NAME _____ CLASS _____ DATE _____

IB BIOLOGY · B3.3

Muscle and motility

Notes to fill in alongside the guide. Each numbered block matches a chapter of the guide, and of the lesson slides. Write in the gaps, answer the cues, annotate the figures, and sum up each section in your own words.

BY THE END YOU CAN

- [ ] Describe movement in motile and sessile organisms B3.3.1
- [ ] Explain muscle contraction with the sliding filament model B3.3.2
- [ ] Explain the roles of titin and antagonistic muscles in relaxation B3.3.3
- [ ] Describe the structure and function of a motor unit B3.3.4
- [ ] Describe skeletons as anchorage for muscles and as levers B3.3.5
- [ ] Describe movement at a synovial joint, using the hip B3.3.6
- [ ] Compare and measure the range of motion of joints B3.3.7
- [ ] Explain how the intercostal muscles act as antagonists in breathing B3.3.8
- [ ] Give reasons for locomotion, with an example of each B3.3.9
- [ ] Describe adaptations of marine mammals for swimming B3.3.10

01 Everything alive moves, even if it stays put

B3.3.1 HL

CUES

Predict: A barnacle is glued to a rock for its adult life. Which statement is correct?

What is meant by motile?

What is meant by sessile?

NOTES

1 An _____ organism, such as a salmon, moves its whole body to find food, escape, or breed.

2 A _____ organism, such as an acorn barnacle or a plant, stays where it is, but it also moves parts of itself.

3 _____ organisms move from place to place; _____ organisms are fixed in place.

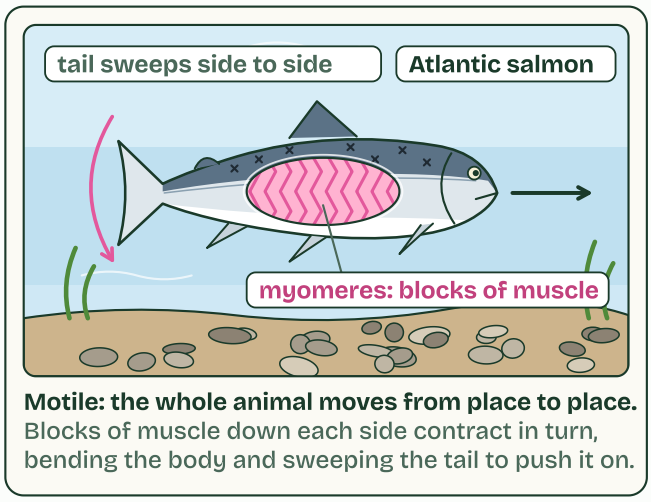
4 Sessile organisms still _____ of their bodies, to feed or to grow toward resources.

5 Movement is used to _____.

Your own notes

ANNOTATE THE FIGURE

The figure shows it as Salmon (motile), Barnacle (sessile) and Flytrap (sessile). Note what changes each time.



Motile: the whole animal moves from place to place. Blocks of muscle down each side contract in turn, bending the body and sweeping the tail to push it on.

SUMMARY

Sum up section 01 in two or three sentences of your own.

02 A muscle fibre is a stack of sarcomeres

B3.3.2 HL

CUES

What is meant by sarcomeres?

NOTES

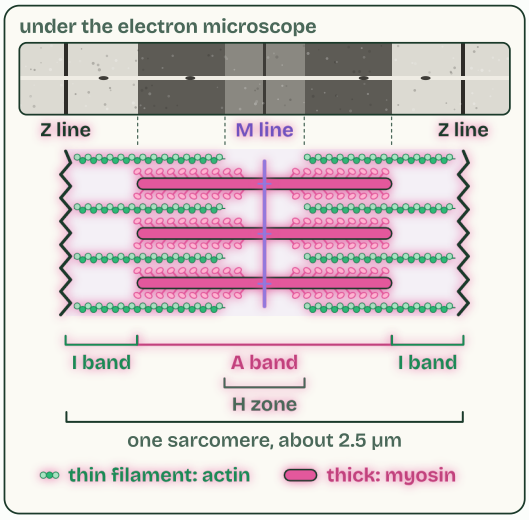
1 Each fibre is packed with thread-like _____, and each myofibril is a chain of repeating units called _____.

