KS3 Physics

Energy

1. The energy value of a food is the amount of energy released when the food is used by the body.
2. The energy value of food is measured in kilojoules (kJ).
3. Food labels can be compared by looking at the energy value per 100 g or per serving.
4. kJ stands for kilojoule.
5. A higher energy value means the food provides more energy to the body.
6. Power is the rate at which energy is transferred.
7. Power is measured in watts (W).
8. W stands for watt.
9. kW stands for kilowatt.
10. Compare the power ratings shown on the appliances.
11. A higher power rating means the appliance transfers energy more quickly.
12. Energy is the amount of energy transferred, while power is how quickly energy is transferred.
13. Energy can be measured in joules (J) or kilowatt-hours (kWh).
14. J stands for joule.
15. kWh stands for kilowatt-hour.
16. Compare the amount of energy transferred by each appliance over the same period of time.
17. A domestic fuel bill shows the cost of energy used in a home.
18. A domestic fuel bill can show the amount of energy used, the cost per unit and the total cost.
19. The more fuel used, the more energy is used and generally the higher the cost.
20. The cost depends on factors such as the amount of fuel used and the price per unit of fuel.
21. A fuel is a substance that releases energy when it reacts, usually by burning.
22. An energy resource is a source from which useful energy can be obtained.
23. A renewable energy resource is a resource that is naturally replaced and will not run out through normal use.
24. A non-renewable energy resource is a resource that is used faster than it is replaced and can eventually run out.
25. Renewable resources are naturally replaced, while non-renewable resources are limited and take a very long time to form.

Energy changes and transfers

1. A simple machine is a device that makes it easier to move or lift a load by changing the size or direction of a force.
2. A simple machine can produce a bigger force by using a smaller force over a greater distance.
3. When a simple machine produces a bigger force, the distance moved is smaller.
4. When a simple machine produces a bigger movement, the force produced is smaller.
5. It means that the force and distance change in opposite ways, so the overall work done remains the same.
6. A temperature difference causes thermal energy to transfer between objects.
7. Thermal energy transfers from the hotter object to the cooler object.
8. Thermal equilibrium is reached when objects have the same temperature and there is no overall transfer of thermal energy between them.
9. The temperature difference gets smaller until it reaches zero.
10. Conduction is the transfer of thermal energy through a substance from hotter areas to cooler areas.
11. Conduction transfers energy through collisions and vibrations of particles.
12. Radiation is the transfer of energy by electromagnetic waves, such as infrared radiation.
13. Convection is the transfer of thermal energy by the movement of a fluid, such as a liquid or gas.
14. An insulator is a material that reduces the transfer of thermal energy.
15. Insulators reduce energy transfer because they are poor conductors of thermal energy.
16. Energy is transferred to or from an object's kinetic energy store when its motion changes.
17. When an object is dropped, energy is transferred from its gravitational potential energy store to its kinetic energy store.
18. When an electrical circuit is completed, energy is transferred electrically to the components.
19. When a spring is stretched, energy is transferred to its elastic potential energy store.
20. During the metabolism of food, energy stored in food is transferred to the body's energy stores and surroundings.
21. When a fuel burns, energy stored in the fuel is transferred to the surroundings, mainly as thermal energy and light.
22. The temperature of an object increases when it gains thermal energy.
23. The temperature of an object decreases when it loses thermal energy.
24. Heating transfers thermal energy from a hotter object to a cooler object.

25. Thermal energy transfer reduces the temperature difference because energy moves from the hotter object to the cooler object.

Changes in systems

1. Energy is the ability to cause change or make things happen.
2. Energy can be measured by measuring the amount of energy transferred or stored.
3. The total amount of energy is conserved during a change; it is transferred between stores or to the surroundings.
4. When a moving object speeds up, its kinetic energy increases.
5. When an object's temperature increases, its thermal energy increases.
6. When an object is raised higher, its gravitational potential energy increases.
7. When a spring is stretched, energy is stored in its elastic potential energy store.
8. When a fuel burns, energy stored in the fuel is transferred to other energy stores and the surroundings.
9. To describe energy changes in a system, compare the energy stores before and after the change and how energy is transferred between them.
10. Physical processes such as heating, cooling, movement, electrical transfer and changes of state can transfer or change energy.

