

Self Check 1 : Waves

1. Place these waves - sound waves, water waves, light waves - correctly in the table below :

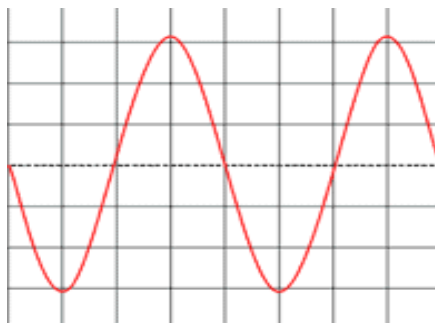
Transverse Wave Examples	Longitudinal Wave Examples

2. Frequency is measured in _____.

3. Complete the table below by putting the wave terms in place.

WAVE TERMS	DEFINITIONS
	height of the wave from the centre to the top
	distance travelled by the wave in one second
	length from peak of one wave to the next
	number of waves which pass a point in one second

4. A signal is shown on an oscilloscope screen.

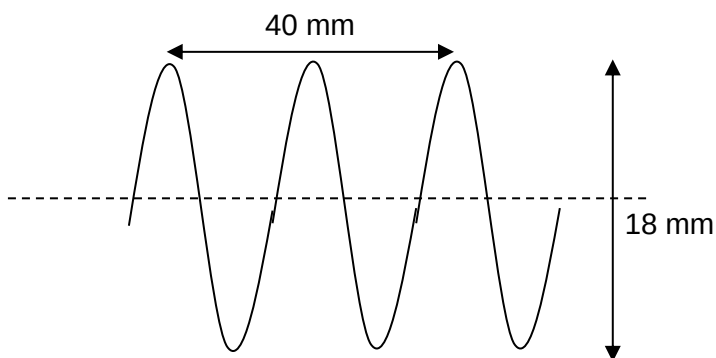


- (a) How many waves are on the screen? _____
- (b) What is the amplitude? (Count the boxes) _____
- (c) What is the wavelength? (Count the boxes) _____

5. Draw a wave of greater amplitude and frequency beside the wave below.



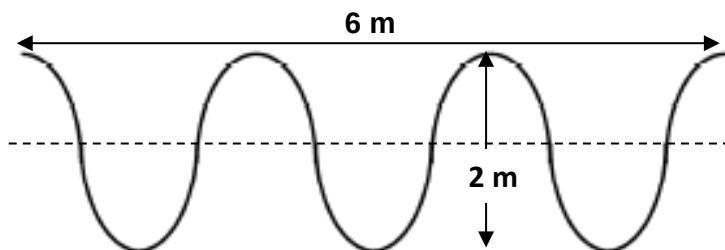
6. A wave is shown below:



(a) What is the amplitude of the wave? _____

(b) What is the wavelength of the wave? _____

7. The diagram below shows a wave.

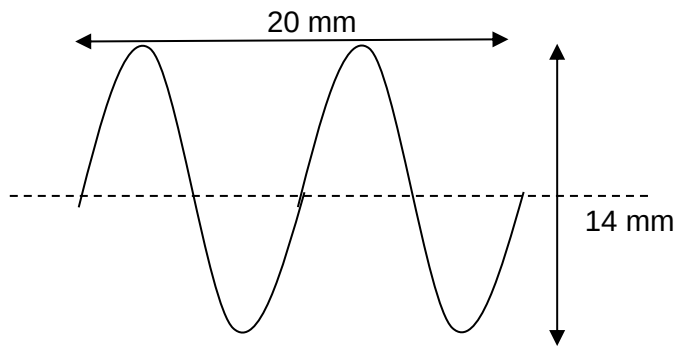


(a) What is the amplitude of the wave? _____

(b) What is the wavelength of the wave? _____

Self Check 2 : Wave Calculations

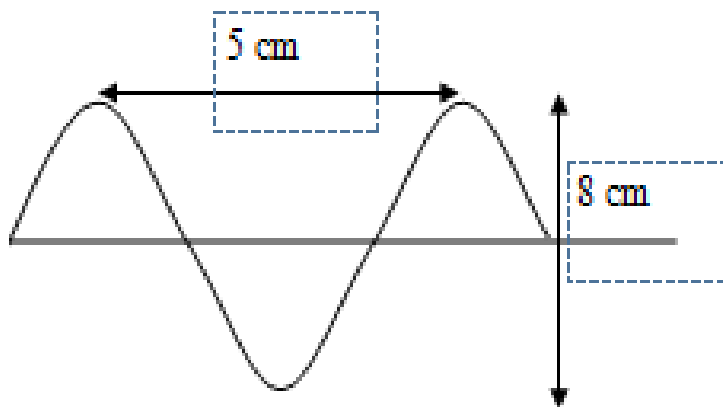
1. A wave is shown below:



(a) What is the amplitude of the wave? _____

(b) What is the wavelength of the wave? _____

2. Another wave is shown:



What is the amplitude of the wave? _____

3. Complete the sentences below:

Frequency is the number of _____ which pass a point in a second.

Frequency is measured in _____

4. What is the frequency if :

(i) 20 waves pass a point in 4 seconds? _____

(ii) 80 waves strike a beach in 20 seconds? _____

Self Check 3 : Wave Speed

1. A water wave travels a distance of 25 metres in a time of 5 seconds.
Calculate the speed of the water wave.

2. Another wave covers a distance of 64 metres in a time of 16 seconds.
At what speed does the wave travel?

3. A water wave travels a distance of 60 metres in a time of 15 seconds.
What is the speed of the water wave?

4. A wave travels a distance of 1200 metres in a time of 1 minute.
Calculate the speed of the wave.

5. A wave of frequency 6 hertz has a wavelength of 0.5 metres.
What is the wave speed?

6. Calculate the speed of sound waves which have a frequency of 500 Hertz
and a wavelength of 3 metres.

7. Waves strike a beach with a frequency of 3 Hertz. If the waves have a
wavelength of 2 metres, find the wavespeed.

Self Check 4 : Speed of Sound

1. a) The approximate value of the speed of sound in air is _____ .
b) The speed of light in air is _____ .
c) Give an example which shows that the speed of light is faster than the speed of sound.

2. A person walking through a golf course sees a golfer in the distance striking a golf ball. The sound of the club hitting the ball is heard by the person 2 seconds later.

Explain why there is a delay between seeing the ball being struck and hearing the sound.

3. A man standing 1700 metres away from a lightning strike hears the thunder 5 seconds after the lightning strike.

Calculate the speed of sound in air.

4. The sound from a siren takes 25 seconds to travel a distance of 8500 metres.

Calculate the speed of the sound in air.

5. A sound wave takes 3 seconds to travel 4500 metres through the water. Calculate the speed of sound in water.

6. Six pupils are standing on Calton Hill, looking at Edinburgh Castle. They measure the time difference between seeing the smoke from the one o'clock gun and hearing the bang. The measured times are:-

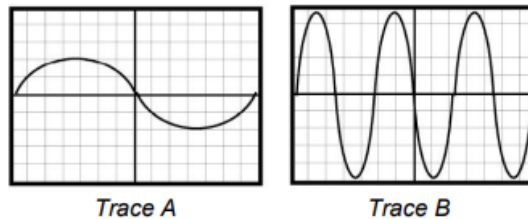
3.8 s, 4.2 s, 4.0 s, 4.4 s, 4.0 s, 3.6 s.

- a) Calculate the average time for the group.

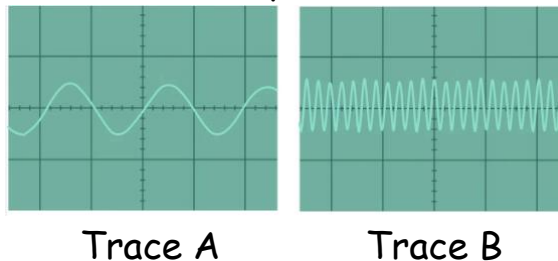
- b) Calculate the speed of sound if the distance from the Castle to Calton Hill is 1300 metres.

Self Check 5 : Sound Waves

- Complete the following sentences:
 - Sound can travel through solids, liquids and _____.
 - Sound does not travel through a _____.
 - For sound to travel there must be _____.
- _____ is the number of waves produced in one second.
- An oscilloscope shows whether a sound wave is loud or quiet, or has a high or low frequency (pitch).

