



**New GCSE**

4781/03A

**SCIENCE B**

**UNIT 1: Space, Energy and Life**

P.M. THURSDAY, 17 January 2013

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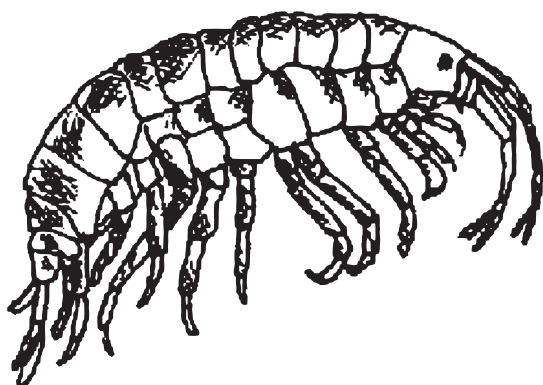
**Resource folder (Pre-Release Article)**

For use with:

GCSE Science B (UNIT 1) **Section B** of the Foundation Tier

GCSE Science B (UNIT 1) **Section A** of the Higher Tier

## Monitoring the environment using invertebrates



### Amphipod

- Swims quickly before burrowing into clumps of vegetation
- Omnivores and scavenges on plant or animal material
- Requires well-oxygenated water
- Moderately tolerant of pollution
- May indicate fair water quality



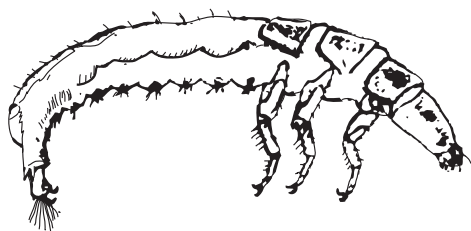
### Blackfly Larva

- Bottom-end swollen and fatter than the head-end
- Attach to the upper smooth surface of rocks using suckers on the bottom end
- Found in flowing water
- Omnivores
- Pollution tolerant
- May indicate poor water quality



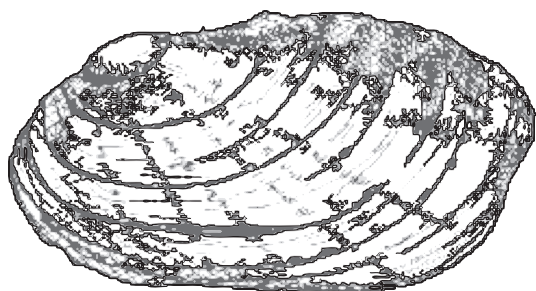
### Bristleworm

- Segmented worm
- Can tolerate low oxygen levels
- Pollution tolerant
- Large numbers indicate poor water quality
- May indicate organic pollution



### Caddisfly Larva

- Larvae resemble caterpillars with skinny legs
- Mostly herbivorous on algae and plants
- Some are predators that eat nymphs
- Larvae and adults are a favourite trout food
- Larvae are moderately tolerant of pollution and warm water
- Large numbers indicate fair water quality



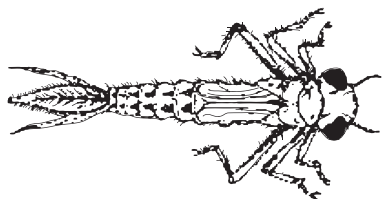
### Clams and Mussels

- Found in slow moving, warm rivers
- Clams are small, round and symmetrical
- Mussels are larger, oblong and lopsided
- Can tolerate polluted environments
- Moderately pollution tolerant
- Large numbers indicate fair water quality



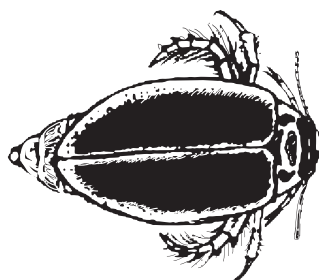
### Crane fly Larva

- Adults do not feed
- Moderately pollution tolerant
- Large numbers indicate fair water quality