Motion and forces

Describing motion

1. Speed is how fast an object moves.
2. speed = distance ÷ time
3. Speed is usually measured in metres per second (m/s).
4. Distance is the length of the path travelled by an object.
5. Distance is usually measured in metres (m).
6. Time is the duration of an event or movement.
7. Time is usually measured in seconds (s).
8. Average speed is calculated using total distance ÷ total time.
9. 12 m/s
10. 120 m
11. The average speed increases.
12. The average speed increases.
13. A distance-time graph shows how an object's distance changes with time.
14. The gradient represents the object's speed.

15. A horizontal line shows that the object is stationary.
16. A straight sloping line shows that the object is moving at a constant speed.
17. A steeper line shows a greater speed.
18. A curved line shows that the object's speed is changing.
19. It can show when an object is moving, stationary, speeding up or slowing down.
20. Calculate the gradient of the graph using change in distance ÷ change in time.
21. Relative motion describes the motion of one object compared with another object.
22. Two moving vehicles can appear to move relative to each other because each vehicle is moving compared with the other.
23. If they travel in the same direction at the same speed, they appear stationary relative to each other.
24. If they travel in opposite directions, their relative speed is the sum of their speeds.
25. Their speeds add together when they move towards each other, so their distance apart decreases more quickly.

Forces

Forces and their effects

1. A force is a push or a pull.
2. A force can change an object's speed, direction or shape.
3. Forces arise from interactions between objects.
4. A push is a force that moves an object away from the object applying the force.
5. A pull is a force that moves an object towards the object applying the force.
6. A force arrow is used to show the size and direction of a force.
7. The direction of a force arrow shows the direction in which the force acts.
8. Forces acting in one dimension can be added together by considering their directions; forces in opposite directions are subtracted.
9. Balanced forces are forces that are equal in size and opposite in direction, giving a resultant force of zero.
10. Forces are measured in newtons (N).
11. When forces are balanced, the object remains stationary or continues moving at a constant speed in a straight line.
12. When forces are unbalanced, the object accelerates, decelerates or changes direction.
13. A moment is the turning effect of a force around a pivot.
14. The turning effect of a force is the tendency of a force to make an object rotate.
15. A pivot is the point around which an object turns.

16. A force has a greater turning effect when it acts further from the pivot.
17. Deformation is a change in the shape of an object.
18. A force can deform an object by stretching, squashing, bending or twisting it.
19. When an object is stretched, it gets longer.
20. When an object is squashed, it gets shorter or changes shape.
21. Friction is a force that opposes motion between surfaces that are touching.
22. Friction slows down moving objects and can produce thermal energy.
23. An object moving through air or water experiences a resistive force that opposes its motion.
24. Air resistance is a force that opposes an object's motion through air.
25. Water resistance is a force that opposes an object's motion through water.

Springs, energy and non-contact forces

1. Force is measured in newtons (N).
2. Extension is the increase in length of a spring when a force is applied.
3. extension = stretched length – original length
4. Compression is when an object is squashed so that its length decreases.
5. The extension of a spring generally increases as the force increases, provided the limit of proportionality is not exceeded.
6. Measure the spring's original length, then its length with the force applied, and subtract the original length from the new length.
7. A force-extension relationship shows how the extension of a spring changes when the applied force changes.
8. A straight-line force-extension relationship shows that extension is directly proportional to force.
9. Hooke's Law states that the extension of a spring is proportional to the force applied, provided the limit of proportionality is not exceeded.
10. Beyond the limit of proportionality, the spring's extension is no longer proportional to the force.
11. Work done is the energy transferred when a force moves an object through a distance.
12. Energy is transferred to the object's elastic potential energy store when it is deformed.
13. Energy is stored in the spring's elastic potential energy store.
14. A non-contact force is a force that acts without objects touching.
15. Gravity is a force of attraction between masses.
16. Gravity can act between objects because masses attract each other even when they are not touching.
17. Near Earth, gravity pulls objects towards the centre of the Earth.
18. In space, gravity can cause objects to attract each other and move in orbits.

19. A magnetic force is a non-contact force caused by magnets acting on other magnets or magnetic materials.
20. Like magnetic poles repel each other.
21. Unlike magnetic poles attract each other.
22. Static electricity is the build-up of electric charge on an object.
23. Objects with the same electric charge repel each other.
24. Objects with opposite electric charges attract each other.
25. Three types of non-contact force are gravitational, magnetic and electrostatic forces.

