Stewards Academy

Science KS3:

Year 8

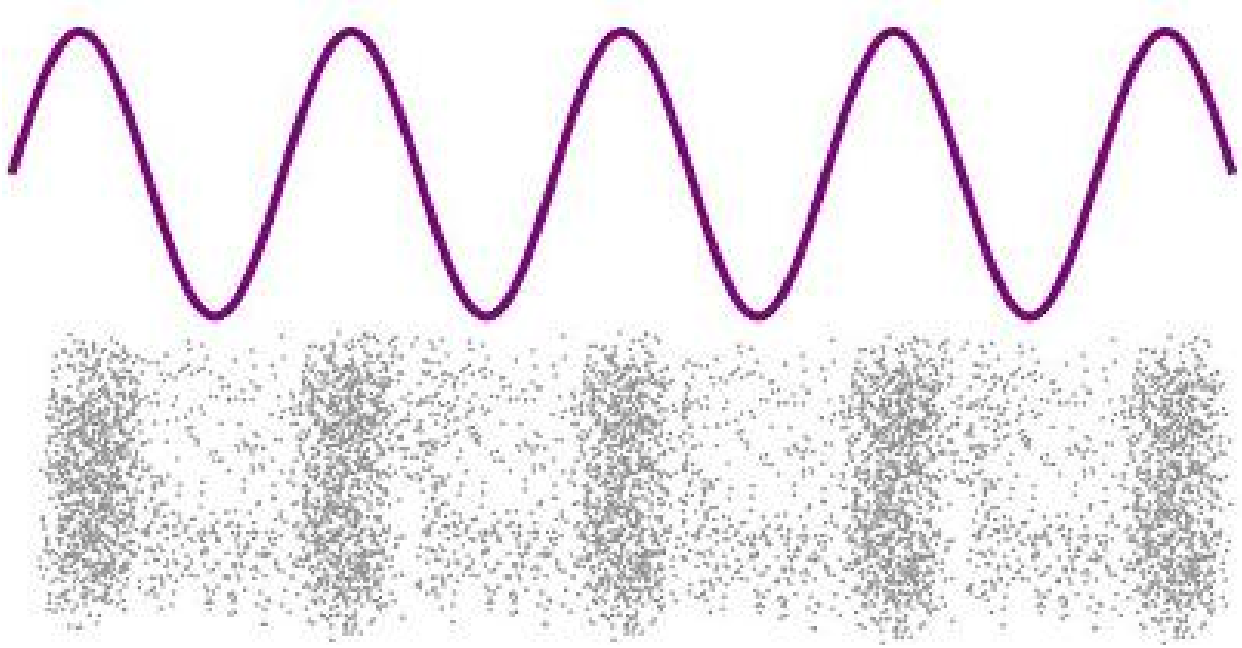
Blended Learning Booklet

Unit 4: Waves

Name:

Form:

- *Aim to complete three lessons each week.*
- *Use the online text book to help you*
- https://www.kerboodle.com/app
- *Login using your user name (1st initial followed by surname all lower case eg Joe Blogs = jblogs)*
- *Password (initially the same as your user name) should be reset to stewards lower case*
- *Institution code is fu0*
- *Complete the work described in the four part lesson*
- Use the mark schemes provided to self assess your work and make corrections in blue pen.



Big Picture – Year 8 Overview
Science

Next Year

End of Year Assess-ment

End of Unit Test

Electromagnets and their uses

Magnets and magnetic fields

Electrostatic charge

Models of electrical circuits

Series and Parallel circuits

Voltage, resistance and current

UNIT 6

Electromagnets

I will be able to use models to explain how an electric circuits work. I will be able to identify different circuit components and make circuits designed to do different jobs. **I will be able to** explain how static charge accumulates on an object and ho this can cause lightening or r electric shocks. **I will be able to** explain how permanent and temporary magnets are made and how they are both surrounded by a magnetic field. **I will be able to** make an electromagnet, explain how to alter its strength and be able to describe several uses for electromagnets.

The rock cycle

The solar system

Global warming and climate change

The carbon cycle

Metal extraction and recycling

End of Unit Test

UNIT 5

Earth

I will be able to explain how everything we have has been created from materials from the Earth. **I will be able to** describe the Earth's structure, how rocks are formed and explain our Earths position in the Solar System and how this influences life on Earth. **I will be able to** explain how metals are extracted from rocks and are a finite resource that we should make sure we recycle so they don't run out. Finally, **I will be able to** state the composition of the atmosphere and the causes and effects of global warming

Rock types,

Structure of the Earth

End of Unit Test

Exo- and endo-thermic

Law of conservation of mass

Thermal decomposition

Combustion

Chemical reactions of metals

Metals and non-metals

Neutralisation

Acids and alkalis

UNIT 4

End of Unit Test

Reactions

I will be able to explain how useful chemical reactions can be in making medicines, fabrics and building materials. Specifically, **I will be able to** describe the reactions of acids and metals in detail. **I will be able to** explain exactly what happens to atoms in chemical reactions and how energy changes are observed during a chemical reaction.

