Chapter 5 Ray Model of Light

AfL Quiz 1

Date: …….

By the end of this quiz, I should be able to:

- show an understanding that the ray model represents the path taken by light
- describe the effects and uses of reflecting surfaces (e.g. plane and curved)
- explain how reflection is affected by a smooth and rough surface using the ray model of light
- investigate the characteristics of the image formed by a plane mirror
- investigate that the angle of reflection is equal to the angle of incidence, with respect to the normal

1 When we see a clear and undistorted image in a reflecting surface like that of still water or a glass mirror, we can be sure the surface is _____.

A rough and broken
B coarse and uneven
C smooth and polished
D crinkled and warped (C)

2 ***Wayang kulit*** is a staged performance showing the shadows of puppets on a screen. Which of the following explains why the shadows have the same shape as the puppets?

A Light travels in straight lines
B Light bends behind the puppets.
C Light goes around the puppets and onto the screen
D Light is reflected off the puppets.

(A)

3 Which statement is **not** correct about reflection of light?

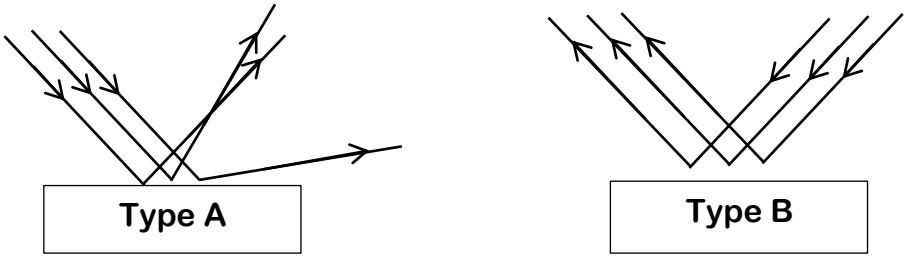
A Only the incident ray and reflected ray lie on the same plane.
B The angle of reflection is always equal to the angle of incidence.
C A virtual image is formed when light strikes a rough surface.
D The normal is perpendicular to the surface of an object where the incident ray strikes.

(A)

4 (a) State two laws of reflection of light.

The incident ray, normal and reflected ray all lie on the same plane. The angle of incidence is always equal to the angle of reflection.

(b) The following diagram shows two types of reflection of light rays.



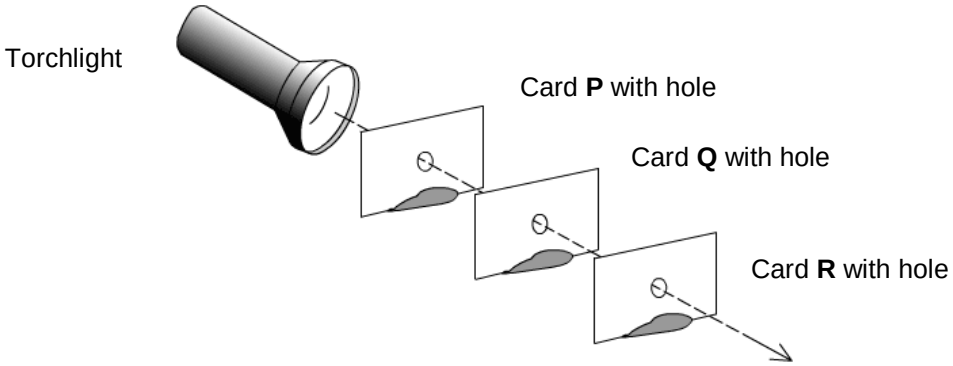
(i) Name the types of reflection.

Type A: **Diffused** Type B: **Regular**

(ii) Why is the reflection of light different between type A and type B?

Light rays are reflected on a rough surface in type A and on a smooth surface in type B.

5 A student sets up an experiment as shown below.



(a) The student now moves card **Q** 2 cm to the left.

Will there be any light passing through card **R**? **No.**

(b) What does this experiment show?