2 Look at it under an electron microscope and the filaments make _____.

Your own notes

ANNOTATE THE FIGURE

Label each part and say what it does: thin filaments, thick filaments, z lines, m line, a band, i band, h zone.



SUMMARY

Sum up section 02 in two or three sentences of your own.

03 Pull, let go, pull again

B3.3.2 HL

CUES

Predict: A muscle fibre is stimulated and its sarcomeres shorten from 2.6 to 2.0 micrometres. What happens to the length of the A band?

What is meant by sliding filament model?

NOTES

1 The _____ says that a sarcomere shortens because the thin filaments slide between the thick ones.

2 Thin filaments _____ between thick filaments, pulled by _____. Neither shortens.

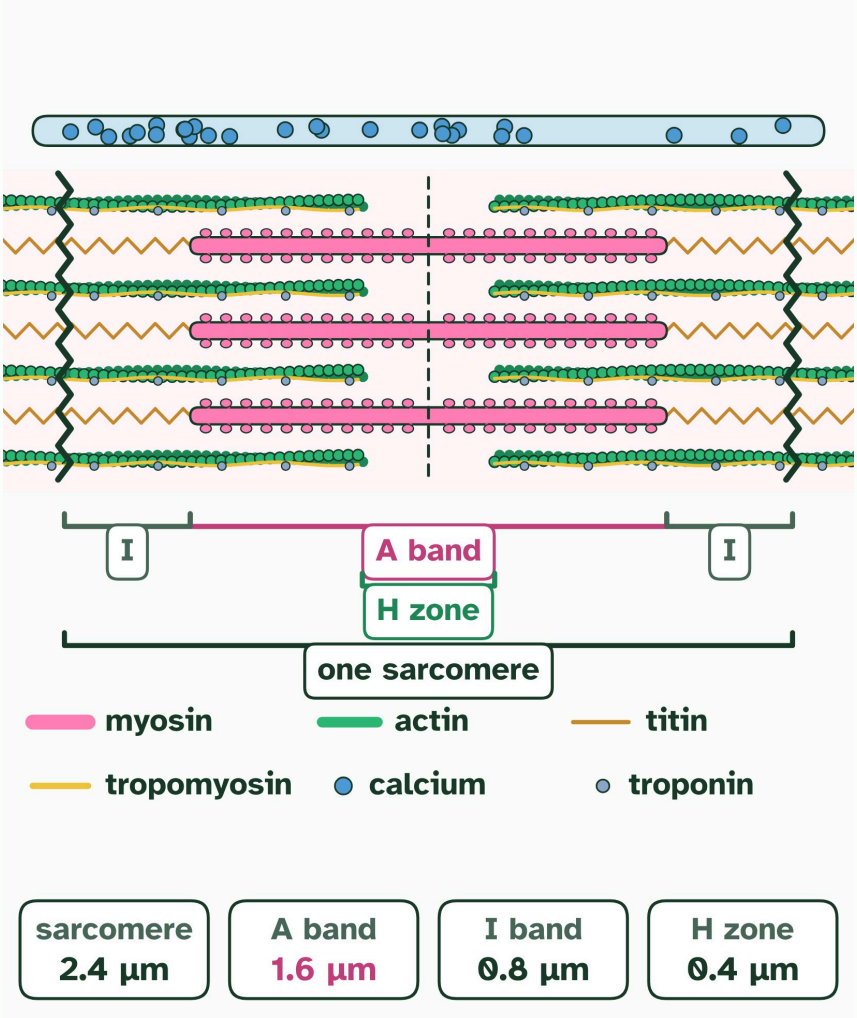
3 The _____ and _____ shorten. The _____ does not.

4 _____ uncovers the sites; _____ lets the heads go.

Your own notes

ANNOTATE THE FIGURE

Annotate this still from the animation (Sliding filaments): what is happening, and why?



REMEMBER IT

C U B P A: cats use big paws, always

C	U	B	P	A
C	U	B	P	A

SUMMARY

Sum up section 03 in two or three sentences of your own.

