A Waves in air, fluids and solids

1. The diagrams below show two types of wave produced on a slinky spring.

A 

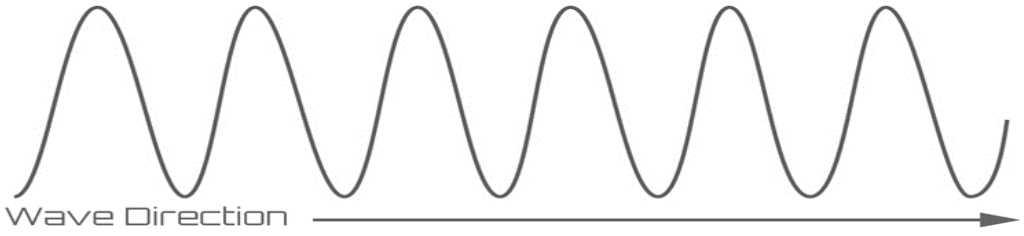
B 

   a. Which one is a transverse wave? (1)

   b. What is the name of the other type of wave? (1)

   c. On **both** slinky diagrams, draw an arrow to show the direction of oscillation of the wave. (2)

2. a. On the diagram below, label the amplitude (a) and wavelength (λ) of the wave. (2)

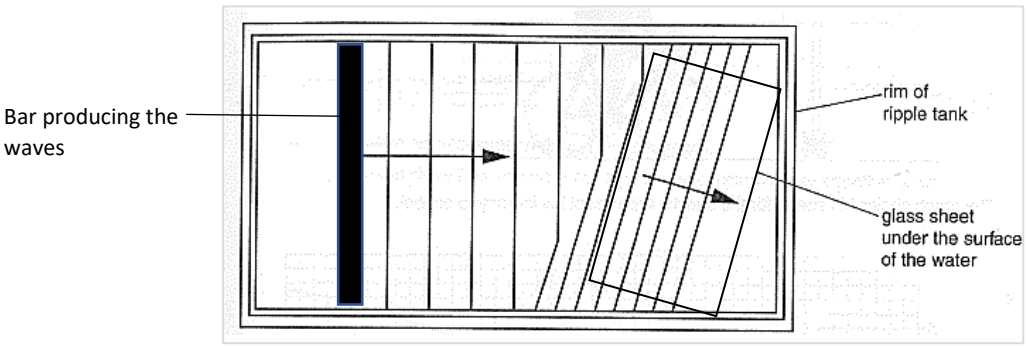


   b. The wave has a frequency of 200Hz. If wave period (*T*) is given by T = 1/f, calculate the period of this wave. (1)

3. Radio waves from a distant galaxy are travelling at 3.0 x 10^8m/s. If they have a wavelength of 28m, calculate the frequency of these waves. (3)

4. The man sees the lightening and hears the thunder 4s later. The lightening hit the ground 1.3km away. Use this information to calculate the speed of sound in air. (2)

5. The water waves produced in a ripple tank are shown below.



a. The bar producing the waves is vibrating at 2Hz and the waves are 0.03m apart. Calculate the speed of the water waves. (2)

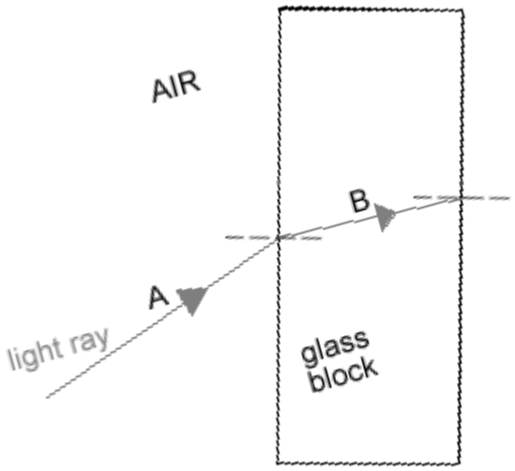
b. When the wave passes over the glass it refracts. State what will happen to each of the following properties of the wave when it refracts: (3)