Pressure in fluids

1. Atmospheric pressure is the pressure caused by the weight of the air above a surface.
2. Atmospheric pressure is caused by the weight of the air in the atmosphere.
3. Atmospheric pressure decreases with height because there is less air above you.
4. The weight of air above you decreases as height increases.
5. Less weight of air above you means less atmospheric pressure.
6. Liquid pressure is the force exerted by a liquid on a surface.
7. Liquid pressure increases as depth increases.
8. Liquid pressure increases with depth because there is more liquid above, producing greater pressure.
9. Upthrust is an upward force exerted by a fluid on an object.
10. Upthrust is caused by the pressure of the fluid acting on the object.
11. Upthrust helps determine whether an object floats or sinks.
12. The object moves upwards.
13. The object moves downwards and may sink.
14. The object is in equilibrium and can remain at rest.
15. Pressure is the force acting on a given area.
16. Pressure = force ÷ area.
17. Pressure is measured in pascals (Pa).
18. Force is measured in newtons (N).
19. Area is measured in square metres (m^2).
20. The pressure increases.
21. The pressure decreases.
22. A sharp object has a smaller contact area, so the same force produces greater pressure.
23. The force acts at right angles to the surface.
24. A smaller contact area produces greater pressure, while a larger contact area produces lower pressure.
25. Divide the force by the area: pressure = force ÷ area.

Balanced forces

1. Opposing forces are forces acting in opposite directions.
2. Equilibrium is when the forces acting on an object are balanced.
3. The object remains at rest or continues moving at a constant speed in a straight line.
4. Weight is the downward force caused by gravity.
5. A stretched spring provides an upward force that can balance the object's weight.
6. A compressed surface provides an upward support force.
7. The object is in equilibrium.
8. The upward support force balances the downward weight.
9. The object accelerates downwards.
10. The object accelerates upwards.

Forces and motion

1. A force can make an object start moving.
2. A force can make an object speed up or slow down.
3. A force can change the direction in which an object moves.
4. The object tends to speed up.
5. The object tends to slow down.
6. The object's speed and/or direction of motion can change.
7. A larger force generally produces a greater change in motion.
8. The direction of the force determines the direction of the change in motion.
9. A force is needed to change the object's state from rest to motion.
10. A force is needed to change the object's motion, such as stopping it or changing its direction.

Waves — Observed waves

1. A water wave is a disturbance that transfers energy through water.
2. Water waves transfer energy through the water while the water particles mainly move up and down.
3. Water waves have transverse wave motion.
4. A transverse wave is a wave where the particles vibrate at right angles to the direction the wave travels.
5. The wave changes direction when it bounces off a surface.
6. The waves combine when they meet.
7. Superposition is when two or more waves overlap and their effects combine.
8. The waves produce a larger resultant wave.
9. The waves produce a smaller resultant wave and may cancel completely.

10. Reflection can change the direction of waves, while superposition can make waves larger or smaller.

Waves — Sound waves

1. Frequency is the number of waves or vibrations passing a point each second.
2. Frequency is measured in hertz (Hz).
3. A high-frequency sound has a higher pitch.
4. An echo is a reflected sound heard again after the original sound.
5. An echo is produced when sound waves reflect from a surface and return to the listener.
6. Sound waves bounce back from a surface.
7. Sound energy is absorbed by the material.
8. Sound needs a medium because its vibrations are passed from particle to particle.
9. A medium is a substance through which a wave can travel.
10. No. Sound cannot travel through a vacuum.
11. Sound travels faster in water than in air.
12. Sound travels faster in solids than in air.
13. Sound is produced by vibrating objects.
14. A loudspeaker's diaphragm vibrates, producing sound waves.
15. A microphone detects sound vibrations and converts them into an electrical signal.
16. The microphone diaphragm vibrates.
17. The eardrum detects sound vibrations.
18. Sound is a longitudinal wave.
19. A longitudinal wave is a wave where particles vibrate parallel to the direction the wave travels.
20. Particles move backwards and forwards parallel to the direction of wave travel.
21. The human auditory range is approximately 20 Hz to 20,000 Hz (20 kHz).
22. Different animals have different auditory ranges, with some able to hear higher or lower frequencies than humans.
23. Their ears and hearing systems are adapted to detect different frequencies.
24. The sound energy is absorbed, so less sound is reflected.
25. Sound waves reflect from a surface and return to the listener, producing an echo.