Modelling waves

Waves, energy and radiation

The eye and colour vision

Light waves

The ear and hearing

Sound waves

UNIT 3

End of Unit Test

Waves

I will be able to explain what sound is and how we are able to hear. I will be able to explain how sound can vary in loudness and pitch. **I will be able to** explain the difference between sound and light waves and how our eyes enable us to see. **I will be able to** explain different properties of waves and name some other types of wave.

DNA , genes and inheritance

Natural selection

Human lifecycle

Reproduction

Adaptation

Variation

UNIT 2

End of Unit Test

Genes

I will be able to describe all stages of the human lifecycle, including how humans reproduce and how our features are inherited from our parents through our DNA. That all organisms show variation and this can help them survive. **I will be able to** explain how organisms have evolved and understand that this occurs though inheritance and natural selection.

Critique claims and justify opinion

Evaluating scientific sources

Scientific communication

Analysisng and evaluating data

Identifying variables

UNIT 1

Year 8

The Enquiry Process

I will be able to explain why controlling variables is important, evaluate and interrogate investigations, be able to communicate scientific ideas appropriately. **I will be able to** critically evaluate scientific claims and weigh up the risks and benefits of new inventions/discoveries

ZOOM IN...

MY LEARNING JOURNEY:

Subject: Waves Year: 8 Unit: 3

In this unit students will investigate sound waves in terms of amplitude and frequency. They will be able to explain how the ear is adapted to detect sound waves. Student will also investigate light waves, be able to explain reflection and refraction as well as explain how the eye is adapted for vision. In addition, students will learn about the electromagnetic spectrum and how wave radiate energy. Students will be able to describe wave properties using models.

DEVELOPING COURAGE

C Understaing how out eyes and ears work
O To carry out practical investigations
U Work safetly with others during practicals
R To determine the angles of refraction and total internal reflection
A How Biology and Pyhsis work together for sight and hearing
G Share our knowledge
E Investigating the effect of prisms on light

UP NEXT

Genes

- Evolution
- Biodiversity
- Inheritance
- Genetic modifcation
- Variation
- Adaptation
- Puberty
- Reproduction
- Foetal development

CAREERS

- Seismologist
- Optician
- Audiologist
- Sound and lighting engineer

PREVIOUS LEARNING

Pupils will need to have some experience of the sun being a luminous object, light travelling in straight lines and how shadows are formed. That different sounds are made by vibrating objects in different ways and these vibrations travel through the air to our ears. They will know that light from the sun is dangerous and that it is important to protect their eyes.

WHAT WE KNOW/ REMEMBER

- .....
- .....
- .....
- .....
- .....

RECOMMENDED READING

1. Spectacular Light and Sound by Rob Colson & Jon Richards,
2. Exploring Heat Light Sound Energy by Shweta Sinha,
3. Light Sound and Electricity by Kirsteen Rogers, P. Clarke, Alastair Smith

PERSONAL OBJECTIVES

- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....

Lesson 1: Sound Waves and Speed

Connection

Have a look at the topic overview and the zoom in.

Populate what you know and your personal objectives.

Activation

LI: State the speed of sound and what it can and cannot travel through, describe how sound is produced and travels, explain observations where sound is transmitted

1. Make a note of the date, title and the LI
2. Key words – vibration, medium, vacuum, speed of sound, speed of light
3. Read pages 56, 57
4. https://www.youtube.com/watch?v=q9ezMbDpIHI
   https://www.youtube.com/watch?v=VLEzBpui2Oo
5. Copy the diagram of “Air molecules move backwards and forwards” (pg56)
6. Answer Questions A, B, C
7. Have a go at the activity “Stormy Night?”

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 1: Answers **4.1.1 Sound waves and speed**

Connection

1.
2.
3.

Demonstration

In-text questions	**A** vibrations **B** solids, liquids, gases **C** 330 m/s
Activity	**How fast?** **a** Table should have two columns, with headings 'material' and 'speed (m/s)'. **b** A bar chart because one of the variables is categoric. **Stormy night** **a** distance = 330 m/s x 4 = 1320 m = 1.32 km **b** There would be no time difference between seeing the lightning and hearing the thunder.
Summary questions	**1** vibrating, vibrate, solids, gases, vacuum (5 marks) **2a** The particles in a gas are further apart than the particles in a liquid. The vibration is not passed on so quickly. (1 mark) **b** There are no particles in a vacuum to transmit the sound/through which a new sound wave can travel. (1 mark) **3** Example answers (6 marks): Light travels much faster than sound. So the light reaches you first. It takes about 0.03 seconds for the sound to reach you. The speed of sound is about 330 m/s. It would take 0.000 000 03 seconds for light to reach you. The speed of light is 300 million m/s. So light is about 1 million times faster than sound. The time it takes light to reach you is about a millionth of the time it takes sound to reach you.

Lesson 2: Loudness and Amplitude

Connection

Q1. Put these in order of speed?

- Vibrations through the ground
- Sound in air
- Light

Q2. What is the name of a material that sound waves travel through?

Q3. Why can sound not travel through a vacuum?