Velocity

Wavelength

Frequency

6. The diagram shows a light ray shining on a block of glass.



   a. What is happening to the light ray at **B**? (1)

   b. Continue the ray of light as it leaves the glass block and label this as **C**. (1)

   c. Some of the light will be reflected before it enters the block. Draw this reflected ray and label it **D**. (1)

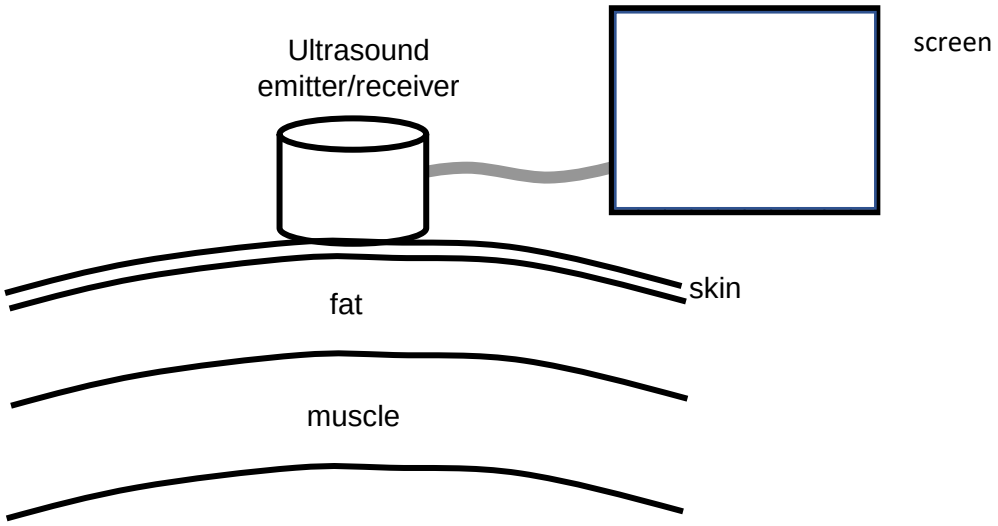
   d. Not all the light that enters the block leaves the block. What has happened to this light that does not leave the block? (1)

7. **(physics only)** Sound waves in the air are converted into vibrations in solids within the ear **(HT).**

   a. Describe how the ear changes air vibrations into solid vibrations. (3)

   b. Explain why this process limits the frequency range humans can hear. (3)

8. The diagram below shows ultrasound being used to produce an image of the inside the body.



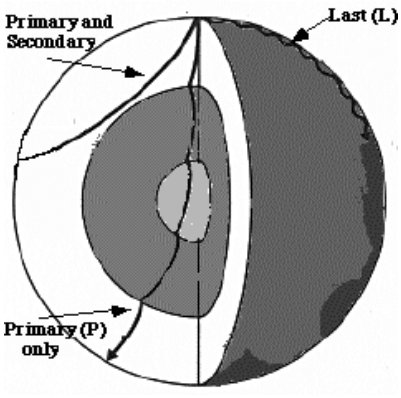
a. Complete the following sentences. Choose from the correct words from the list below. (4)

media **radiated** **transmitted** **reflected** **boundary**

Ultrasound can travel through different materials – solids, liquids and gases. When ultrasound meets a _____ between two different _____ some of the ultrasound is _____ and some is _____ . The reflected pulses are seen on the screen.

b. Draw a trace on the screen to show how the ultrasound image will appear. (2)

9. The diagram shows how Primary and Secondary seismic waves travel through the Earth.



   a. What type of waves are S waves? (1)

   b. Why do the S waves not travel all the way through the Earth? (1)

   c. The P waves bend when they come to a new boundary surface. What is this bending called? (1)

   d. Explain why the P waves bend in this way. (3)

10. Describe how echo sounding is used to locate a shoal of fish under a fishing trawler. (4)

B Electromagnetic waves

1. All electromagnetic waves have features in common. The table below lists features of waves. Tick the correct **boxes** that apply to all electromagnetic waves. (3)

Property	True	False
They are all transverse waves		
They have different speeds		
They have different frequencies		
They all have the same wavelength		
They can all be reflected, refracted and transmitted		
They can all travel through a vacuum		