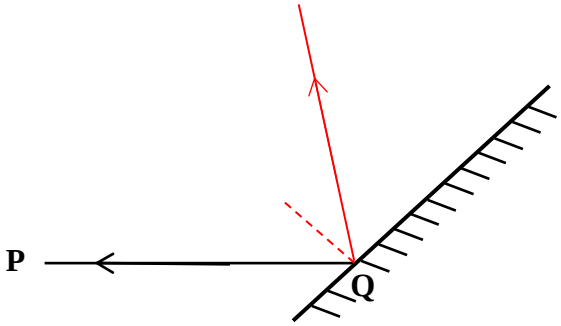
This is experiment shows that light travels only in a straight line.

Chapter 5 Ray Model of Light

Practice WS – Reflection

Date: ……

1 The diagram below shows the path of light ray, **PQ** leaving a mirror.



(a) What is the name of the light ray **PQ**? **Reflected ray**

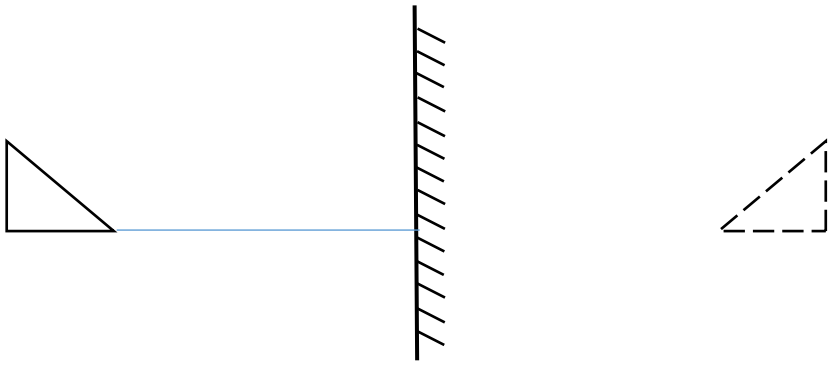
(b) Complete the ray diagram to show how ray **PQ** is obtained.

(c) Using a protractor, measure the following angles.

(i) Angle of incidence **(angle measured using protractor)**

(ii) Angle of reflection **(equal angle from (i) measured using protractor)**

2 The diagram shows an object placed in front of a mirror.



(a) Complete the reflection diagram of the object.

(b) State three characteristics of the image formed by a plane mirror.

1. **Virtual**
2. **Upright**
3. **Laterally inverted**
4. **Same size and shape**

(c) What is the total distance between the object and the image? **8cm (∓ 0.2cm)**

(d) The object is now moved 1.2 cm closer to the surface of the mirror. Calculate the distance between the object and the image now. **5.6cm (∓ 0.2cm)**

3 There are nine letters in the word ‘SINGAPORE’. In the boxes below, write down the appearance of each ltter if the word is reflected off a plane mirror.

4 The table shows a summary of the characteristics of the images formed by a plane mirror, concave mirror and convex mirror. Complete the table.

Plane mirror	Concave mirror	Convex mirror
• V**irtual** • U**pright** • **Same** size and shape. • **Laterally** inverted.	• V**irtual** • When object is **close** to mirror, image is **upright and magnified**. • When object is far away from mirror, image is **vertically inverted**.	• V**irtual** • Size is **smaller**. This allows a **wider field of view**.

