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**B1 L10**

# B1 L10 Active transport and exchange surfaces: Exam questions worksheet

## Mark scheme · Total 20 marks

/ means alternative answers. ( ) words in brackets are not needed for the mark. **allow** = accept this answer. **ignore** = this does not lose or gain a mark. **do not accept** = this answer cannot score the mark. If a tick-box question has more than one box ticked, give 0 marks.

| Question | Answers | Extra information | Mark | AO / Spec. ref. |
|---|---|---|---|---|
| **01.1** | line 1 (to the arch): **gill arch** (1)<br>line 2 (to the top filament): **gill filament** (1)<br>line 3 (to the vessel): **blood vessel** (1) | 1 mark for each correct label.<br>**allow** capillary for line 3.<br>If more than one word from the box is written on one line, do not give that mark. | 3 | AO1<br>4.1.3.1 |
| **01.2** | They are covered in tiny plates. | | 1 | AO1<br>4.1.3.1 |
| | | **Question 01 total** | **4** | |
| **02.1** | 6 × 0.5 × 0.5 (1)<br>= **1.5** ($cm^2$) (1) | Correct answer with no working = 2 marks. | 2 | AO2<br>4.1.3.1<br>(maths) |
| **02.2** | **12 : 1** | **allow** their 02.1 answer ÷ 0.125, written as ___ : 1.<br>**do not accept** 1 : 12. | 1 | AO2<br>4.1.3.1<br>(maths) |
| **02.3** | the bigger the cube, the longer it takes to become colourless | **allow** "the smaller the surface area to volume ratio, the longer it takes".<br>"it takes longer" alone = 0: the answer must link size or ratio to time. | 1 | AO3<br>4.1.3.1 |
| **02.4** | a larger cube / organism has a smaller surface area to volume ratio, so it takes much longer for substances to diffuse to its middle (1)<br>so a large organism needs exchange surfaces (to take in enough) and a transport system (to carry substances to every cell) (1) | **allow** data used for the first mark, for example "the 2 cm cube took about 4 times as long as the 1 cm cube". | 2 | AO3<br>4.1.3.1 |
| | | **Question 02 total** | **6** | |
| **03** | the concentration of nitrate ions is higher in the root hair cell (25) than in the soil water (0.5) / 50 times higher (1)<br>so the ions must move against the concentration gradient, which needs energy from respiration (1) | The first mark needs data or a comparison from Table 2.<br>**allow** "diffusion would move nitrate ions out of the cell" for the second mark.<br>**do not accept** "energy is made / produced". | 2 | AO2<br>4.1.3.3 |
| | | **Question 03 total** | **2** | |
| **04** | villi row: ✓ large surface area, ✓ efficient blood supply, no tick for ventilated (1)<br>leaf row: ✓ large surface area only (1) | Each row must be fully correct for its mark. | 2 | AO1<br>4.1.3.1 |
| | | **Question 04 total** | **2** | |

| Question | Answers | Extra information | Mark | AO / Spec. ref. |
|---|---|---|---|---|
| **05** | Level of response: see the level descriptors and indicative content below. | | 6 | AO1 4.1.3.1, 4.1.3.2, 4.1.3.3 |
| | | **Question 05 total** | **6** | |
| | | **TOTAL** | **20** | |

## 05 Level descriptors

| Level | Marks | Descriptor |
|---|---|---|
| **3** | **5–6** | A detailed and coherent comparison of all three processes. What moves, which way it moves (relative to the concentration gradient) and whether energy is needed are given for each, with clear similarities and differences, and examples. |
| **2** | **3–4** | A comparison of at least two of the processes, with some similarities or differences correctly stated. There may be an omission or one error. |
| **1** | **1–2** | Simple statements about one or more of the processes, with little or no comparison. |
| **0** | **0** | No relevant content. |

## 05 Indicative content

- all three move substances into or out of cells / across membranes
- diffusion: the net movement of particles from a higher to a lower concentration / down a concentration gradient
- diffusion happens in gases and in solutions; example: oxygen into the blood / carbon dioxide out of a respiring cell
- osmosis: the movement of water only
- osmosis: from a dilute solution to a more concentrated solution, through a partially permeable membrane
- osmosis is the diffusion of water
- in osmosis, water moves; in active transport, a dissolved substance (such as mineral ions or sugar) moves
- example of osmosis: water into a root hair cell
- active transport: from a more dilute to a more concentrated solution / from a lower to a higher concentration / against a concentration gradient
- active transport needs energy from respiration; diffusion and osmosis do not
- examples of active transport: mineral ions into root hair cells / sugar from the gut into the blood
- cells that do a lot of active transport have many mitochondria
- **do not accept** “energy is made / produced”; for osmosis, “from a high concentration to a low concentration” is credited only if it says “of water”

## Model answers

**01.1** 1 gill arch; 2 gill filament; 3 blood vessel. **01.2** They are covered in tiny plates. **02.1** $6 \times 0.5 \times 0.5 = 1.5$ cm². **02.2** $1.5 : 0.125 = 12 : 1$. **02.3** The bigger the cube, the longer it takes to become colourless. **02.4** Bigger cubes have a smaller surface area to volume ratio and take much longer for the acid to diffuse to the middle. So a large organism needs exchange surfaces to take in enough, and a transport system to carry substances to every cell.

**03** The concentration of nitrate ions is higher in the root hair cell (25) than in the soil water (0.5). So the ions must be moved against the concentration gradient, and this needs energy from respiration. **04** villi: large surface area and efficient blood supply; leaf: large surface area only.

**05 (Level 3)** All three move substances into or out of cells. In diffusion, particles of a gas or a dissolved substance move from a higher to a lower concentration, for example oxygen into the blood. Osmosis is the diffusion of water only, from a dilute solution to a more concentrated solution through a partially permeable membrane, for example water into a root hair cell. Active transport is different: it moves substances from a lower to a higher concentration, against the concentration gradient, for example mineral ions into a root hair cell. Active transport needs energy from respiration, so cells that do a lot of it have many mitochondria. Diffusion and osmosis need no energy.

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