Energy and waves

1. Pressure waves transfer energy.

2. Ultrasound is sound with a frequency above the upper limit of human hearing.
3. Ultrasound can be used to clean objects by producing vibrations that help remove dirt.
4. Ultrasound can be used in physiotherapy to transfer energy into tissues and help treat injuries.
5. Waves can transfer information by carrying signals from one place to another.
6. A microphone converts sound vibrations into an electrical signal.
7. The sound wave makes the microphone's diaphragm vibrate.
8. The diaphragm responds to sound vibrations.
9. Pressure waves are useful for transferring energy because they carry energy from one place to another.
10. Waves are useful for transferring information because they can carry signals from one place to another.

Light waves and reflection

1. A light wave is a wave that transfers energy and allows us to see.
2. Light waves can transfer energy and can be reflected, absorbed or transmitted.
3. Light waves do not need a material medium to travel through, unlike waves in matter.
4. Yes, light waves can travel through a vacuum.
5. A vacuum is a region containing no matter.
6. The speed of light in a vacuum is about 300,000,000 m/s.
7. Light can travel through empty space because it does not need particles to transfer its energy.
8. The material absorbs the light energy.
9. Absorption is when a material takes in light energy.
10. Diffuse scattering is when light is scattered in many different directions from a rough surface.
11. The light is reflected in many different directions.
12. Specular reflection is the reflection of light from a smooth surface in a regular direction.
13. Light is reflected in a regular direction.
14. Diffuse scattering sends light in many directions, while specular reflection sends light in a regular direction.
15. A smooth, shiny surface produces specular reflection.
16. A rough surface produces diffuse scattering.
17. The light is absorbed or reflected rather than transmitted through the material.

18. The light energy is transferred to the material, often increasing its thermal energy.
19. Light may be absorbed, transmitted, reflected or scattered depending on the material.
20. Transmission is the passing of light through a material.
21. The light passes through the material.
22. The light changes direction as it bounces off the surface.
23. The light is reflected in many different directions.
24. Smooth surfaces tend to produce specular reflection, while rough surfaces tend to produce diffuse scattering.
25. Light can be absorbed, transmitted or reflected by a material.

Light rays, lenses and the eye

1. The ray model represents light as straight lines called rays.
2. Arrows on light rays show the direction in which the light travels.
3. The ray model can show the path of light using straight lines and arrows.
4. A plane mirror forms an image by reflecting light from the object into the observer's eyes.
5. Light is reflected from the mirror.
6. A pinhole camera is a simple camera with a small hole that allows light to enter.
7. Light travels in straight lines through the pinhole and forms an image on the opposite side.
8. The image is upside down because light rays from the top and bottom of the object cross at the pinhole.
9. Refraction is the change in direction of light when it passes from one material into another.
10. The light ray changes direction and may change speed.
11. Light changes direction because its speed changes when it enters a different material.
12. A convex lens is a lens that is thicker in the middle than at the edges.
13. A convex lens bends light rays towards each other.
14. Focusing light means bringing light rays together at a point.
15. The focal point is the point where parallel light rays meet after passing through a convex lens.
16. A ray diagram can show parallel rays bending towards each other and meeting at the focal point.
17. The main function of the human eye is to detect light and form an image.
18. The cornea helps focus light as it enters the eye.
19. The iris controls the size of the pupil.
20. The pupil is the opening through which light enters the eye.
21. The lens focuses light onto the retina.

22. The retina detects light and contains light-sensitive cells.
23. The optic nerve carries signals from the retina to the brain.
24. The eye forms an image by focusing light onto the retina.
25. The eye detects light using light-sensitive cells in the retina.

Light, energy and colour

1. Light transfers energy from a source to an absorber.
2. A source of light is an object that produces or emits light.
3. An absorber of light is a material that takes in light energy.
4. Light can cause chemical changes, such as photosynthesis.
5. Light can cause electrical effects, such as producing an electrical signal in a light-sensitive device.
6. A photosensitive material is a material that responds to light.
7. Photosensitive material is found in the retina of the eye.
8. Photosensitive material in the retina detects light and helps produce signals sent to the brain.
9. Cameras use photosensitive materials to detect and record light.
10. The colour of light depends on its frequency.
11. Frequency is the number of waves passing a point each second.
12. Different colours of light have different frequencies.
13. White light is light containing a mixture of different colours.
14. White light contains the colours of the visible spectrum: red, orange, yellow, green, blue, indigo and violet.
15. A prism separates white light into its different colours.
16. Different colours of light are refracted by different amounts as they pass through the prism.
17. A light filter is a material that allows some colours of light through and absorbs others.
18. A coloured filter transmits its own colour and absorbs many of the other colours.
19. Much of the white light is absorbed by the black object.
20. A black object appears black because it absorbs most of the visible light that falls on it.
21. A red object appears red because it diffusely reflects red light and absorbs much of the other visible light.
22. A white object appears white because it diffusely reflects most of the visible light.
23. The light energy is transferred to the object.
24. The reflected light travels away from the object in many directions.
25. An object appears a particular colour because of the colours of light it reflects into our eyes.

