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**B1 L8**

# B1 L8 Diffusion: 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 (the crowded area): **higher concentration** (1)<br>line 2 (the other area): **lower concentration** (1)<br>line 3 (the arrow): **net movement** (1) | 1 mark for each correct label.<br>If more than one phrase from the box is written on one line, do not give that mark.<br>**do not accept** 'osmosis' or 'cell wall'. | 3 | AO1<br>4.1.3.1 |
| **01.2** | **Diffusion happens in gases and in solutions.** | | 1 | AO1<br>4.1.3.1 |
| | | **Question 01 total** | **4** | |
| **02.1** | 7.5 ÷ 30 (1)<br>= **0.25** (mm per minute) (1) | Correct answer with no working = 2 marks.<br>4 (30 ÷ 7.5) = 0 marks.<br>**allow** 0.25 written as 1/4. | 2 | AO2<br>4.1.3.1<br>(maths) |
| **02.2** | as the concentration of the dye increases, the **distance moved increases** | **allow** 'the higher the concentration, the further the dye moves'.<br>**allow** 'each time the concentration doubles, the distance goes up by 1.5 mm'.<br>**do not accept** 'it goes up' with no variable named. | 1 | AO3<br>4.1.3.1 |
| **02.3** | the **difference in concentration** between the dye and the agar is bigger / the concentration gradient is steeper (1)<br>so the (net) **rate of diffusion is faster** / more dye particles diffuse into the agar in the same time (1) | **allow** 'more particles move out of the well than move back'.<br>**ignore** 'there is more dye'.<br>**do not accept** 'the particles have more energy' (that is temperature). | 2 | AO2<br>4.1.3.1 |
| | | **Question 02 total** | **5** | |
| **03.1** | the **removal of waste products made in the body** | **allow** 'getting rid of waste made by the body / by cells'.<br>**ignore** 'in urine' / 'by the kidneys'.<br>**do not accept** 'getting rid of undigested food / faeces' or 'getting rid of waste' with no idea that the waste is made in the body. | 1 | AO1<br>4.1.3.1 |
| **03.2** | there are more urea particles / the **concentration of urea is higher** in the liver cell than in the blood (plasma) (1)<br>so urea **diffuses** / there is a net movement **from a higher to a lower concentration** / down the concentration gradient (1) | **allow** '11 urea particles in the cell and 2 in the blood' for the first mark.<br>**do not accept** 'the cell pushes urea out' or 'the kidneys pull urea into the blood'. | 2 | AO2<br>4.1.3.1 |
| | | **Question 03 total** | **3** | |
| **04** | in hot water the particles have **more (kinetic) energy** (1)<br>so they **move faster** (so they spread out / diffuse faster) (1) | **ignore** convection / currents.<br>**do not accept** 'the particles expand / get bigger / melt'.<br>**do not accept** 'the hot water has more energy' alone for the first mark: the answer must refer to the particles. | 2 | AO2<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<br>AO2<br>4.1.3.1 |
| | | **Question 05 total** | **6** | |
| | | **TOTAL** | **20** | |

## 05 Level descriptors

| Level | Marks | Descriptor |
|---|---|---|
| **3** | **5–6** | A detailed and coherent explanation. How both gradients are kept steep is explained (cells use oxygen and make carbon dioxide; the blood keeps flowing), and this is clearly linked to fast diffusion and to why the cells need it (respiration, removal of waste). |
| **2** | **3–4** | How at least one gradient is kept steep is explained, with some link to faster diffusion or to respiration. The links may be incomplete. |
| **1** | **1–2** | Simple relevant statements, for example ‘the blood brings oxygen’ or ‘cells use oxygen’, with little or no link to the concentration gradient. |
| **0** | **0** | No relevant content. |

## 05 Indicative content

- cells use oxygen in respiration, so the oxygen concentration inside the cells stays low
- flowing blood keeps bringing fresh blood with a high oxygen concentration
- so the oxygen concentration is higher in the blood than in the cells: a steep gradient
- respiration makes carbon dioxide, so its concentration inside the cells stays high
- flowing blood carries carbon dioxide away (to the lungs, where it is breathed out), so its concentration in the blood next to the cells stays low
- the heart keeps the blood moving / the blood is replaced all the time
- a steeper concentration gradient gives a faster rate of diffusion
- so the cells get oxygen fast enough for respiration, which releases energy (for example for muscle contraction)
- so carbon dioxide (a waste product) does not build up in the cells
- if the blood stopped flowing, the gradients would become less steep and diffusion would slow down
- during exercise, cells respire faster, so the gradients become steeper

**do not credit** ‘respiration gives the oxygen energy to diffuse’ or ‘energy is made / produced’ (these statements do not score; the rest of the answer can still score).

## Model answers

**01.1** 1 higher concentration; 2 lower concentration; 3 net movement. **01.2** Diffusion happens in gases and in solutions. **02.1** 7.5 ÷ 30 = 0.25 mm per minute. **02.2** As the concentration of the dye increases, the distance it moves increases. **02.3** The 8 % dye has the biggest difference in concentration between the dye and the agar, so the concentration gradient is steepest and the dye diffuses fastest.

**03.1** The removal of waste products made in the body. **03.2** There are more urea particles in the liver cell than in the blood, so the concentration of urea is higher in the cell. