Surname	Centre Number	Candidate Number
First name(s)		2

GCE A LEVEL

S24-1400U50-1E

1400U50-1E

FRIDAY, 3 MAY 2024 – MORNING

BIOLOGY – A2 unit 5
Practical Examination
Practical Analysis Task

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**20**	
2.	**10**	
Total	**30**	

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ADDITIONAL MATERIALS

A calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.
Pencil may be used to draw tables and graphs.
Write your name, centre number and candidate number in the spaces at the top of this page.
Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.
The maximum mark for this paper is 30.

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Answer **all** questions.

1. A country park in Wales is a site of special scientific interest (SSSI). It contains a variety of landscapes including farmland, mature hedgerows, woodland, heathland, peat bogs and areas affected by coal mining. **Image 1.1** shows part of the country park.

Image 1.1

Students carried out an investigation to assess the biodiversity along a 12 m stretch of a river whose source is found within the country park. The students carried out kick sampling at five points, in shallow water along the riverbed, collecting samples from within each quadrat area only.

Image 1.2 shows the position of quadrats placed along a 12 m stretch of the riverbed during the kick sampling process.

Image 1.2

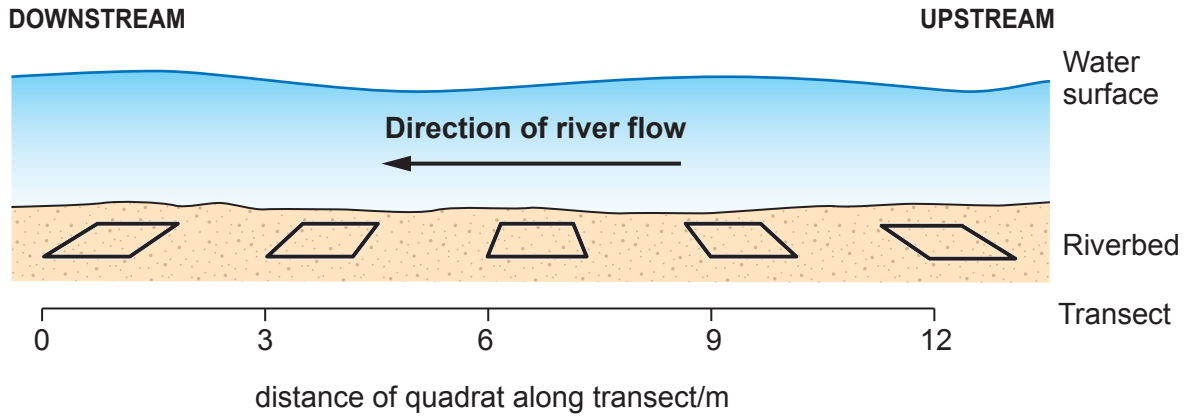
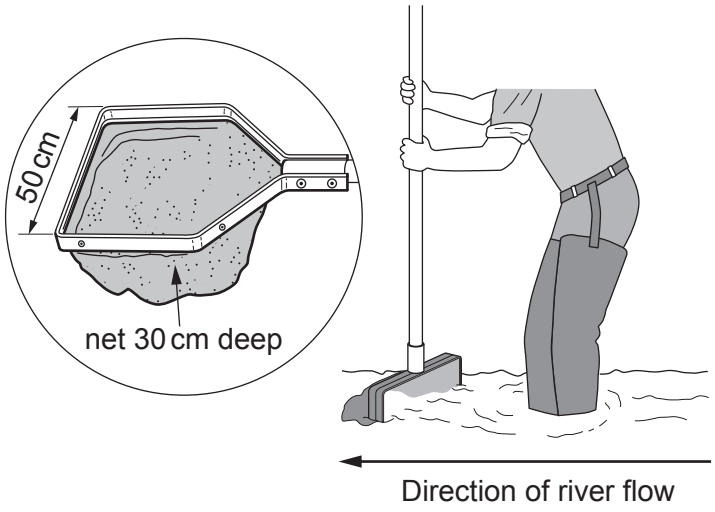


Image 1.3



A basic method used to collect the organisms in the river is described below:

1. Place five (0.5 m × 0.5 m) quadrats at 3 m intervals along the riverbed as seen in **Image 1.2**.
2. Place the flat edge (bottom) of the net on the riverbed on the downstream edge of the quadrat.
3. Kick into the stones/mud inside the quadrat, as seen in **Image 1.3**, for 30 seconds.
4. Empty the contents of the net into a tray containing river water.
5. Identify, count, and record the number of individuals from each different species caught in the net.
6. Return the organisms to the river safely.

Examiner only

(a) (i) State **two** variables that were controlled in this investigation. [2]

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(ii) Explain why the students placed the net on the downstream edge of the quadrat. [1]

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(iii) Explain why collecting several samples along the 12 m stretch of riverbed is more representative of the biodiversity present than a single sample. [1]

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(b) Identify **one** hazard associated with investigating biodiversity in the river and suggest how you would minimise the risk by completing the risk assessment below. [2]

Hazard	Risk	Control measure
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

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(c) (i) The results for the kick sampling of the river can be seen in **Table 1.4**.