Chapter 5 Ray Model of Light

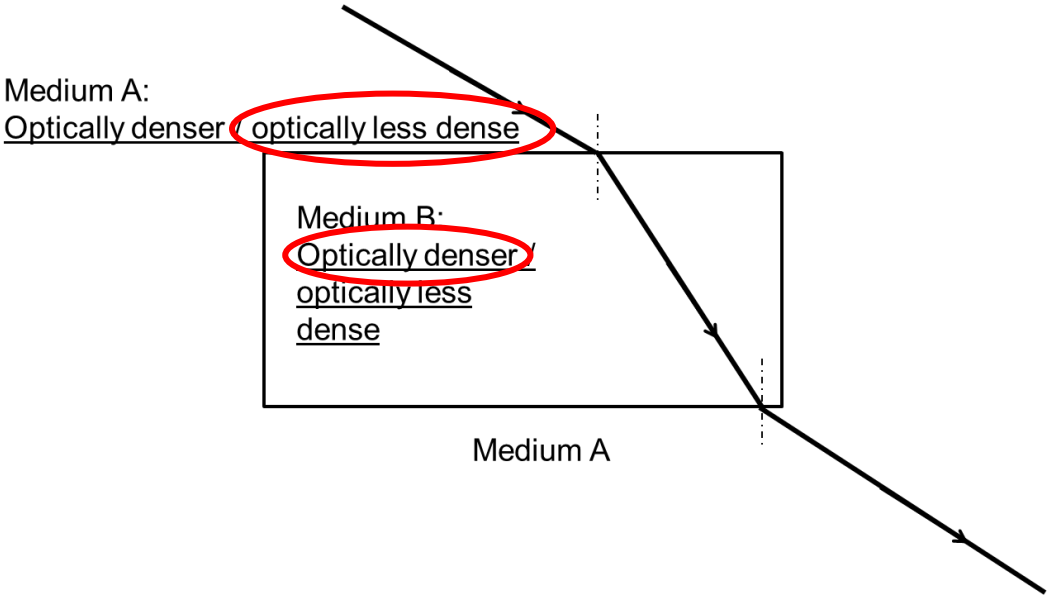
Practice WS – Refraction

Date: ……

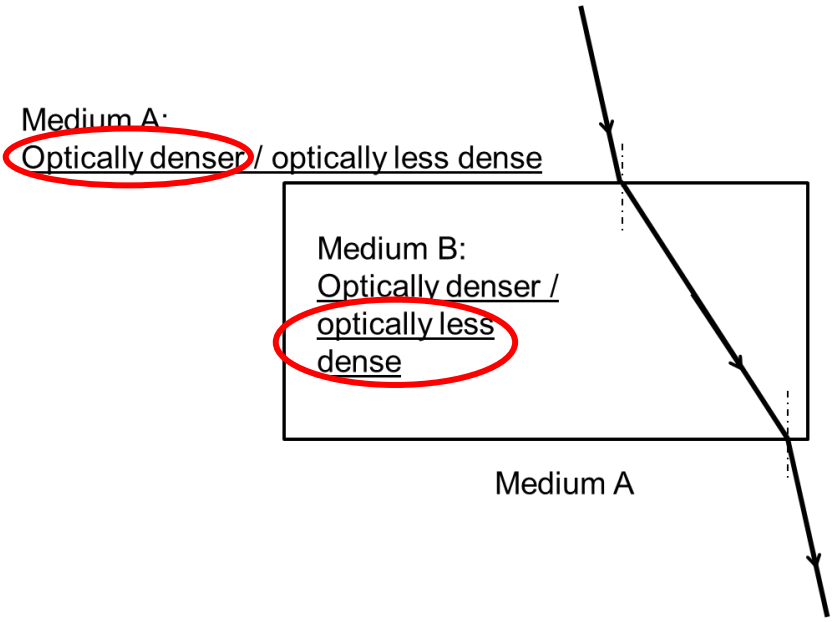
By the end of this WS, I should be able to

- show an understanding that the change in the speed of light in different mediums can cause refraction (calculation of angles not required)