Activation

LI: Describe the link between amplitude and loudness

1. Make a note of the date, title and the LI
2. Key words – amplitude, frequency, wavelength, peak, crest, trough, longitudinal wave, oscilloscope, absorption, echo
3. Read pages 58, 59
4. https://www.youtube.com/watch?v=ke7RUj3IJZs
5. Copy the "This diagram shows the amplitude and wavelength of a wave" (pg58)
6. Copy the "A loud sound has a bigger amplitude than a soft sound" (pg59)
7. Answer Questions A and B

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 2: Answers **4.1.2 Loudness and amplitude**

Connection

1. Fastest –
- light
- vibrations through the ground
- sound in air

Slowest

2. A medium

3. In a vacuum there are no particles that can vibrate to produce sound

Demonstration

In-text questions	**A** Three from: amplitude, frequency, wavelength, speed **B** It shows a changing p.d. produced from a sound wave by a microphone
Summary questions	**1** energy, amplitude, wavelength, amplitude, longitudinal, the same (6 marks) **2** amplitude = 3 divisions x $\frac{4V}{division}$ = 12V (1 mark) **3** Extended response question. Example answer (6 marks): In a cave you hear an echo/multiple echoes because sound is reflected once/many times. The echoes get quieter because the sound spreads out and is eventually absorbed. You hear the sound travelling through the door because some is transmitted, but it is quieter than the shout because some is absorbed.

Lesson 3: Frequency and Pitch

Connection

Q1. Draw a diagram of a wave and label the amplitude

Q2. What is wavelength and frequency measured in?

Q3. Which of the following has a bigger amplitude:

- Rock Concert
- Whisper

Explain your answer

Activation

LI: Describe the link between frequency and wavelength

1. Make a note of the date, title and the LI
2. Key words – pitch, hertz, kilohertz, auditory range, infrasound, ultrasound
3. Read pages 60, 61
4. https://www.youtube.com/watch?v=5_aSR7pH40U
5. https://www.youtube.com/watch?v=qNf9nzvnd1k (warning! High pitch sound)
6. Copy the diagram "A high sound has a higher frequency than a low sound" (pg60)
7. Copy the table for the auditory range of different species (pg61)
8. Copy the equation for frequency (pg61)
9. Answer Questions A, B, and answer the "Conversions" activity

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

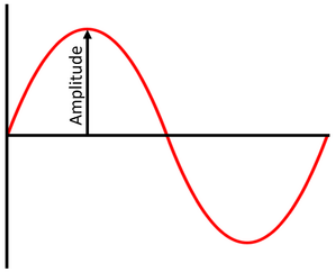
Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 3: Answers **4.1.3 Frequency and pitch**

Connection

1. 

2. Wavelength is measured in meters and frequency is measured in hertz

3. A rock concert has a larger amplitude because it is louder. The louder the sound the bigger the amplitude

Demonstration

In-text questions	**A** Frequency **B** Whale
Activity	**Conversions** **a** 0.02 kHz-20kHz **b** 1 kHz-123 kHz
Summary questions	**1** hertz, frequency, time period, auditory, narrower (5 marks) **2** frequency $= \frac{1}{\text{period}}$ $= \frac{1}{4}$ = 0.25 Hz (2 marks) **3** Extended response question (6 marks). Example answers: Vocal chords vibrate to produce sound. Sound waves are made air is squashed and stretched. Pitch depends on frequency. To make a higher note her vocal chords vibrate more times per second. That makes the frequency of a sound wave higher. Loudness depends on amplitude. To make a louder note her vocal chords vibrate with a bigger amplitude. That makes the amplitude of a sound wave bigger.

Lesson 4: The Ear and Hearing

Connection

Q1. What is the frequency range of humans?

Q2. Convert 210,000Hz into kilohertz

Q3. If the time period of a wave is 0.2s, what is the frequency?

Activation

LI: name some parts of the ear, describe how the ear works, describe how your hearing can be damaged

1. Make a note of the date, title and the LI
2. Key words – ear, pinna, auditory canal, eardrum, outer ear, ossicle, middle ear, amplify, oval window, cochlea, auditory nerve, inner ear, volume, decibel
3. Read pages 62,63
4. https://www.youtube.com/watch?v=eiLTvWILVil
5. Draw and label the diagram of the ear
6. Answer Questions A, B, C,

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 4: Answers **4.1.4 The ear and hearing**

Connection

1. 20Hz – 20,000Hz
2. 210KHz
3. Frequency = 1/ period

1/0.2= 5 Hz

Demonstration

In-text questions	**A** ear drum **B** decibel **C** ear drum
Activity	**What protection?** Example: somebody wears the ear defenders, another person reduces a loud sound until the person with the ear defenders cannot hear it. Change ear defenders and repeat. The independent variable is the ear defenders. The control variables are person, distance to loudspeaker, frequency of sound. Repeat with different people and compare results.
Summary questions	**1** ear drum, ossicles, oval window, cochlea, hairs, cochlea, auditory nerve, decibels, damaged (9 marks) **2** Not permanent: ear wax, perforated ear drum, ear infection Permanent: listening to loud music, head injury (2 marks) **3** Shorter hairs in your cochlea detect higher frequencies. Longer hairs detect lower frequencies. As you get older, the shorter hairs break off/are damaged. So you cannot hear such high frequencies. (4 marks)

Lesson 5: Light

Connection

Q1. Describe the pathway of sound through the ear

Q2. What is the pain threshold in decibels?

