

W3L1 | Lens detective

Monday | 09:30–10:10 | Introduce | Standard route

Name: _____ Date: _____

Core first. Your teacher will select the questions that fit this lesson. Write, speak, point or dictate your own words. Keep your first attempt so you can improve it.

Work together

Choose $\times 4$ then $\times 40$ objectives with a $\times 10$ eyepiece. Predict the total each time.

1. A $\times 10$ eyepiece is used with $\times 4$, $\times 10$ and $\times 40$ objectives. Calculate the three totals.

2. A blurred image is enlarged. Does it necessarily show two close dots more clearly? Explain.

W3L1 | Continue and improve

Standard route | Use after the core questions when directed

3. **Record your route: real microscope / digital model. Give one observation and one thing this route cannot establish.**

Optional transfer

Why must the specimen be centred before increasing magnification?

Improve the same work

One correction I made, and why:

My request for next time: _____

W3L2 | Calculation relay — without a race

Wednesday | 09:30–10:10 | Explore | Standard route

Name: _____ Date: _____

Core first. Your teacher will select the questions that fit this lesson. Write, speak, point or dictate your own words. Keep your first attempt so you can improve it.

Work together

Work alone or in a pair. One person chooses the relationship; the other checks the units. Swap for the next item.

1. **A. Image = 20 mm; actual = 0.1 mm. Calculate magnification.**

2. **B. Image = 50 mm; actual = 0.5 mm. Calculate magnification.**

W3L2 | Continue and improve

Standard route | Use after the core questions when directed

3. **C. Magnification = $\times 400$; actual = 0.05 mm. Calculate image size.**

4. **D. Image = 30 mm; magnification = $\times 600$. Calculate actual size.**

5. **E. Image = 25 mm; actual = 50 μm . Calculate magnification.**

6. **F. Put nm, μm and mm in order from smallest unit to largest.**

Optional transfer

What happens to M if only the printed image length doubles?

Improve the same work

One correction I made, and why:

My request for next time: _____

W3L3 | Find the first faulty step

Friday | 09:30–10:10 | Do | Standard route

Name: _____ Date: _____

Core first. Your teacher will select the questions that fit this lesson. Write, speak, point or dictate your own words. Keep your first attempt so you can improve it.

Work together

Read the stated measurements. This route does not depend on the printer scale.

1. **A cell image is 48 mm long; the actual cell is 80 μm . Sam writes $48 \div 80 = \times 0.6$. Identify and repair the error.**

2. **A printed scale bar represents 20 μm . It measures 10 mm on the paper; the cell measures 25 mm. Calculate the cell's actual length.**

W3L3 | Continue and improve

Standard route | Use after the core questions when directed

3. The print is enlarged to 200%. Explain what changes and what stays the same.

Optional transfer

Two pupils judge the same fuzzy image edge differently. Suggest a sensible reporting choice.

Improve the same work

One correction I made, and why:

My request for next time: _____

W4L1 | Counter crossings

Monday | 09:30–10:10 | Introduce | Standard route

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Work together

Draw two equal-volume regions: 12 particles left and 3 right. Predict the initial net direction.

Illustrative model/sample data - these are not measurements made by this class.

Model interval	Left → right	Right → left
Early	8	2
At balance	5	5

Your labelled sketch / model

1. Use the early crossing counts to calculate net movement and direction.

2. At balance, how much net movement is there? What is still happening?

W4L1 | Continue and improve

Standard route | Use after the core questions when directed

3. Explain one reason a higher temperature can increase diffusion rate.

Optional transfer

Why must the two starting regions have equal volumes if particle counts alone are used to compare concentration?

Improve the same work

One correction I made, and why:

My request for next time: _____

W4L2 | Build an alveolus explanation

Wednesday | 09:30–10:10 | Explore | Standard route

Name: _____ Date: _____

Core first. Your teacher will select the questions that fit this lesson. Write, speak, point or dictate your own words. Keep your first attempt so you can improve it.

Work together

Sketch an alveolus next to a capillary. Label air and blood.

Gas	Alveolar air relative to arriving blood	Net direction
Oxygen	Higher	
Carbon dioxide	Lower	

Your labelled sketch / model

1. Complete both net-direction entries.

2. Explain how thin walls help oxygen uptake.

W4L2 | Continue and improve

Standard route | Use after the core questions when directed

3. Explain how blood flow helps maintain gas exchange.

Optional transfer

If the wall thickens, will extra ventilation necessarily restore the original exchange rate?

Improve the same work

One correction I made, and why:

My request for next time: _____

W4L3 | Evidence conference

Friday | 09:30–10:10 | Do | Standard route

Name: _____ Date: _____

Core first. Your teacher will select the questions that fit this lesson. Write, speak, point or dictate your own words. Keep your first attempt so you can improve it.

Work together

Read the controlled comparison below; it is illustrative model data, not a class experiment.