2. The diagram below shows the electromagnetic spectrum. Three of the waves have not been named.

	Microwaves		Visible light	Ultra-violet		Gamma

Increasing frequency

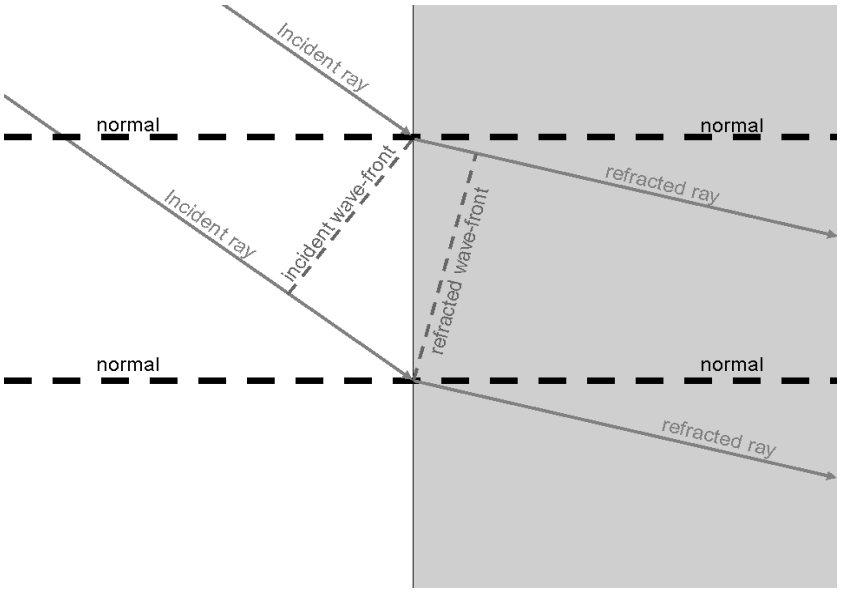
a. Fill in the three spaces above with the correct names. (3)

b. Which of the waves above is used in TV remote controls? (1)

c. Which of the waves above is satellite TV? (1)

3. When an infrared heater is switched on, a person a few metres away begins to warm up. Explain what has moved from the heater to the person and how this occurred.. (2)

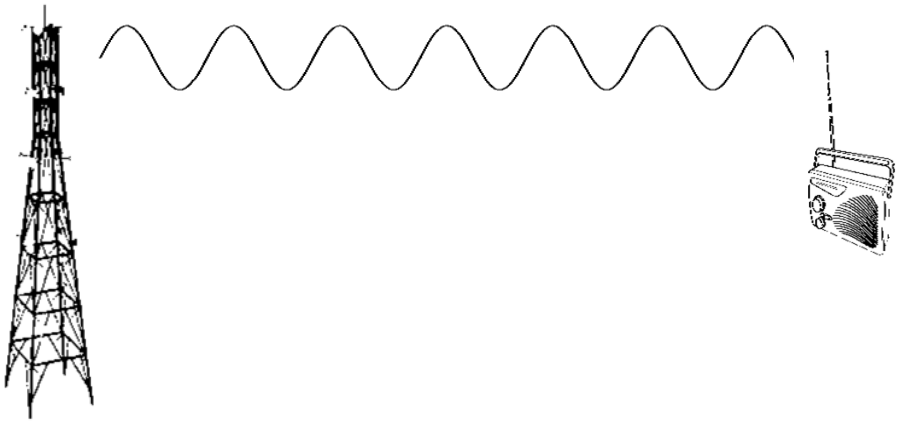
4. The diagram shows a wave front being refracted as it enters a block of glass from the air **(HT)**.



