw and label a longitudinal wave.
18. What is the equation to calculate wave speed?
19. What is the units of wave speed?

Reflection and refraction (H)

1. What 4 things do substances do to electromagnetic waves.
2. What happens to plane waves crossing a boundary between two different materials?

More about waves

1. What are sound waves?
2. What can sound waves not travel through?
3. Give three ways waves can be investigated.

The electromagnetic spectrum

1. What type of wave is an EM wave?
2. What do EM waves transfer energy to?
3. How many waves is the EM spectrum?
4. What speed do they travel in a vacuum or in air?
5. How are the waves that form the EM spectrum grouped?
6. Name the 7 regions of the EM spectrum.

Light, infrared, microwaves, radio waves and communications

1. Give a use for light, infrared, microwave and radiowaves.
2. What causes the refraction of waves? (HT)
3. What can electrical circuits do to produce radiowaves? (HT)
4. Name a danger of light, infrared and microwave.

Ultraviolet waves, X-rays, gamma rays and uses in medicine

1. Give a use for UV waves, X-rays and gamma rays.
2. How can EM waves be generated or absorbed from atoms? (HT)
3. Where do gamma rays originate from? (HT)
4. Which are ionising waves on the EM spectrum?
5. What is radiation dose a measure of?
6. Give a risk of UV, X-rays and gamma rays.

Magnetism and electromagnetism

1. Where is the magnetic field strongest?
2. What type of force do two magnets exert on each other?
3. What do 2 like poles do?
4. What do 2 unlike poles do?
5. What does a permanent magnet produce?
6. How can an induced magnet be made?
7. What type of force does induced magnetism cause?
8. What happens to induced magnets when they are removed from a magnetic field?

Magnetic fields and magnetic fields of electric devices

1. What is the magnetic field?
2. Name 3 magnetic materials
3. What affects the strength of a magnetic field?
4. What direction does a magnetic field go?
5. What does a compass contain?
6. What direction do compass needles point?
7. What is made when a current flows through a wire?
8. What does the strength of a magnetic field in a wire depend on?
9. What is the magnetic field in a solenoid like?
10. How can you increase the strength of a solenoid?
11. What is an electromagnet?

The motor effect (H)

1. What is the motor effect?
2. What equation links force, magnetic flux density, current and length?
3. What are the units for each?
4. What is the basis of an electric motor?

By the end of Spring 2, the skills you will know are:

Waves

1. What piece of equipment is used to measure time?
2. Sketch the wave produced on the string and label it with amplitude and the wavelength.
3. Describe the direction of movement of particles and transfer of energy in the wave on the string.
4. A student pushes a slinky back and fourth to investigate longitudinal waves, draw a labelled diagram of this.
5. What is an alternative way of measuring wavelength that does not involve a strobe light?
6. What is the function of the white screen and lamp?
7. How can frequency be calculated?
8. How can wave speed be calculated?
9. What are the units for wavelength, frequency and wave speed?

10. What is an advantage of using a wave generator or motor to produce waves in a ripple tank instead of producing them by hand?

Key Maths Skills

1. Rearrange equations
2. Substitute into equations
3. Converting between units and standard form