Illustrative model/sample data - these are not measurements made by this class.

Model patch	Contact area / cm ²	Transfer / model units per minute
A	10	4
B	20	8

1. Describe the comparison using numbers.

2. Concentration difference, membrane and temperature are held constant. Explain the increase.

W4L3 | Continue and improve

Standard route | Use after the core questions when directed

3. Does this prove that every real medicine patch should be doubled in size? Explain.

Optional transfer

Name a repeat measurement that would strengthen this comparison.

Improve the same work

One correction I made, and why:

My request for next time: _____

W5L1 | Membrane decisions

Monday | 09:30–10:10 | Introduce | Standard route

Name: _____ Date: _____

Core first. Your teacher will select the questions that fit this lesson. Write, speak, point or dictate your own words. Keep your first attempt so you can improve it.

Work together

Draw a plant cell in each of three labelled surroundings: more dilute than its cell solution, equal, and more concentrated.

Your labelled sketch / arrows:

More dilute outside	Equal concentrations	More concentrated outside

1. Predict net water movement in the three cases, in order.

2. Explain why the potato may lose mass in a solution more concentrated than its cell solution.

W5L1 | Continue and improve

Standard route | Use after the core questions when directed

3. If water can mix freely and there is no separating membrane, why is “osmosis” not the precise name?

Optional transfer

At equal concentrations, has water stopped moving?

Improve the same work

One correction I made, and why:

My request for next time: _____

W5L2 | Design a fair potato investigation

Wednesday | 09:30–10:10 | Explore | Standard route

Name: _____ Date: _____

Core first. Your teacher will select the questions that fit this lesson. Write, speak, point or dictate your own words. Keep your first attempt so you can improve it.

Work together

Choose the paper/sample route unless the approved practical has been arranged with suitable staffing and equipment.

Illustrative model/sample data - these are not measurements made by this class.

Solution label	Initial mass / g	Final mass / g	Change / g	Change / %
Water	4.00	4.40		
0.4 mol dm ⁻³ sucrose	4.00	4.00		
0.8 mol dm ⁻³ sucrose	4.00	3.60		

Route used: planning/sample data / approved practical. Record what actually happened.

1. These are illustrative sample data. Complete mass change and percentage change.

2. Name the independent variable, dependent variable and two controls.

W5L2 | Continue and improve

Standard route | Use after the core questions when directed

3. Some cylinders are not blotted. Explain the problem and a specific improvement.

Optional transfer

Would one cylinder at each concentration show the spread of results?

Improve the same work

One correction I made, and why:

My request for next time: _____

W5L3 | Data detective

Friday | 09:30–10:10 | Do | Standard route

Name: _____ Date: _____

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Work together

Use class data if available; otherwise label this dataset “illustrative sample data”.

Illustrative model/sample data - these are not measurements made by this class.

Sucrose / mol dm ⁻³	Repeat 1 / %	Repeat 2 / %	Repeat 3 / %	Mean / %
0.0	18	20	22	
0.2	10	12	14	
0.4	0	2	4	
0.6	-10	-8	-6	
0.8	-18	-20	-22	

1. Complete all five means. Describe the trend.

2. Estimate zero change using a straight line between the nearest values either side of zero.

W5L3 | Continue and improve

Standard route | Use after the core questions when directed

3. An extra repeat at 0.6 gives +9%. What should you do before excluding it?

Optional transfer

Add the +9% repeat at 0.6. Find the new mean and explain its effect.

Improve the same work

One correction I made, and why:

My request for next time: _____

W6L1 | Carrier and energy model

Monday | 09:30–10:10 | Introduce | Standard route

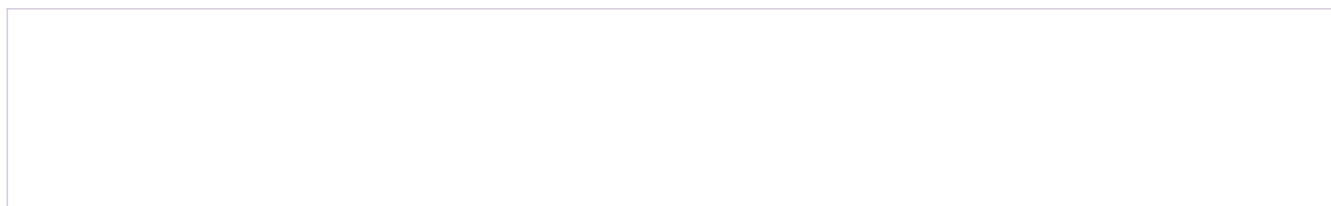
Name: _____ Date: _____

Core first. Your teacher will select the questions that fit this lesson. Write, speak, point or dictate your own words. Keep your first attempt so you can improve it.

