



Year:

9

Term:

Sp1

Topic:

- 1 What type of energy store is exemplified by moving objects?
- 2 The law of conservation of energy states what three things that can happen to energy
- 3 Which word means 'wasted into the surroundings'?
- 4 When energy is wasted, it is usually which energy stores?
- 5 The law of conservation of energy states that which two things cannot happen to energy?
- 6 What can be done to moving parts in a system to reduce heat loss by friction?
- 7 What name is given to a material which does not conduct thermal energy well?
- 8 What name is given to a material which allows thermal energy to pass through it easily?
- 9 What is the unit for energy?
- 10 What type of heat transfer occurs in solids?
- 11 What type of heat transfer happens only in fluids (gas and liquids)?
- 12 Which is the only type of thermal energy transfer can occur in a vacuum?
- 13 Which dissipates less thermal energy? Thin walls or thick walls?
- 14 Which dissipates less thermal energy? Walls with large or small area
- 15 Which dissipates less thermal energy? Large or small temperature difference

Kinetic energy
Transferred usefully, stored or dissipated
Dissipated
Thermal and sound
Created or destroyed
Lubrication (adding oil/grease)
Thermal insulator
Thermal conductor
Joules (J)
Conduction
Convection
Radiation
Thick
Small
Small

Energy Types (P.1)

Topic:

- 1 Equation for work done.
- 2 Units for work done.
- 3 What is work done?
- 4 Units for power.
- 5 Equation for power.
- 6 Units for time.
- 7 Define power.
- 8 One watt is the same as...
- 9 Equation for efficiency in terms of energy
- 10 Equation for efficiency in terms of power
- 11 Units for efficiency
- 12 Units for force
- 13 One Joule is the same as...
- 14 The minimum value of efficiency
- 15 The maximum value of efficiency

Work done = Force x distance
Joules (J)
Energy transferred.
Watts (W)
Power = Energy transferred/time
seconds (s)
Rate at which energy is transferred.
1 joule per second.
efficiency = useful output energy transfer/total input energy transfer
efficiency = useful output power/total input power
No units
Newtons (N)
one Newton-metre

Work power and efficiency (P.2)

Topic:

- 1 What is the equation for elastic potential energy?
- 2 What is the equation for kinetic energy?
- 3 What is the equation for gravitational potential energy?
- 4 Which equation describes Hooke's Law?
- 5 What type of energy is stored in a stretched elastic band?
- 6 What type of energy is stored in a squashed up tennis ball?
- 7 What needs to be applied for an object to change shape?
- 8 Define the term for an object returning to its original shape after being stretched
- 9 Define the term for an object not returning to its original shape after being stretched
- 10 Identify the Law: "The extension of a spring is directly proportional to the force applied to it."
- 11 What sort of energy is stored in a bungee cord?
- 12 What do you call the point at which Hooke's Law no longer applies?
- 13 In a graph of Hooke's Law, what happens at the limit of proportionality?
- 14 What is the equation for "gravitational potential energy"?
- 15 What is the equation for Kinetic Energy?

$E_e = 1/2ke^2$
 $E_k = 1/2 mv^2$
 $E_g = mgh$
 $F = ke$
Elastic potential energy
Elastic potential energy
A force
Elastic deformation
Inelastic deformation
Hooke's Law
Elastic potential energy
The limit of proportionality
Line no longer straight, it will curve
 $E_g = mgh$
 $E_k = 1/2mv^2$

Elastic objects and potential Energy (P.3)

Topic:

- 1 What are the two types of waves?
- 2 What type of wave is sound?
- 3 What type of wave is visible light?
- 4 How do the particles that make up a wave transfer energy?
- 5 What are the 4 properties of a wave?
- 6 Define "frequency"
- 7 Define "amplitude"
- 8 Define "wavelength"
- 9 Define "period"
- 10 State the equation to calculate the period of a wave
- 11 State the equation to calculate wave speed
- 12 State the relationship between speed and wavelength
- 13 In a transverse wave, oscillations are _____ to the direction of energy transfer
- 14 In a longitudinal wave, oscillations are _____ to the direction of energy transfer
- 15 What do waves transfer?

