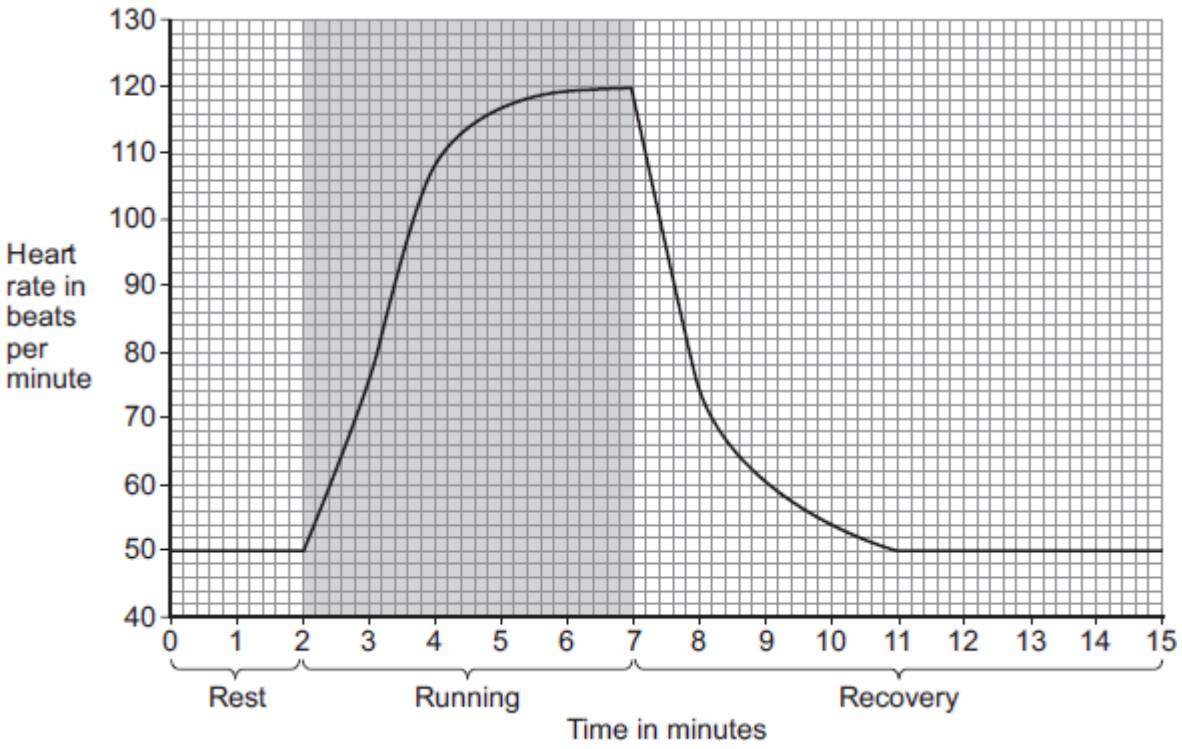
Name of the Student:_____
Max. Marks : 25 Marks **Time : 25 Minutes**

Q1.

A student ran on a treadmill for 5 minutes.

The speed of the treadmill was set at 12 km per hour.

The graph below shows the effect of the run on the student's heart rate.



(a) (i) What was the student's heart rate at rest?

_____ beats per minute

(1)

(ii) After the end of the run, how long did it take for the student's heart rate to return to the resting heart rate?

_____ minutes

(1)

(b) During the run, the student's muscles needed larger amounts of some substances than they needed at rest.

(i) Which **two** of the following substances were needed in larger amounts during the run?

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Tick ( ) **two** boxes.

carbon dioxide ☐

glucose ☐

lactic acid ☐

oxygen ☐

protein ☐

(2)

(ii) Why are the two substances you chose in part **(b)(i)** needed in larger amounts during the run?

Tick (✓) **one** box.

To help make more muscle fibres ☐

To release more energy ☐

To help the muscles to cool down ☐

(1)

(c) After exercise, a fit person recovers faster than an unfit person.

Let the student's heart rate at the end of exercise = **a**.

Let the student's heart rate after 2 minutes of recovery = **b**.

The table below shows how the difference between **a** and **b**, (**a − b**), is related to a person's level of fitness.

(a − b)	**Level of fitness**
< 22	Unfit
22 to 52	Normal fitness
53 to 58	Fit

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59 to 65	Very fit
> 65	Top athlete

What is the student's level of fitness?

Use information from the graph and the table.

a = _____ beats per minute

b = _____ beats per minute

(**a − b**) = _____ beats per minute

Level of fitness = _____

(3)

(d) The student repeated the run with the treadmill set at 16 km per hour.

The student's heart rate took 3 minutes longer to return to the normal resting rate than when running at 12 km per hour.

