Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Q1.

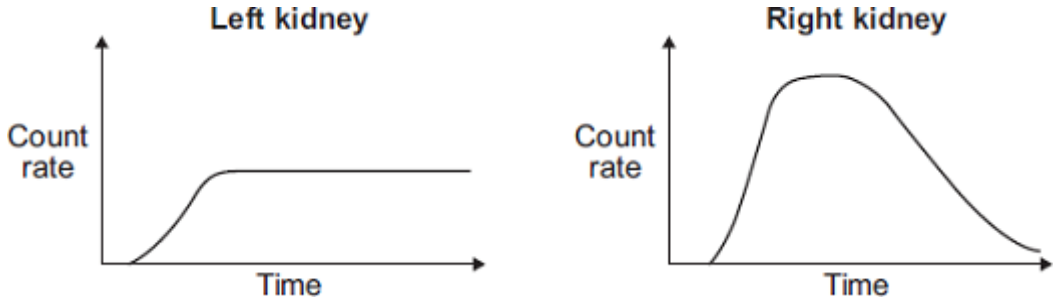
A doctor uses the radioactive isotope technetium-99 to find out if a patient's kidneys are working correctly.

The doctor injects a small amount of technetium-99 into the patient's bloodstream. Technetium-99 emits gamma radiation.

If the patient's kidneys are working correctly, the technetium-99 will pass from the bloodstream into the kidneys and then into the patient's urine.

Detectors are used to measure the radiation emitted from the kidneys.

The level of radiation emitted from each kidney is recorded on a graph.



(a) How do the graphs show that technetium-99 is passing from the bloodstream into each kidney?

_____

_____

(1)

(b) By looking at the graphs, the doctor is able to tell if there is a problem with the patient's

kidneys.

Which **one** of the following statements is correct?

Put a tick (✓) in the box next to your answer.

Only the right kidney is working correctly. ☐

Only the left kidney is working correctly. ☐

Both kidneys are working correctly. ☐

Explain the reason for your answer.

_____

_____

_____

_____

(3)

(Total 4 marks)

Q2.

(a) Explain what ultrasound is.

_____

_____

_____

_____

(2)

(b) Ultrasound is used for pre-natal scanning. This is much safer than using X-rays. However, doctors were only sure ultrasound was safe after experiments on mice.

Do you think the ultrasound experiments on mice were justified?

Explain your answer.

_____

_____

_____

_____

(2)

(c) Explain what scientists should do if they find evidence that ultrasound may be harmful to human health.

_____

_____

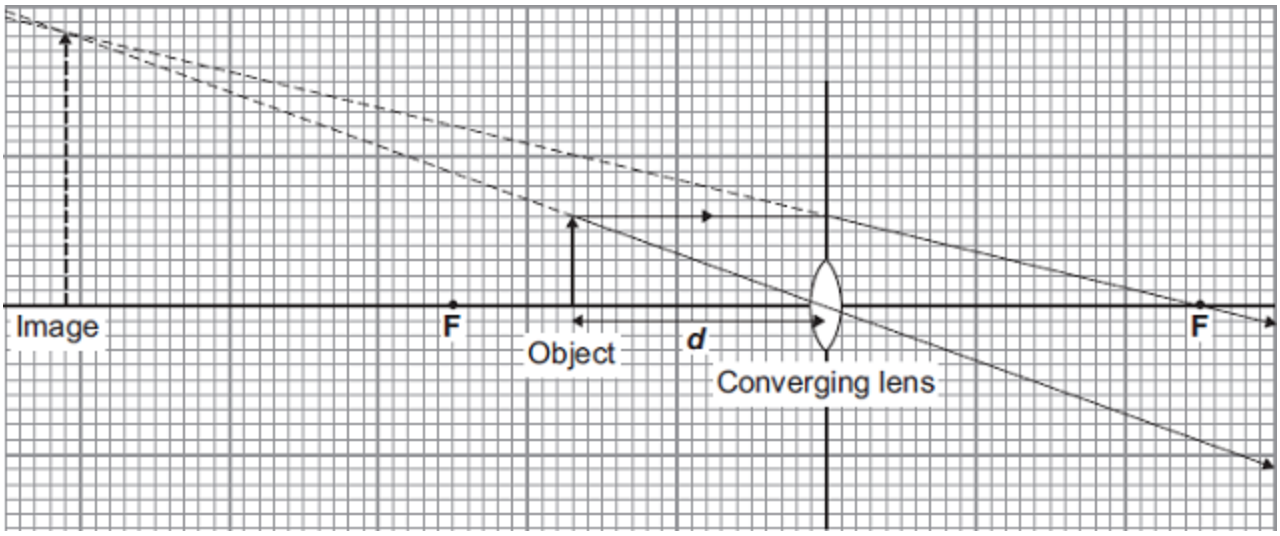
_____

(2)

(Total 6 marks)

Q3.

A student investigates how the magnification of an object changes at different distances from a converging lens.
The diagram shows an object at distance ***d*** from a converging lens.



(a) (i) The height of the object and the height of its image are drawn to scale.

Use the equation in the box to calculate the magnification produced by the lens shown in the diagram.

$$\text{magnification} = \frac{\text{image height}}{\text{object height}}$$

Show clearly how you work out your answer.

_____

_____

_____

Magnification = _____

(2)

(ii) The points **F** are at equal distances on either side of the centre of the lens.

State the name of these points.

_____

(1)

(iii) Explain how you can tell, **from the diagram**, that the image is virtual.

_____

_____

(1)

(b) The student now uses a different converging lens. He places the object between the lens and the point **F** on the left.

The table shows the set of results that he gets for the distance ***d*** and for the magnification produced.

Distance *d* measured in cm	**Magnification**
5	1.2
10	1.5
15	2.0
20	3.0
25	6.0

His friend looks at the table and observes that when the distance doubles from 10 cm to 20 cm, the magnification doubles from 1.5 to 3.0.

His friend's conclusion is that:

The magnification is directly proportional to the distance of the object from the lens.

His friend's observation is correct.

His friend's conclusion is wrong.

(i) Explain using data from the table why his friend's conclusion is wrong.

_____

_____

_____

_____

(2)

(ii) Write a correct conclusion.

_____

_____

(1)

(iii) The maximum range of measurements for ***d*** is from the centre of the lens to **F** on the left.

The student **cannot** make a correct conclusion outside this range.

Explain why.

_____

_____

(1)

(Total 8 marks)