



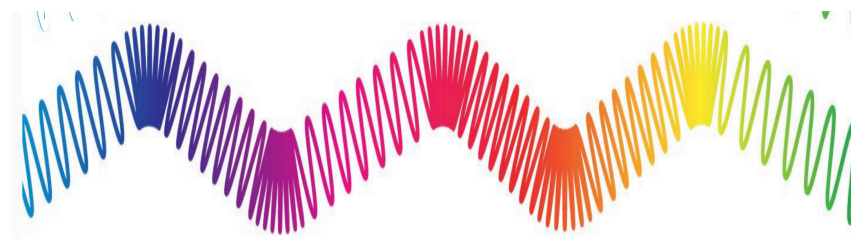
Waves Lesson 1: What is a Wave?!

To join in bring: Clear bottle of flowing liquid. Half-full or less is best. Olive/veg oil, vinegar, squash, water, etc. Won't be opened! Plastic cup / sturdy mug of water. Slinky if you have one

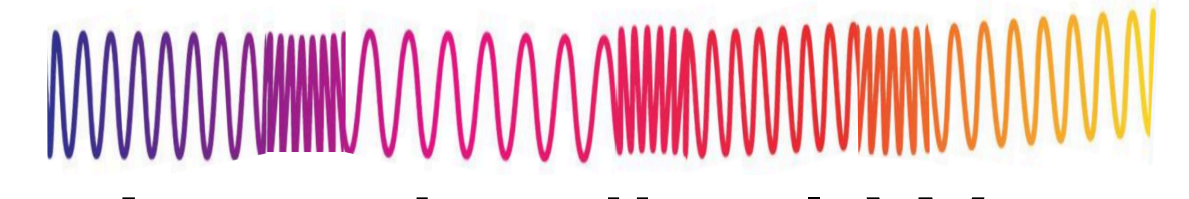
After today I hope you'll...

- Understand the difference between a transverse and longitudinal wave
- Be able to give at least one example of each wave
- Be able to identify the amplitude and wavelength, crest and trough of a wave in a diagram

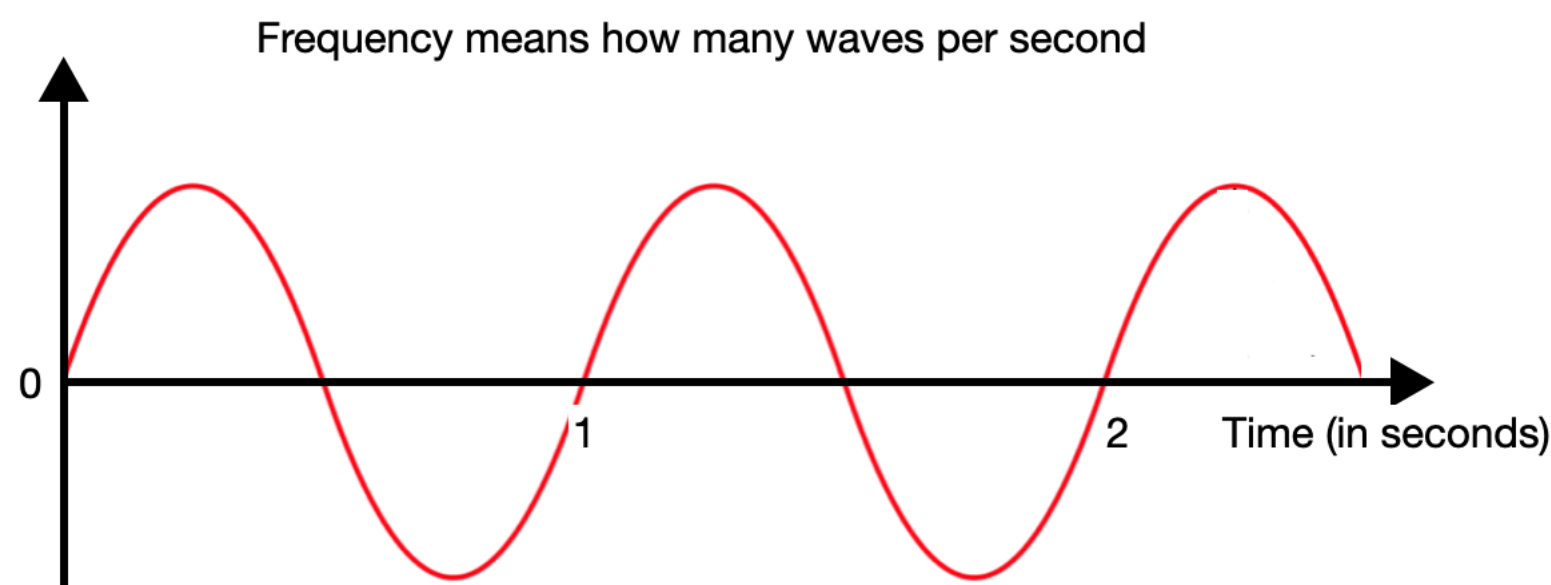
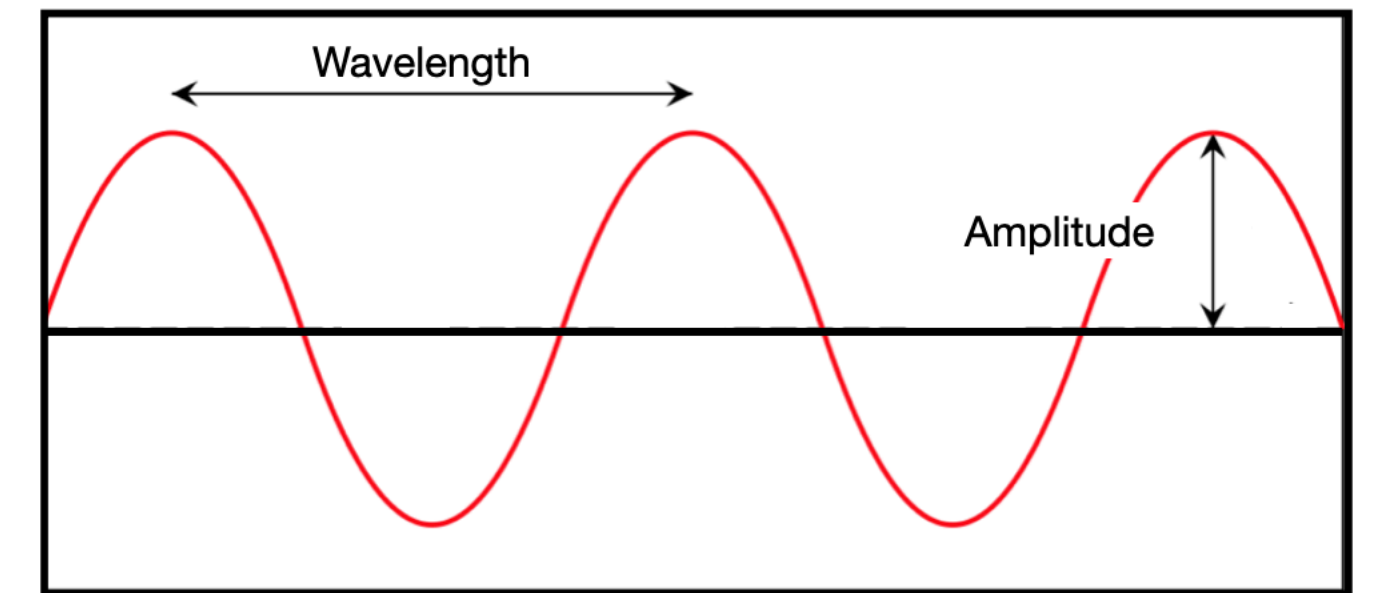
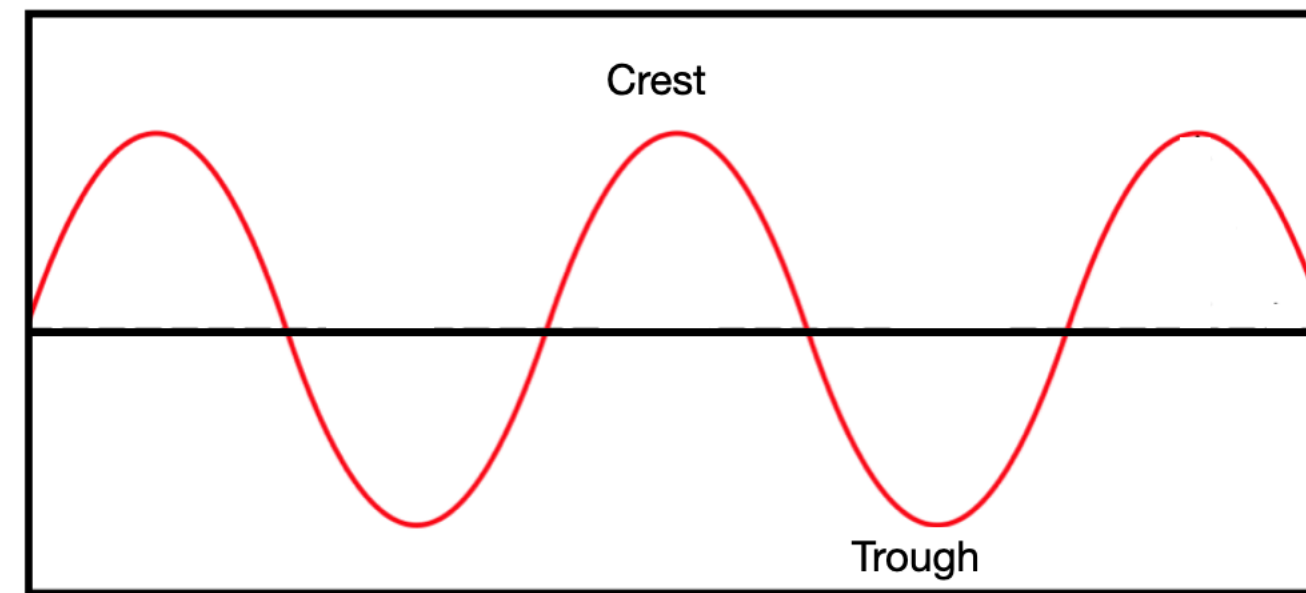
Useful diagrams:



Transverse Wave



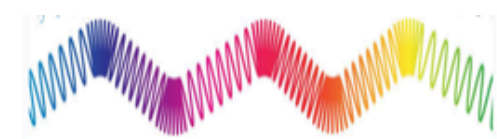
Longitudinal Wave



1) Listen to the 'story'! How many waves do you see, or hear mentioned? Write them down here.

Tick the correct boxes!

One has been done for you



Transverse Waves



Longitudinal Waves

Do they transfer energy?	✓	
Do they transfer matter?		
Energy & vibrations are at right angles to each other Energy \longleftrightarrow Vibrations \updownarrow		
Energy & vibrations are parallel to each other Energy \longleftrightarrow Vibrations \longleftrightarrow		
Write TWO examples of each!

**Done? Are dominoes falling a wave?
Explain your answer.**



GCSE Questions!

Which two sentences describes transverse waves? (2)

A: The vibrations are at right angles to the direction the wave is travelling in.

B: A: The vibrations are parallel to the direction the wave is travelling in.