Q3. How is hearing damaged by loud sounds?

Activation

LI: Describe what happens when a light ray meets a different medium, state the speed of light

1. Make a note of the date, title and the LI
2. Key words – reflect, absorb, luminous, non-luminous, transparent, translucent, opaque, eclipse
3. Read pages 64, 65
4. https://www.youtube.com/watch?v=vt-SG7Pn8UU
5. https://www.youtube.com/watch?v=r-5ngsfw4KI
6. Draw and label "you see objects because light reflects off them or because they emit light" (pg64)
7. Answer Questions A, B, C include the diagrams for solar and lunar eclipse when answering C

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 5: Answers **4.2.1 Light**

Connection

1. Sound is collected by the pinna, it then travels down the auditory canal and vibrates the ear drum. This causes the ossicles to vibrate which amplifies the sound and then makes the oval window vibrate. This then passes the vibration to liquid in the cochlea which causes tiny hairs to convert the vibrations to electrical impulses which travel down the auditory nerve.

2. 120dB

3. Loud sounds can burst the ear drum and damage the tiny hairs in the cochlea.

Demonstration

In-text questions	**A** You can clearly see through a transparent material but not through a translucent material, even though light travels through both. **B** 300 million m/s **C** In a solar eclipse the moon is between the Earth and the Sun. In a lunar eclipse the Earth is between the Sun and the moon.
Activity	**Sort those words** For example, the light bulb emits light because it is luminous. The flower reflects light because it is non-luminous and opaque. This light is then absorbed by your eye. The water transmits light and is transparent.
Summary questions	**1** luminous, emits, reflects, non-luminous, opaque (5 marks) **2** Light is absorbed by water even though you can see through it. Only a small amount is absorbed, so you need a lot of water for it to become dark. (2 marks) **3** Extended response question (6 marks). Example answers: Light from all parts of the Sun reaches the Earth. So the Sun appears as a disc. As the Moon passes in front of the Earth you see a section of the Sun is now black/a partial eclipse. Light from part of the Sun no longer reaches the Earth at that point. If you are in the right place on the Earth's surface you will see the Sun as a black disc with a halo/corona around it/total eclipse The Moon blocks the light from all of the Sun.

Lesson 6: Reflection

Connection

Q1. What is the speed of light?

Q2. What does opaque mean?

Q3. Describe a lunar eclipse

Activation

LI: Describe how light is reflected from a mirror, Describe how images are formed in a plane mirror, use ray diagrams to show how light reflects and forms images

1. Make a note of the date, title and the LI
2. Key words – image, virtual image, incident ray, reflected ray, normal line, angle of incidence, angle of reflection, law of reflection, scattered, specular reflection, diffuse reflection
3. Read pages 66, 67
4. https://www.youtube.com/watch?v=V0Z_nk5JS_E
5. Draw and label the diagram “light is reflected at equal angles”, “you see an image in a mirror” and the two diagrams showing specular and diffuse reflection.
6. Answer Questions A, B and complete the activity “Angular problem”

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 6: Revision Answers **4.2.2 Reflection**

Connection

1. 300 million m/s

2. Opaque means that light is not transmitted through the material

3. A lunar eclipse is when the moon passes into the darkest part of the earths shadow called the umbra.

Demonstration

In-text questions	**A** When light is reflected from a mirror, the angle of incidence is equal to the angle of reflection **B** When light reflects from a surface in all directions it is scattered.
Activity	**Angular problem** **a** 50° **b** 50° **c** No, the angle of incidence is equal to the angle of reflection and the angle between them can be anything from nearly 180° to 0°.
Summary questions	**1** virtual, size, shape, distance, right, incidence, reflection (7 marks) **2** Ray from top of head to mirror and then to the eye. (1 mark) Ray from the feet to the mirror and then to the eye. (1 mark) Rays traced back to show virtual image. (1 mark) **3** See the teacher notes in the Kerboodle lesson player for this section. (4 marks)

Lesson 7: Refraction

Connection

Q1. State the law of reflection

Q2. what is the normal line?

Q3. Describe the difference between diffuse and specular reflection

Activation

LI: Describe what happens when light enters a medium, use a ray diagram model to describe how light passes through lenses and transparent material

1. Make a note of the date, title and the LI
2. Key words – refraction, medium, lens, convex, converging, focus, focal point, real, virtual, concave, diverging
3. Read pages 68, 69
4. https://www.youtube.com/watch?v=zarxpu43-ls
5. Draw and label the diagram “light refracts when it enters or leaves a glass block” pg 68
6. Answer Questions A, B include the diagrams of a convex and concave lens

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 7: Answers **4.2.3 Refraction**

Connection

1. The angle of incidence is equal to the angle of reflection

2. The normal line is an imaginary line at 90° to the surface

3. Specular reflection is when the reflected light is all reflected at the same angle while diffuse reflection is when light is reflected in all directions due to it being a rough surface

