Science teaching guide

Weeks 3–7 | LAUNCH | How to run the Office pack

Teach from the PowerPoints in the weekly folders. Their first eight stages form one 40-minute lesson. Answer boards, worksheet pages and video pages are resources reached through buttons; they are not extra lesson time.

First lesson setup

1. Keep the whole extracted pack together, then upload or sync its folders to OneDrive.
2. Open the week's plan and print the selected worksheet PDF. The standard worksheet is also available in Word.
3. Download or sync the PowerPoint before teaching, then use Slide Show mode. All diagram and worksheet images are stored inside the presentation.
4. Use Check / Reveal after an attempt, then Return to task. The sequence can also be followed using the stage buttons.
5. Online model and video buttons open the browser and need an internet connection. Relative file links work from the downloaded folder; OneDrive's preview may not resolve them. Every worksheet is also pictured inside the PowerPoint, and the named files sit alongside it.
6. Use the paper activity and still diagram if the browser cannot open. PowerPoint contains no macros or required add-ins.

Access and pupil voice

Offer writing, speaking, pointing or the pupil's own dictated words. Keep support optional. Ask what they want to revisit, listen, agree who will act and return to that request next lesson. Keep assessment scores and personal responses private.

The pack teaches cells, microscopy and transport taught so far; it does not claim all of GCSE Topic 1 is complete. The full assessment is an original 24-mark classroom paper, not an official paper or a grade predictor.

Practical and media decisions

Keep a record of the route actually used

Week 3

Microscopes and prepared slides are optional. Use them only with the approved handling procedure and suitable staffing. The diagram route supports observation and calculation; it does not show that a pupil has handled a microscope. Have calculators and rulers ready. Questions use stated lengths, so printer scaling does not affect the answers.

Week 4

Paper, counters, pens and calculators are enough. The datasets are illustrative. Use the alveolus drawing for gas exchange. An optional physical demonstration needs the setting's approved procedure; dye spreading in warm water may include convection.

Week 5

Wednesday defaults to planning and labelled sample-data analysis. If the approved potato practical is arranged, agree the exposure interval, adult supervision and named collection handover before the lesson. A teacher or technician collects the results after the approved exposure; keep those results for Friday. Do not leave potatoes soaking until Friday. Watching a video or using staff samples does not establish pupil practical completion.

Week 6

Use counters or the projected model. Friday includes printable scenario cards. Pupils can place, number or point to cards; cutting and dragging are optional. Ask for concentration and energy evidence before naming the process.

Week 7

Print the assessment for Friday. Use Q2, Q3 and Q5 only in the ten-minute Independent Task: 11 marks. The full 24-mark paper requires a separate 25-minute slot. Keep first attempts and scores private, and agree one precise next action.

Video prompts and alternatives

Optional concept clips | freesciencelessons

Microscopy

https://www.youtube.com/watch?v=L5StAE_uuxM

Ask: What is the difference between making an image bigger and resolving more detail?

Pause on the first relevant example, then take an explanation. Use at most 90 seconds within the model slot. If unavailable, use the labelled model in the PowerPoint and answer the same question.

Diffusion

https://www.youtube.com/watch?v=O965gA4goVI

Ask: What keeps happening when there is no net movement?

Pause on the first relevant example, then take an explanation. Use at most 90 seconds within the model slot. If unavailable, use the labelled model in the PowerPoint and answer the same question.

Gas exchange in the lungs

https://www.youtube.com/watch?v=aPUPfzsqDgs

Ask: How does a thin wall help oxygen move into the blood?

Pause on the first relevant example, then take an explanation. Use at most 90 seconds within the model slot. If unavailable, use the labelled model in the PowerPoint and answer the same question.

Osmosis

https://www.youtube.com/watch?v=B0cH91joZwA

Ask: Which substance moves, through what, and in which net direction?

Pause on the first relevant example, then take an explanation. Use at most 90 seconds within the model slot. If unavailable, use the labelled model in the PowerPoint and answer the same question.

Active transport

https://www.youtube.com/watch?v=ECldVkp6Rw0

Ask: What two clues distinguish active transport from diffusion?

Pause on the first relevant example, then take an explanation. Use at most 90 seconds within the model slot. If unavailable, use the labelled model in the PowerPoint and answer the same question.