Give reasons why it took longer to recover after running faster.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 12 marks)

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Q2.

Freshwater streams may have different levels of pollution. The level of pollution affects which species of invertebrate will live in the water.

Table 1 shows the biomass of different invertebrate species found in two different streams, **X** and **Y**.

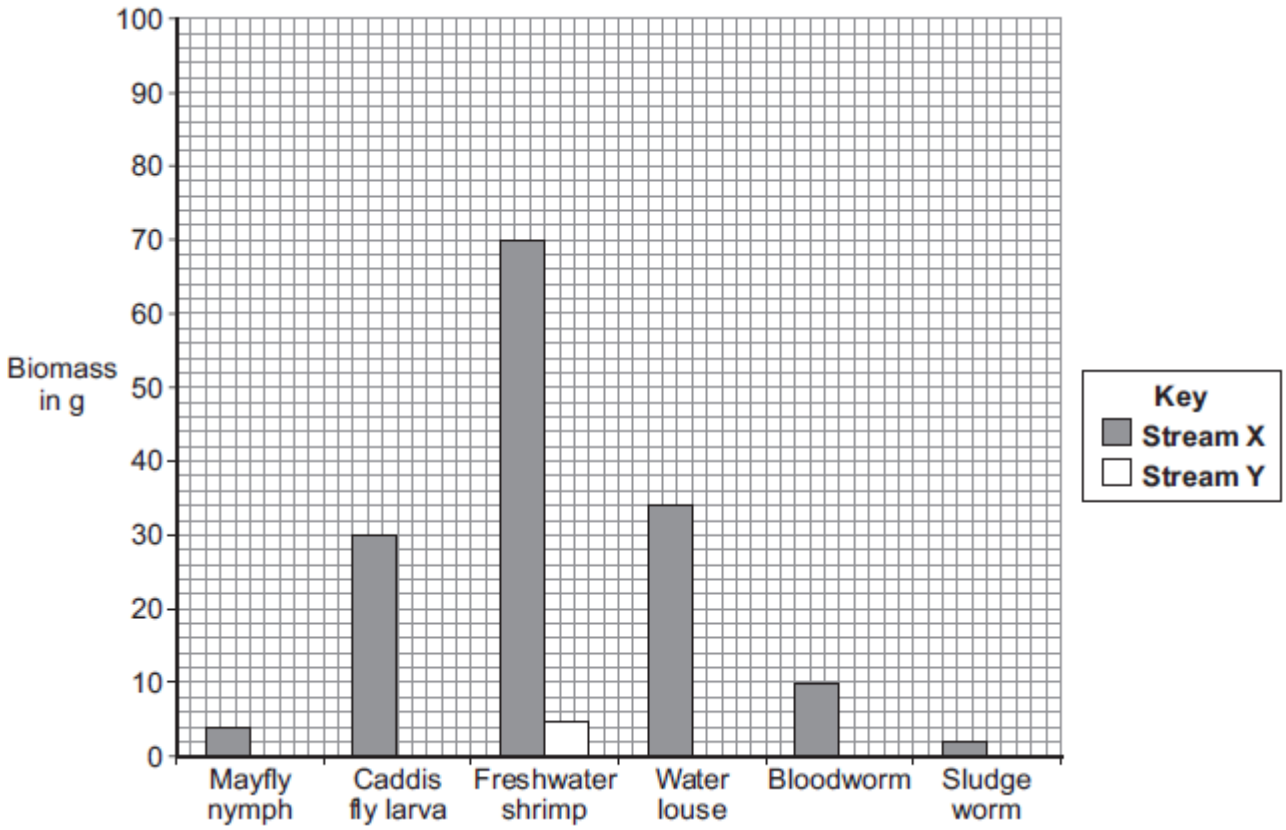
Table 1

	Biomass in g	
Invertebrate species	**Stream X**	**Stream Y**
Mayfly nymph	4	0
Caddis fly larva	30	0
Freshwater shrimp	70	5
Water louse	34	10
Bloodworm	10	45
Sludge worm	2	90
Total	**150**	**150**

(a) The bar chart below shows the biomass of invertebrate species found in **Stream X**.

(i) Complete the bar chart by drawing the bars for water louse, bloodworm and sludge worm in **Stream Y**.

Use the data in **Table 1**.



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Species present

(2)

(ii) **Table 2** shows which invertebrates can live in different levels of water pollution.

Table 2

Pollution level	Invertebrate species likely to be present
Clean water	Mayfly nymph
Low pollution	Caddis fly larva, Freshwater shrimp
Medium pollution	Water louse, Bloodworm
High pollution	Sludge worm

Which stream, **X** or **Y**, is more polluted?
Use the information from **Table 1** and **Table 2** to justify your answer.