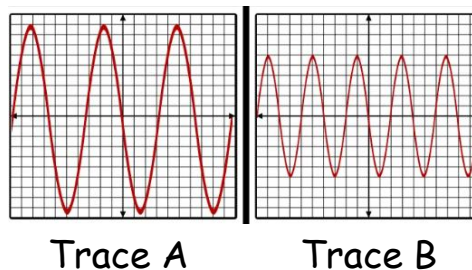


- Trace A shows a sound wave with a _____ volume.
 - Trace B shows a sound wave with a _____ volume.
- Sound waves are shown on an oscilloscope.



Which trace shows a sound of higher pitch? _____

- More sound waves are shown below.



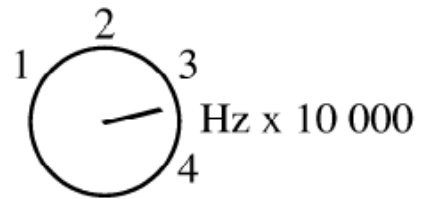
Describe the differences between the sounds shown on traces A and B.

Self Check 6 : Ultrasound

1. Sounds above the range of human hearing are called _____.

2. In class, a signal generator attached to a loudspeaker is adjusted to the frequency shown opposite.

A pupil states that they can hear the note from the loudspeaker.



a) Is the pupil's statement true or false? _____

b) Explain your answer to part (a).

c) State a frequency that would probably be heard by every pupil in the class. _____

3. A sound is generated in a school laboratory.

A detector with a meter is needed to pick up the sound since the frequency is beyond the range of human hearing.

a) What is the name of this type of sound? _____

b) Name three animals which would be able to hear this sound.

c) This type of sound has an important medical use.
Describe what it is used for.

Self Check 7 : Loud Sounds

1. The poster opposite appears on the wall of a hospital waiting room. Part of it has been torn and some words are missing.

source of noise	sound level in
-----------------	----------------

silence	0
---------	---

whisper	20
---------	----

normal conversation	60
---------------------	----

warning level	
---------------	--

heavy traffic	90
---------------	----

	120
--	-----

- a) What is the missing word after "sound level in"? _____

- b) Why does the lower section of the paper carry a warning?

- c) Suggest a source of noise for the sound level of 120. _____

2. A sound engineer sometimes wears ear defenders in a studio.

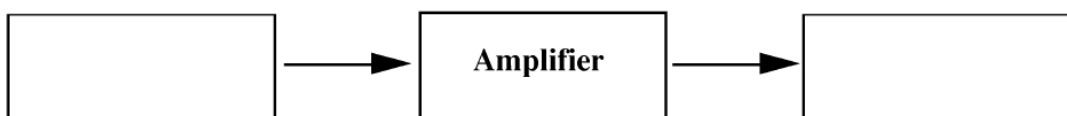


What is the purpose of ear defenders?

3. A public address system is used at airports to give passengers information.

It is made up of three components.

Complete the diagram by filling in the missing components.

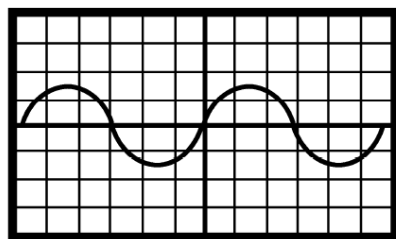


4. Complete the table below.

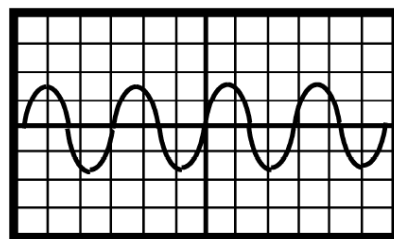
Part of the System	Function
	Changes sound energy into electrical energy.
Amplifier	
Loudspeaker	

5. Give four examples of electronic devices that use amplifiers.

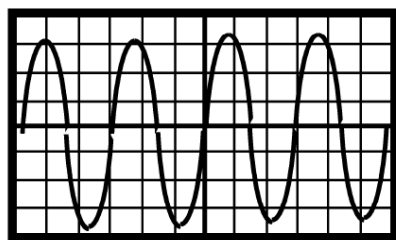
6. Trace A is the input signal to an amplifier.