Links were located on 5 September 2026. Playback and filtering depend on the school connection. The material is linked, not downloaded or rebadged. Source: https://www.freesciencelessons.co.uk/gcse-biology-paper-1/cell-biology/

W3L1 | Microscopy

Staff only | answers and response guidance

Core explanation: Magnification is how many times larger an image is. Resolution is whether close points can be seen separately. Enlarging a blur does not recover detail.

Misconception: Do not add the lens powers. At high power use fine focus only; follow the microscope's approved procedure.

Retrieval: A microscope. Greater magnification, e.g. a higher-power lens or enlarging a print. Suitable resolution/optics and correct focus; enlargement alone is not enough.

Starter: No — size and detail are different

We Do: ×400 Correct relationship. Now state which two lens values were multiplied.

Worksheet answers

1. ×40; ×100; ×400. Multiply eyepiece by objective.

2. No. Magnification increases image size; resolution is the ability to distinguish nearby points. Enlargement alone adds no detail.

3. Accept a route-labelled observation. A digital drawing cannot establish the real specimen's appearance or demonstrate practical handling.

Transfer: The field of view becomes smaller, so an off-centre specimen may disappear.

Independent model: The total magnification changes from ×40 to ×400 because 10 × 40 = 400. The field of view becomes smaller, so less of the specimen is visible. The image appears larger, but improved resolution depends on the optics and focus, not magnification alone. The digital model does not reproduce real specimen preparation or optical limits.

Exit: A larger image may still be blurred; resolution concerns seeing nearby points separately.

Support: Ask which change is about size and which is about detail before naming either term.

Source adaptation: W3 Magnification slides 5–7; microscopy is retained from the LAUNCH baseline.

W3L2 | Magnification

Staff only | answers and response guidance

Core explanation: Name the unknown, match the units, select the relationship, substitute, then check. Magnification is a ratio: write ×200, not 200 mm.

Misconception: 50 µm is 0.05 mm, not 50 mm. A correct final value is not evidence that the unit route was understood.

Retrieval: M = I ÷ A (also I = M × A). 1000 µm. So the ratio compares like units; otherwise a scale factor remains hidden.

Starter: ×1000

We Do: 24 mm = 24,000 µm Correct. Now divide 24,000 µm by 60 µm.

Worksheet answers

1. 20 ÷ 0.1 = ×200.

2. 50 ÷ 0.5 = ×100.

3. I = M × A = 400 × 0.05 = 20 mm.

4. A = I ÷ M = 30 ÷ 600 = 0.05 mm = 50 µm.

5. 50 µm = 0.05 mm; 25 ÷ 0.05 = ×500.

6. nm, µm, mm. Each adjacent unit here differs by a factor of 1000.

Transfer: M doubles because actual size is unchanged and M = I ÷ A.

Independent model: 36 mm = 36,000 µm. Magnification = image size ÷ actual size = 36,000 ÷ 90 = ×400. This is plausible because the measured image is hundreds of times larger than the actual cell.

Exit: Convert image and actual size to the same unit before dividing.

Support: Ask which two values are known and whether their units match before discussing arithmetic.

Source adaptation: W3 worksheet Tasks 1–3 and W3 slides 6–9.

W3L3 | Scale Bars

Staff only | answers and response guidance

Core explanation: A ruler measurement changes if a picture is resized. A scale bar stays useful if the image and bar are resized together.

Misconception: Do not claim pupils measured a real cell if they used stated lengths or a model. A precise-looking number is not automatically an accurate measurement.

Retrieval: 80 µm. A = I ÷ M. Fuzzy edge, ruler alignment, scale-bar measurement or image resizing.

Starter: Their units and working

We Do: Rearrangement/relationship Correct diagnosis. Magnification uses image size divided by actual size.

Worksheet answers

1. Units were not matched. 48 mm = 48,000 µm; 48,000 ÷ 80 = ×600.

2. Cell is 25 ÷ 10 = 2.5 scale bars long; 2.5 × 20 = 50 µm.

3. Printed cell and bar both double. Their ratio and the estimated actual length stay the same. The printed image magnification doubles.

Transfer: Repeat the measurement, record the range/uncertainty and avoid unsupported precision; do not invent a single exact boundary.

Independent model: 48 mm = 48,000 µm. Magnification = 48,000 ÷ 80 = ×600. A unit error would be visible if millimetres and micrometres were divided directly or converted by the wrong factor. A measurement error would be checked by realigning the ruler with the specimen edges and measuring again.