_____

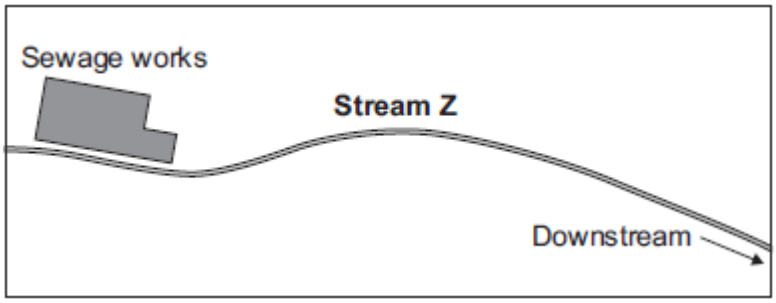
_____

_____

_____

(2)

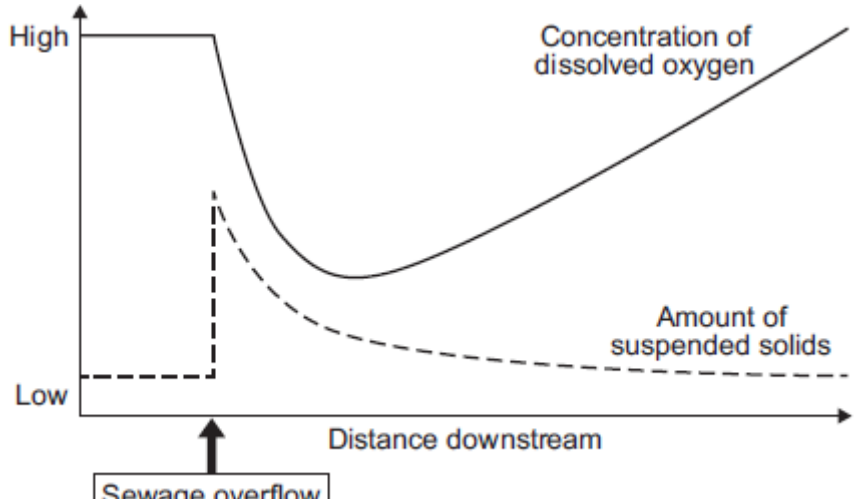
(b) There is a sewage works near another stream, **Z**.



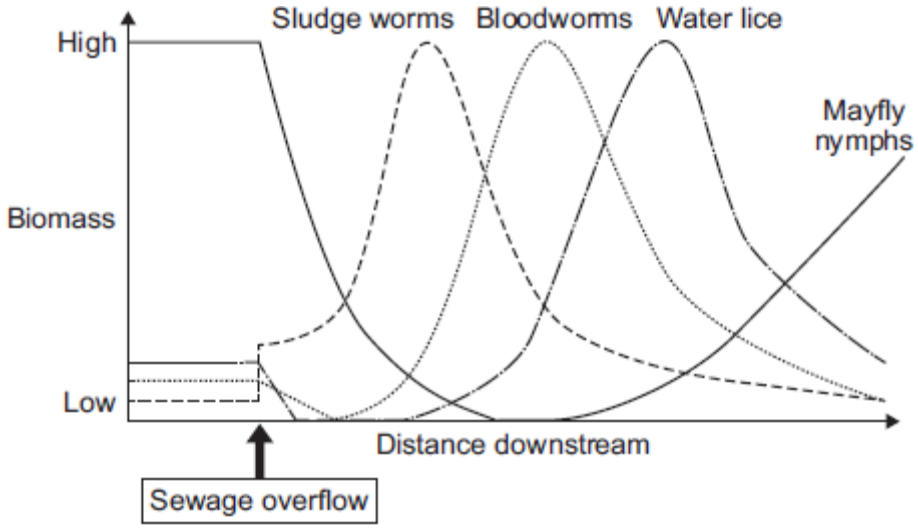
An accident caused sewage to overflow into **Stream Z**.
Two weeks later scientists took samples of water and invertebrates from the stream.
They took samples at different distances downstream from where the sewage overflowed.
The scientists plotted the results shown in **Graphs P** and **Q**.

Graph P: change in water quality downstream of sewage overflow

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Graph Q: change in invertebrates found downstream of sewage overflow



(i) Describe the patterns shown in **Graph P**.

(4)

(ii) Describe the relationship between dissolved oxygen and the survival of mayfly nymphs in **Stream Z**. Suggest a reason for the pattern you have described.

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_____

_____

_____

_____

_____

(3)

(c) Many microorganisms are present in the sewage overflow.

Explain why microorganisms cause the level of oxygen in the water to decrease.

_____

_____

_____

_____

(2)

(Total 13 marks)

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