C: They carry energy

D: They carry particles

2. Light is a transverse wave. Give another example of a transverse wave. (1 mark)

3. What kind of wave is a sound wave? (1 mark)

4. Look at the diagram below. Which letter represents the wave's...

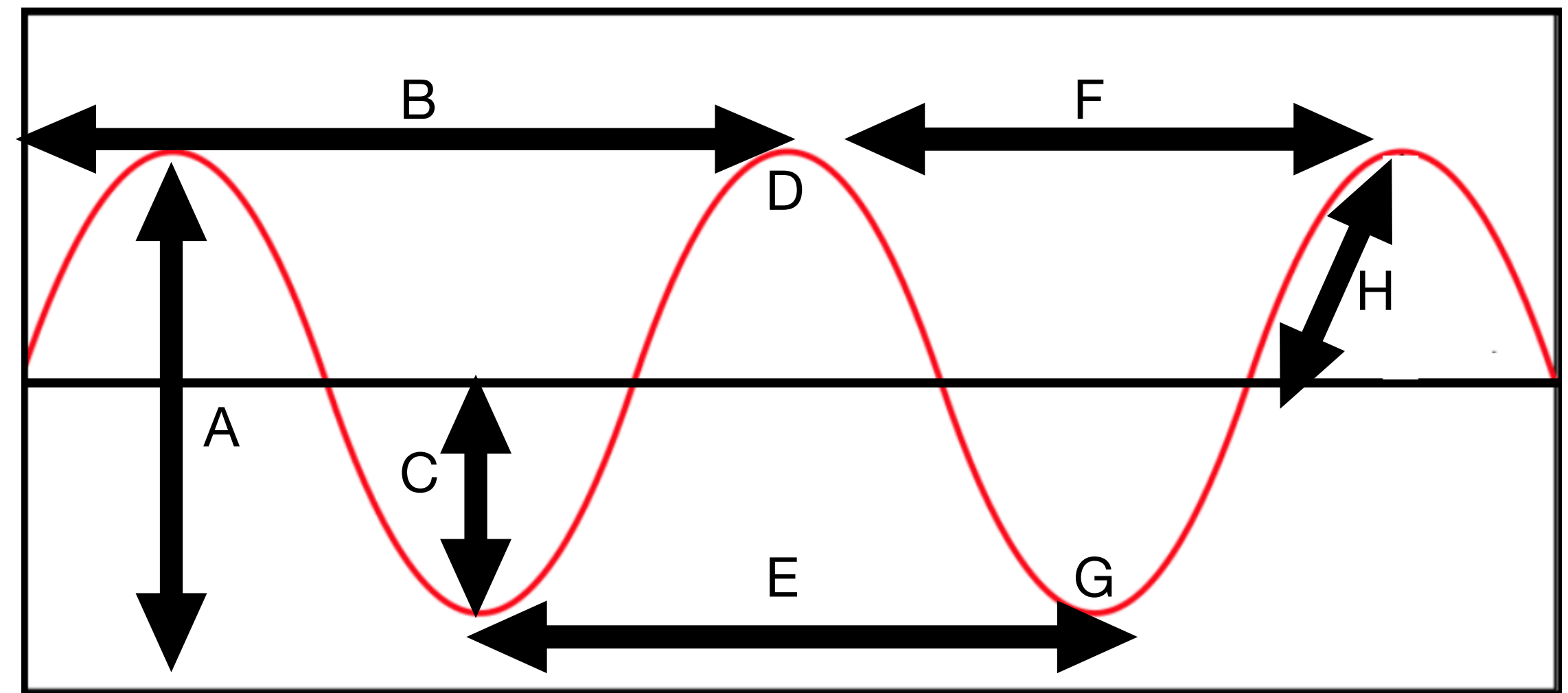
Amplitude ____

Wavelength ____

Crest ____

Peak ____

(4 marks)

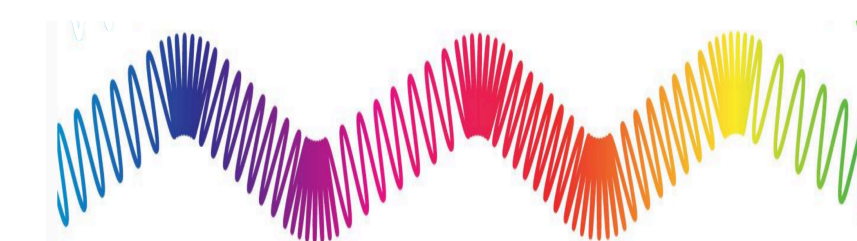
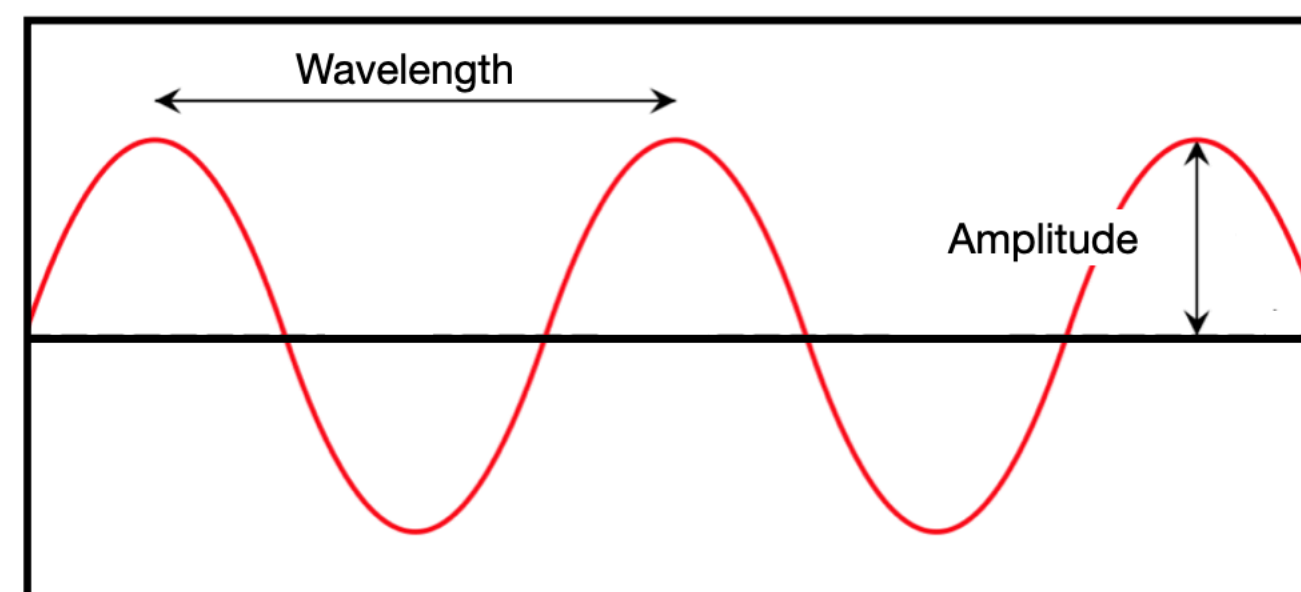


Many thanks for supporting me on Kofi! You'll receive Theatre of Science magazine and diffraction glasses that are very appropriate for waves! Very grateful that this is my job xx



Waves Lesson 2: Electromagnetic Waves!

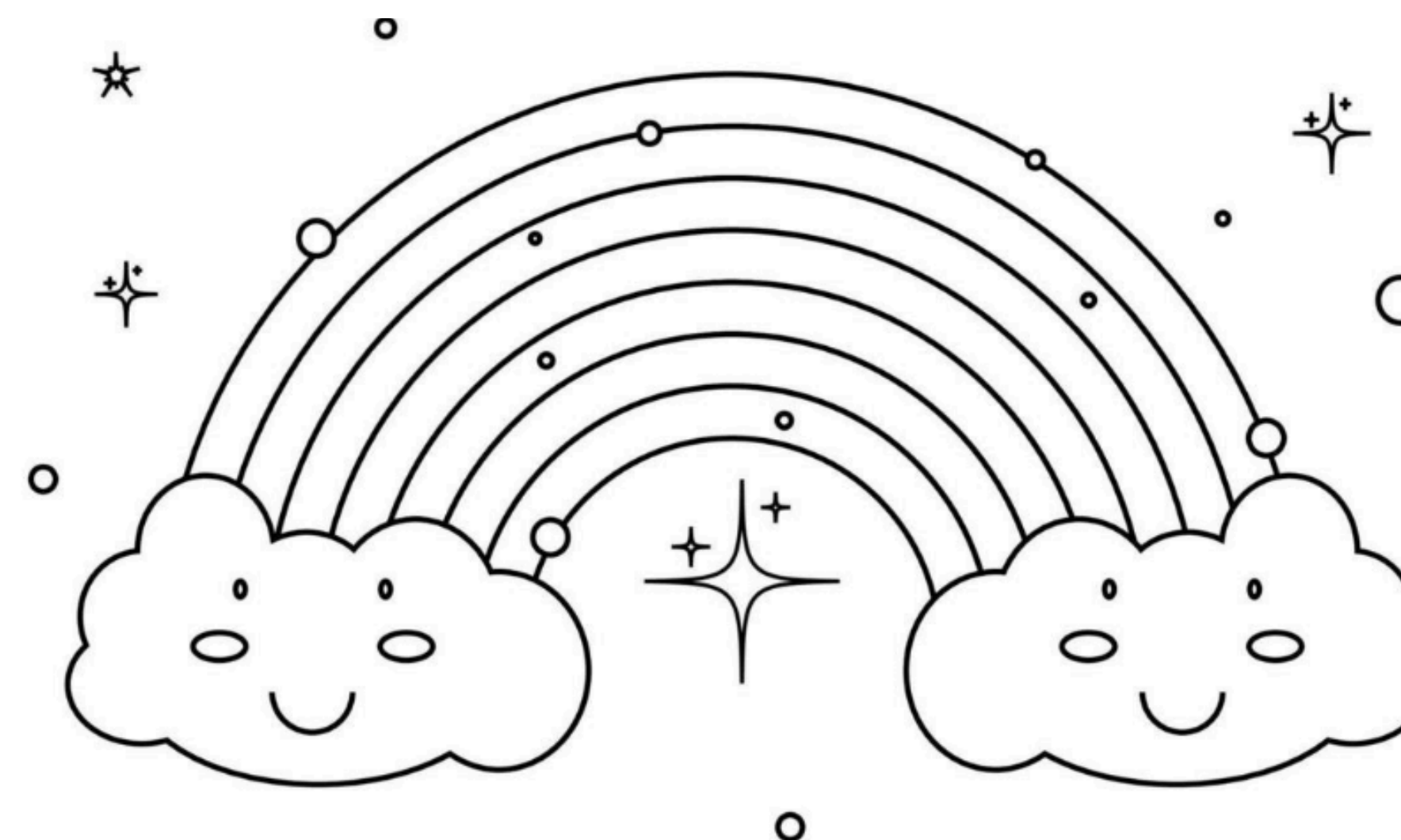
To join in bring: Two magnets, any size. Sunscreen / any moisturiser etc with UV protection! Candle and way of lighting it (if adult supervising).



Transverse Wave

After today I hope you'll...

- Know that light is an electromagnetic wave, like radio, microwave, infrared, visible, ultraviolet, x-ray and gamma rays
- Know that electromagnetic waves can travel through space.
- Give three uses for electromagnetic waves
- Explain two features of electromagnetic waves - can they travel through the atmosphere? Do they damage cells? And explain how that makes them useful or dangerous.

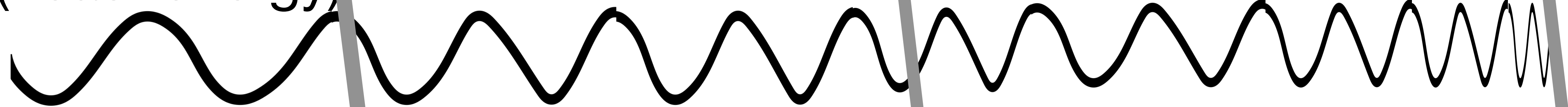


You might want to use this page to make notes. Or you might want to just enjoy listening! Up to you.