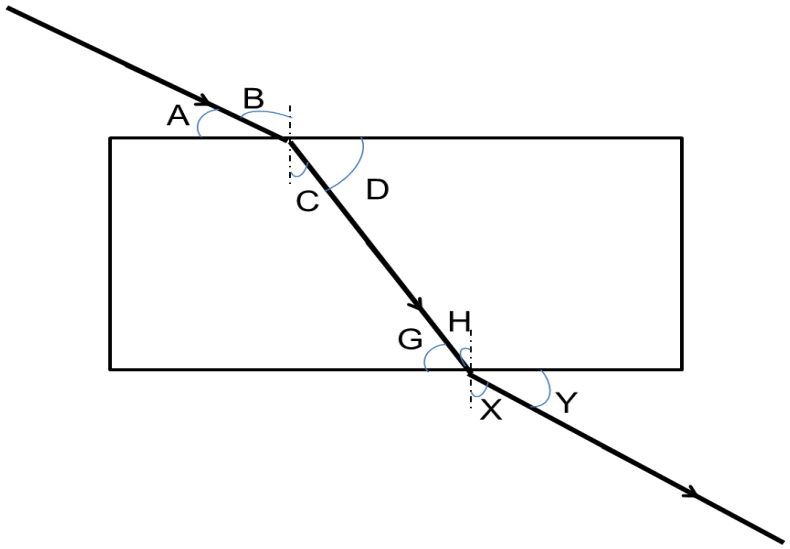
1 In the following diagram, circle whether the medium is optically denser or optically less dense.



2 In the following diagram, circle whether the medium is optically denser or optically less dense.



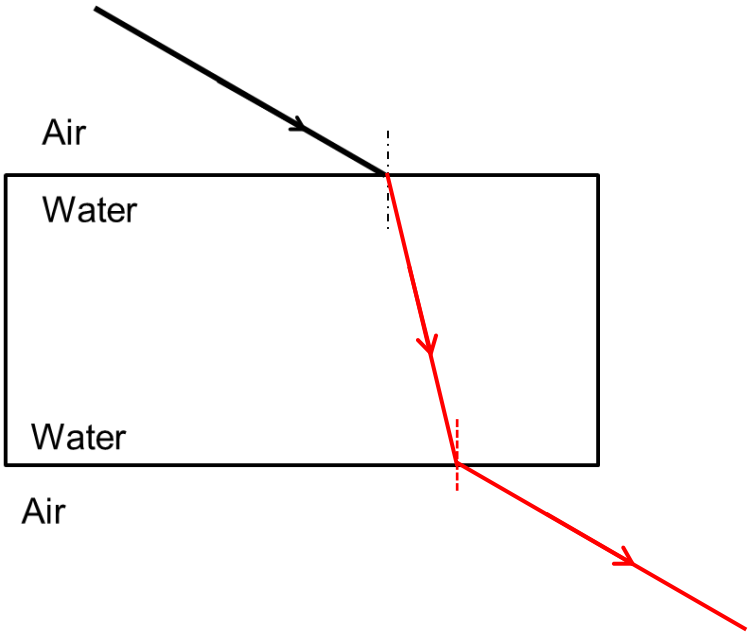
3



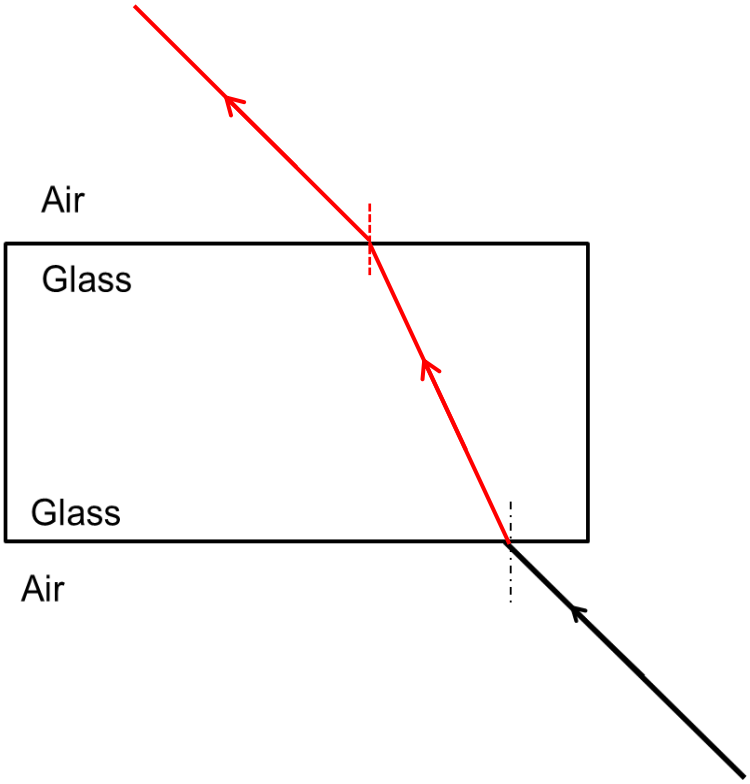
(a)	State which is angle of incidence – A or B?	**B**
(b)	State which is angle of refraction – C or D?	**C**
(c)	State which is angle of incidence – G or H?	**H**
(d)	State which is angle of refraction – X or Y?	**X**