Exit: Check unit conversion and powers of ten first; then check the measurement and arithmetic.

Support: Do not repair the whole calculation. Ask the pupil to name the error type and change one step.

Source adaptation: W3 worksheet estimation and exam-style task; W3 slides 8–10.

W4L1 | Diffusion

Staff only | answers and response guidance

Core explanation: Particles move randomly in both directions. Net movement is the difference between those two movements, not a rule obeyed by every particle.

Misconception: Passive means no energy supplied by respiration is needed. It does not mean particles have no kinetic energy.

Retrieval: Amount of a substance per unit volume. A difference/change in concentration across a distance. More particles on one side produce more crossings from that side on average.

Starter: Yes — more particles begin on the high side

We Do: Particles move randomly, with net movement down the gradient Accurate. Use crossing counts to justify the net direction.

Worksheet answers

1. 8 − 2 = 6 particles net left to right in this illustrative interval.

2. 5 − 5 = 0 net. Particles still move randomly and cross both ways.

3. Particles have greater average kinetic energy and move faster, so exchange occurs faster, other conditions unchanged.

Transfer: Concentration is amount per volume. Unequal volumes can make counts misleading.

Independent model: Chamber A has the faster initial net diffusion because its concentration difference is larger. Particles move randomly in both directions, but more particles begin on the left in A, so more left-to-right crossings occur at first. This produces a greater net movement down the concentration gradient.

Exit: Random particle movement and crossings continue at equilibrium.

Support: Ask the pupil to compare starting counts on both sides before discussing direction.

Source adaptation: W4 Diffusion worksheet particle model and exam task; no W4 PPTX was supplied.

W4L2 | Gas Exchange

Staff only | answers and response guidance

Core explanation: For each feature, say what it changes physically and why that affects diffusion. “Good lungs” is not an explanation.

Misconception: Both alveolar and capillary walls contribute to the diffusion path. Do not describe oxygen as choosing a destination.

Retrieval: Alveolar air into arriving blood, down its oxygen gradient. Arriving blood into alveolar air, down its CO_2 gradient. Temperature, concentration gradient, distance or surface area.

Starter: A thinner wall

We Do: It removes oxygenated blood and maintains a gradient Correct. Link maintained gradient to continued net diffusion.

Worksheet answers

1. Oxygen: air into blood. Carbon dioxide: blood into air.

2. They give a short diffusion distance, so oxygen crosses more quickly down its gradient.

3. Blood flow removes oxygenated blood and brings blood with less oxygen, helping maintain the oxygen gradient; it also supplies CO_2 for diffusion into the alveolus.

Transfer: No. Ventilation can help maintain a gradient but does not remove the longer diffusion path.

Independent model: A thicker alveolar wall increases the distance oxygen must diffuse, so the rate of oxygen movement into blood falls. Faster ventilation may maintain a steep oxygen concentration gradient, but it does not make the thickened exchange surface thinner, so the longer diffusion path remains.

Exit: A thin exchange surface shortens the diffusion distance.

Support: Ask for the feature, then its physical effect, then the diffusion consequence; do not jump straight to ‘more efficient’.

Source adaptation: W4 worksheet oxygen/CO_2 context, expanded through the existing lungs lesson.

W4L3 | Diffusion Evidence

Staff only | answers and response guidance

Core explanation: Describe tells us the pattern. Explain links that pattern to a mechanism. Evaluation asks whether the evidence supports the conclusion.

Misconception: Dye spreading in warm water can include convection. Do not present an uncontrolled demonstration as proof of diffusion rate alone.

Retrieval: Net particle movement from higher to lower concentration, down a gradient. A shorter distance increases exchange rate, other conditions unchanged. Scientific cause linked to consequence.

Starter: Surface area and distance

We Do: The small cube had a shorter average diffusion distance, so dye reached its centre sooner. Correct: evidence, scientific cause and consequence are linked.

Worksheet answers

1. Area doubles from 10 to 20 cm^2 and transfer doubles from 4 to 8 model units per minute.

2. A larger area gives more surface for particles to cross at the same time, increasing total net transfer down the gradient.

3. No. These are model data. Real doses, materials and biological effects are not established; do not change medicines from this classroom model.

Transfer: Measure transfer per minute repeatedly for both areas under the same controlled conditions.

Independent model: A larger contact area provides more surface through which particles can diffuse at the same time. If a concentration gradient is maintained, this can increase the total net movement of medicine across the skin each minute. Repeated measurements of mass released per minute for both patch designs would strengthen the conclusion.