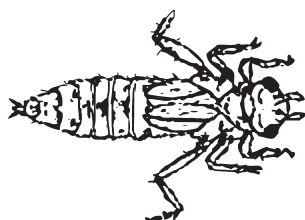
### Damselfly Nymph

- Nymphs have three paddle-shaped tails
- Predatory on mayfly nymphs and mosquito larvae, worms and anything else small enough to grab
- Moderately pollution tolerant
- Large numbers indicate fair water quality



### Diving Beetle

- Found in water both as adults and larvae
- Strong swimmers
- Carnivorous on larvae and small fish
- Adults are not useful as an indicator of water quality because they breathe from surface air bubbles



### Dragonfly Nymph

- Predatory on larvae, nymphs, tadpoles and small fish
- Adults don't fold their wings; the wings lay flat and outspread
- Found in slow moving and still water
- Moderately pollution tolerant
- Large numbers indicate fair water quality



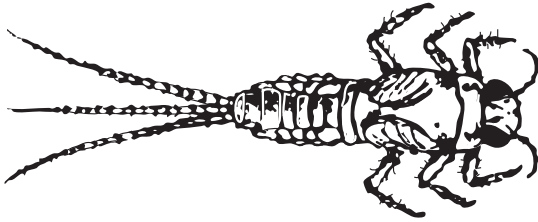
### Flatworm

- Small, pale blobs found in the vegetation or under rocks
- Omnivorous on living or dead plants and animals
- Pollution tolerant
- Large numbers indicate poor water quality



### Bloodworm

- Segmented worm
- Pollution tolerant
- Large numbers indicate poor water quality



### Mayfly Nymph

- Three long tails
- Feathery gills are located along sides of the abdomen
- Nymphs require clean, oxygenated water
- Pollution intolerant
- Large numbers likely indicate good water quality and high oxygen levels



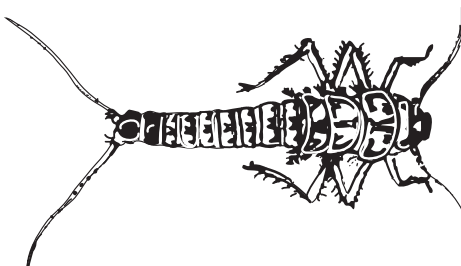
### Midge Larva

- Some larvae have red blood
- Larvae resemble a short worm
- Omnivores feeding on small organisms, decaying matter and algae
- Pollution tolerant
- Large numbers indicate poor water quality and organic enrichment



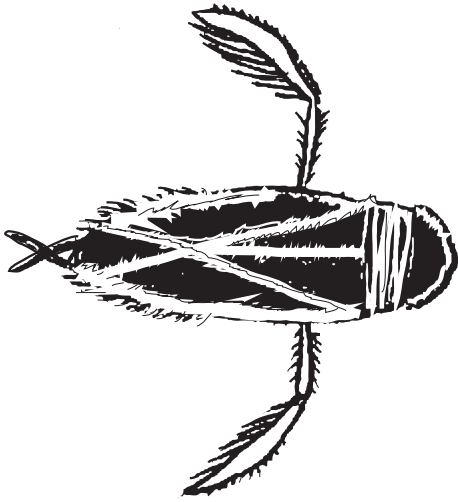
### Snail

- Herbivores that feed on algae scraped from stones and leaves
- Lung-breathing snails have shells coiled like a tuba or spiral shells opening on the left side without a door. They obtain air from above the water's surface and therefore are not as sensitive to pollution and are not really good indicators of water quality
- Gill-breathing snails have spiral shells opening on the right side with a door. They rely on oxygen dissolved in the water and may be more susceptible to pollution
- Pollution tolerant
- Large numbers of lunged snails indicate poor water quality and organic enrichment
- Large numbers of gilled snails indicate good water quality



### Stonefly Nymph

- Two long tails and antennae
- Found in deeper, faster water
- Very pollution intolerant
- Indicate good water quality with high oxygen



### **Water Boatman**

- Can fly or swim
- Found in all types of water, moving or still
- Boatman “scuba dive” with an air bubble trapped on their body
- Not necessarily useful as indicators of water quality because the adults breathe surface air

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*You need to refer to the resource folder to answer questions in this section.*