Demonstration

In-text questions	**A** In reflection light bounces off something, in refraction it changes direction. **B** A lens focuses or bends the rays of light to a focal point.
Activity	**Watch that spelling!** **a** lens **b** parallel
Summary questions	**1** towards, away from, ray (3 marks) **2a** Ray diagrams that show: A convex lens is thicker in the middle than at the edges A concave lens is thicker at the edges than in the middle A convex lens focuses light A concave lens spreads light out (4 marks) **b** Ray diagrams that show: Light travelling through a block is refracted, and so is light through a convex lens. (1 mark) Light travelling through a block continues in a direction parallel to the initial direction, but light through a lens comes to a focus. (1 mark) **3a** Light is scattered from the building towards your eye (1 mark) It refracts towards the normal going into the glass (1 mark) And away from the normal as it comes out (1 mark) Some of it is reflected. (1 mark) **b** Diagram as on page 68 (1 mark) showing bending towards/away from labelled normal (1 mark).

Lesson 8: The eye and vision

Connection

Q1. When does refraction occur?

Q2. What sort of lens is in the human eye?

Q3. compare convex and concave lenses

Activation

LI: Name parts of the eye, use ray diagrams to describe how light passes through the lens in your eye, describe how lenses may be used to correct vision

1. Make a note of the date, title and the LI
2. Key words – retina, pupil, iris, cornea, inverted, photoreceptor, optic nerve, brain
3. Read pages 70, 71
4. https://www.youtube.com/watch?v=VK-x-8-JMwY (Eye dissection)
5. https://www.youtube.com/watch?v=AZ1DY6QYRO4
6. Draw and label the diagram "How an image is formed in your eye"
7. Answer Questions A, B, C, D- Include the diagrams to show how the lens work when answering C & D

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 8: Answers **4.2.4 The eye and vision**

Connection

1. When light passes from one medium to another

2. Lenses in the human eye are convex

3. Convex lenses cause light to converge and focus at a focus point beyond the lens. Concave lenses cause light to diverge.

Demonstration

In-text questions	**A** the cornea and the lens **B** chemical reaction **C** concave **D** long sight
Activity	**Real or virtual** A real image is an image that you can put on a screen whereas a virtual image is one that you can see in a mirror.
Summary questions	**1** reflects, pupil, cornea, lens, retina, real, electrical, optic nerve (9 marks) **2** If you are short sighted you cannot see distant objects You correct this with a concave lens If you are long sighted you cannot see nearby objects You correct this with a convex lens (4 marks) **3** In long-sight light from a distant object is focused behind the retina The convex lenses in glasses refract the light inwards so that the light focusses on the retina The contact lens is closer to your eye than glasses So can be thinner because it needs to refract light less to focus the image on the retina. (4 marks)

Lesson 9: Colour

Connection

Q1.What is the name of the ring of muscle that controls the size of the pupil?

Q2. Name the special cells that are on the retina? And the two types?

Q3. What is the difference between long sighted and short sighted?

Activation

LI: State the difference between different colours in terms of frequency, use the ray model to describe how objects appear different colours and how light is refracted through a prism

1. Make a note of the date, title and the LI
2. Key words – prism, spectrum, dispersion, continuous, frequency, primary colour, secondary colour, filter
3. Read pages 72,73
4. https://www.youtube.com/watch?v=iIhEkW_rF4Y
5. Draw and label the diagram "This Venn diagram shows the primary and secondary colours of light" and the three diagrams showing how light reflects off a black cat, a white mouse and a red apple.
6. Answer Questions A, B, C

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 9: Answers **4.2.5 Colour**

Connection

1. Iris

2. Photoreceptors and the two types are cones and rods

3. Someone who is short sighted has a lens that refracts light too much and so the rays focus before they get to the retina.

Someone who is long sighted has a lens that refracts light too little and so the rays focus further than the retina.

Demonstration

<table>
<tr><td>In-text questions</td><td>A splits white light into a spectrum
B cyan, yellow, magenta
C A black object absorbs all colours of light.</td></tr>
<tr><td>Activity</td><td>What table?
<table>
<tr><td>Colour of material</td><td>Appearance in red light</td><td>Appearance in green light</td><td>Appearance in blue light</td><td>Appearance in cyan light</td><td>Appearance in magenta light</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>Summary questions</td><td>1 refracted, least, most, dispersion, transmits, absorbs, absorbs, reflects, reflects, green (10 marks)
2 Diagram shows white light hitting a prism at a glancing angle (1 mark)
Refracted at both surfaces (1 mark)
Violet refracted more than red. (1 mark)
3 A white light source emits all the frequencies of light (1 mark)
The filter absorbs most frequencies but transmits a narrow range of frequencies (1 mark)
If some of the frequencies that pass through the green and red filters are the same you will see some light. (1 mark)</td></tr>
</table>

Lesson 11: Sound waves, water waves, and energy

Connection

Q1. What are the three primary colours?

Q2. What coloured light has the highest frequency?

Q3. what colour would a red shirt appear through a green filter?