4 It is known that the optical density increases in the following order: air, water, glass. In the following diagram, complete the path of light till it exits the water.

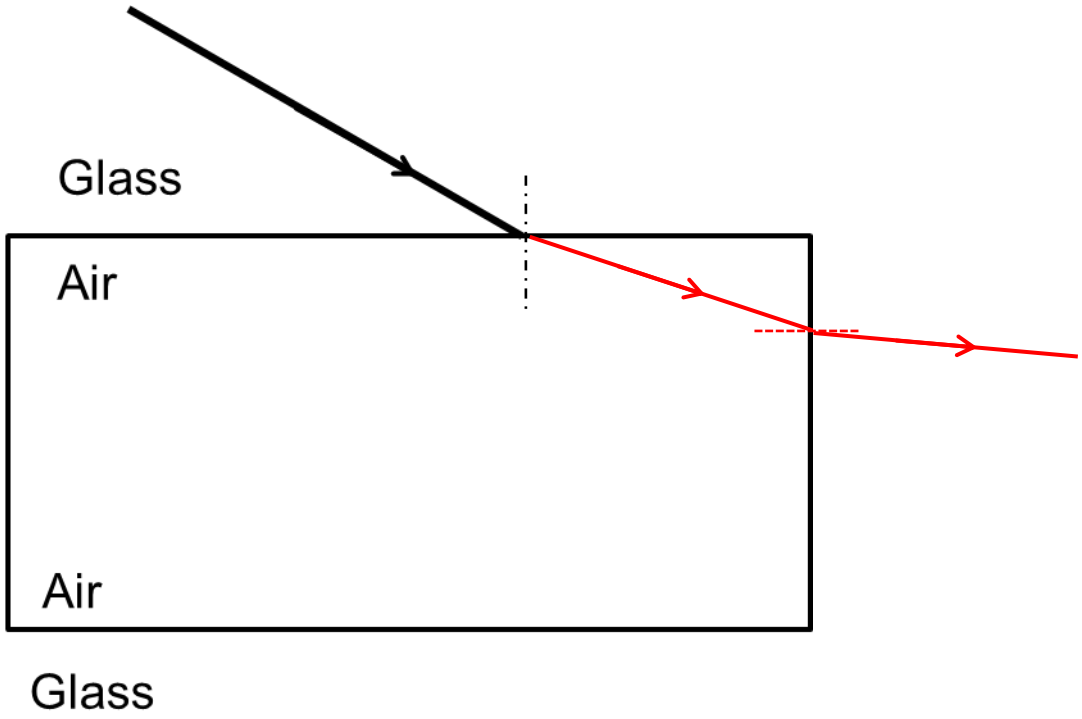
(a)



(b)



(c)