*Answer **all** questions in the spaces provided.*

**1.** Water pollution can be monitored using invertebrate animals as indicators.

- (a) Describe how you would carry out an investigation into monitoring water pollution using invertebrates. [6 QWC]

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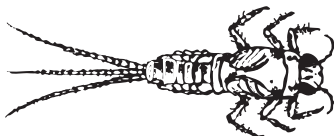
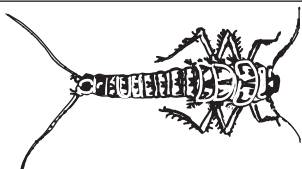
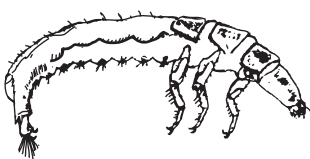
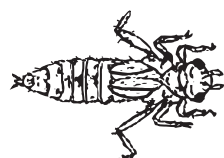
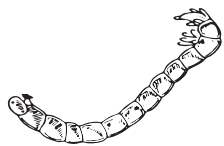

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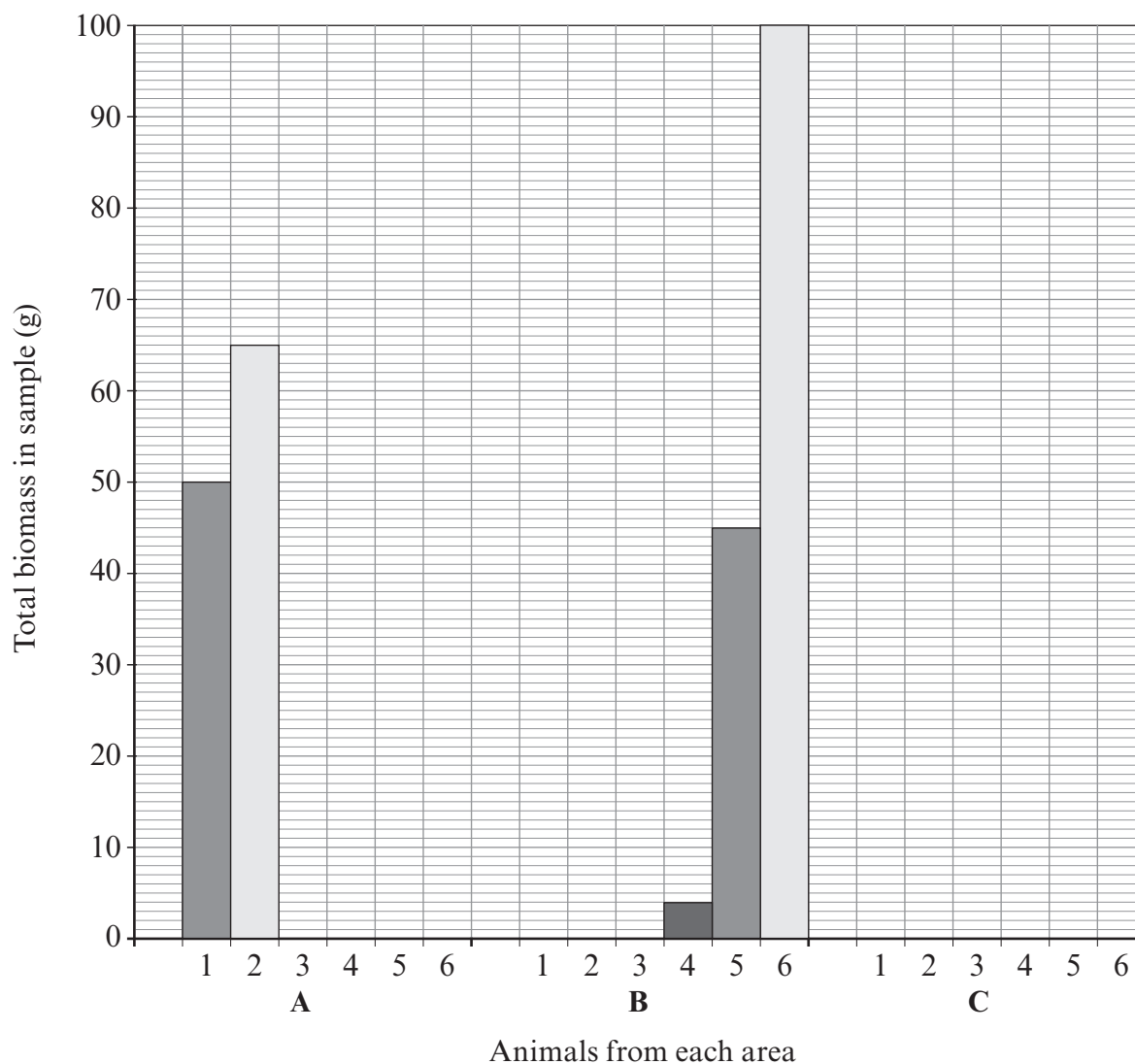
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- (b) This table shows the results of invertebrates identified in three parts of a stream A, B and C obtained during an investigation.