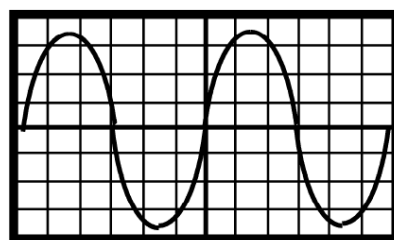
A



B



C



D

a) Which trace shows the output signal of the amplifier? _____

b) The input signal has a frequency of 200 Hz.

State the frequency of the output signal. _____

Self Check 8 : E-M Spectrum

1. The waves shown below are all members of the electromagnetic spectrum. Fill in the blanks in the spectrum below and complete the sentences.

Gamma Rays		Ultraviolet	Visible Light		Microwaves	Radio & TV Waves
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- (a) The speed of these waves is _____.
- (b) _____ have the greatest wavelength.
- (c) _____ have the largest frequency.
- (d) All the waves of the electromagnetic spectrum are _____ waves.

2. The sun produces both infrared and visible light.

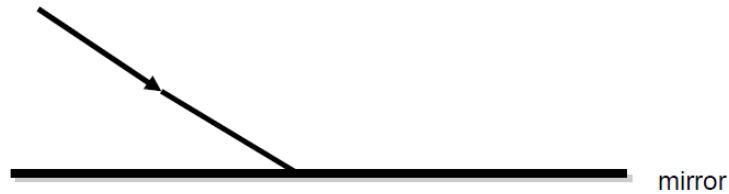


- (a) _____ has a longer wavelength than _____.
- (b) The speed of red light is _____ the speed of infrared.
- (c) It takes visible light from the sun 8 minutes to reach the Earth. It also takes _____ for infrared from the sun to reach the Earth.

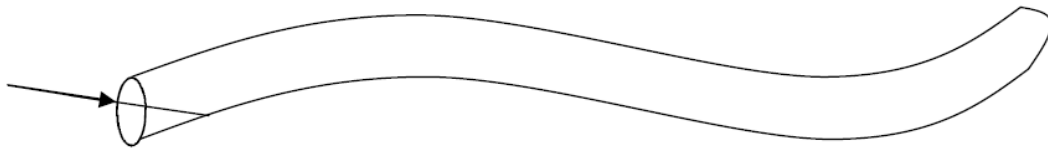
Self Check 9 : Light

1. Stars and lamps can be seen because they give out light.
Pencils and your jotter are seen because they _____ light.

2. A beam of light strikes a mirror as shown.
Neatly complete the diagram, below, showing the direction of the beam of light.

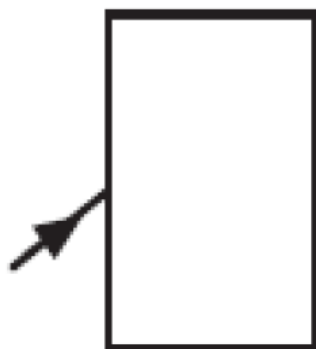


3. Light is reflected along an optical fibre which is used in telecommunications. Complete the diagram showing how the light passes through the optical fibre.



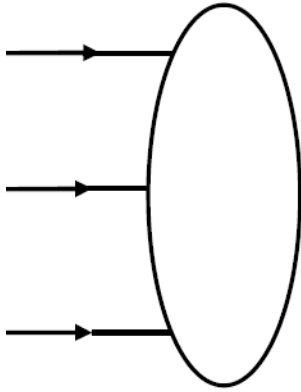
4. In refraction the speed of light _____ as it passes from one material to another.
Sometimes a ray of light _____ direction as passes from one material to another.

5. Complete the diagram below to show the path of the ray of light through the block.

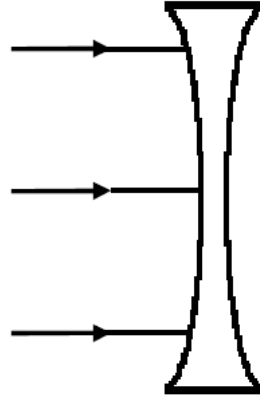


6. Copy and complete the following diagrams to show the path of the light rays after passing through the lenses :

(a)