04 A spring, and a partner muscle

B3.3.3 HL

CUES

Predict: Why can a muscle that has just contracted not simply lengthen itself again?

What is meant by titin?

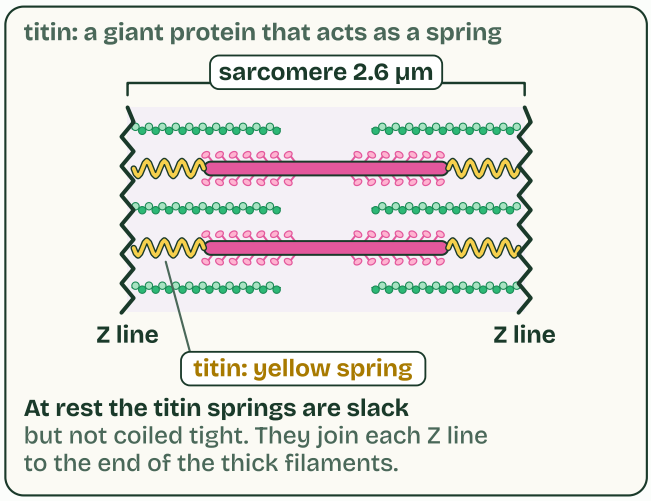
NOTES

1. One is the protein _____, the largest protein in the body.
2. When contraction stops, the titin _____ and helps pull the sarcomere back to its resting length.
3. It also _____ being stretched too far, which stops the filaments being pulled apart.
4. The other is an _____.
5. A muscle can only exert force when it _____: it pulls, never pushes.
6. _____ is an elastic protein: it _____ after contraction and _____.
7. A muscle can only _____, so joints are moved by _____.
8. Example: _____; _____.

Your own notes

ANNOTATE THE FIGURE

The figure shows it as At rest, Stretched and Contracted. Note what changes each time.



SUMMARY

Sum up section 04 in two or three sentences of your own.

05 One neuron, many fibres

B3.3.4 HL

CUES

Predict: Which statement is correct about the fibres in one motor unit?

What is meant by neuromuscular junction?

What is meant by motor unit?

NOTES

1 Where the axon of the neuron meets the fibre is a _____: a synapse that works as you saw in C2.1 and C2.2.

2 A _____ is one motor neuron and all the fibres it supplies, which contract together, all or nothing.

3 A muscle contains many motor units, and the force it makes depends on _____.

4 To make a bigger force the nervous system _____ more units, smallest first.

5 Muscles that need fine control, such as those that move the eye or the fingers, have many _____, so force changes in tiny steps.