Electromagnetic Waves

(Least energy)

(Most energy)



Radio

Microwave

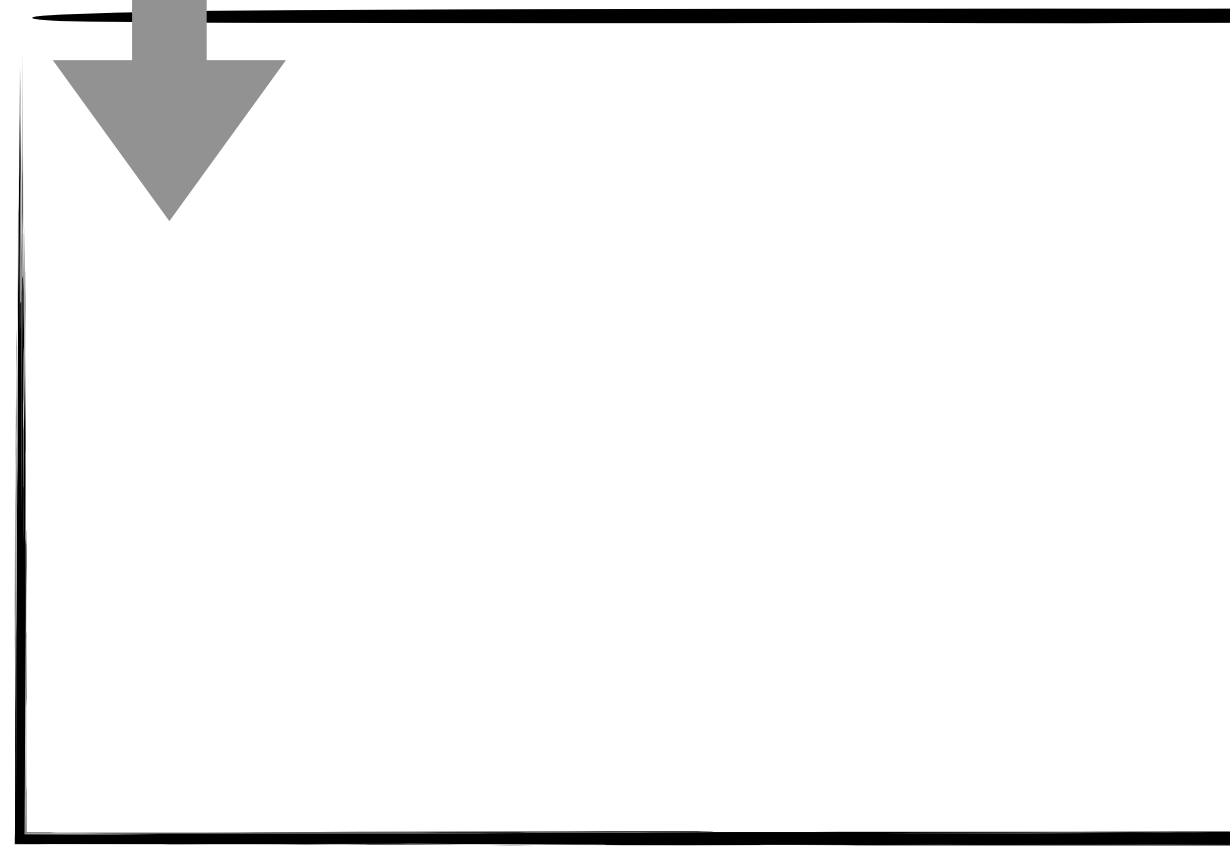
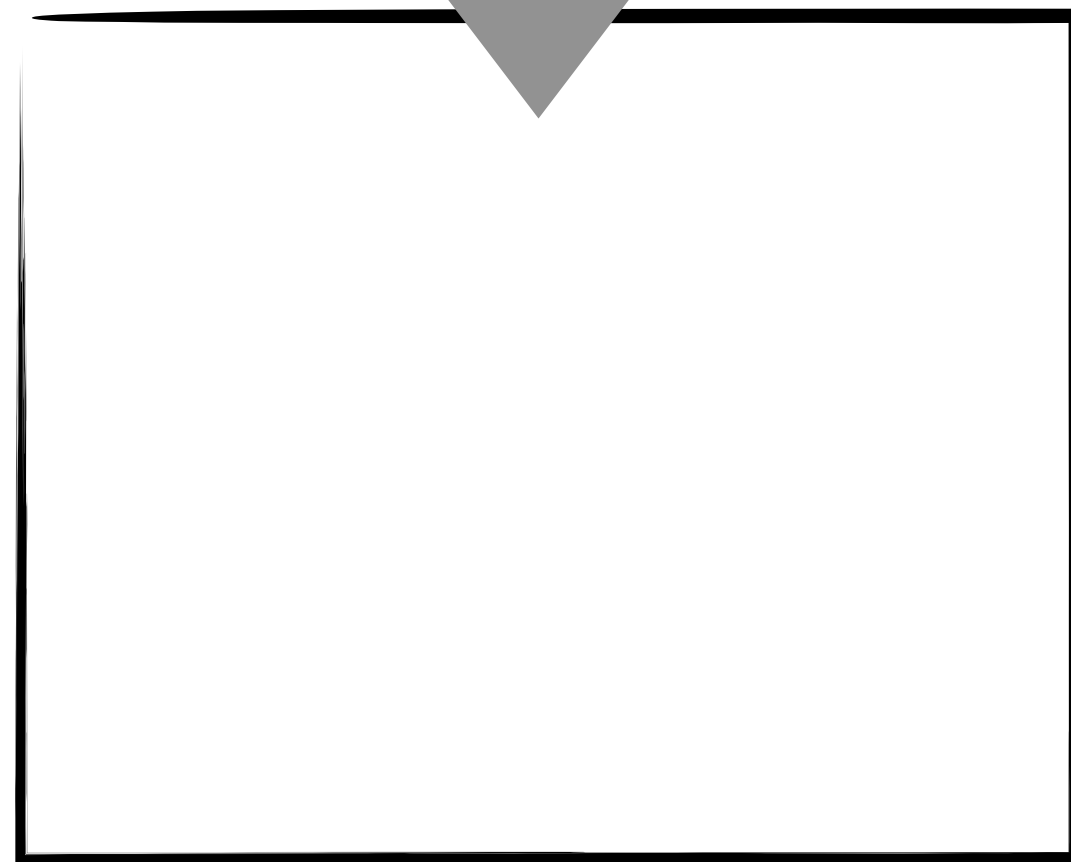
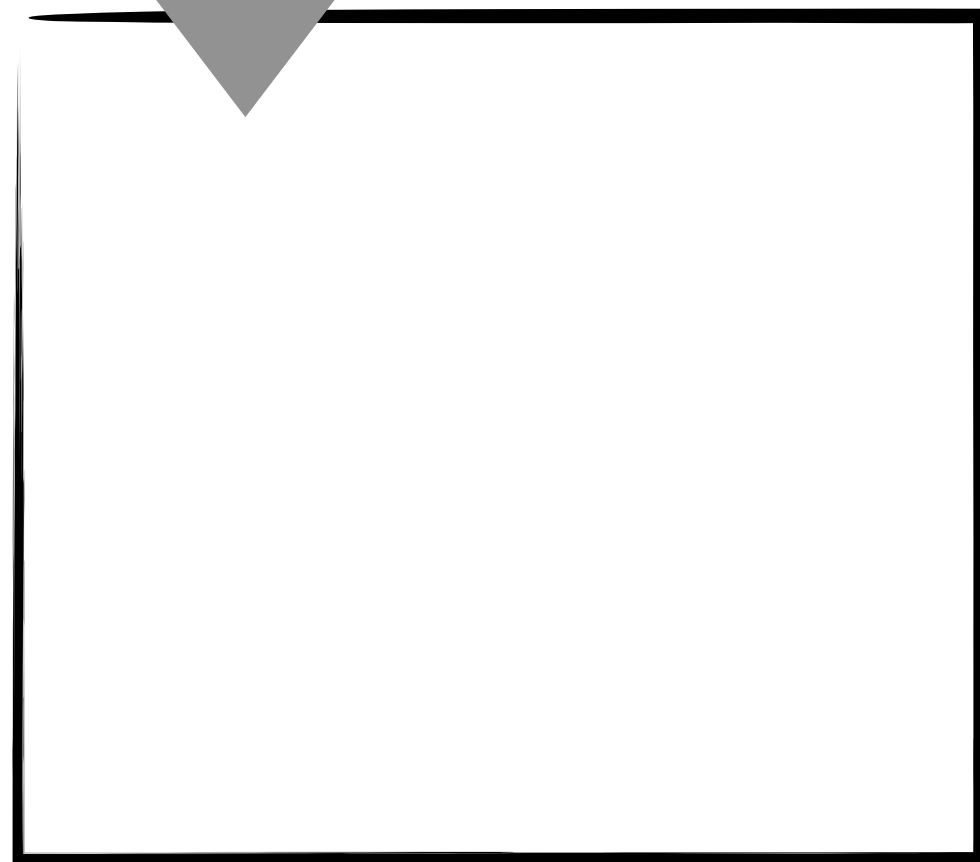
Infrared

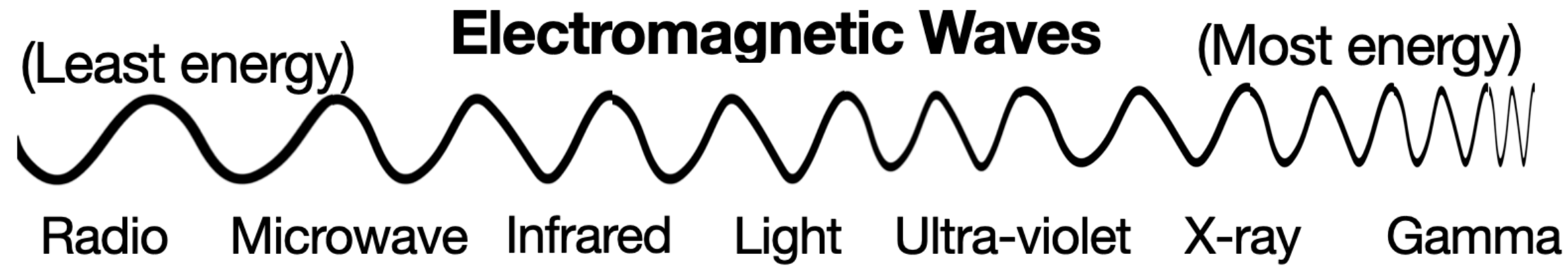
Light

Ultra-violet

X-ray

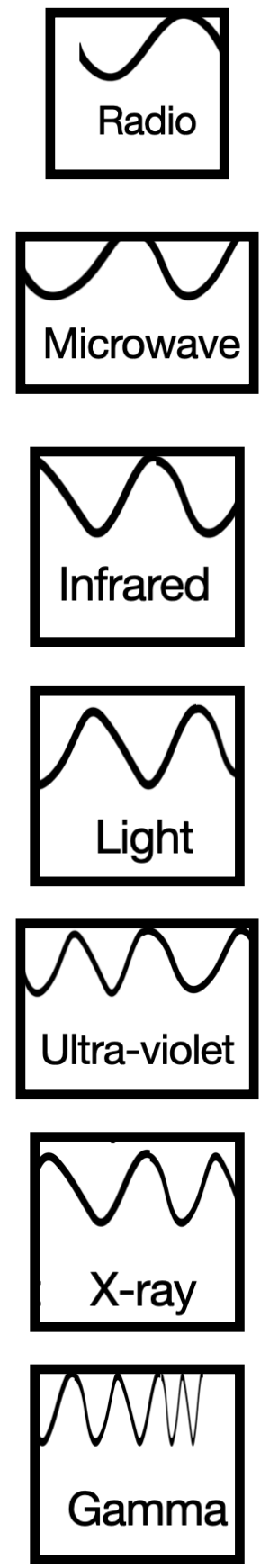
Gamma





5) Match the wave to the use

- Used for cooking: they can travel deep into food
- Used to send mobile phone signals
- Used in communications because they travel most easily through the atmosphere
- Used in communications because they travel most easily through the atmosphere
- Used for night vision goggles
- Used to treat cancer
- Travel through skin, absorbed by bone



1) Which of these waves travel at the speed of light?

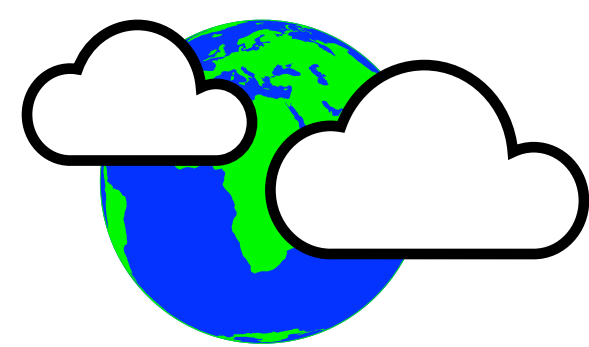
2) Which of these waves can travel through space?

3) Which of these waves do you give off?! Guess!

4) Which three are most damaging to human cells?

6) Puzzles!

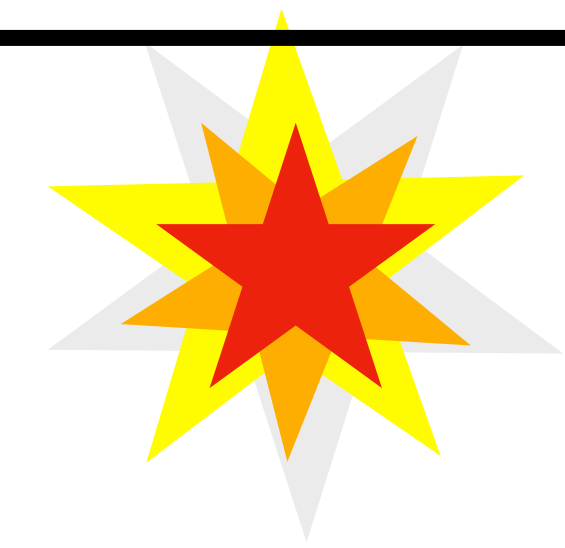
You want to use a satellite to get images of clouds around Earth. At night! What kind of wave detector do you use?



