Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Q1.

Stars go through a life cycle. About 90 % of all stars are in the 'main sequence' period of the life cycle.

(a) Stars are stable during the 'main sequence' period of the life cycle.

Why?

_____

_____

(1)

(b) The table gives an estimated time for the number of years that three stars, **X**, **Y** and **Z**, will be in the 'main sequence' period of their life cycle.

Star	Relative mass of the star compared to the Sun	Estimated 'main sequence' period in millions of years
X	0.1	4 000 000
Y	1.0	9 000
Z	40.0	200

(i) This data suggests that there is a pattern linking the mass of a star and the number of years the star is in the 'main sequence' period of its life cycle.

What is the pattern suggested by the data?

_____

_____

(1)

(ii) Scientists cannot give the exact number of years a star will be in the 'main sequence' period.

Suggest why.

_____

_____

(1)

(iii) Nuclear fusion is the process by which energy is released in stars.

Which **one** of the following can be concluded from the data in the table?

Draw a ring around the correct answer in the box to complete the sentence.

The rate of nuclear fusion in a large star is

faster than
the same as
slower than

in a small star.

Explain the reason for your answer.

_____

_____

_____

_____

(3)

(c) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate*.

Describe what happens to a star **much bigger** than the Sun, once the star reaches the end of the 'main sequence' period of its life cycle.

Your answer should include the names of the stages the star passes through.

_____

_____

_____

_____

_____

_____

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_____

(6)

(Total 12 marks)

Q2.

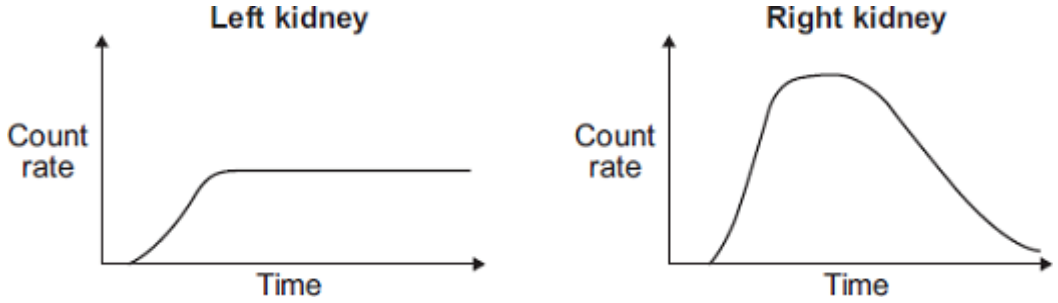
A doctor uses the radioactive isotope technetium-99 to find out if a patient's kidneys are working correctly.

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.

_____

_____

_____

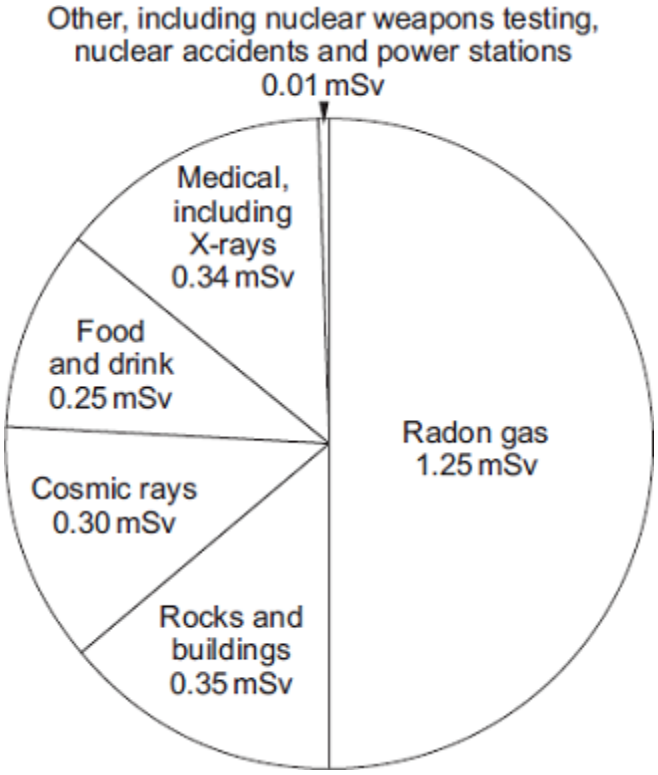
_____

(3)

(Total 4 marks)

Q3.

The pie chart shows the sources of the background radiation and the radiation doses that the average person in the UK is exposed to in one year.
Radiation dose is measured in millisieverts (mSv).



(a) (i) What is the total radiation dose that the average person in the UK receives?

_____

_____

Total radiation dose = _____ mSv

(1)

(ii) A student looked at the pie chart and then wrote down three statements.

Which **one** of the following statements is a correct conclusion from this data?

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

In the future, more people will be exposed to a greater proportion of radon gas. ☐

People that have never had an X-ray get 50 % of their radiation dose from radon gas. ☐

The radiation dose from natural sources is much greater than from artificial sources. ☐

(1)

(b) The concentration of radon gas inside a home can vary from day to day.

The table gives data for the radiation measured in homes in four different parts of the UK. The radiation was measured using two detectors, one in the living room and one in the bedroom. The measurements were taken over 3 months.

Area of the UK	Number of homes in the area	Number of homes in the sample	Average radiation in Bq/m^3	Maximum radiation in Bq/m^3
A	590 000	160	15	81
B	484 000	130	18	92
C	221 000	68 000	162	10 000
D	318 000	35 300	95	6 900

(i) Give **one** reason why the measurements were taken over 3 months using detectors in different rooms.

_____

_____

(1)

(ii) Use information from the table to suggest why a much higher proportion of homes were sampled in areas **C** and **D** than in areas **A** and **B**.

_____

_____

_____

(2)

(Total 5 marks)