6 A _____ is one _____ and all the _____ it supplies through _____.

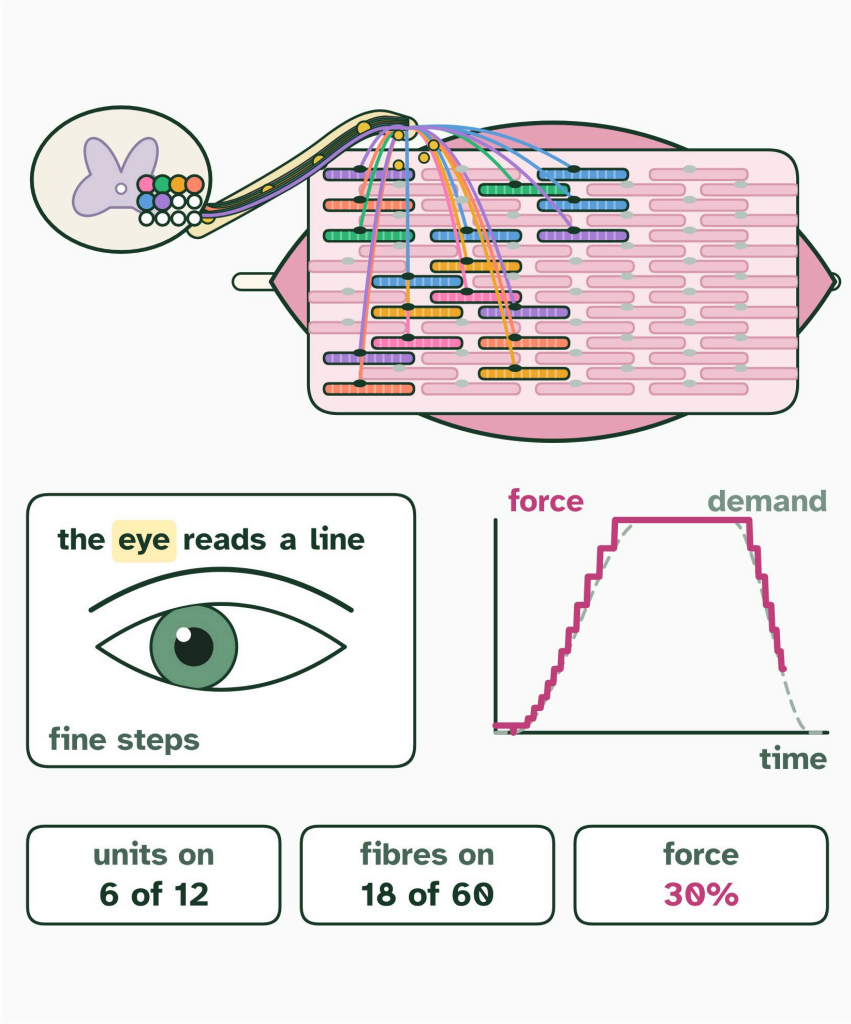
7 More force comes from _____.

8 _____ give fine control; _____ give great force.

Your own notes

ANNOTATE THE FIGURE

Annotate this still from the animation (Motor units and recruitment): what is happening, and why?



SUMMARY

Sum up section 05 in two or three sentences of your own.

06 Something to pull against

B3.3.5 HL

CUES

Predict: A muscle in the arm of a person and one in the leg of a crab are alike in which way?

What is meant by exoskeleton?

What is meant by endoskeleton?

NOTES

1 The skeleton does this job: it is an _____ for muscles, joined to them by tendons.

2 It also acts as a set of _____.

3 Animals have two kinds of skeleton. _____, such as crabs and insects, have an _____: a hard case outside the body with the muscles inside. _____ have an _____: bones inside the body with muscles attached outside.

4 A skeleton gives muscles an _____ and acts as _____.

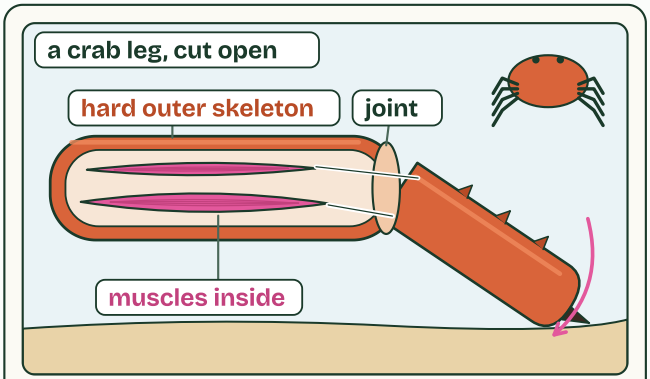
5 **Arthropods:** _____, muscles inside.

6 **Vertebrates:** _____, muscles outside.

Your own notes

ANNOTATE THE FIGURE

The figure shows it as Exoskeleton (crab) and Endoskeleton (person). Note what changes each time.



Exoskeleton (arthropods): a hard case outside, with muscles inside pulling on its inner walls. It protects and anchors, but must be shed to grow.

SUMMARY

Sum up section 06 in two or three sentences of your own.

07 Force against distance

B3.3.5 HL

CUES

Predict: A load of 5 kg is held in the hand 30 cm from the elbow, and the biceps pulls 4 cm from the elbow. What is true of the force in the muscle?

NOTES

1 In the forearm the _____ is the pivot (the fulcrum), the _____ pulls on the forearm only a few centimetres from the elbow (the effort), and the _____ is held in the hand about 30 cm away.