Exit: Description states what changed; explanation states why using the science.

Support: Ask which evidence changes the gradient, distance or area; do not dictate a model answer.

Source adaptation: W4 worksheet rate-factor explanation task.

W5L1 | Osmosis

Staff only | answers and response guidance

Core explanation: Osmosis is net water movement through a partially permeable membrane from a more dilute to a more concentrated solution.

Misconception: The potato is tissue, not a single membrane. Its cells have membranes. “Concentrated” must be relative to the solution on the other side.

Retrieval: The overall difference between movements in opposite directions. Which substances can pass into or out of a cell. No; random movement continues both ways.

Starter: Water

We Do: Net movement of water through a partially permeable membrane from a more dilute to a more concentrated solution Accurate GCSE phrasing for this course.

Worksheet answers

1. Into the cell; no net movement; out of the cell.

2. Water leaves cells by osmosis through their partially permeable membranes, causing net water loss and lower tissue mass.

3. Osmosis requires a partially permeable membrane. Without one, water can mix/diffuse but this is not osmosis across a membrane.

Transfer: No. Movement continues both ways at equal average rates, so net movement is zero.

Independent model: Water moves out of the plant cell by osmosis because the surrounding sugar solution is more concentrated and the cell membrane is partially permeable. Water can cross the membrane in the model, but the larger solute particles are blocked. Unlike active transport, osmosis does not move solute against a concentration gradient using cellular energy.

Exit: Water and a partially permeable membrane; also state the correct net direction.

Support: Ask what can cross the membrane and compare the solutions before giving any direction cue.

Source adaptation: W5 Osmosis slides 5–7 and worksheet Task 1.

W5L2 | Osmosis Investigation

Staff only | answers and response guidance

Core explanation: Today's default cover route is planning and sample-data analysis. A full soak, repeated measurements and graph do not fit inside a six-minute shared-task slot.

Misconception: Only record practical completion for pupils who actually carry out the approved practical. Sample data and pre-soaked staff samples are not proof of that completion.

Retrieval: Solution/sucrose concentration. (Final mass − initial mass) ÷ initial mass × 100. To avoid different amounts of surface solution distorting final mass.

Starter: Final mass compared with initial mass

We Do: It compares the change with the starting value Correct. Dividing by initial mass makes different starting masses more comparable.

Worksheet answers

1. Water: +0.40 g, +10%. 0.4: 0.00 g, 0%. 0.8: −0.40 g, −10%. Use (final − initial) ÷ initial × 100.

2. Independent: sucrose concentration. Dependent: percentage change in potato mass. Controls include potato source/dimensions, solution volume, exposure time, temperature and blotting.

3. Surface solution adds to final mass and can exaggerate gain or hide loss. Use the same gentle blotting procedure for every cylinder.

Transfer: No. Use repeats at each concentration, retain raw results and compare their variation.

Independent model: Different cylinder diameters change surface area and the amount of potato tissue, so concentration may not be the only cause of different percentage changes. Use a cork borer and cut equal lengths. Unequal blotting leaves different amounts of solution on the surface, changing the measured final mass; use the same blotting method and time. A negative percentage change means the potato lost mass because net water movement was out of its cells by osmosis.

Exit: Repeats show variation and can reduce random effects in a mean; they do not correct a systematic method error.

Support: Ask what must stay the same and what the named problem could do to the measured mass before suggesting an improvement.

Source adaptation: W5 slides 8–10 and worksheet results/evaluation task.

W5L3 | Osmosis Data

Staff only | answers and response guidance

Core explanation: Keep the raw data visible. Flag unusual values and investigate. Never delete a value simply because the graph looks tidier without it.

Misconception: Between +12% at 0.2 and −8% at 0.6, straight-line interpolation gives 0.44 mol dm^{-3}, not the midpoint 0.4.

Retrieval: Mass loss relative to starting mass. To investigate it and justify a mean decision; unusual does not automatically mean wrong. x: concentration / mol dm^{-3}; y: mean percentage change in mass / %.

Starter: Keep it visible and investigate before deciding

We Do: The tested tissue and solution had little or no net water movement under those conditions Accurate and appropriately cautious.