Table 1.4

Organism	*n*	*n – 1*	*n (n–1)*
Dragonfly nymph	47	46	2162
Mayfly nymph	40	39	1560
Freshwater shrimp	22	21	462
Caddisfly larvae	14	13	182
Bloodworm	8	7	56
Damselfly nymph	23	22	506
Flatworm	6	5	30
Frog (tadpole)	24	23	552
Minnow	9	8	72
Aquatic beetle	12	11	132
Stonefly nymph	7	6	42
	N = 212		*Σn(n–1)* = ...
	N(N–1) = ...		

The formula for calculating the Simpson's Diversity Index can be seen below.
Where: *N* = number of organisms sampled;
n = number of individuals of each species.

$$D = 1 - \frac{\Sigma n\,(n-1)}{N\,(N-1)}$$

Complete **Table 1.4 and** use the formula above to calculate the Simpson's Diversity Index for the river. **Give your answer to two decimal places.** [3]

Simpson's Diversity Index = ...

Examiner only

(ii) Using your answer to (c)(i), state a conclusion for the level of biodiversity in the river. Explain how you reached your conclusion. [2]

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(iii) Describe **two** ways by which confidence in the results could be improved. [2]

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(iv) Name **two** abiotic factors that could affect the biodiversity in the river. [1]

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(d) Another investigation focussed on the abundance of two plant species in the country park; the round-leaved sundew (*Drosera rotundifolia*) and the wood anemone (*Anemone nemorosa*). The round-leaved sundew grows in both boggy and woodland habitats, whereas the wood anemone only grows in woodland habitats.

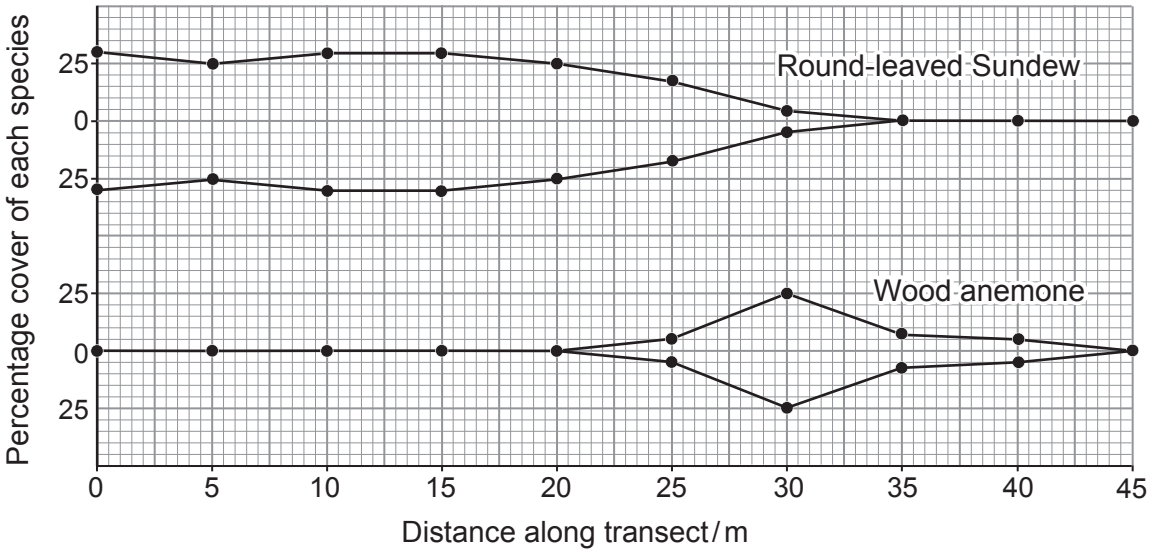
A belt transect was carried out across boggy ground and adjacent woodland. Quadrats (0.5 m × 0.5 m) were placed at 5 m intervals along the transect.

Image 1.5 shows the position of the transect and the percentage cover for the two different plant species in each quadrat. The percentage cover of each species is shown graphically in **Image 1.6**.

Image 1.5

Belt transect	0m	5m	10m	15m	20m	25m	30m	35m	40m	45m
% cover										
Sundew	60	50	60	60	50	35	10	0	0	0
Wood anemone	0	0	0	0	0	10	50	15	10	0

Image 1.6



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(i) Name the type of graphical representation used to display the data seen in **Image 1.6**. [1]

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(ii) Describe **one** advantage of displaying the data in this way when comparing the distribution of different species. [1]

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(iii) Explain the trend in the percentage cover of the wood anemone between 30 and 45 metres along the transect. [1]

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(iv) The round-leaved sundew is able to survive in boggy ground, which has high levels of denitrification. It is an insectivorous plant which captures insects and digests them on its leaves as shown in **Image 1.7**.