2 The bones act as _____, the joint as the _____, the muscle as the _____.

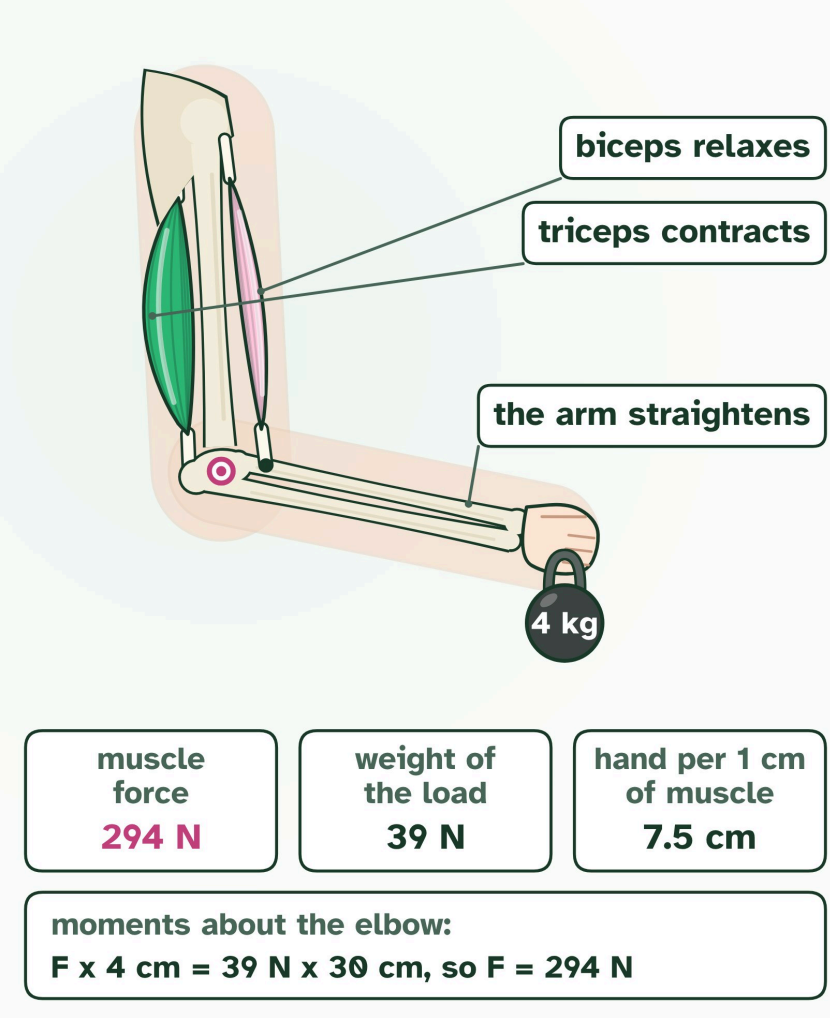
3 Close to the pivot: _____ needed, _____.

4 Farther from the pivot: _____, _____.

Your own notes

ANNOTATE THE FIGURE

Annotate this still from the animation (The arm as a lever): what is happening, and why?



SUMMARY

Sum up section 07 in two or three sentences of your own.

08 Inside the hip joint

B3.3.6 HL

CUES

What is meant by synovial joint?

NOTES

1 A _____ is a joint that moves freely.

2 The human _____ is a ball and socket synovial joint between the _____ and the _____.

3 The ends of both bones are covered with _____, which is smooth and absorbs shock.

4 The cavity is filled with _____, which lubricates it and reduces friction.

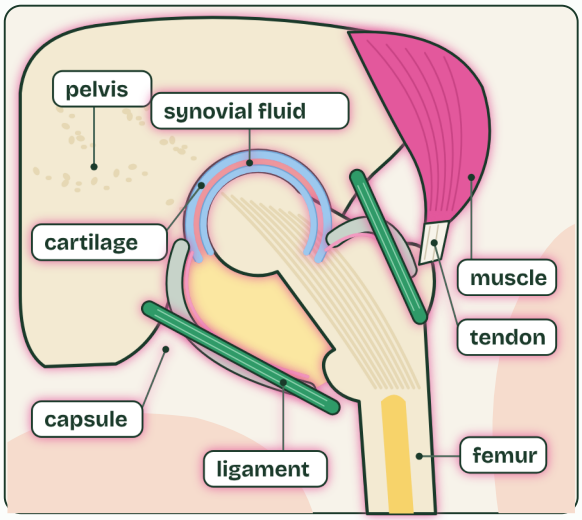
5 A _____ encloses the joint and _____ join bone to bone and hold the joint in place. _____ pull on the bones through _____, which join muscle to bone, and so move the leg.