Worksheet answers

1. Means: +20, +12, +2, −8, −20%. Mean mass change decreases as concentration increases.

2. Between (0.4,+2) and (0.6,−8): $0.4 + (2 \div 10) \times 0.2 = 0.44$ mol dm^{-3}. It is an approximate interpolation.

3. Retain and flag it; check labels, raw masses, calculation, timing and blotting, then repeat if feasible. State evidence for inclusion/exclusion rather than deleting automatically.

Transfer: $(-10 - 8 - 6 + 9) \div 4 = -3.75\%$. It makes the mean less negative and changes the inferred crossing/trend.

Independent model: Assuming a straight line between the two means: $0.2 + (12 \div 20) \times 0.4 = 0.44$ mol dm^{-3}. This is approximate because the real curve may not be straight and repeats vary. Test extra concentrations around 0.44 mol dm^{-3} with repeats.

Exit: An unusual result can be genuine variation or error; investigate before deciding.

Support: Ask what the data shows before asking what it means, and require a reason for any exclusion decision.

Source adaptation: W5 percentage-change and evaluation tasks, extended with repeated data and graphing.

W6L1 | Active Transport

Staff only | answers and response guidance

Core explanation: Active transport uses energy released by respiration to move a substance against its concentration gradient through membrane transport proteins.

Misconception: Diffusion is random at particle level. The contrast is net movement down a gradient versus energy-dependent movement against it, not “diffusion never moves backwards”.

Retrieval: Net movement from higher to lower concentration of that substance. Water. Diffusion and osmosis. Either is acceptable for the singular question.

Starter: No — movement against the gradient needs another mechanism

We Do: A substance moved against its concentration gradient and needed energy Correct. Now state that respiration supplies the energy.

Worksheet answers

1. From lower outside to higher inside, against its concentration gradient.

2. Active transport; energy released by respiration, using membrane transport proteins.

3. Less energy is available, so active uptake is expected to slow or stop. The model’s instant on/off switch simplifies a real cell.

Transfer: No. Surface area can support passive and active exchange; gradient and energy evidence distinguish them.

Independent model: Nitrate ions move from a lower concentration outside the cell to a higher concentration inside, which is against the concentration gradient. Active transport is therefore required and uses energy supplied by respiration through membrane transport proteins. If respiration is strongly reduced, less energy is available and nitrate uptake will slow or stop.

Exit: Active transport is energy-dependent movement against a gradient, not a fast version of net diffusion.

Support: Ask the pupil to compare concentrations and trace the movement arrow before naming the process.

Source adaptation: W6 slides 5–8 and worksheet Task 1.

W6L2 | Root Hairs And Gut

Staff only | answers and response guidance

Core explanation: Use two clues: direction relative to the gradient and dependence on respiration. “Root hair” or “gut” alone does not determine every transport mechanism.

Misconception: The gut can use more than one transport mechanism. Here the stated against-gradient uptake and energy evidence support active transport.

Retrieval: To take up mineral ions when their concentration is lower outside than inside. More membrane area for exchange/uptake at the same time. Against-gradient uptake falls when respiration is inhibited, with suitable controls.

Starter: Less respiration means less energy for active transport

We Do: Uptake continues against the gradient and falls when respiration is inhibited Correct: both direction and energy dependence support active transport.

Worksheet answers

1. Both move from lower outside to higher inside; both inward movements are against the gradient.

2. Inward uptake continues against the concentration gradient and falls when respiration is inhibited, supporting energy-dependent transport.

3. Root-hair extension gives a large contact area for absorption. Gut microvilli increase membrane area for uptake. Many transport proteins provide routes; mitochondria support energy demand.

Transfer: Check viability and compare with an appropriate untreated control; a drop in uptake alone is not conclusive about one protein or pathway.

Independent model: Glucose is moving from a lower concentration in the intestine to a higher concentration inside the epithelial cell, so diffusion alone cannot explain continued uptake. The fall when respiration is inhibited shows that the process needs cellular energy, supporting active transport. A large folded surface and membrane transport proteins increase opportunities for uptake; mitochondria support the energy demand.

Exit: Add how the feature changes area, transport capacity or energy supply, and how this affects uptake.

Support: Ask whether concentration evidence alone is enough, then prompt for a second clue about energy or respiration.

Source adaptation: W6 slides 6–9 and root-hair explanation task.

W6L3 | Compare Transport

Staff only | answers and response guidance

Core explanation: Read the evidence before naming the process. Some statements belong to more than one process; some scenarios do not contain enough information.