Image 1.7

Use the information provided to suggest how the ability of the round-leaved sundew to capture insects and digest them is an adaptation to its habitat. [3]

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2. **Image 2.1** shows a photomicrograph of a transverse section of an artery viewed through a light microscope. **Image 2.2** shows a low power plan of this artery.

Image 2.1

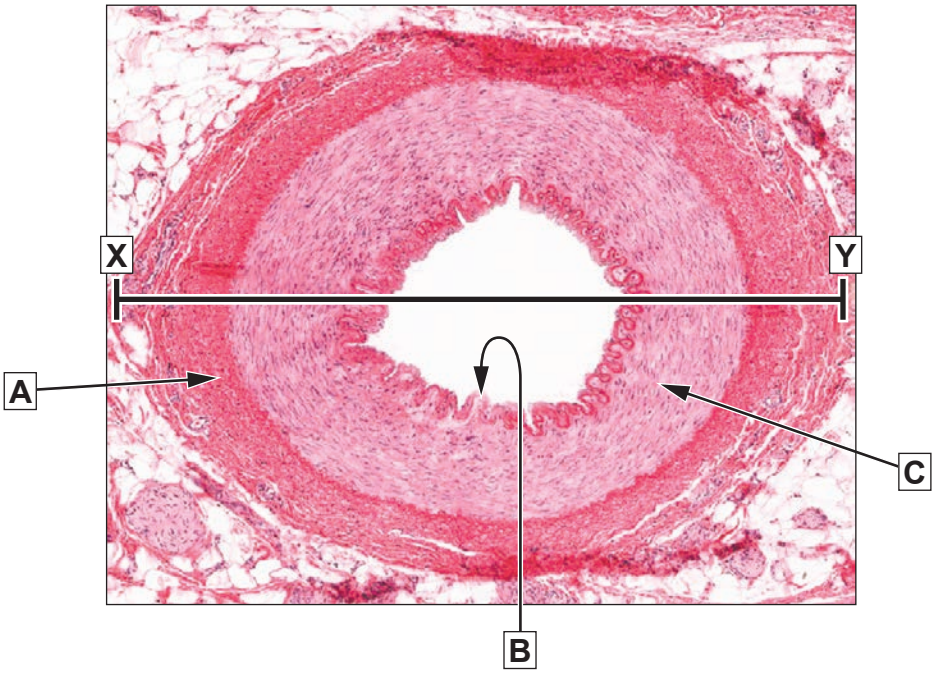
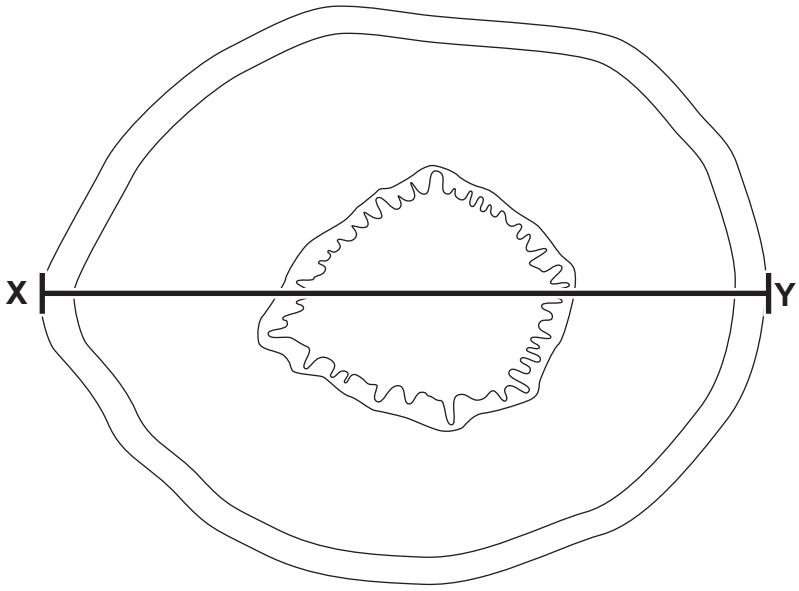


Image 2.2



(a) (i) State the name of tissues **A**, **B** and **C** shown in **Image 2.1**. [2]

A: .....

B: .....

C: .....

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(ii) Before viewing the T.S. artery, the light microscope was calibrated. The following values were observed:

100 stage micrometer units = 40 eyepiece units.

Calculate the length of one eyepiece unit when each stage micrometer unit = 0.01 mm.
Give your answer in micrometres. [2]

1 eyepiece unit = ... µm

(iii) The distance between **X** and **Y** in **Image 2.1** was measured as 88 eyepiece units. Using your answer from (ii), calculate the size of the artery on the slide.
Give your answer in millimetres. [2]

Size of the artery = ... mm

(iv) Use your answer from (iii) to calculate the magnification of the low power plan of the artery shown in **Image 2.2**. [2]

Magnification of the low power plan = x .....

(b) Describe **one** way in which the structure of a vein would differ from that of an artery. [1]

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(c) Explain why a light microscope would not be suitable to observe cell organelles such as a mitochondrion. [1]

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