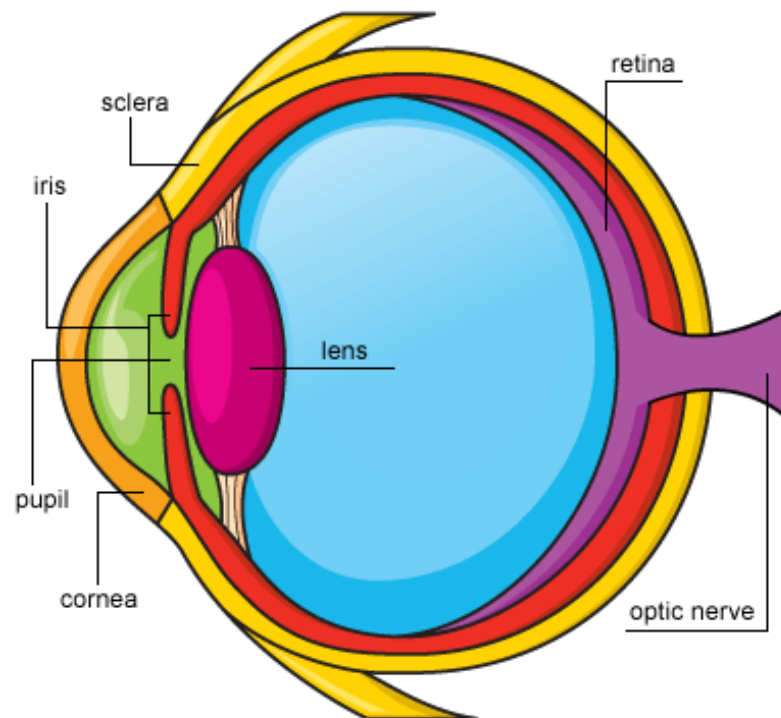


(b)



7. Label each of the lenses above.

8. Refraction is very important for sight.



(a) In the eye, refraction take places in both the _____ and the _____ .

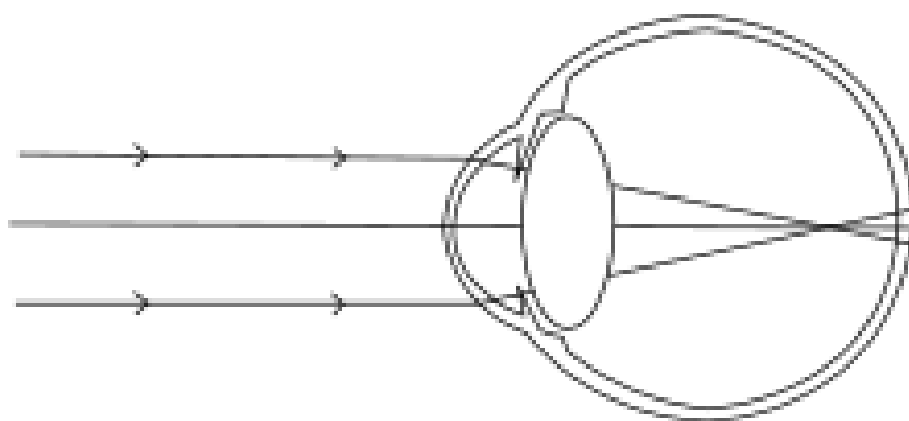
(b) Light is focussed upon the _____ at the back of the eye.

9. Joanne can see the number plate on a far away car but cannot see cables clearly when she is wiring a plug.

(a) Joanne would be described as having _____.

(b) Joanne would have a _____ lens in her glasses.

10. A student has the following eye defect:



(a) The student has _____.

(b) If the student was looking at a distant object it would be _____.

(c) The student would need a _____ lens in their glasses to correct this eye defect.

Self Check 10 : Infrared

1. All hot objects give off heat radiation.
This invisible heat energy is known as _____ radiation.
2. Special cameras which detect infrared radiation can be used in medicine to take colour photographs known as thermograms.
The different colours on the thermogram show how the _____ changes.
3. Physiotherapists use infrared lamps to relieve the pain of their patients who have pains in their muscles.
The _____ from the lamps help the patient.
4. Some surfaces absorb infrared radiation better than others.
The table below shows the percentage of infrared absorbed by different surfaces.

Surface	Percentage of Infrared radiation absorbed (%)
Whitewashed wall	40
Red brick wall	70
Polished aluminium	25
Tar	90

- (a) Draw a bar chart (**on graph paper**) showing the percentage of infrared radiation absorbed by the surface.
- (b) _____ absorbs the most infrared radiation.
- (c) _____ would be the best material to use for the outer wall of a house in a very sunny country.