Explain in detail why the ray bends as it enters the glass. (3)

5. Explain why a green object heats up more in sunlight than a white object **(HT)**. (4)

6. Television and radio broadcasts are sent through the air as radio signals.



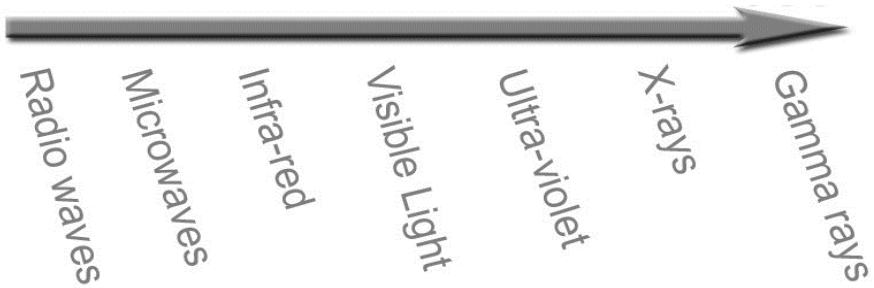
   a. Why are radio waves suitable to send signals in this way? (1)

   b. How is the radio signal produced in the transmitting antenna? (2)

   c. What is produced in the aerial of the radio when it receives radio waves? (2)

7. In which part of an atom are gamma waves produced? (1)

8. The diagram shows the waves that make up the electromagnetic spectrum.



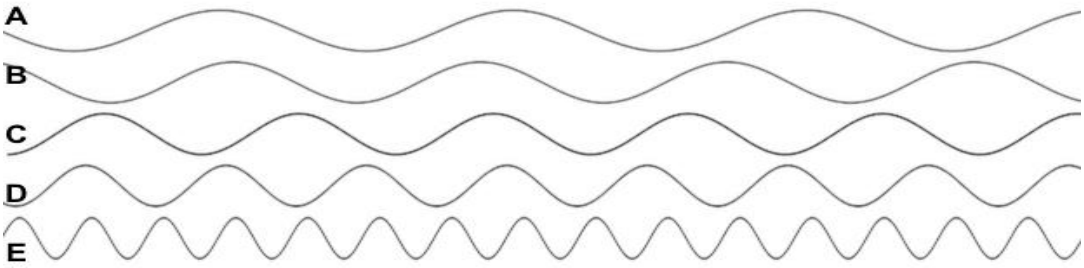
   a. Circle the waves that are ionising radiations. (3)

   b. What property of the spectrum of waves is shown to be increasing by the arrow? (1)

9. What is the meaning of the term radiation dose? (1)

10. Explain why ionising radiations can be dangerous if the dose becomes high. (2)

11. The waves shown below represent part of the electromagnetic spectrum.



a. Which wave is likely to be a radio wave? (1)

b. Which wave would be carrying the greatest amount of energy? (1)

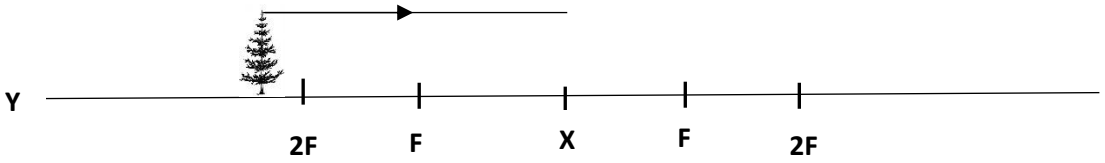
c. Which wave could be used for medical imaging? (1)

d. If the waves represent the colours of visible light, what colour could wave C represent? (1)

12. Give the most suitable type of electromagnetic radiation for the applications stated: (5)

Application	**Type of electromagnetic radiation**
Satellite communications, cooking food	
Fluorescent lamps, disinfecting water, security marking	
Cooking, thermal imaging, short range communications	
Sterilising food and medical equipment, cancer treatment	
Vision, photography, illumination	

13. (physics only)



a. Draw the symbol for a convex lens at the point labelled **X**. (1)

b. What is the correct name for line **Y**? (1)

c. What is the correct name for the distance from point **X** to point **F**? (1) One ray has been partly drawn. Complete the path of this ray. Put an arrow on this ray. (1)