Transverse and longitudinal
Longitudinal
Transverse
They oscillate (vibrate)
Frequency, amplitude, wavelength, period
The number of waves passing a fixed point per second (hertz)
Maximum displacement that any particle achieves from its undisturbed position (metres)
Distance from one point on a wave to the same point on the next wave (metres)
Time taken for 1 complete oscillation (seconds)
 $T = 1/f$
 $v = f \times \lambda$
They are directly proportional
perpendicular
parallel
Energy (not matter)

Waves (P.4)

Topic:

- 1 What type of waves are electromagnetic waves?
- 2 At what speed do all electromagnetic waves travel?
- 3 What do the different types of electromagnetic waves vary in?
- 4 List the electromagnetic waves in order of frequency from lowest to highest
- 5 Which sub-cellular structure is damaged by ionising radiation?
- 6 Which type of wave is the most ionising?
- 7 Which wave is used in medical imaging?
- 8 Which wave is used in telecommunications?
- 9 Which wave has the longest wavelength?
- 10 State 3 properties shared by all electromagnetic waves
- 11 Which wave has the shortest wavelength?
- 12 State 1 risk associated with UV rays
- 13 Which two types of waves are ionising radiation?
- 14 Which wave can be detected by the human eye?
- 15 Which 3 rays can have hazardous effects on the human body?

Transverse
Speed of light (300,000,000m/s)
Frequency
Radio waves, microwaves, infrared waves, visible light, ultraviolet, X-Rays, gamma rays
DNA
Gamma Rays
X-Rays
Radio waves and microwaves
Radio waves
1) All travel at the speed of light
Gamma rays
Skin cancer
X-Rays and Gamma Rays
Visible light
UV, X-Ray and Gamma rays

Electromagnetic waves 1 (P.5)

Science Knowledge Organiser

Year: 9

Term: Sp1

- Topic:**
- 1 What is produced by oscillations in electrical circuits? (HT only)
 - 2 What happens when a radio wave is absorbed? (HT only)
 - 3 What causes EM waves to be generated/absorbed?
 - 4 State two effects of UV waves
 - 5 State two effects of X-rays and gamma rays
 - 6 State two uses of radio waves
 - 7 State 2 uses of microwaves
 - 8 State 3 uses of infrared
 - 9 State 1 use of visible light
 - 10 State 2 uses of UV waves
 - 11 State two uses of X-rays and gamma rays
 - 12 Why are radio waves used in television and radio? (HT only)
 - 13 Why are microwaves used in cooking? (HT only)
 - 14 Why are microwaves used in satellite communication?(HT only)
 - 15 Why are X-rays and gamma rays used in medical imaging? (HT only)

Electromagnetic waves 2 (P.6)

Radio waves
 Alternating current produced
 Changes in atoms/nuclei of atoms
 Cause skin to age prematurely, increase risk of skin cancer
 1) mutations of genes, 2) cancer
 TV and radio
 Satellite communication and cooking food
 Electrical heaters, cooking food, infrared cameras
 Fibre optic communication
 Energy efficient lamps and sun tanning
 Medical imaging and treatments
 Can be reflected from atmosphere due to wavelength
 Frequency matches frequency of water particles vibrating
 Frequency allows them to pass through atmosphere
 Highly ionising and penetrating

- Topic:**
- 1 What type of waves are sound waves?
 - 2 What type of waves are light waves?
 - 3 Light waves travel in _____
 - 4 Why can sound waves not travel in a vacuum
 - 5 What happens to the speed of a light wave as it enters a more dense medium
 - 6 Which state does a sound wave travel fastest in?
 - 7 Which state does a sound wave travel slowest in?
 - 8 What happens to the direction of a light wave as it enters a different medium?
 - 9 What must sound waves travel through?
 - 10 When light and sound waves reach a boundary between mediums (materials) what four things can happen to them?
 - 11 What happens to the loudness of a sound wave when it's amplitude increases?
 - 12 What happens to the pitch of a sound wave when it's frequency increases?
 - 13 Do light waves vary their speed?
 - 14 What is the amplitude of a sound wave related to?
 - 15 What is the frequency and wavelength of a sound wave related to?

Sound and light waves introduction (P.7)

Longitudinal
 Transverse
 Straight lines
 A vacuum has no particles
 The first part of the light wave slows down
 Solid
 Gas
 The light wave changes direction towards the normal
 A medium
 Reflected, refracted, absorbed, transmitted
 The loudness increases
 The pitch increases (gets higher)
 No, they all travel at the same speed
 It's volume
 It's pitch

- Topic:**
- 1 State 3 things that can happen to waves when they reach a boundary
 - 2 State the name of a reflected sound wave
 - 3 What happens when a sound wave travels through a solid?
 - 4 Name the 4 main parts of the ear
 - 5 Why is human hearing limited?
 - 6 What is the range of normal human hearing?
 - 7 State two uses of ultrasounds
 - 8 Name one object that converts sound waves into electrical waves
 - 9 State the two types of waves produced by earthquakes
 - 10 Which type of wave are P-waves and S-waves?
 - 11 Which type of earthquake wave travels in solids only?
 - 12 Which type of earthquake wave travels in solids AND liquids?
 - 13 What have P-waves and S-waves provided evidence for?
 - 14 Name two animals that use echolocation
 - 15 State one use of echolocation by humans