Your own notes

ANNOTATE THE FIGURE

Label each part and say what it does: synovial fluid, pelvis, femur, cartilage, synovial fluid, joint capsule, ligaments, muscle, tendon.

The right hip, cut open from the front



SPOT THE MISTAKE

What do students often get wrong about movement at a synovial joint? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 08 in two or three sentences of your own.

09 How far, in how many directions

B3.3.7 HL

CUES

Predict: Why can the hip move in more directions than the knee?

What is meant by range of motion?

NOTES

1 The _____ of a joint is how far it can move, as an angle, in each direction.

2 A _____ joint such as the knee or elbow moves in _____: it flexes and extends.

3 A _____ joint such as the hip or shoulder moves in _____: it flexes and extends, swings out (abduction) and in (adduction), and rotates.

4 You measure a range with a _____, which has a fixed arm and a moving arm that you line up with the two bones, or by analysing a photograph or video on a computer.

5 _____ is the angle a joint moves through, in each dimension.

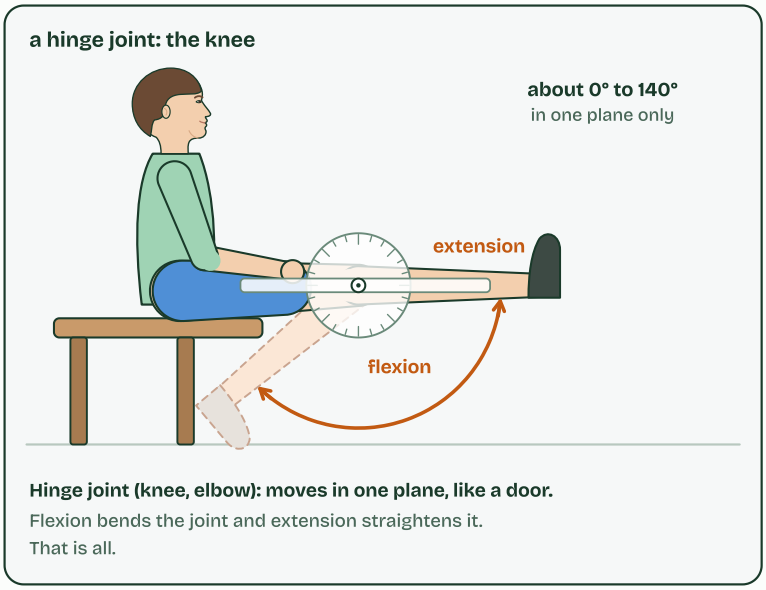
6 **Hinge:** one plane. _____ many.

7 Measured with a _____ or from images.

Your own notes

ANNOTATE THE FIGURE

The figure shows it as Hinge (knee) and Ball and socket (hip). Note what changes each time.



SUMMARY

Sum up section 09 in two or three sentences of your own.

10 Two layers that pull opposite ways

B3.3.8 HL

CUES

Predict: The internal intercostal muscles contract, and the external ones are stretched. What happens?

What is meant by intercostal muscle?

NOTES

1 Between every pair of ribs there are two layers of _____.

2 The _____ have fibres that run _____.

3 The _____ lie beneath them with fibres at _____, running down and back.

4 Because their fibres run in different directions, the two layers move the ribcage in _____: they are antagonistic muscles.

5 When one layer contracts it _____.

6 _____ layer: contracts to _____, raising the ribs.