Electricity and electromagnetism

Current electricity

1. Electric current is the flow of electric charge.
2. Electric current is measured in amperes (A).
3. An ammeter measures electric current.
4. The flow of charge means electric charge moving through a circuit.
5. A series circuit has components connected in a single loop.
6. A parallel circuit has components connected in separate branches.
7. The current is the same at all points in a series circuit.
8. The current splits between the branches and recombines where the branches meet.
9. Potential difference is the difference in electrical energy per unit charge between two points.
10. Potential difference is measured in volts (V).
11. A voltmeter measures potential difference.
12. A battery provides a potential difference that pushes charge around a circuit.
13. A bulb rating tells you the voltage and/or power the bulb is designed to operate at.
14. Resistance is how much a component opposes the flow of electric current.
15. Resistance is measured in ohms (Ω).
16. Potential difference, current and resistance are related by $V = I \times R$.
17. Resistance can be calculated using $R = V \div I$.
18. A conductor is a material that allows electric current to flow easily.
19. An insulator is a material that does not allow electric current to flow easily.
20. Conductors have low resistance, while insulators have high resistance.
21. An insulator has high resistance because it strongly opposes the flow of charge.
22. A conductor has low resistance because charge can flow through it easily.
23. The current divides between the different branches of a parallel circuit.
24. The branch currents add together to give the total current.
25. A complete circuit provides a continuous path for charge to flow.

Static electricity

1. Static electricity is a build-up of electric charge on an object.
2. Rubbing two objects together can transfer electrons from one object to the other.
3. Electrons are transferred when objects are rubbed together.
4. An object becomes negatively charged when it gains electrons.
5. An object becomes positively charged when it loses electrons.

6. Objects with the same type of charge repel each other.
7. Objects with opposite charges attract each other.
8. The force between charged objects depends on the size of their charges and the distance between them.
9. An electric field is a region where an electric charge experiences a force.
10. An electric field can exert a force on a charged object without the objects touching.

Magnetism

1. A magnetic pole is a region of a magnet where the magnetic force is strongest.
2. The two types of magnetic pole are north and south.
3. Two north poles repel each other.
4. Two south poles repel each other.
5. A north pole and a south pole attract each other.
6. A magnetic field is the region around a magnet where magnetic forces act.
7. A compass can be moved around a magnet to show the direction of the magnetic field at different points.
8. Magnetic field lines show the shape and direction of a magnetic field.
9. The direction of magnetic field lines shows the direction of the force on a north pole.
10. Earth produces a magnetic field because of processes involving moving molten material in its outer core.
11. A compass can help with navigation because its needle aligns with Earth's magnetic field.
12. A compass points in a particular direction because its magnetic needle aligns with Earth's magnetic field.
13. A magnetic field is produced around the wire.
14. An electromagnet is a magnet produced by an electric current.
15. An electromagnet can be made stronger by increasing the current, adding more coils, or using an iron core.
16. The magnetic field disappears or becomes much weaker when the current is switched off.
17. A D.C. motor is a device that uses electrical energy to produce rotational movement.
18. A D.C. motor works because a current-carrying wire in a magnetic field experiences a force.
19. A magnetic field exerts a force on a current-carrying wire.
20. The force on current-carrying wires in a magnetic field can make a motor rotate.
21. Electromagnets are useful because they can be switched on and off and their strength can be changed.

22. An electromagnet needs an electric current, so it can be switched on and off; a permanent magnet remains magnetic without a current.
23. A compass can show a magnetic field because its needle turns to align with the field.
24. Increasing the current makes the magnetic field stronger; reversing the current reverses the field direction.
25. An electric current produces a magnetic field, allowing electricity to be used to create an electromagnet.