Self Check 11 : Ultraviolet

1. Some ultraviolet radiation from the Sun reaches the surface of Earth.
 - (a) A low level of exposure to ultraviolet radiation helps to produce _____.
 - (b) Too much exposure to ultraviolet radiation could cause _____.
 - (c) _____ protects your skin from too much exposure to ultraviolet radiation.
2. Washing powder often contains a chemical which absorbs ultraviolet radiation. These chemicals _____ visible light to make clothes seem brighter.
3. Shopkeepers will place bank notes under an _____ lamp to check for security markings which prove the notes are real.
4. Certain pens can be used to security mark special items in case they are stolen. These security markings can be identified under an _____ lamp.

Self Check 12 : X-rays

1. Dentists use _____ to take pictures of your teeth.



2. In hospitals, radiographers use x-rays to image the body.

X-rays are used for detecting _____ bones.

3. An X-ray photograph of an arm is shown below.



- (a) The bone appears lighter as the x-rays are _____ by the bone.
- (b) The tissue around the bone is darker as the _____ can pass through it.
- (c) If there was a break in the bone there would be a _____ line across it.

4. Radiographers stand behind protective shields when they take X-ray photographs because X-rays are _____.

5. X rays are used at airports for scanning _____ .



Self Check 13 : Gamma-rays

1. Gamma rays are used in the treatment of cancer and in the sterilisation of medical instruments.

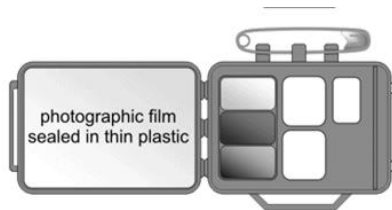
In each case gamma rays are being used to _____ cells.

2. Great care is required when handling gamma sources.

(a) This is because gamma rays are _____ .

(b) Workers who deal with gamma sources wear special film badges which contain photographic film.

Photographic film turns _____ when exposed to gamma rays.



This lets the worker know if they have been exposed to

_____ .

3. Only very thick concrete, steel or lead offer any protection as a shield against gamma radiation because gamma rays can pass through materials

_____ .

4. In medicine chemicals which give out gamma rays are used to trace paths through the inside of the body.

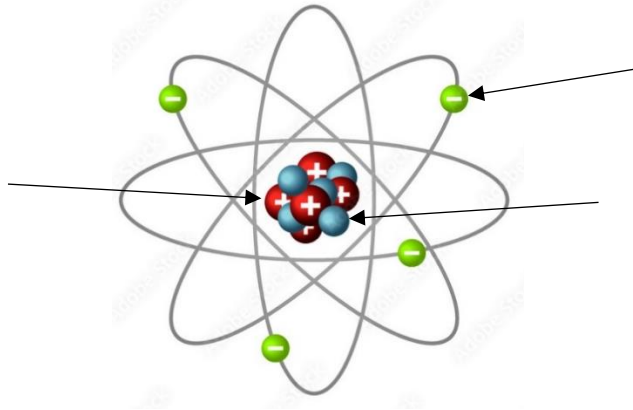
(a) Gamma rays are used for this purpose as they are not easily

_____ .

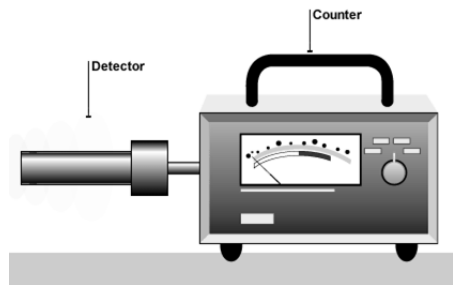
(b) The strength of a gamma source _____ with time. This is essential to keep the patient safe.

Self Check 14 : Nuclear Radiation

1. Label the simple diagram of the atom below.



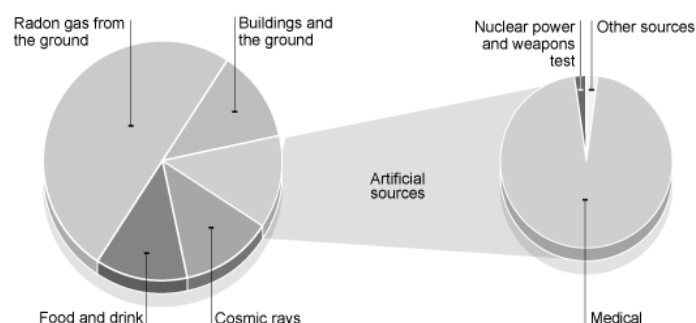
2. A teacher places the apparatus below on a bench in a laboratory.