Misconception: “Water only” points to osmosis, but the membrane and relative solutions still matter. Movement through a membrane alone does not prove active transport.

Retrieval: Osmosis, through a partially permeable membrane. Active transport, using cellular energy. Diffusion and osmosis need no energy supplied by respiration.

Starter: The moving substance is water and the membrane is partially permeable

We Do: Both can move substances across membranes, whereas only active transport can move against a concentration gradient using cellular energy. Correct comparison using both/whereas/only.

Worksheet answers

1. Diffusion: net oxygen movement down its concentration gradient.

2. Osmosis: net water movement through a partially permeable membrane from more dilute to more concentrated.

3. Active transport: against-gradient movement with cellular energy.

4. Insufficient evidence: need substance, gradient direction and energy evidence.

Transfer: Both move substances and may occur across cell membranes. Diffusion is net movement down a gradient without energy supplied by respiration; active transport moves against a gradient using that energy.

Independent model: Both diffusion and active transport can move substances across cell membranes, whereas diffusion is net movement down a concentration gradient and active transport can move against it using cellular energy. Oxygen enters blood by diffusion down its concentration gradient. Water enters the root hair cell by osmosis through a partially permeable membrane. Mineral ions moving against their concentration gradient require active transport and energy from respiration.

Exit: Among these three processes, only active transport uses cellular energy to move a substance against its gradient.

Support: Ask for the deciding clue before accepting a process label; then ask for one linked comparison.

Source adaptation: W6 missing sort cards, comparison table and exam-style comparison.

W7L1 | Review

Staff only | answers and response guidance

Core explanation: This reviews cells, microscopy and transport taught so far. It is not a claim that every part of GCSE Topic 1, including enzymes, has been completed.

Misconception: Do not turn confidence colours into public rankings. Ask for a piece of work or a corrected explanation to support a review choice.

Retrieval: M = I ÷ A. Osmosis: water through a partially permeable membrane without energy from respiration. Active transport: against-gradient movement using that energy. Solution/sucrose concentration.

Starter: All three are valid links

We Do: A thinner alveolar wall shortens diffusion distance Correct causal link.

Worksheet answers

1. Accept the accurate feature–function pair from the table; e.g. beating cilia move mucus and trapped particles.

2. Magnification increases apparent size. Resolution is seeing nearby points separately; enlargement does not necessarily improve it.

3. Accept accurate causal links: matching units for magnification; mass change as osmosis evidence; respiration supplies energy for active transport.

Transfer: Pupil-owned choice supported by an actual uncertainty, correction or successful answer; no fixed choice.

Independent model: Magnification calculations require image and actual size in matching units, often millimetres and micrometres. Diffusion is net movement down a concentration gradient, while osmosis is net water movement through a partially permeable membrane. Potato mass percentage change provides evidence about osmosis when control variables are kept constant. Active transport can move substances against a gradient using energy from respiration. An anomalous result should remain visible and be investigated before deciding whether to include it in a mean.

Exit: Accept an evidence-backed learning choice. The adult records the next action, not a public grade.

Support: Ask for the reason connecting two ideas; do not turn the map into rapid-fire recall or a public score.

Source adaptation: W7 slides 3–6 and review worksheet; specialised cells are taught before being assessed.

W7L2 | Command Words

Staff only | answers and response guidance

Core explanation: The command word tells you the kind of answer. Marks depend on the question and its mark scheme, not magic words such as “whereas”.

Misconception: “Evaluate” is more than listing improvements: weigh relevant evidence or method strengths/limits and make a supported judgement where asked.

Retrieval: State the pattern/features, using relevant values. A scientific cause/reason linked to the observed consequence. For a method limitation: issue, effect on evidence, justified improvement; weigh strengths/limits if asked.

Starter: State

We Do: Unequal cylinder diameter changes surface area, so concentration is not the only cause; use equal diameters. Correct weakness → consequence → improvement chain.

Worksheet answers

1. As concentration increases from 0.2 to 0.6, mean mass change decreases from +12% to −8%.

2. A thin wall gives a short diffusion distance, so oxygen can diffuse into blood more quickly down its gradient.

3. 30 mm = 30,000 µm; M = I ÷ A = 30,000 ÷ 75 = ×400.

4. Repeat each concentration using the same controlled method to measure spread and calculate a mean. Repeats do not fix inconsistent blotting, so standardise that too.