	Photograph of invertebrate	Species	Total biomass in sample (g)		
			A	B	C
1		.....	50	0	4
2		.....	65	0	0
3		Caddisfly larva	0	0	30
4		.....	0	4	34
5		.....	0	45	10
6		.....	0	100	2

- (i) Use the information in the resource folder to identify each invertebrate and complete the table. One has been completed for you. [5]

- (ii) Plot the results for part **C** of the stream as a bar chart on the grid below. The data for parts **A** and **B** in the stream have already been plotted for you. [3]



- (iii) Use the information in the resource folder and the results of the investigation to describe how the quality of water (pollution level) changes from part **A** of the stream, as it flows to parts **B** and **C**. [3]

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- (iv) Explain how the results to the investigation support your answer to (iii). [3]

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- (c) During the investigation, any water boatmen collected were not counted. Explain why they were ignored. [2]

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- (d) How could the repeatability of the data collected be improved? [2]

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**END OF PAPER**



# **GCSE MARKING SCHEME**

**SCIENCE B**

**JANUARY 2013**

## SECTION B

Question	Answers	Marks
1 (a)	<p>Indicative content</p> <ul style="list-style-type: none"> <li>• Collect some water in your large tray.</li> <li>• Use the same technique each time you collect a sample – holding the net in the same way for the same length of time.</li> <li>• Scoop up some of the material from the bottom of the stream, or stir the bottom material and place the net downstream to catch it.</li> <li>• Try to identify the animals against the indicator chart.</li> <li>• Count the animals.</li> <li>• Pour the water gently back into the pond or stream.</li> <li>• Repeat at different times / different sections of the stream.</li> </ul> <p>5-6 marks The candidate constructs an articulate, integrated account correctly linking relevant points such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.</p> <p>3-4 marks The candidate constructs an account correctly linking some relevant points such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.</p> <p>1-2 marks The candidate makes some relevant points such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.</p> <p>0 marks The candidate does not make any attempt or give a relevant answer worthy of credit.</p>	6

Question	Answers	Marks
(b) (i)	<p>In descending order:</p> <ul style="list-style-type: none"> <li>• Mayfly Nymph</li> <li>• Stonefly Nymph</li> <li>• (<i>Caddis fly larva</i>)</li> <li>• Dragonfly Nymph</li> <li>• Bloodworm</li> <li>• Bristleworm</li> </ul>	5
(ii)	5/6 correct (3) 3/4 correct (2) 1/2 correct (1)	3
(iii)	<p>A - good water quality  B – polluted  C – becoming cleaner / low levels of pollution</p>	3
(iv)	<p>Quotes examples of preferred water quality for the invertebrates (x3), e.g. Mayfly Nymph – pollution intolerant / large numbers indicate good water quality.</p> <p>Explanation must coherently and correctly connect points to achieve 3 marks.</p>	3
(c)	<p><i>1 mark for the following point:</i>  adults breathe surface air.</p> <p><i>The second mark can only be awarded if the candidate coherently and correctly links the conclusion to the statement above:</i>  so do not indicate water quality.</p>	2
(d)	<p>Collect more than one sample at each location,  Collect samples in the same way</p>	2