Matter

Physical changes

1. Conservation of material means that material is not created or destroyed during a physical change.
2. The mass stays the same when a substance melts, provided no material is lost.
3. The mass stays the same when a substance freezes.
4. The mass stays the same when a substance evaporates if the vapour is not lost.
5. The mass stays the same when a substance condenses.
6. The mass stays the same when a substance dissolves.
7. A reversible physical change can be changed back to the original substance or state.
8. Melting can be reversed by freezing, and freezing can be reversed by melting.
9. Evaporation can be reversed by condensation.
10. Sublimation is when a solid changes directly into a gas without becoming a liquid.
11. During condensation, a gas changes into a liquid.
12. During evaporation, particles escape from the surface of a liquid and become a gas.
13. During dissolving, particles of a substance spread among the particles of the solvent.
14. Density is the mass of a substance per unit volume.
15. A solid generally has a greater density than its liquid.
16. A liquid generally has a greater density than a gas.
17. The particles in a solid are closely packed in fixed positions.
18. The particles in a liquid are close together but can move past each other.
19. The particles in a gas are far apart and move freely.
20. Brownian motion is the random movement of particles caused by collisions with other particles.

21. Brownian motion in gases is caused by collisions with fast-moving gas particles.
22. Diffusion is the spreading out of particles from an area of higher concentration to an area of lower concentration.
23. Diffusion is caused by the random movement of particles.
24. Particles diffuse from a region of higher concentration to a region of lower concentration until they become more evenly spread.
25. A physical change does not produce a new substance, while a chemical change produces one or more new substances.

Particle model

1. Solid particles are closely packed and arranged in fixed positions.
2. Liquid particles are close together but can move past each other.
3. Gas particles are far apart and move freely in all directions.
4. Solid particles vibrate in fixed positions, liquid particles move past each other, and gas particles move freely.
5. Particles are closest together in solids, further apart in liquids, and very far apart in gases.
6. Changes of state occur when particles gain or lose energy and change their movement and arrangement.
7. Solid particles are held closely together and only vibrate around fixed positions.
8. Liquid particles can move past each other, allowing the liquid to flow.
9. Ice is less dense than liquid water because its particles form a more open structure when it freezes.
10. Atoms are single particles that make up elements, while molecules are groups of two or more atoms joined together.

Energy in matter

1. Particles move faster when a substance is heated.
2. Particles generally become further apart when a substance is heated.
3. Particles move more slowly when a substance is cooled.
4. Particles generally become closer together when a substance is cooled.
5. Internal energy is the total energy stored inside a material due to its particles.
6. Internal energy is stored in the movement and interactions of the particles.
7. Increasing temperature increases the internal energy of a material.
8. Decreasing temperature decreases the internal energy of a material.
9. Faster-moving particles have greater kinetic energy, contributing to greater internal energy.
10. Heating transfers energy to the particles, increasing the material's internal energy.

Space physics

1. Gravity is a force of attraction between objects with mass.
2. Weight is the force acting on an object due to gravity.
3. Weight = mass × gravitational field strength = 6 × 10 = 60 N.
4. Weight is measured in newtons (N).
5. Mass is measured in kilograms (kg).
6. Gravitational field strength is measured in newtons per kilogram (N/kg).
7. The gravitational field strength on Earth is approximately 10 N/kg.
8. An object's weight depends on the gravitational field strength, which is different on different planets.
9. The Earth and Moon attract each other through gravity.
10. The Earth and Sun attract each other through gravity.
11. The Sun is a star at the centre of our Solar System.
12. A star is a very large, hot ball of gas that gives out light and other radiation.
13. The Sun is a fairly typical star, although stars vary in size, temperature and brightness.
14. The Milky Way is the galaxy that contains our Solar System.
15. A galaxy is a huge collection of stars, gas and dust held together by gravity.
16. Another galaxy is a separate huge collection of stars, gas and dust outside our own galaxy.
17. The seasons are caused by the tilt of Earth's axis as Earth orbits the Sun.
18. Earth's tilted axis means different parts of Earth receive different amounts of sunlight during the year.
19. Day length changes because the tilt of Earth's axis changes how long different parts of Earth are facing towards the Sun.
20. The Northern and Southern Hemispheres are tilted towards the Sun at different times of the year.
21. Daylight hours are longer during summer in the Northern Hemisphere.
22. Daylight hours are shorter during winter in the Northern Hemisphere.
23. A light year is the distance light travels in one year.
24. A light year measures distance, not time.
25. A light year is useful because distances between stars and galaxies are extremely large.