Ice gives off far less IR radiation than water. What wave would you try to detect if you wanted to accurately map the ice on Earth's oceans?



You want to study bursts of the highest energy electromagnetic waves there are. What waves do you try and detect and where do you put the detector?





Waves Lesson 3: Colour!

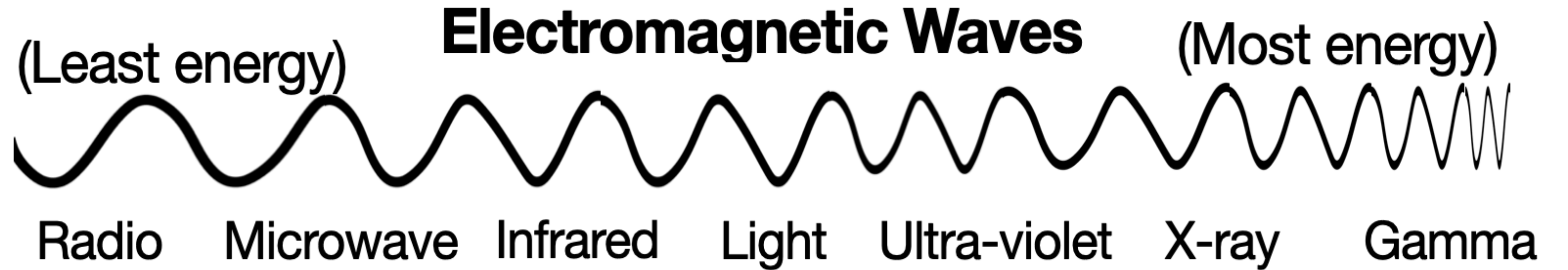
To join in bring: Wine glass of water, mobile phone torch, white paper, sellotape, scissors, cereal box/similar (can be full of cereal!). Two primary colours of paint, brush.

After today I hope you'll...

- Know that light is an electromagnetic wave and that different coloured lights have different wavelengths.
- Know which colours have the longest and shortest wavelengths.
- Understand why objects appear to be the colour they are.
- Be able to explain how filters can affect light.



Many thanks for supporting me on Kofi! You'll receive Theatre of Science magazine and diffraction glasses that are very appropriate for waves! Very grateful that this is my job xx



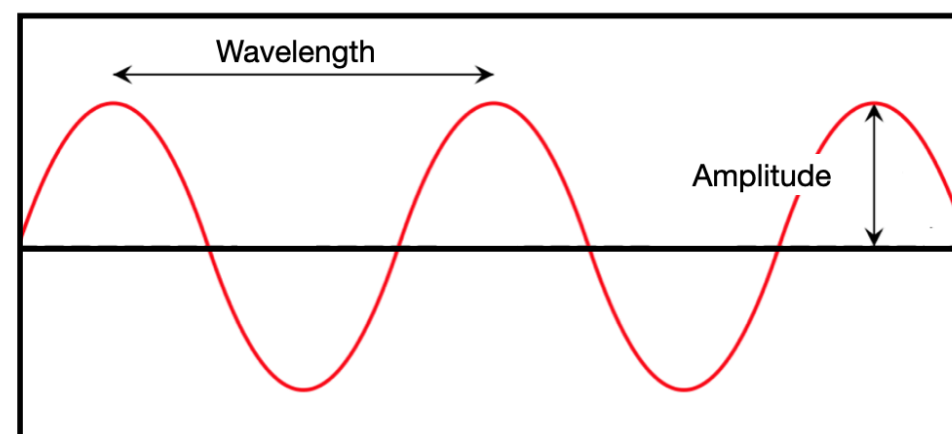
1) These colours of light are electromagnetic waves! Put a cross where they fit in the picture above.



2) Which colour has the shortest wavelength?

3) Which colour carries the least energy?

4) Why do we see different wavelengths as different colours?! Answer with **one word!**



Notes



1) What colour does a red Lego brick look in blue light?

2) What colour does a blue Lego brick look in blue light?

3) What colour does a red Lego brick look in white light?

4) What colour does a green leaf look in red light?

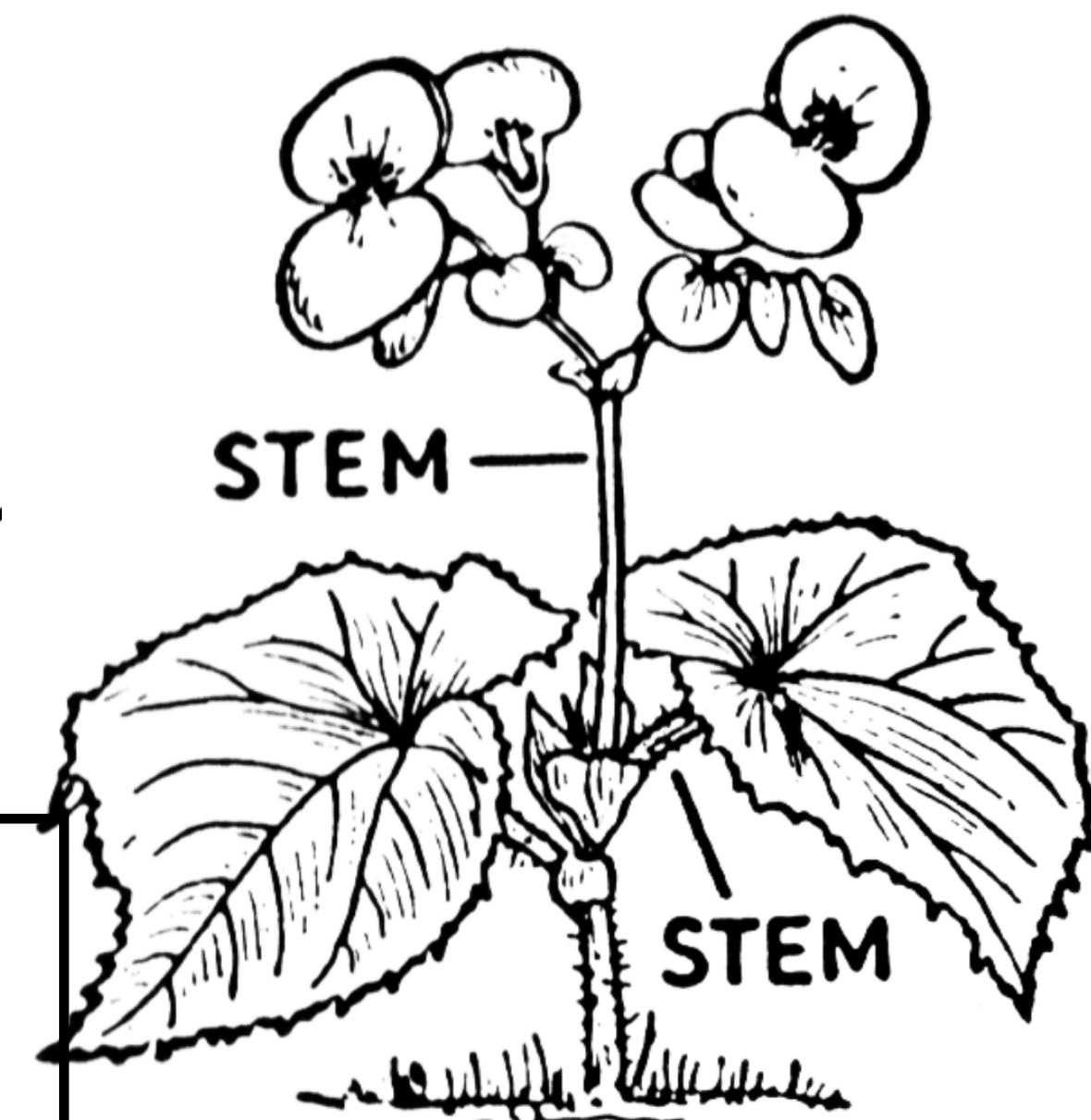
5) What colour does a blue Lego brick look in red light?

1) What colour does white light appear if it passes through a blue filter?

2) What colour does red light appear if it passes through a blue filter?

3) What colour does red light appear if it passes through a red filter?

Mark in quiz



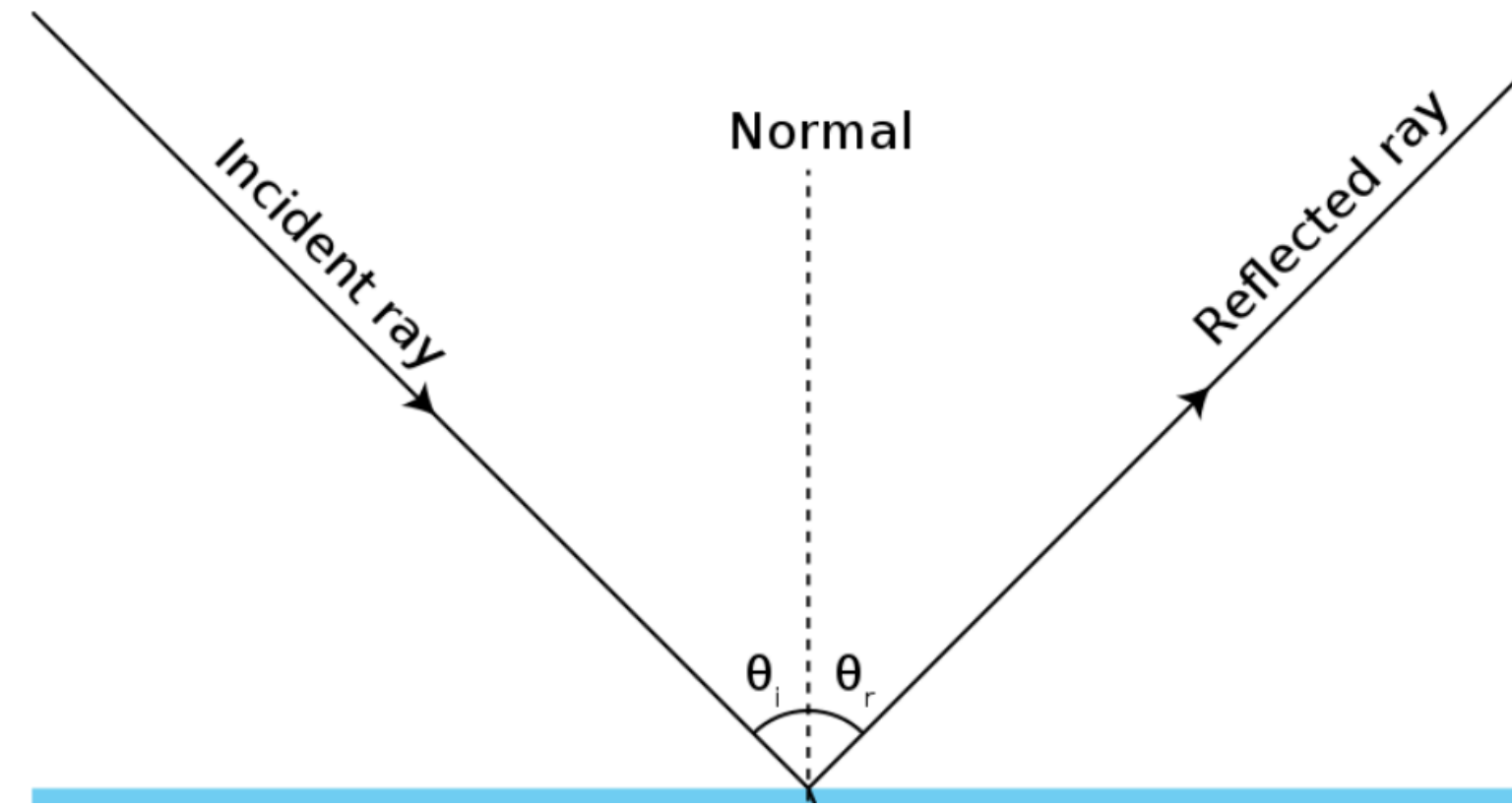


Waves Lesson 4: Reflection!