Transfer: E.g. both can move solutes across membranes, but diffusion is down a gradient and active transport can be against it using cellular energy.

Independent model: Describe: percentage change becomes less positive and then negative as concentration increases. Explain: a thin alveolar wall shortens diffusion distance, so oxygen reaches blood faster. Compare: both processes can move substances across membranes, whereas only active transport can move against a gradient using cellular energy. Evaluate: inconsistent blotting leaves different surface solution masses; standardise the blotting method and time. Calculate: 30 mm = 30,000 µm; magnification = 30,000 ÷ 75 = ×400.

Exit: Explain usually needs a scientific cause linked to a consequence; the actual wording still controls the answer.

Support: Ask which command word sets the answer shape before prompting Biology content.

Source adaptation: W7 test/review preparation, expanded into a full Explore lesson.

W7L3 | Assessment And Response

Staff only | answers and response guidance

Core explanation: This is original low-stakes classroom assessment, not an official Pearson paper and not a grade predictor. Use agreed access arrangements and keep results private.

Misconception: A 25-minute paper cannot fit inside a 10-minute Independent Task. The main lesson uses a selected short set; the complete paper is a separately scheduled option.

Retrieval: Make a genuine first attempt using agreed access arrangements. mm to µm: multiply by 1000; reverse: divide by 1000. Name the method detail, its effect on the result and a justified improvement.

Starter: Any mode can be valid when the reason fits the learning need

We Do: Open the answer-shape checklist, identify one missing link and edit the same answer Correct improvement cycle.

Worksheet answers

1. Pupil selects one genuine attempt; do not substitute a copied model.

2. Accept an accurate change, e.g. adding the membrane and water direction to an osmosis explanation.

3. Accept a concrete task/reteach/retrieval choice, received by the adult and recorded without claiming it has already happened.

Transfer: The relationships can be wrong, e.g. a sentence may mention a gradient while reversing its direction. A keyword check is not marking.

Independent model: Use Q2, Q3 and Q5 of the marking guide below. The reflection prompts are not replacement assessment questions.

Exit: Pupil identifies an actual correction and a specific next learning action.

Support: Ask which command word and answer-shape element is missing; preserve authorship and avoid dictating the final response.

Source adaptation: W7 slides 7–10 and reflection worksheet; the missing assessment and marking guidance are newly written.

Assessment mark scheme

Staff only | original classroom rubric | 24 marks overall

Credit scientifically equivalent wording. Use the point-specific guidance below; key words alone do not establish a correct relationship. Do not penalise the same carried-forward arithmetic error twice. No grade boundaries are assigned.

1. Cells and their jobs [4 marks]

Cell membrane. [1]

Contains genetic material/DNA and controls cell activities. Accept either appropriate statement for [1].

Tail enables movement/swimming [1], helping it reach the egg for fertilisation [1].

2. Magnification [4 marks]

M = **I** ÷ A [1]; 25 mm = 25,000 µm or 50 µm = 0.05 mm [1]; correct substitution/division [1]; ×500 [1]. Correct unsupported ×500: 1/4. Do not double penalise a consistent carried-forward arithmetic error.

3. Diffusion [3 marks]

Particles move randomly/both ways [1]; net movement is from higher to lower oxygen concentration [1]; down a concentration gradient [1]. Credit the direction and gradient separately only when both ideas are clear; no energy from respiration is needed but that is not an extra mark here.

Assessment mark scheme

Staff only | original classroom rubric | 24 marks overall

Credit scientifically equivalent wording. Use the point-specific guidance below; key words alone do not establish a correct relationship. Do not penalise the same carried-forward arithmetic error twice. No grade boundaries are assigned.

4. Osmosis data [5 marks]

(3.60 − 4.00) ÷ 4.00 × 100 [1]; −10% [1]. The negative sign matters. A correct unsupported −10% gains the answer mark only.

Net water moves out of the cells [1]; through partially permeable cell membranes [1]; by osmosis from the more dilute cell solution to the more concentrated surroundings [1].

5. Active transport [4 marks]

Active transport [1]; ions move against the concentration gradient, lower outside to higher inside [1]; membrane transport/carrier proteins [1]; energy released by respiration [1].

6. Evaluate a method [4 marks]

Use the same gentle blotting method on every cylinder [1] so varying surface solution does not distort final mass [1]. Use repeats at each concentration [1] to reveal spread and support a mean/reduce random effects [1]. Repeats do not remove a systematic blotting error.