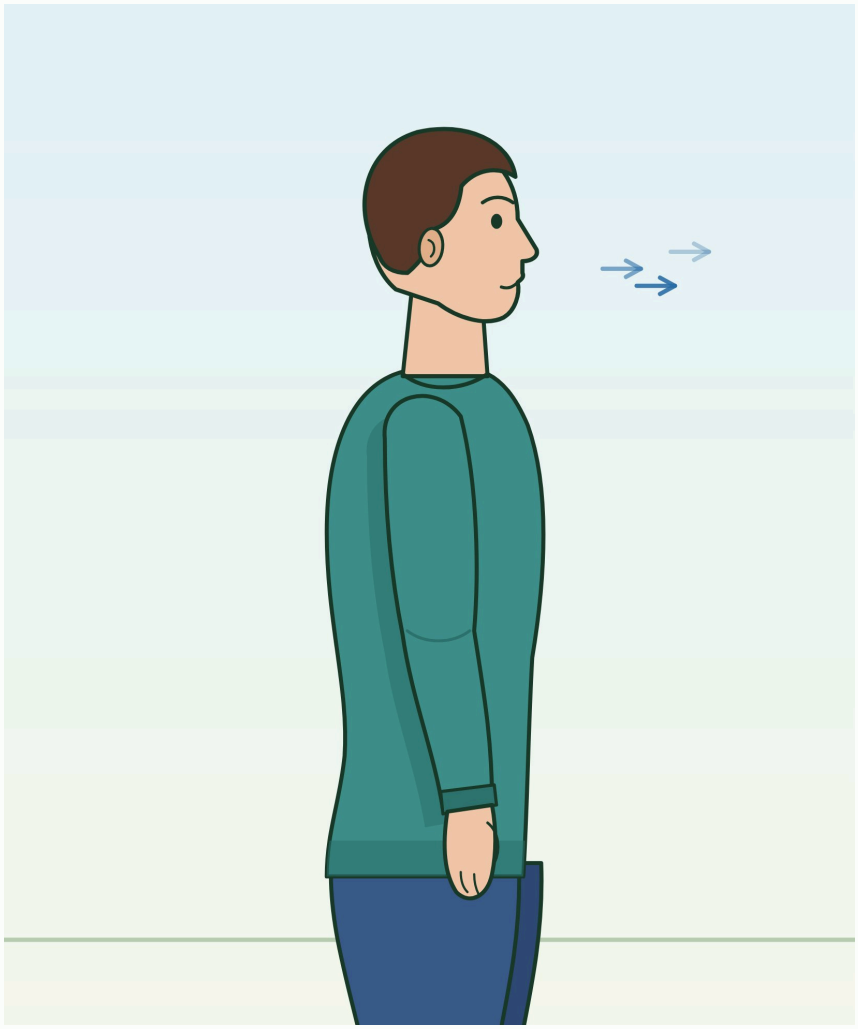
7 _____ layer: contracts for _____, lowering them.

8 They are _____: fibres run in different directions, and one stretches the other.

Your own notes

ANNOTATE THE FIGURE

Annotate this still from the animation (Intercostal muscles at work): what is happening, and why?



REMEMBER IT

IEEI: Inhale External, Exhale Internal

I I E	E E I
I	E

SUMMARY

Sum up section 10 in two or three sentences of your own.

11 Why travel at all?

B3.3.9 HL

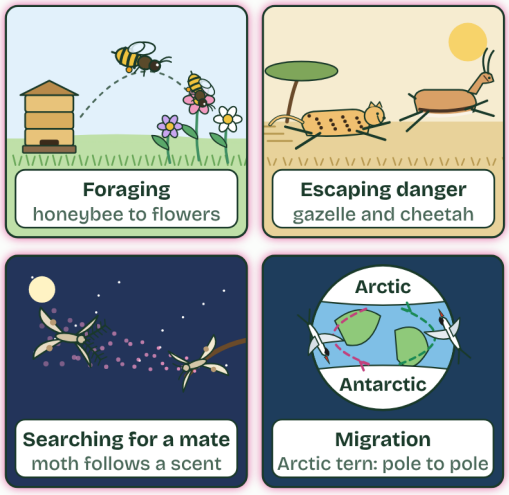
CUES

NOTES

Your own notes

ANNOTATE THE FIGURE

Label each part and say what it does: foraging for food., escaping from danger., searching for a mate., migration..