To join in bring: Bring a mirror!!

After today I hope you'll...

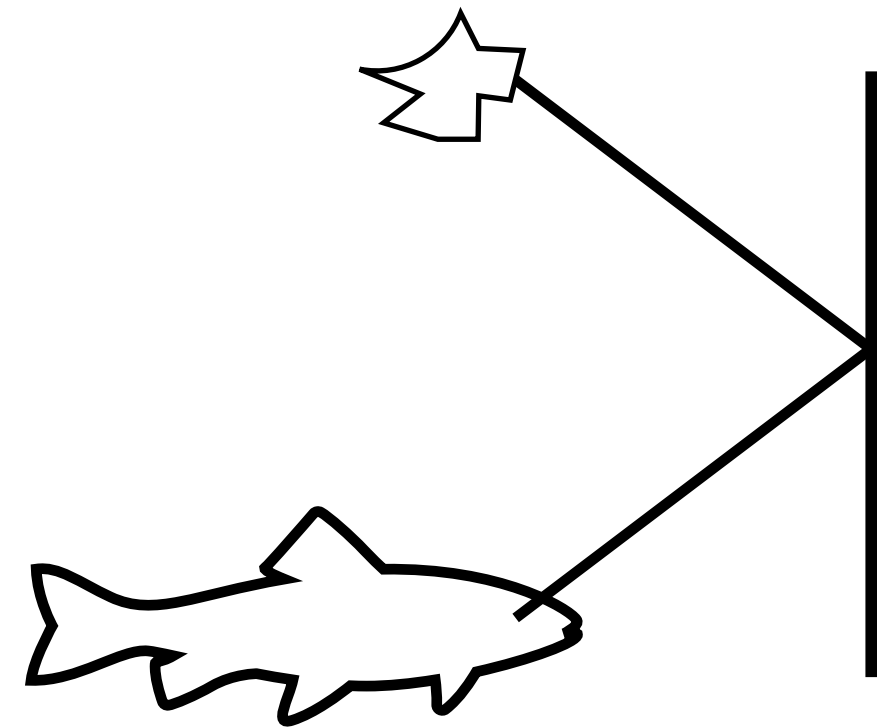
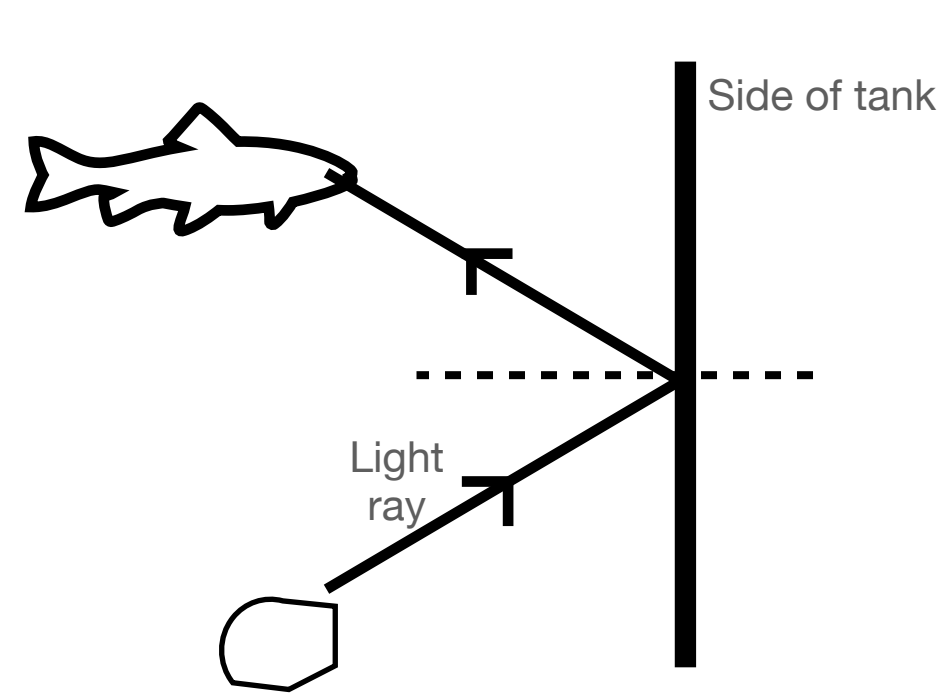
- Know that all waves can be reflected
- Understand what the incident ray, angle of incidence, reflected ray and angle of reflection are.
- Be able to label the above on diagrams.
- Draw ray diagrams to show how people see images in mirrors.



Anything you didn't understand that you want to look up later? Any questions you want to post in Lara's group? Write them down as they come to you!

Ray Diagram Questions!

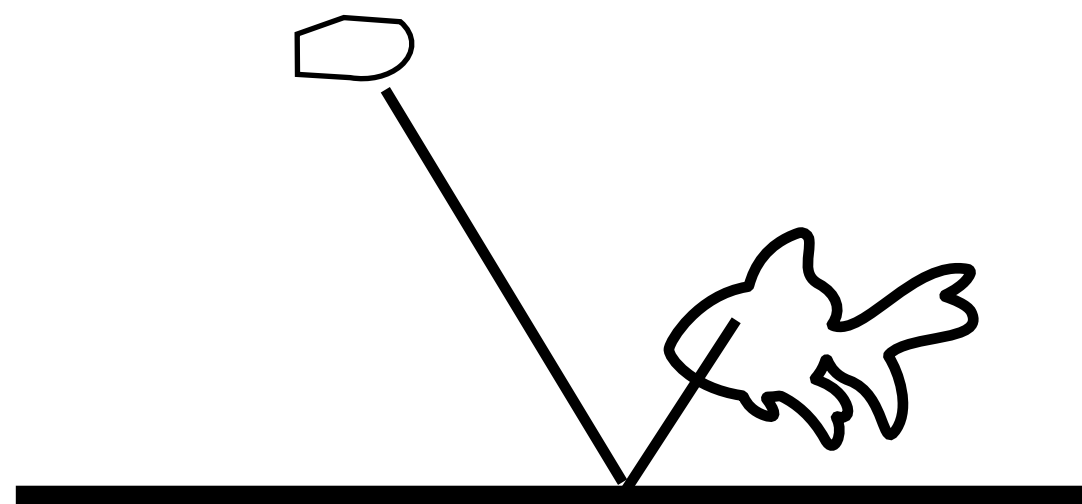
1. Draw arrows on the light rays to show how these fish see the food. One has been done for you.
(Hint, they are average fish, they can't shoot laser beams out of their eyes)



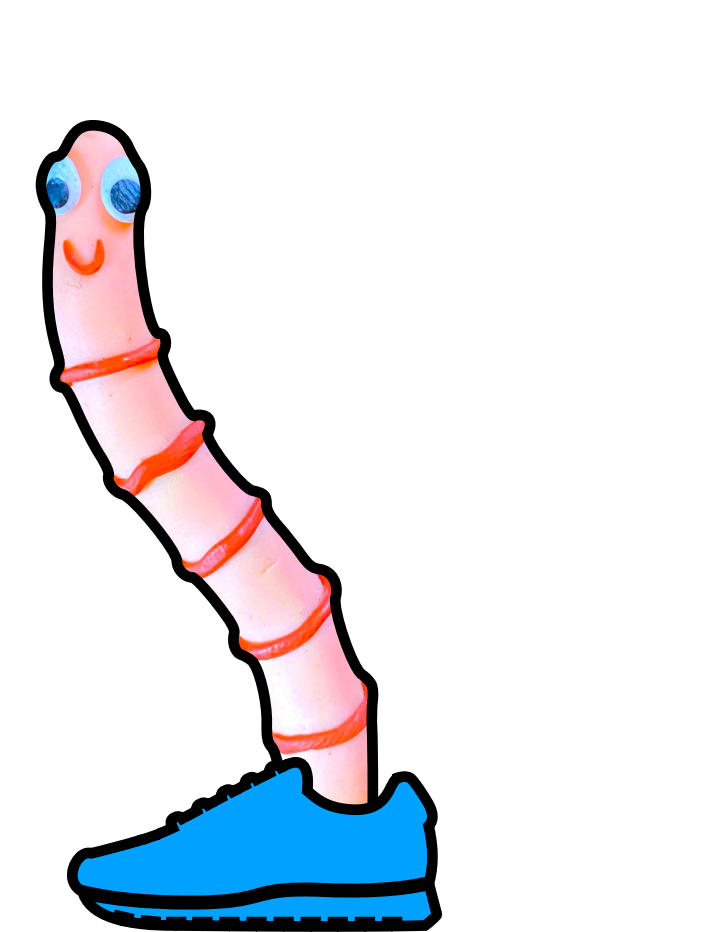
2. Label the reflected rays with an 'r' in each diagram

3. Label the incident rays with an 'i'.

4. Sketch the normals!
The first has been done.



5. Wormy has a new shoe. Draw a normal in the middle of the mirror, then draw light rays to show how she can see her boss new footwear,



6. On the back of this page, draw a diagram showing how an ant sees their pants in a mirror.

7. Label the incident ray, reflected ray, angle of incidence and angle of reflection in the diagram.

GCSE Questions!

1. A woman looks at her reflection in a mirror. Draw a cross where the image of the bow on her head would be.

2 marks

2. Draw a ray from the bow that reflects off the mirror and into the woman's eye. Draw arrows to show what direction the ray is travelling in.

2 marks

3. Mark the angle of incidence with an i , and the angle of reflection with an r .

1 mark



4. A mug is placed 20cm in front of a flat mirror.

Is the image...

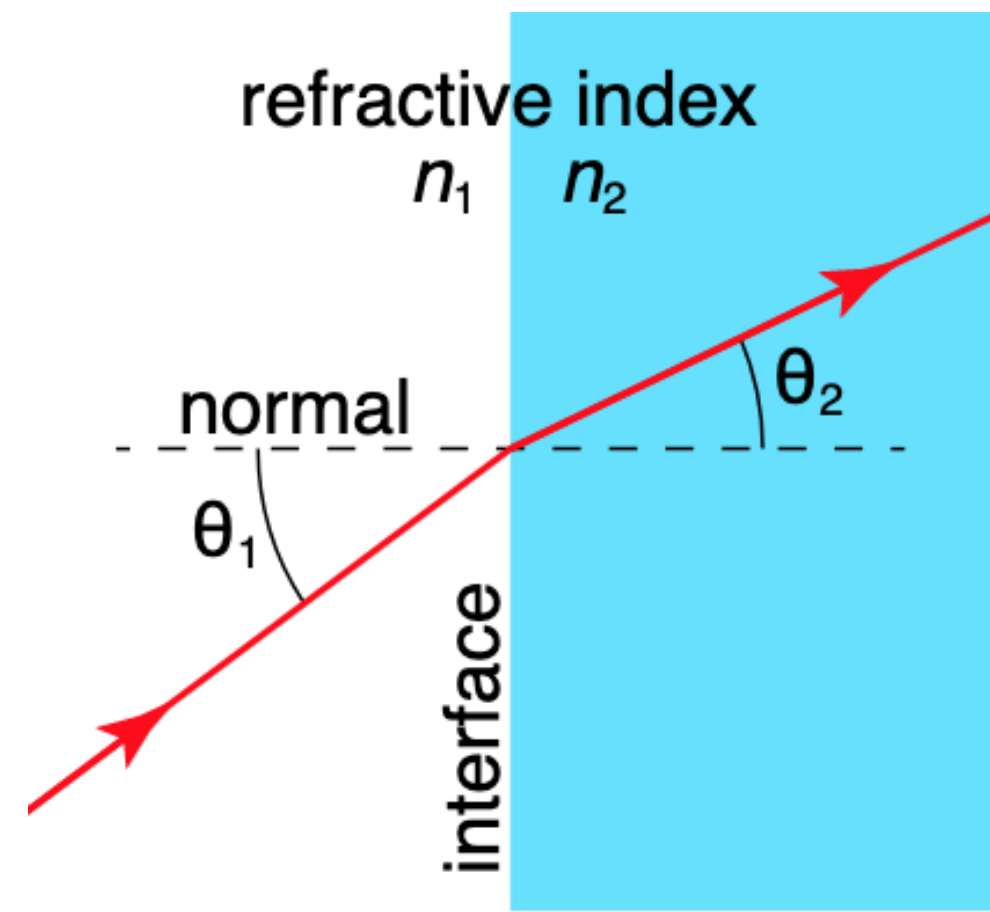
- a) Bigger and 20cm away from the mug
- b) Bigger and 40cm away from the mug
- c) The same size and 20cm from the mug
- d) The same size and 40cm from the mug