Chapter 5 Ray Model of Light

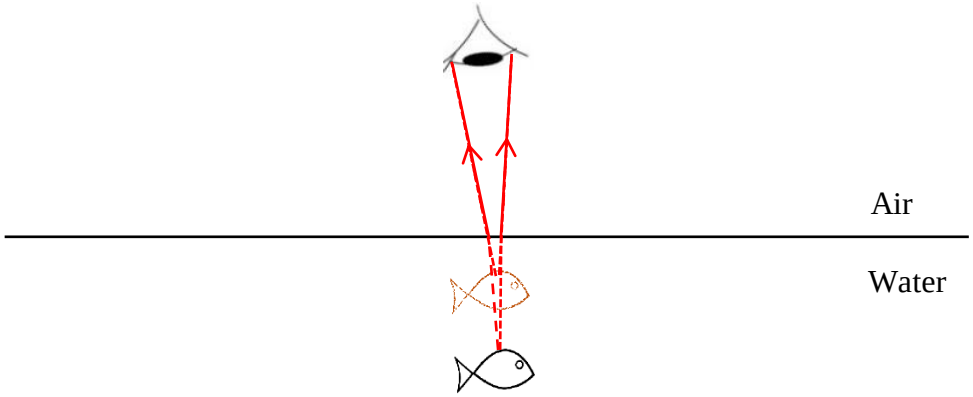
AfL Quiz 2

Date: ……

By the end of this quiz, I should be able to:

- describe some effects of refraction
- describe the dispersion of white light by a prism using the ray model of light

1 A fish is swimming at the bottom of a pond.

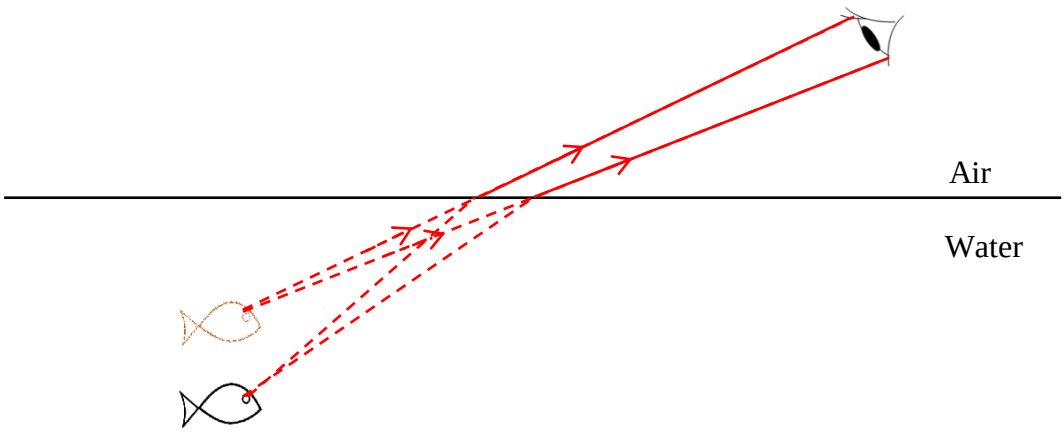


(a) Draw a ray diagram, with 2 lights rays from the fish to the eye, to show how the observer can see the fish.

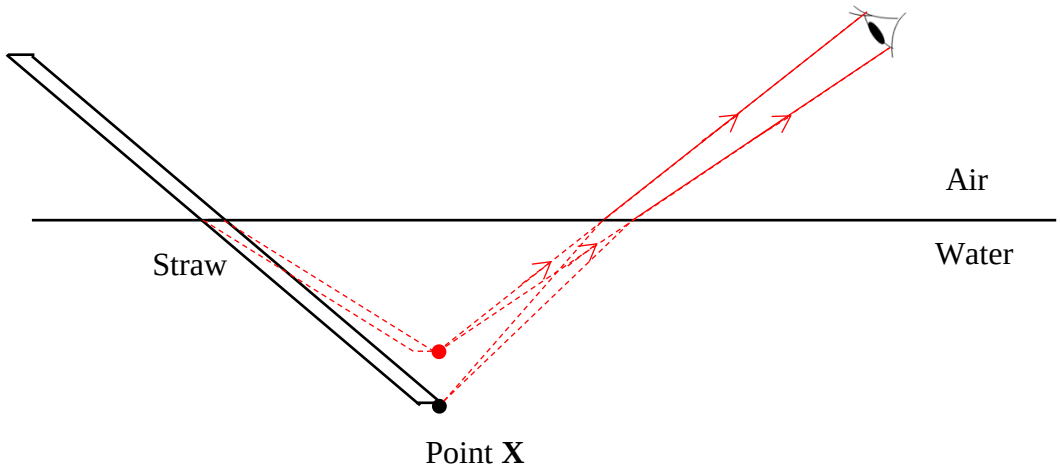
(b) Based on your answer in part **(a)**, circle the correct option.