Properties of waves (separate only) (P.8)

Reflected, transmitted or absorbed
 Echo
 The solid particles vibrate
 1) Pinna, 2) Ear drum, 3) Cochlea, 4) Auditory nerve
 Limited frequency range in which sound waves can convert to vibrations in solids
 20Hz - 20kHz
 Medical and industrial imaging
 Microphone
 P-waves and S-waves
 P-waves = longitudinal
 S-waves
 P-waves
 Structure and size of Earth's core
 Bats and dolphins
 Measuring water depth

- Topic:**
- 1 Visible light is made up of a _____ of colours
 - 2 What determines the colour of visible light?
 - 3 Which type of reflection occurs from a smooth surface in a single direction?
 - 4 Which type of reflection occurs from a rough surface and causes scattering of light?
 - 5 How does a colour filter work?
 - 6 What determines the colour of an opaque object?
 - 7 What colour does an object occur if all wavelengths of light are REFLECTED equally?
 - 8 What colour does an object occur if all wavelengths of light are ABSORBED equally?
 - 9 What is the name given to an object that transmits all light?
 - 10 What is the name given to an object that transmits some light?
 - 11 When drawing a ray diagram, what is the name given to the line drawn at 90° to the object?
 - 12 What is the name given to the light ray that goes INTO an object?
 - 13 What is the name given to the light ray that is reflected from an object?
 - 14 What is the rule that links the angle of incidence and the angle of reflection?
 - 15 Recall the colours of light from low frequency to high frequency

Light waves - reflection (separate only) (P.9)

spectrum
 It's wavelength and frequency
 Specular reflection
 Diffuse reflection
 Absorbs certain wavelength and transmits others
 Which wavelengths of light are most strongly reflected
 White
 Black
 Transparent
 Translucent
 The normal
 Incident ray
 Normal
 Angle of incidence = Angle of reflection
 ROYGBIV

- Topic:**
- 1 Describe what happens to a wave as it moves from a less dense to a more dense medium
 - 2 Describe the change in speed and direction of a wave that is moving from a less dense to a more dense medium
 - 3 Describe the change in speed and direction of a wave that is moving from a more dense to a less dense medium
 - 4 What is the symbol for a convex lens?
 - 5 What is the symbol for a concave lens?
 - 6 What is the name given for the point where light rays converge?
 - 7 What is the equation of calculating magnification?
 - 8 Which term means an image is upside down compared to the object?
 - 9 Which term means an image is bigger than the real object?
 - 10 Which term means an image is smaller than the real object?
 - 11 What is a "real" image?
 - 12 What is a "virtual" image?
 - 13 When drawing a diagram for light rays passing through a lens, what is the point called where the rays meet/cross?
 - 14 When drawing a diagram for light rays passing through a lens, what is the point called where the rays spread out from?
 - 15 What is the name given for the line drawn through the middle of a lens? (from the bottom of an object?)

Light waves - refraction (separate only) (P.10)

It refracts
 1) Slows down, 2) changes direction towards the normal
 1) Speeds up, 2) changes direction away from the normal
 ↔
 →←
 Focal point
 Magnification = image height/object height
 Inverted
 Magnified
 Diminished
 Can be projected onto a screen & formed on opposite side of lens to object
 Cannot be projected onto a screen & formed on same side of lens to object
 Converge
 Diverge
 Principal axis

Science Knowledge Organiser

Year: 9

Term: Sp1

Topic:

- 1 What piece of equipment is used to measure the water that will go into the beaker?
- 2 Which piece of equipment measures the starting temperature of the water?
- 3 Which piece of equipment is used to measure the time?
- 4 What is the purpose of the cardboard lid?
- 5 One experiment aimed to find out which type of insulation was better at insulating the beaker. What was the IV?
- 6 One experiment aimed to find out which type of insulation was better at insulating the beaker. What was the DV?
- 7 One experiment aimed to find out the most effective thickness for the insulator. What was the IV?
- 8 One experiment aimed to find out the most effective thickness for the insulator. What was the DV?
- 9 Is type of insulator a continuous or a categorical variable?
- 10 State 2 control variables in both experiments
- 11 Which materials should be the best insulators?
- 12 How will you know which is the best insulator?
- 13 How could you improve the accuracy of the temperature measurement?
- 14 How could you check your results were repeatable?
- 15 How could you check your results were repeatable?