1 mark

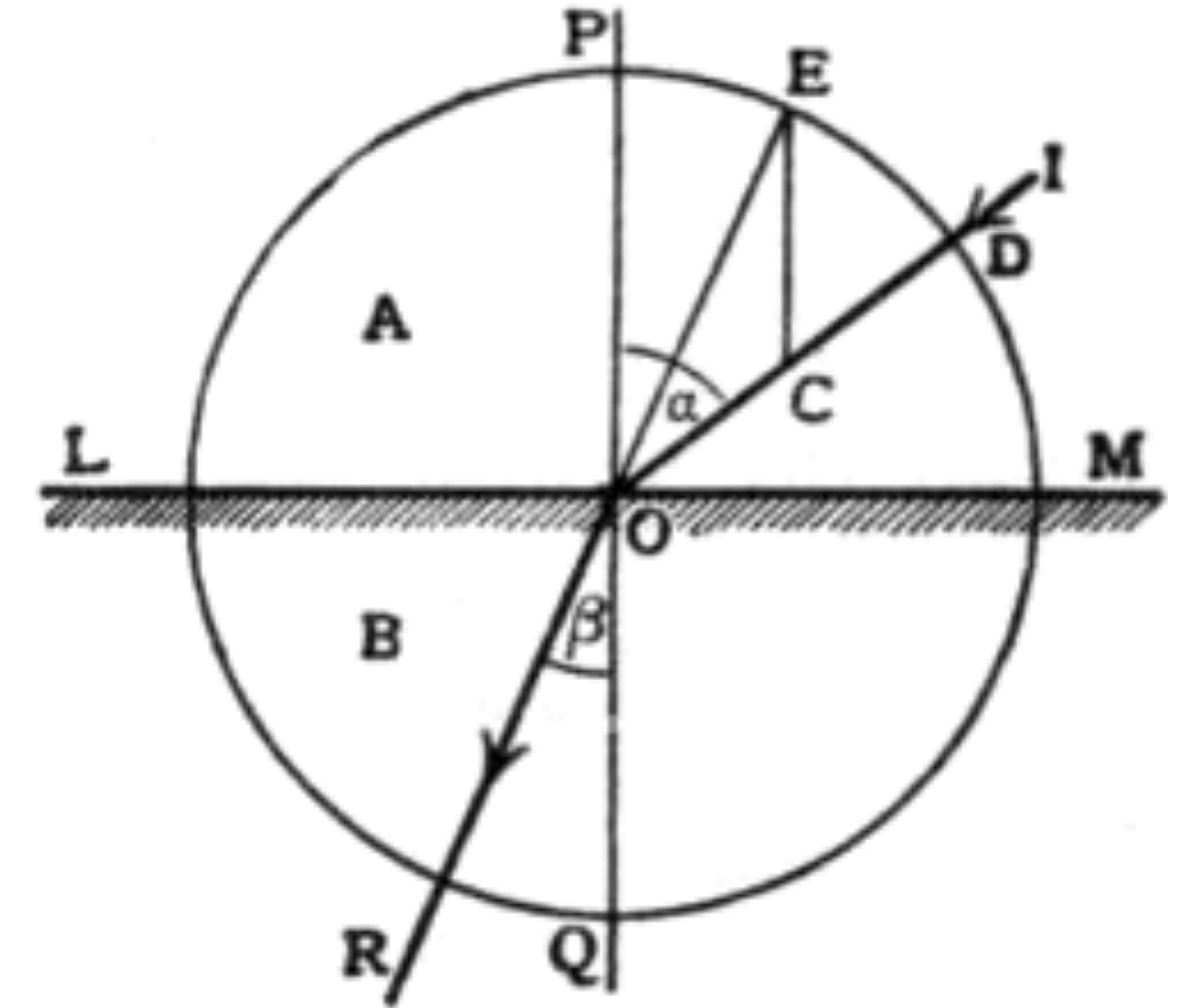


Waves Lesson 5: Refraction!

To join in bring: Large glass of water, pen, cereal bowl, coin



Doodle:



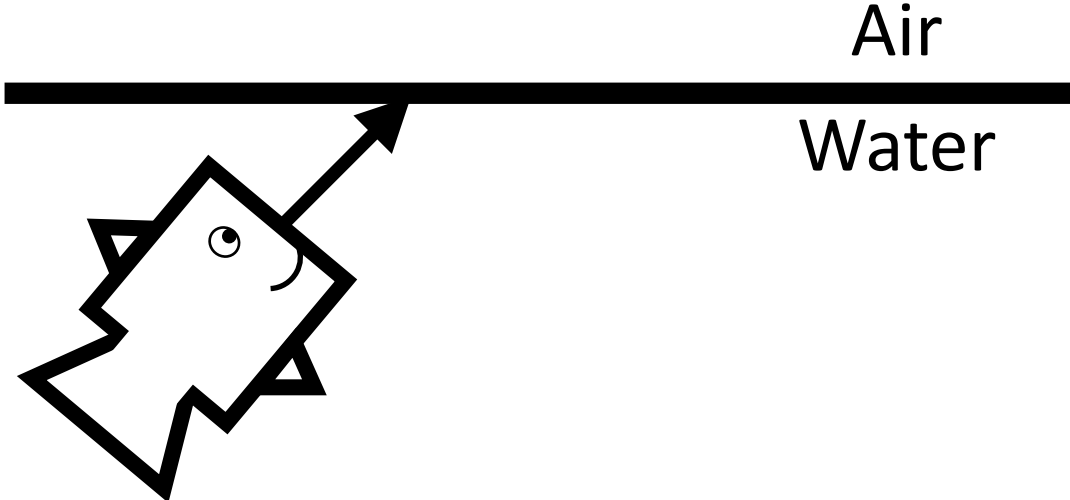
After today I hope you'll...

- Know that all waves can be refracted
- Understand what the incident ray, angle of incidence, refracted ray and angle of refraction are.
- Be able to label the above on diagrams.
- Draw simple ray diagrams to show how light refracts.
- Understand the term 'refractive index'.

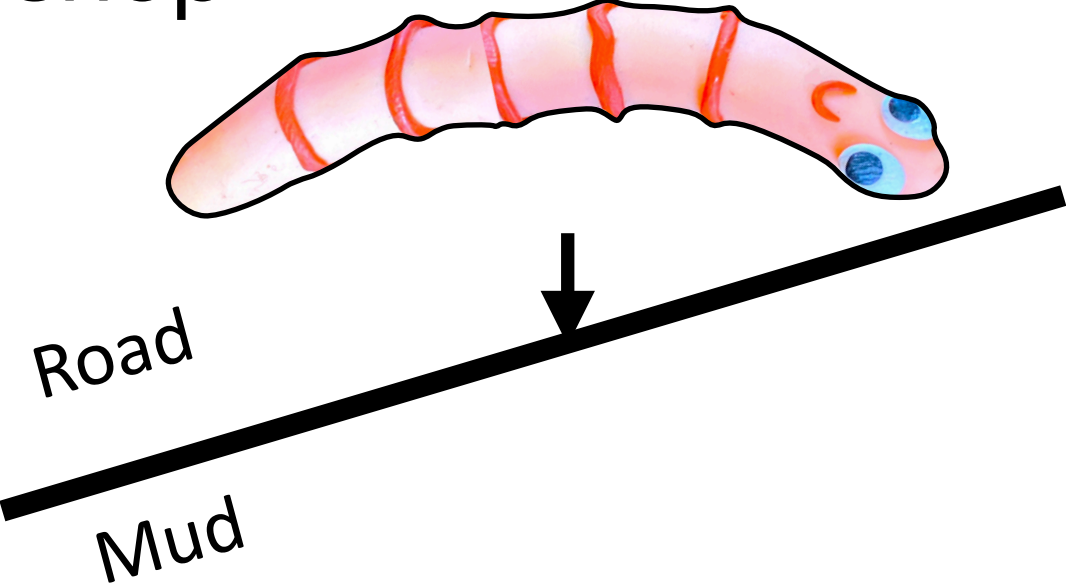
Anything you didn't understand that you want to look up later? Any questions you want to post in Lara's group? Write them down as they come to you!

When each object hits the boundary, Which direction will it go in? Draw a line!

1) Weirdly square fish leaping out of water



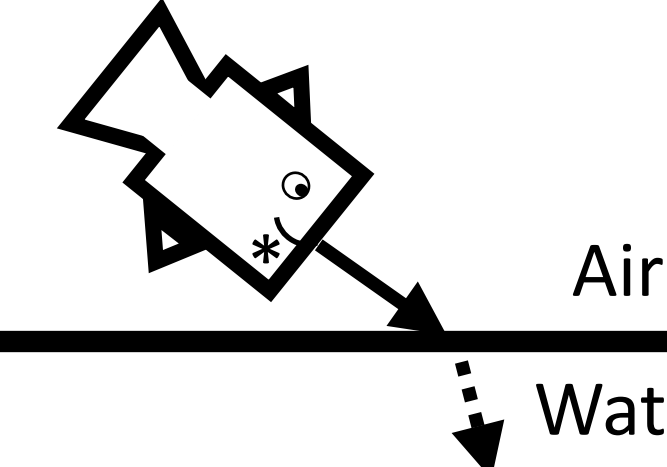
2) Wormy rolling to the shoe shop



Example

1) Going into water - fish will *slow down*.

2) Corner with a * will hit water first, so fish will change direction as shown

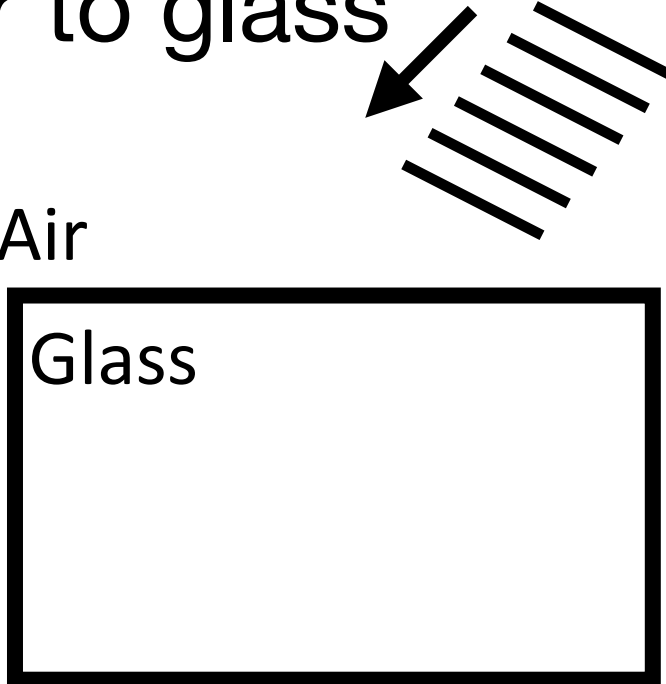


(Boundary is 'line' between the different materials)

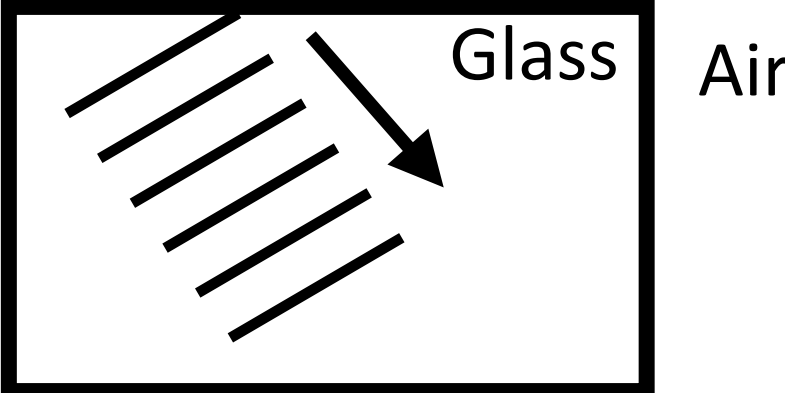
3) Steamroller hitting a triangle of glue it could happen