Activation

LI: describe how sound transfers energy, describe the link between amplitude or frequency and energy

1. Make a note of the date, title and the LI
2. Key words – compression, rarefaction, pressure wave, microphone, loudspeaker, ultrasound
3. Read pages 58, 59
4. https://www.youtube.com/watch?v=dzDye6mi-6M
5. Draw and label the diagram “A microphone detects sound in a similar way to your ear” pg 59
6. Answer Questions A, B, C

Demonstration

Attempt the summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

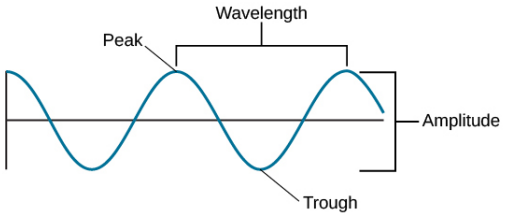
Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

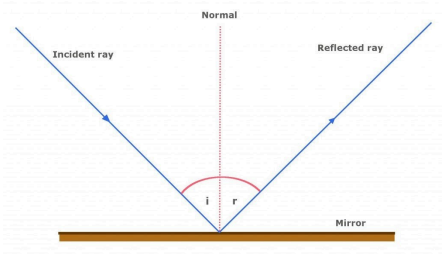
Consolidation

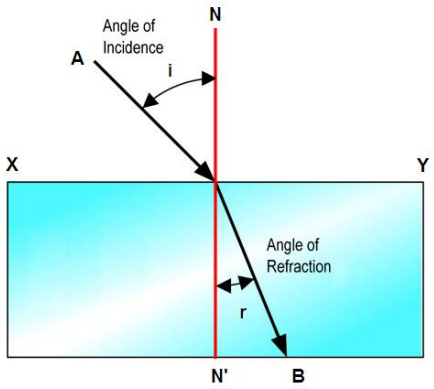
Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 11: Answers **4.3.1 Sound waves, water waves, and energy**

Connection

1. 

2. 

3. 

Demonstration

In-text questions	**A** compression: an area of high pressure; rarefaction: an area of low pressure **B** higher than 20 kHz **C** One from: to clean objects, to warm muscles and ligaments
Summary questions	**1** to, fro, same, faster, higher, amplitude, frequency (7 marks) **2** A sound wave hits a diaphragm and makes it vibrate. This makes a magnet move backwards and forwards. This produces a changing potential difference. (3 marks) **3** Ultrasound has a higher frequency than sound waves. The energy of a wave depends on its frequency. Sound waves do not transfer enough energy to clean materials or heat muscles. (3 marks)

Lesson 12: Radiation and Energy

Connection

Q1. Sound is a **longitudinal/transverse** wave

Q2. What frequency is ultra sound?

Q3. Describe how a microphone works

Activation

LI: describe the electromagnetic spectrum

1. Make a note of the date, title and the LI
2. Key words – visible light, electromagnetic spectrum, ionisation, radio waves, microwaves, infrared, ultraviolet, x-rays, gamma rays
3. Read pages 60, 61
4. https://www.youtube.com/watch?v=bjOGNVH3D4Y
5. https://www.youtube.com/watch?v=OYK7G6r0Pec
6. Copy the diagram pg 60 showing the electromagnetic waves in order and linking them to their frequency and wavelength - use table at the bottom of pg61 to link uses to the different waves.
7. Answer Questions A and the activity pg 61 “Remember those waves!”

Demonstration

Attempt the summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 12: Answers

4.3.2 Radiation and energy

Connection

1. Sound waves are longitudinal wave

2. Ultrasound is above 20,000Hz

3. A microphone converts sound waves to a changing potential difference

Demonstration

In-text questions	**A** Radio waves, microwave, infrared, visible light, ultraviolet, X-rays, gamma rays
Activity	**Remember those waves!** Any suitable mnemonic of the waves in order.
Summary questions	**1** X-rays, ultraviolet, visible, infrared, microwaves, radio waves, wavelength, heating, ionise, cancer (10 marks) **2** Example answers (6 marks): When light hits the body some is reflected and some is absorbed. When light is absorbed it heats the body. Ultraviolet radiation can also be reflected and absorbed. Ultraviolet radiation is ionising. It can damage the DNA of cells. It can cause cancer. **3** Ultraviolet is ionising/can cause cancer. The other ionising radiations are absorbed by the atmosphere. (2 marks)

Lesson 13: Modelling Waves

Connection

Q1. What wave has the highest amount of energy?

Q2. What does ionising mean?

Q3. How are wavelength and frequency related?