(i)	The image appears closer to the observer.	**True** / False
(ii)	The image is virtual.	**True** / False
(iii)	Light undergoes bending when it travels from water to air.	**True** / False
(iv)	Light bends away from the normal when it travels from water to air.	**True** / False

2 A fish is swimming at the bottom of a pond. Draw a ray diagram, with 2 lights rays from the fish to the eye, to show how the observer can see the fish.



3 The following diagram shows a straw that is partially immersed in water. Point **X** is a point at the tip of the straw.



(a) Draw the path of 2 light rays, from Point **X** to the eye, by which the observer is able to see Point **X** of the straw.

(b) Hence, draw the image of the immersed portion of the straw as seen by the observer.

(c) Describe the image formed by the straw.

Image is closer to surface of water, virtual, same size and shape and upright

Chapter 5 Ray Model of Light

AfL Quiz 3

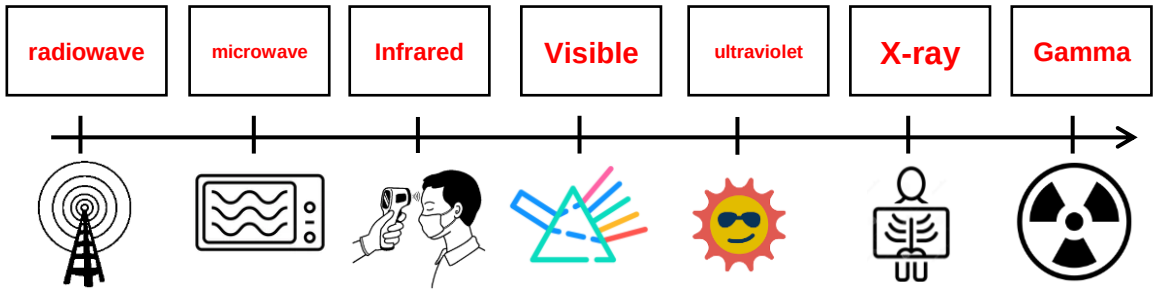
Date: ……

By the end of this quiz, I should be able to:

- show an awareness that EM radiation (e.g. infrared, ultraviolet and light) has both beneficial and harmful effects. (Note: abbreviation, “EM”, suffice; spelling of the full word “electromagnetic” is not required)
- show an awareness about the impact of light produced by technology, on society and environment (e.g. city lights can improve night visibility but cause light pollution, disorientation of birds and use up a lot of electrical energy)

1 Use the helping words in the box to complete the diagram summarising the EM spectrum.

visible	infrared	Gamma ray	X-ray	ultraviolet	radio	microwave



2 The following passage describes some uses of infrared radiation.

Fibre optics is the technology used to transmit electrical information as a series of infrared light pulses through the strands of fibre made of glass or plastic over long distances.

State two harmful effects of infrared radiation.

Large doses of infrared radation causes damage to skin, tissues and eyes.

3 The following paragraph describes some uses of ultraviolet light.

(a) Gel polish is a type of nail polish used to paint nails. Gel polish is increasing in popularity as it has a fast "drying" process called ***curing*** which uses is induced by ultraviolet radiation. Curing is a chemical reaction that takes place when the liquid chemical substances in the gel reacts with ultraviolet light, causing the liquid chemicals to harden.

State a harmful effect of overexposure to ultraviolet light.

Overexposure of U.V light can cause sunburn or skin cancer.

(b) Ultraviolet radiation reduces germs and improves hygiene and storage conditions by breaking molecular bonds in the DNA of viruses and bacteria, rendering them unable to reproduce and effectively killing them.

State a beneficial effect of ultraviolet light.

UV from the sun is needed by our bodies to produce vitamin D which strengthen bones, muscles and the body's immune system.

OR

UV from the sun is useful for disinfection and sterilization of surgical instruments.