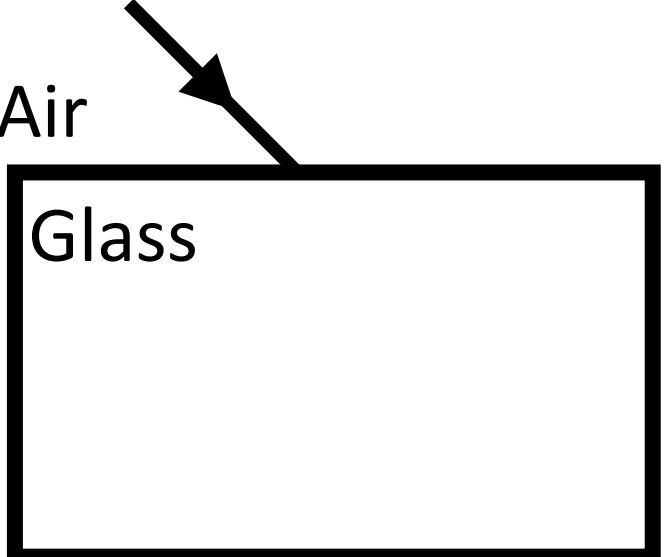
5) Light moving from air to glass



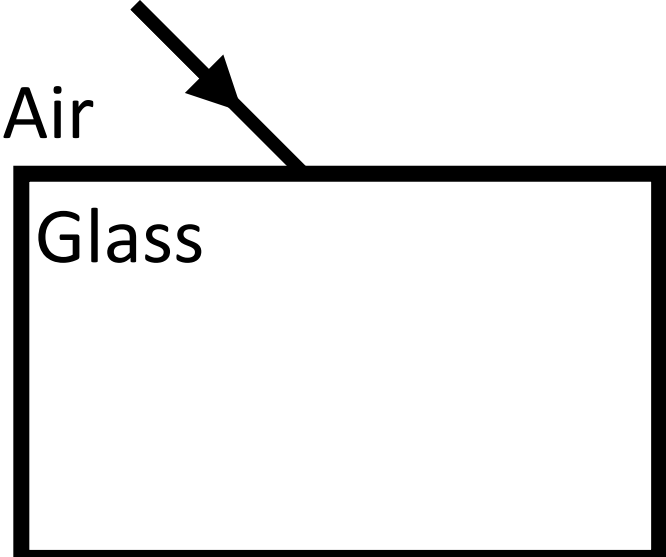
6) Light moving from glass to air



6) Light moving from air to glass

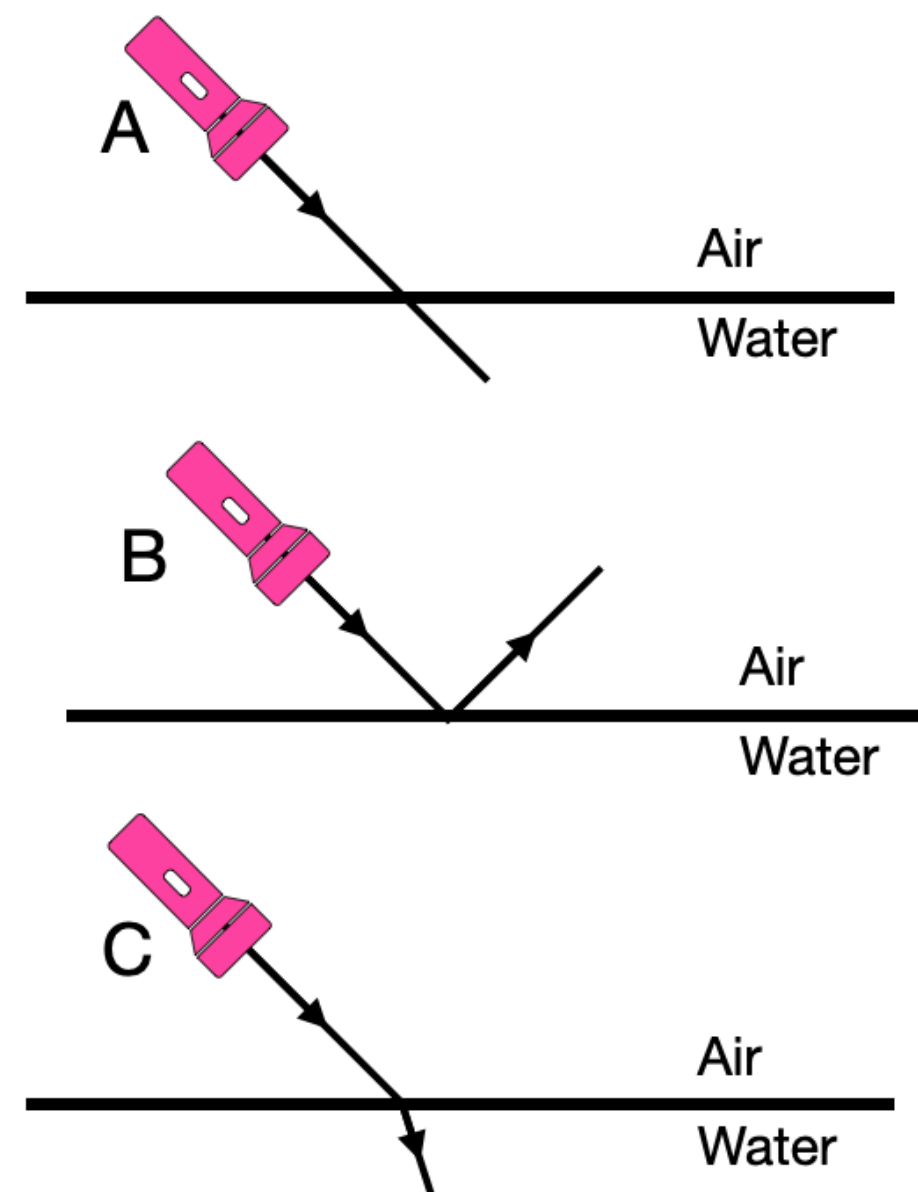


Done? Show how the light travels through the glass and out the other side!

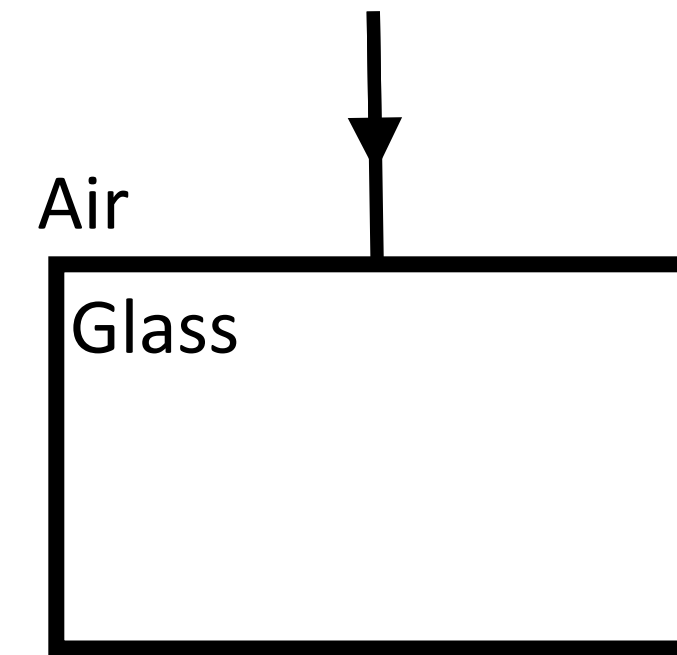


Summary Questions

1. A laser is shone at the surface of a swimming pool. Which diagram shows what would happen?



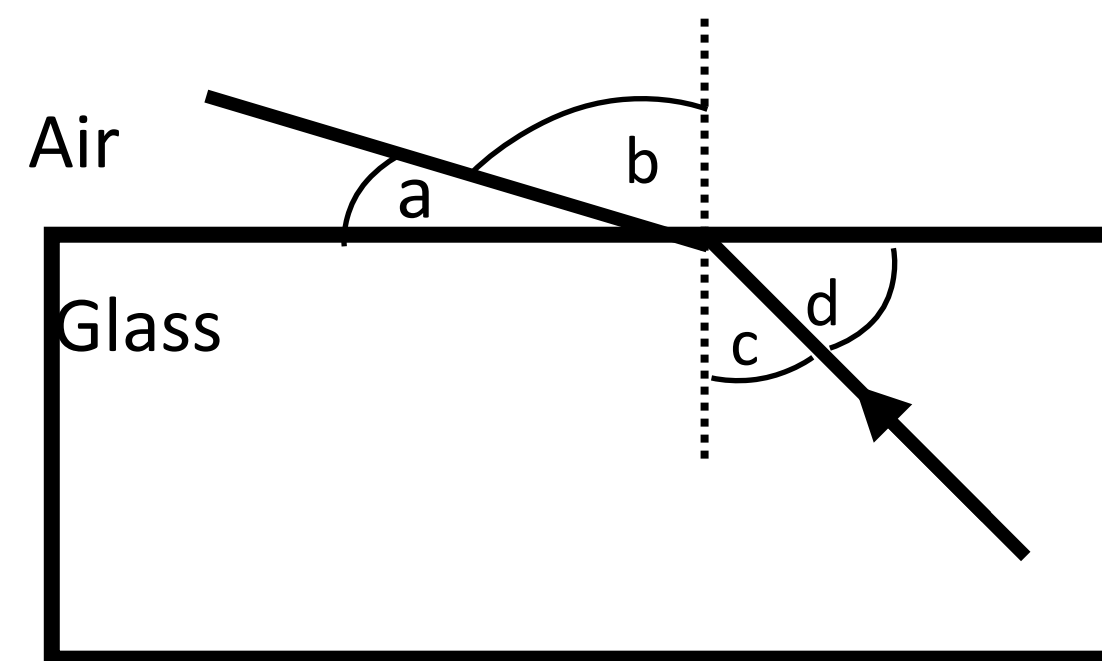
2. A ray of light passing into a glass block as shown. Describe what happens to the direction the light is travelling in.



4. Different materials slow light down by different amounts. How much a material slows light down is called its...

- a) Reflective subtext
- b) Refractive indices
- c) Refractive ibex
- d) Refractive index

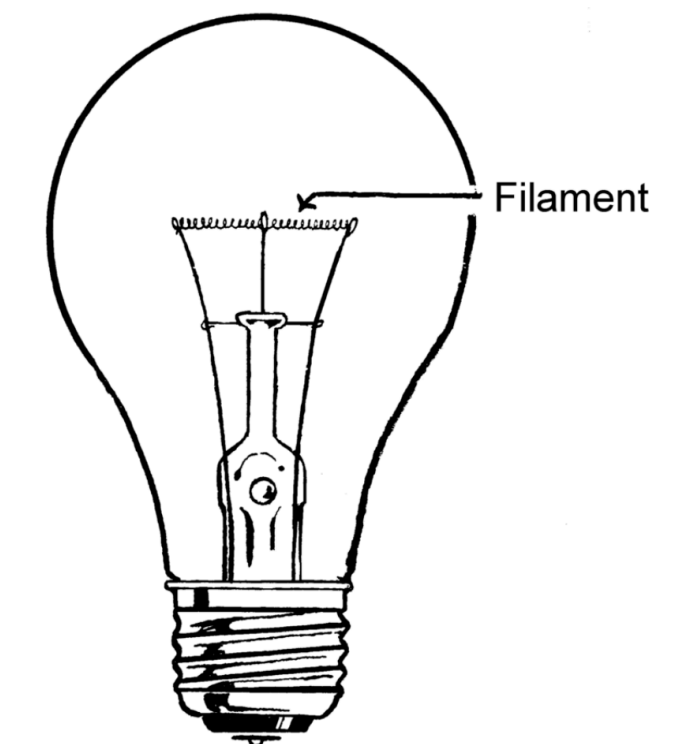
3) A ray of light leaves a piece of glass.



What letter shows the angle of refraction: a, b, c or d?