Work together

Draw two equal-volume regions: 2 nitrate-ion counters outside and 8 inside, separated by a membrane.

Your labelled sketch / model



1. Which way is nitrate moving relative to its concentration gradient?

2. Name the mechanism and its energy source.

W6L1 | Continue and improve

Standard route | Use after the core questions when directed

3. If respiration is greatly reduced, predict the effect on nitrate uptake and explain.

Optional transfer

Does a large surface area alone prove active transport?

Improve the same work

One correction I made, and why:

My request for next time: _____

W6L2 | Two-clue uptake investigation

Wednesday | 09:30–10:10 | Explore | Standard route

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Work together

Read the concentration evidence. The numbers are model values in the same units.

Illustrative model/sample data - these are not measurements made by this class.

Context	Outside	Inside	Normal uptake index	Inhibited index
Root nitrate	2	8	100	15
Gut glucose	3	9	100	20

1. For each context, identify the gradient direction of inward uptake.

2. Explain why the two clues support active transport.

W6L2 | Continue and improve

Standard route | Use after the core questions when directed

3. Link a root-hair adaptation and a gut-cell adaptation to their functions.

Optional transfer

What extra check would help show that the inhibitor did not simply kill the cells?

Improve the same work

One correction I made, and why:

My request for next time: _____

W6L3 | Transport card sort

Friday | 09:30–10:10 | Do | Standard route

Name: _____ Date: _____

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Work together

Cut the four scenario cards or number them on paper; a seated route works equally well.

1. **A. Oxygen has a higher concentration in alveolar air than in arriving blood. It moves into blood.**

2. **B. Water enters a root cell from a solution more dilute than the cell solution, through a partially permeable membrane.**

W6L3 | Continue and improve

Standard route | Use after the core questions when directed

3. **C. Mineral ions enter a root cell against their gradient; uptake requires energy from respiration.**

4. **D. A substance crosses a cell membrane. No other information is given.**

Optional transfer

Write one similarity and two linked differences between diffusion and active transport.

Improve the same work

One correction I made, and why:

My request for next time: _____

Transport scenario cards

W6L3 | Place, number or point to a card; cutting is optional

Sort into diffusion, osmosis, active transport or need more evidence. Give the deciding clue.

Sort each card. Give the deciding clue before naming the process.

Diffusion	Osmosis	Active transport	Need more evidence
A. Oxygen has a higher concentration in alveolar air than in arriving blood. It moves into blood.		B. Water enters a root cell from a solution more dilute than the cell solution, through a partially permeable membrane.	
C. Mineral ions enter a root cell against their gradient; uptake requires energy from respiration.		D. A substance crosses a cell membrane. No other information is given.	

My deciding clues

W7L1 | Repair the knowledge map

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Work together

Teach the three cell adaptations below before using them in the map.

Cell	Feature	Function
Sperm	Tail; many mitochondria	Movement towards the egg; energy for movement
Egg	Nutrient-rich cytoplasm	Supports early development after fertilisation
Ciliated epithelial cell	Beating cilia	Moves mucus and trapped particles along the airway

1. Explain one of the cell adaptations using feature → function.

2. Correct: “A larger image always has more resolution.”

W7L1 | Continue and improve

Standard route | Use after the core questions when directed

3. Write three reasoned links between magnification, units, osmosis, percentage change, active transport and respiration.

Optional transfer

Choose a review priority and quote one piece of your work as evidence.

Improve the same work

One correction I made, and why:

My request for next time: _____

W7L2 | Command-word clinic

Wednesday | 09:30–10:10 | Explore | Standard route

Name: _____ Date: _____

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Work together

Identify the command word before you answer.

1. **Describe:** concentration rises from 0.2 to 0.6 mol dm⁻³ while mean mass change falls from +12% to -8%. State the pattern.

2. **Explain:** “The alveolar wall is thin.” Add the missing mechanism and consequence.

W7L2 | Continue and improve

Standard route | Use after the core questions when directed

3. **Calculate:** image length is 30 mm and actual length is 75 μm .

4. **Evaluate:** “We should repeat it.” Make this a specific, justified improvement to the potato investigation.

Optional transfer

Compare is not two unrelated lists. Write one linked transport comparison.

Improve the same work

One correction I made, and why:

My request for next time: _____

W7L3 | Independent evidence and response

Friday | 09:30–10:10 | Do | Standard route

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Work together

In the 40-minute lesson, complete questions 2, 3 and 5 from the assessment booklet during the 10-minute Independent Task.

1. **My question numbers and first attempt are on the assessment pages. Which answer will I improve?**

2. **What exact scientific detail did I change, and why is it clearer?**

W7L3 | Continue and improve

Standard route | Use after the core questions when directed

3. What should happen next because of my feedback?

Optional transfer

Explain why an answer can include key words but still be scientifically wrong.

Improve the same work

One correction I made, and why:

My request for next time: _____