SUMMARY

Sum up section 11 in two or three sentences of your own.

12 Built for diving

B3.3.10 HL

CUES

Predict: Why does a dolphin breathe out explosively through its blowhole when it surfaces?

NOTES

1 _____ body, _____, and a tail with a _____ that beats _____.

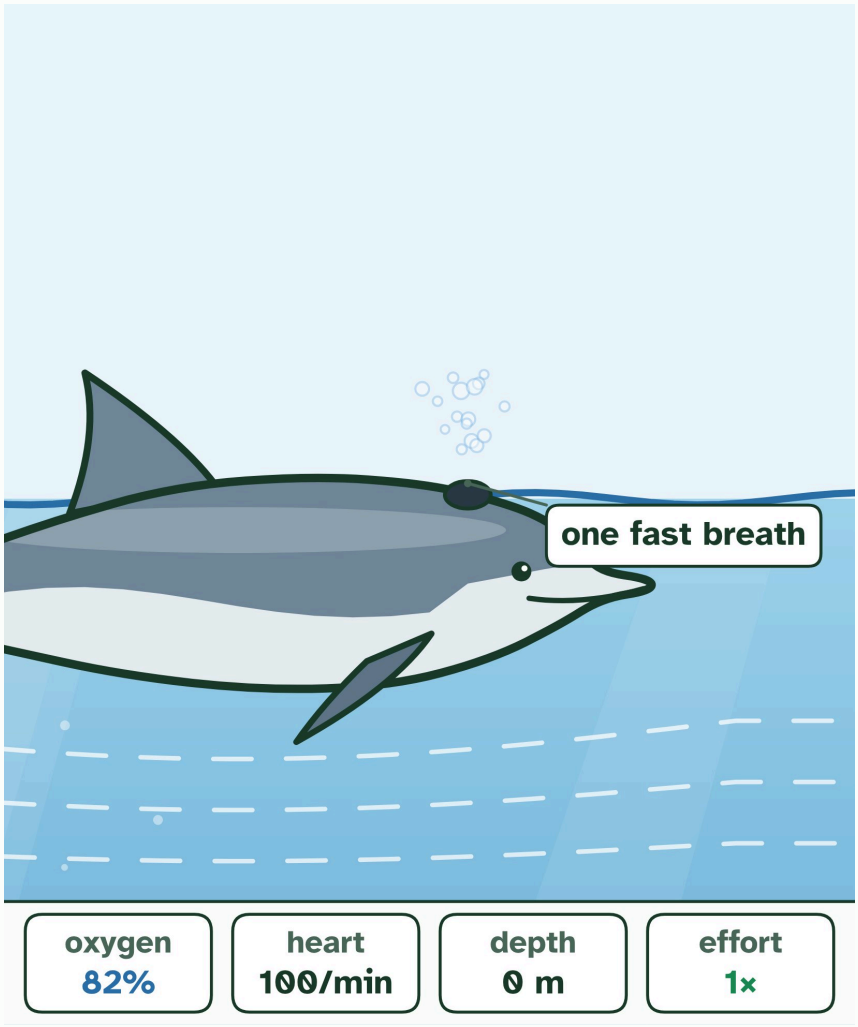
2 A _____ that can be closed: the animal _____ and breathes _____.

3 Each adaptation saves _____ or _____.

Your own notes

ANNOTATE THE FIGURE

Annotate this still from the animation (A dolphin swimming and diving): what is happening, and why?



SUMMARY

Sum up section 12 in two or three sentences of your own.

Check yourself

The check for this guide is online: a fresh paper of past-paper style questions from the exam bank on B3.3 each time, marked as you go, and saved to your Exam practice progress when you are signed in. Scan the code, or type the link.

biologybybradford.com/exam-maker/sit?topics=B3.3&level=HL&paper=quiz&marks=15&src=ep

How this was made. The course structure, the activities and the teaching choices come from my own classroom, my presentations and my years of teaching IB and AP Biology. I use Claude, an AI, to help write and build the interactive guides, lesson plans, slides and practice questions, and to draw the diagrams and code the interactives. I direct the work and review it against the IB and AP specifications before it goes live.