- (a) The detector of radiation in the diagram is a _____ .
(b) The detector takes readings although there is no radioactive source nearby. It is detecting _____ radiation .

3. _____ radiation is the radiation which is around us every day.

4. The pie charts below show the sources of background radiation.



- (a) _____ is the natural source which results in the most background radiation.
(b) _____ is the artificial source which results in the most background radiation.

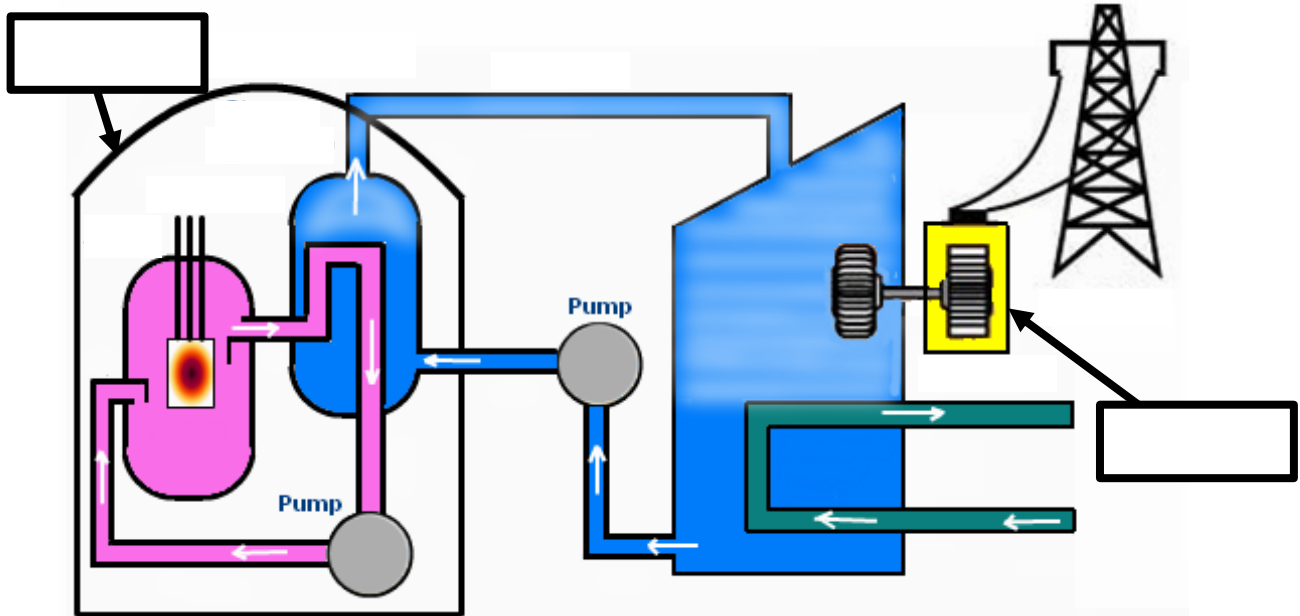
5. The table below gives the dose of radiation received by a patient in different medical examinations.

Source	Dose (units)
Chest X-ray	30
Pelvic X-ray	300
Barium meal	1000
Thyroid Scan	16400

- (a) The patient receives the highest dose from a _____ .
- (b) The maximum allowed dose in one year for a member of the public is 5000 units. A patient is only allowed _____ barium meals per year.
- (c) Draw a bar chart (**on graph paper**) showing the dose received by each source.

Self Check 15 : Nuclear Industry

1. Many countries use nuclear reactors to produce electrical energy.
A diagram of a nuclear power station is shown below.



- (a) Label the diagram above.
(b) Inside the reactor of this nuclear power station a _____ reaction takes place.
(c) Complete the table below.

Advantages of nuclear power	Disadvantages of nuclear power

2. The diagram below shows the nuclear reaction which takes place in a nuclear reactor. This is a _____ reaction. Label the diagram.