5. Light travels fastest through...

- a) A vacuum (where there are no particles)
- b) Air
- c) Glass
- d) Diamond



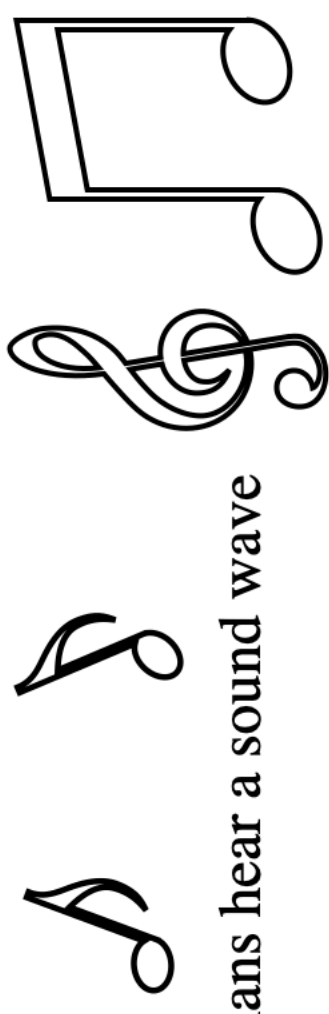


All-Ages Waves Lesson 6: Sound

(Last one before a week off for half-term. Then we start coral reefs!)

After today's lesson I hope you'll:

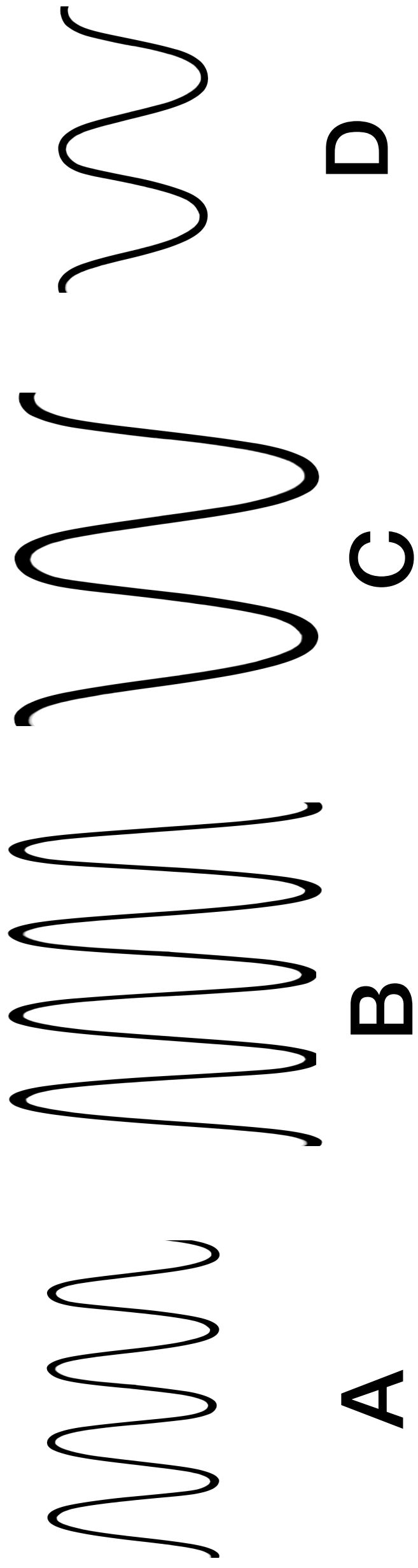
- Know that sound, unlike light, needs particles to travel
- Know how different materials affect the speed of sound
- Understand how frequency and amplitude affect how humans hear a sound wave
- Describe some behaviours of sound waves



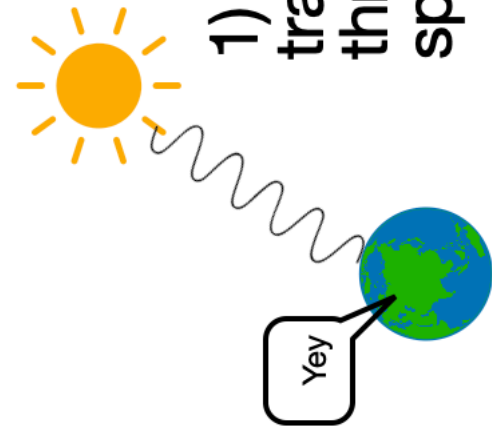
Bring: Wine glass, small jug water, elastic band (or string instrument!), string, metal spoon.

Starter for if you've seen waves lesson one!

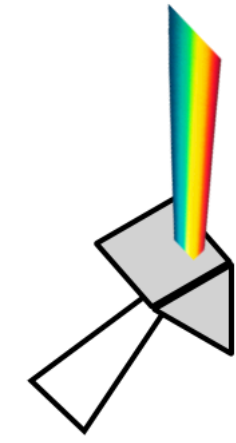
- 1) Which of these has the largest amplitude? 2) Which has the highest frequency? 3) What does frequency mean?



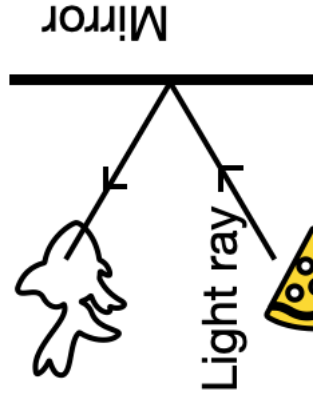
Light waves...



1) Can travel through space



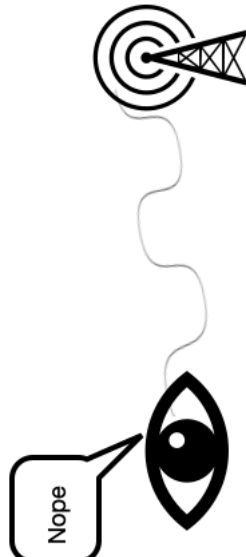
2) Travel slower through glass



3. Can be reflected



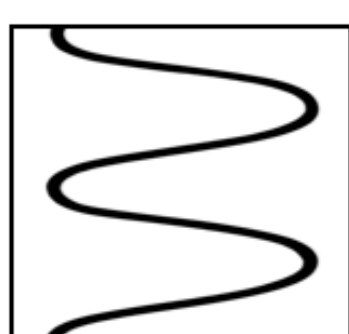
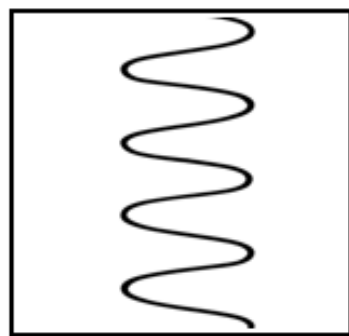
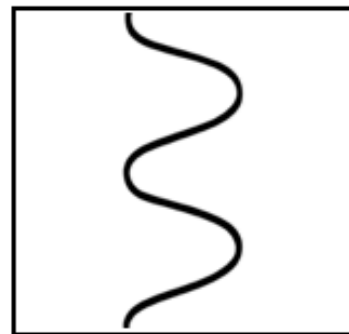
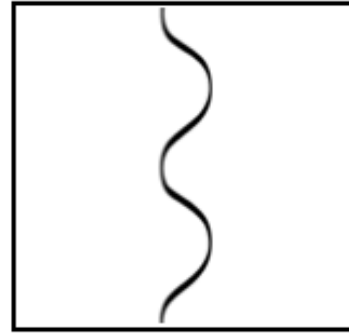
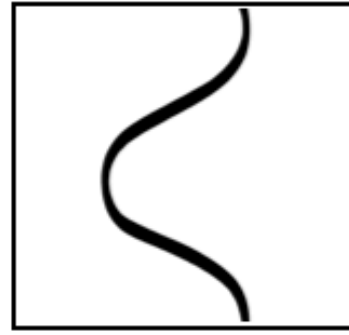
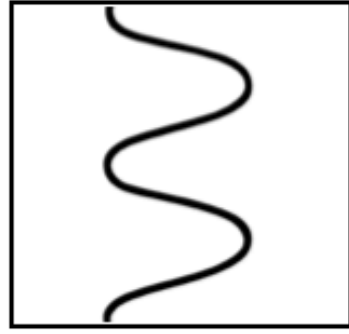
4. Can be stretched



5. Exist that can't be detected by humans

Can the same be said for sound waves?
Write yes or no next to each case.

1. First Sound Second Sound? 2. First Sound Second Sound? 3. First Sound Second Sound?



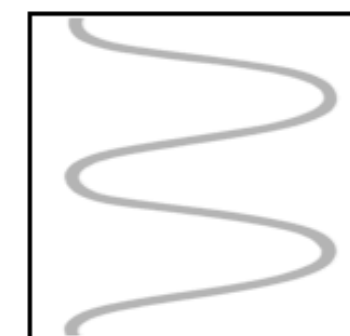
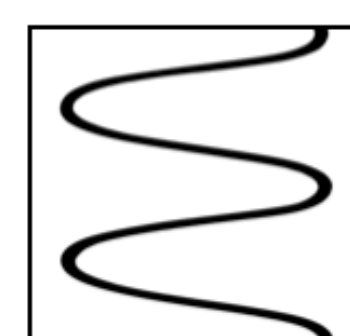
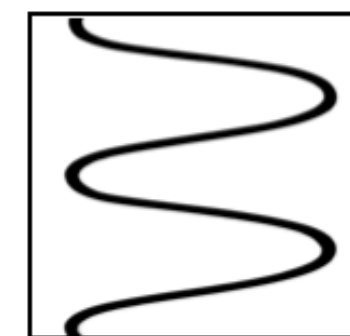
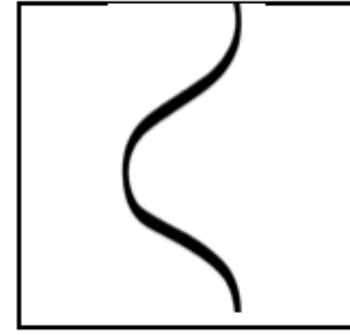
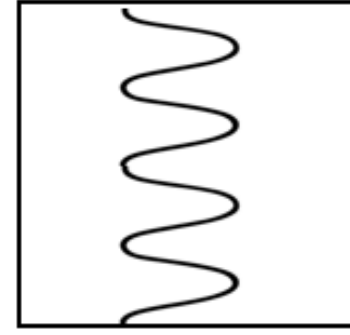
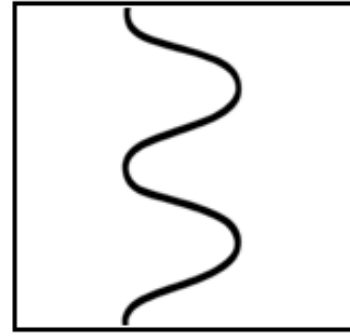
a

b

a

b

4. First Sound Second Sound?



a

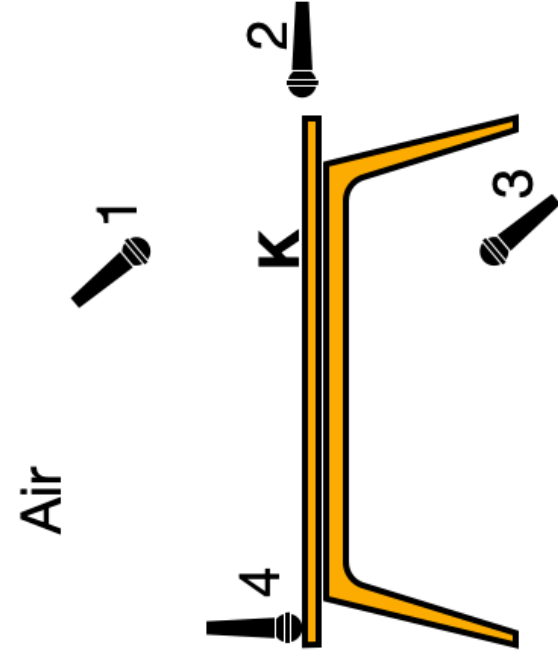
b

a

b

GCSE questions!

1) A hand knocks on a table at K. Four microphones surround the table. Which microphone will pick up the sound first?



2) This picture represents a sound wave. Which sentence is correct?

- The sound is getting higher
- The sound is getting louder
- The amplitude of the wave is decreasing
- The frequency of the wave is decreasing.



Summary questions!

1. Give one difference between a sound wave and a light wave, and one similarity. (Give more if you like!)
2. What is a sound wave called when it reflects?
3. Sketch two sound waves that are the SAME loudness but DIFFERENT pitches (ie one high sound, one low sound).

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£5 a month makes this work for everybody!