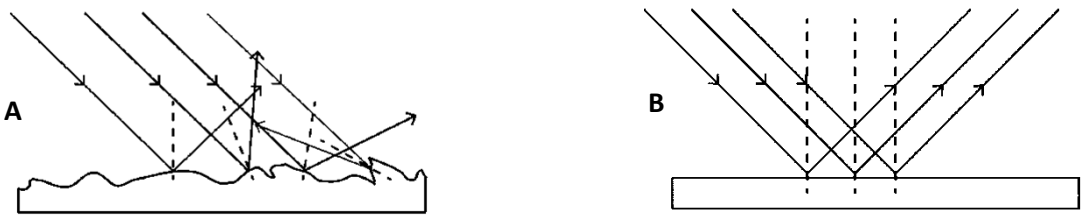
d. Draw a second ray on the diagram to show how the image position can be found. (1)

e. Describe the image produced by this lens. (2)

14. Below are two types of lens. Name each type of lens and complete the three light rays passing through each lens. **(physics only)** (4)

15. A convex lens produces an image 35mm tall when a 5mm tall object is viewed. Calculate the magnification produced by this lens. **(physics only)** (2)

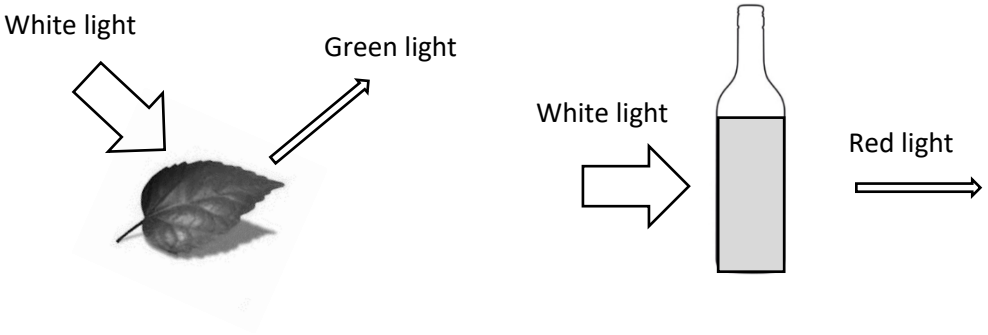
16. The diagrams show light rays being reflected off two types of surface. **(physics only)**



a. What type of reflection is shown at A and at B? (2)

b. Which surface is likely to be a smooth piece of white paper? (1)

17. White light is shining on a green leaf and on a bottle of red juice.



Describe what is happening to the spectrum colours of light in each diagram. **(physics only)** (4)

18. If a blue object in a dark room is illuminated with a red light, what colour will the object appear? **(physics only)** (1)

C Black body radiation (physics only)

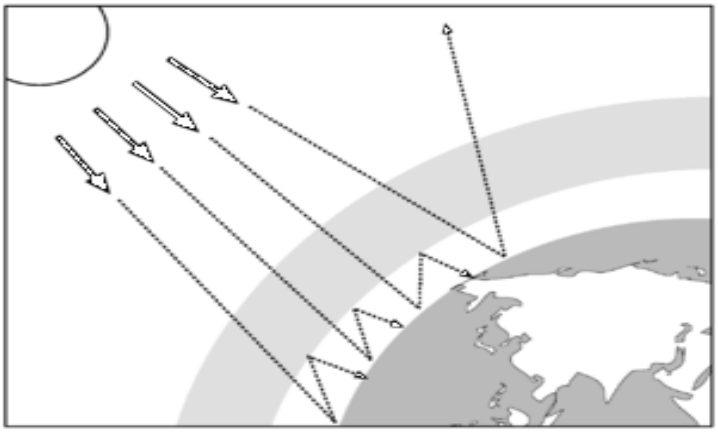
1. The table describes some properties of a perfect black body. Put a tick in the correct box to show whether the statement is true or false. (4)

Property	**True**	**False**
A black body absorbs all radiation that falls on it		
A black body always reflects radiation at a longer wavelength than that which it receives		
A black body is an excellent emitter of radiation		
A black body transmits all the radiation that falls on it		

2. A piece of iron is heated in a furnace until it is white hot.
How will the radiation emitted from the hot metal differ from the radiation emitted when the metal was cold? (2)

3. The black cube below is in a warm room. Its temperature is constant.
What is the relationship between radiated and absorbed radiation for this object? (2)

4. The diagram shows how the Earth absorbs and emits radiation.



Use the diagram to help explain how changes between absorbed and emitted radiation could affect the temperature of the Earth. (4)