Activation

LI: compare transverse and longitudinal waves

1. Make a note of the date, title and the LI
2. Key words – transverse wave, wave, longitudinal wave, transmission, superposition
3. Read pages 62, 63
4. https://www.youtube.com/watch?v=GkNJvZINSEY
5. https://www.youtube.com/watch?v=iTD5DO5MMgA
6. Draw and label the diagram “a wave reflects off a barrier” and “waves are refracted when they slow down”
7. Copy the table showing the Wave, Type, Speed and Media
8. Answer Questions A, B

Demonstration

Attempt the summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 13: Answers **4.4.1 Modelling waves**

Connection

1. Gamma rays

2. Ionising means it has enough energy that electrons are knocked out of the atoms

3. As wavelength increases frequency decreases

Demonstration

In-text questions	**A** Direction is at right angles/90° to the direction of motion of the wave. **B** They add up or they cancel out.
Summary questions	**1** 90°, ripples, refracted (3 marks) **2** Example answers (6 marks): Light waves are electromagnetic. Sound waves are mechanical. Light does not need a medium to travel through, sound does. Light waves are transverse, and oscillations are at right angles to the direction of motion. Sound waves are longitudinal and vibrations are in the same direction as light. Light travels a million times faster than sound. **3** Waves travel at different speeds in different media. They travel faster in solids than in liquids or gases. Waves that can travel through liquids arrived at detectors, but waves that could not did not arrive, so scientists worked out that part of the Earth was liquid. (4 marks)

Lesson 14 & 15: Revision

Connection

Q1. Describe a transverse wave?

Q2. Which is faster? The speed of sound through air or rock. Why?

Q3. What is the difference between light and sound?

Activation

LI: Revise using the End-of-Big ideas questions on waves

1. Make a note of the date, title and the LI
2. https://www.youtube.com/watch?v=0Anh9HthWgQ
3. https://www.youtube.com/watch?v=CVsdXKO9xlk
4. https://www.youtube.com/watch?v=BL2MtP7j-xk
5. https://www.youtube.com/watch?v=TgJKf3G6LuE
6. https://www.youtube.com/watch?v=OKoxLFrjc3I
7. https://www.youtube.com/watch?v=2fN_jvf4fw8
8. https://www.youtube.com/watch?v=UUc44Vg5pCI

Demonstration

Attempt the End-of-Big ideas questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 14 & 15: Answers

4 Waves – Part 1 Checkpoint

Connection

1. Red, blue and green
2. Violet light
3. It would appear black because red light can not pass through a green filter

Demonstration

End-of-Big Idea questions	**1** Diagram with correct label of amplitude and correct label of wavelength. (2 marks) **2** A, H, I, M, O, T, U, V, W, X, Y (1 mark) **3a** Diagram with the same wavelength but larger amplitude. (1 mark) **b** Diagram with the same amplitude but smaller wavelength. (1 mark) **c** Amplitude correctly labelled on diagrams from part **a** and **b**. (2 marks) **4a** Blue jacket and red trousers. All colours are in white light, the blue jacket reflects blue and the red trousers reflect red. (2 marks) **b** Black jacket and black trousers. The blue jacket and red trousers would absorb green light do no light is reflected. (2 marks) **5a** The light is refracted so the image of the fish is below where it really is. (2 marks) **b** The light does not change direction so the fish is below the bird. (2 marks) **6** Credit a sensible situation where ear defenders might be needed, such as on a building site. (1 mark) **7a** C (1 mark) **b** B (1 mark) **c** The particles in C are closer together than the particles in A. The particles in A are closer together than the particles in B. Sound travels better through materials where the particles are closer together. (3 marks) **8a** 10 divisions means a time of 10 divisions x $\frac{2\text{ ms}}{\text{division}}$ = 20 ms = 20 × 10^{-3}s, or 0.02s (1 mark) There are 5 waves in 0.02s So frequency = $\frac{5\text{ waves}}{0.02\text{s}}$ (1 mark) = 250 Hz (1 mark) **b** p.d. =5 divisions x $\frac{2\text{ V}}{\text{division}}$ (1 mark) = 10 V (1 mark) **9a** How does the intensity of a sound vary with distance from the source? (1 mark) **b** Independent – distance from sound source; dependent – loudness of sound; controls – frequency and loudness of sound from source (1 mark) **c** line graph (1 mark)

Lesson 14 & 15: Answers **4: Waves – Part 2 Checkpoint**

Connection

1. A transverse wave is when the oscillations are at 90° to the direction of the wave

2. Air- 300 m/s Rock - 3km/s. Travels faster in sound as the particles are closer together in a solid and so the vibrations are transfered quicker.

3. Light is an electromagnetic wave and sound is a physical wave. Light travels at 300 million m/s and sounds travels in air at 300 m/s.

Demonstration

End-of-Big Idea questions	**1a** Any two of the following, for one mark each: radio (1), microwaves (1), infrared (1) **b** Any two of the following, for one mark each: ultraviolet (1), X-rays (1), gamma rays (1) **2a** It reflects. (1 mark) **b** They add up or cancel out. (2 marks) **c** Any two of the following, for one mark each: rays (1), ripples/waves (1), slinky (1) **3a** The oscillation is at 90° to the direction of travel. (1 mark) **b** The oscillation is parallel to the direction of travel. (1 mark) **4a** angle of incidence (1 mark) **b** mass of plastic (1 mark) **c** angle of refraction (1 mark) **d** As the mass increases, the angle of refraction decreases. (1 mark) **e** The mass could be recorded from smallest to largest. (1 mark) **5a** Both contain a component that moves when the sound wave hits it (ear drum/diaphragm). Both produce an electrical signal. (2 marks) **b** Some radiation is ionising, which can damage DNA and cause cancer. Sound is a pressure wave/mechanical wave, which does not ionise/damage DNA. (4 marks) **6** Examples of correct scientific points (6 marks): During the lesson sound is produced by various sources, including people. Light is emitted by sources (light bulbs/Sun). Sound is a pressure wave. When sound hits a solid material it makes the particles vibrate more. This raises the temperature of the material. Light from sources is reflected, transmitted, or absorbed by materials in the room. If it is absorbed it raises the temperature of the material. **7** Angle would be bigger in water. Water slows light down less. (2 marks)