Topic:

- 1 Define Hooke's law
- 2 In this RP, you are investigating the relationship between force and extension of a spring. What would be the IV?
- 3 In this RP, you are investigating the relationship between force and extension of a spring. What would be the DV?
- 4 Which piece of equipment attaches the clampstand to the work bench?
- 5 Which piece of equipment is used to hold the top of the spring?
- 6 State two potential hazards and give a safety precaution you could take to minimize the risk of each
- 7 What is one common mistake during this practical?
- 8 What is it called when a spring no longer returns to its original shape?
- 9 What is meant by extension?
- 10 How could you check the results were repeatable?
- 11 How could you check the results were reproducible?
- 12 Which piece of equipment is used to measure extension?
- 13 Which piece of equipment is used to hold the clamp?
- 14 Which symbol means directly proportional?
- 15 What kind of graph would you plot?

Topic:

- 1 Which piece of equipment is used to investigate water waves?
- 2 Which piece of equipment generates the waves in the water?
- 3 How do we see the water waves when using a ripple tank?
- 4 How do you measure the wavelength of the water waves?
- 5 Why do you measure across multiple waves and divide by the number of waves?
- 6 How do you measure the frequency of water waves?
- 7 How do you calculate wave speed?
- 8 What is the piece of equipment that generates waves in a piece of string?
- 9 Which piece of equipment is used to measure the length of the wave?
- 10 How do you determine the frequency of the waves in the piece of string?
- 11 What is the most common error made when measuring the wavelength?
- 12 What is the relationship between wave speed and frequency?
- 13 What is the unit for wavelength?
- 14 What is the unit for frequency?
- 15 What is the unit for wave speed?

Topic:

- 1 Which piece of equipment produces a single ray of light?
- 2 Which piece of equipment is used to measure the angle of incidence and the angle of reflection?
- 3 What is the line drawn at 90° to the surface called?
- 4 What is the light ray that enters the mirror/glass block called?
- 5 What is the light ray that leaves the glass block called?
- 6 What is the light ray that is reflected from the mirror called?
- 7 What is the angle between the normal and the incident ray called?
- 8 What is the angle between the normal and the reflected ray called?
- 9 What is the relationship between the angle of incidence and the angle of reflection?
- 10 What happens to a light ray when it enters a more dense material?
- 11 What happens to a light ray when it enters a less dense material?
- 12 What is the term given to a wave changing speed and therefore direction when it crosses the boundary between two
- 13 What is it called when a wave hits a surface and bounces back?
- 14 Is a light wave transverse or longitudinal?
- 15 Is a water wave transverse or longitudinal?

RP: Thermal insulation (P2) (separate only) (P.42)

- Measuring cylinder
- Thermometer
- Stopwatch
- Prevent heat loss through convection
- Type of material
- Temperature change of water
- Thickness of the insulator
- Temperature change of the water
- Categorical
- Volume of water & cooling time
- Those with air in them
- Lower temperature change
- Use a digital thermometer
- Repeat the experiment and see if you got similar results
- Someone else does similar experiment, check they got similar results

RP: Hooke's Law (P6) (P.46)

- Force is directly proportional to extension of a spring
- Force
- Extension of the spring
- G-clamp
- Boss head clamp
- 1) Weights falling on your toes - clamp stand to the work bench
- Measuring length of spring not extension
- Elastic limit
- How much longer the spring has got
- Do the each reading 3 times and check you get the same results each time
- Someone else replicates your study and check whether they get the same results
- Ruler
- Clamp stand
- \propto
- A scattergraph with line of best fit

RP: Waves (P8) (P.48)

- Ripple tank
- Motor and bar
- Shine light through water and look at the shadows created
- Using a ruler
- Means you are measuring the mean length (more accurate)
- Count how many pass a point in 10 seconds and then divide by 10.
- velocity = frequency / wavelength
- A vibration generator
- A meter ruler
- Read it from the power supply
- Only measuring half of the wave
- Directly proportional
- Metres (m)
- Hertz (Hz)
- Metres per second

RP: Light (P9) (separate only) (P.49)

- Ray box
- Protractor
- The normal
- The incident ray
- The refracted ray
- The reflected ray
- The angle of incidence
- Angle of reflection
- They are equal
- It slows down, moves towards the normal
- Speeds up, moves away from the normal
- Refraction
- Reflection
- Transverse
- Transverse