Lesson 16: Revision

Connection

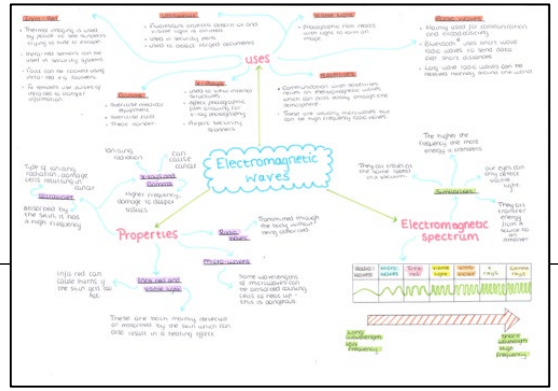
N/A

Activation

LI: Complete a piece of revision work

1. Make a summary sheet OR
2. Make flash cards OR
3. Complete the revision questions from book 1 (page 197) and 2 (page 161)

mind map



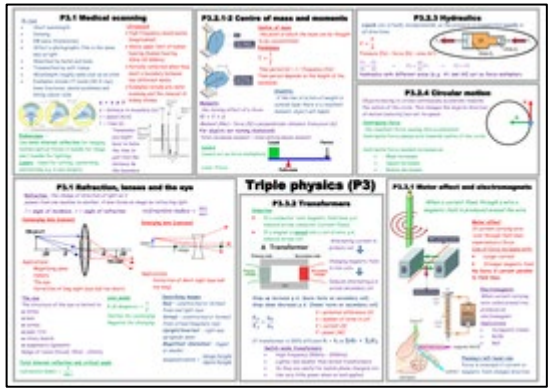
Demonstration

Use your revision work to quiz the person sat next to you OR work in a group to quiz each other.

flash cards

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



Summary sheet

Attainment Band	Waves: Sound & Light Knowledge and Understanding
Yellow/Yellow +	• Use the slinky model to make connections between loudness and amplitude • Draw and interpret wave diagrams that represent different sounds • Explain how echoes can be used to measure the speed of sound and the distance of objects in different applications • Use the particle model to explain why the speed of sound is different in different materials • Explain why some materials are good at reflecting and absorbing sound • Compare and contrast detection of sound by the ear and by a microphone • Use a knowledge of the structure of the ear to explain how to prevent damage to the ear; use data to identify the hearing ranges of different organisms • Explain why these waves are suitable for their applications • Explain how waves can add or cancel out • Explain what is meant by the frequency of a wave • Compare diffuse scattering and specular reflection • Draw ray diagrams to show how the eye works • Explain that the higher the frequency, the shorter the wavelength and the more light is refracted Explain in outline photosynthesis, the photoelectric effect and photochemical smog
Blue	• Describe the features of a longitudinal sound wave • Relate the terms 'frequency', 'wavelength' and 'amplitude' to different waves • Describe how echoes can be used in different applications • Use the particle model to explain why sound cannot travel through a vacuum • Design an investigation and collect evidence about the ability of different materials to reflect and absorb sound • Explain how parts of the ear are adapted to enable us to hear • Describe different ways the ear may become damaged and possible solutions to these problems • Describe a wide range of applications for ultrasound and infrasound • Explain that waves can be reflected • Compare the properties of water waves and light waves • Explain how light is absorbed by opaque materials • Explain what happens when light is reflected and when it is refracted • Explain that the colour of light in a spectrum depends on its frequency • Describe examples of chemical and electrical effects caused when materials absorb light

Stewards Academy
Science Department
ASSESSMENT FEEDBACK
Year 8 – 3

Green	• Recognise the need for vibrations to make sound waves • Recall that sound transfers energy from place to place • State what is meant by the term 'frequency' and how it relates to the pitch of sound • Recognise an echo as a reflection of sound; follow a procedure to measure the speed of sound • Describe the effects of different materials on the transmission of sound • Name materials that reflect and absorb sound • Name different parts of the ear • Describe what is meant by the loudness of sound and how we can protect ourselves from loud sounds • Describe the range of sounds relating to ultrasound and infrasound • Describe how ripples and waves move in water • Recall that light travels in waves • Recall that light passes through transparent materials • Recall that the ray model is a way of showing the direction of light and how it changes • Recall ways that a spectrum can be made, including using a prism • Describe the range of "light" (relating to the EM spectrum) focus on light • Recall that light transfers energy from place to place
White	• Some of the above elements have been achieved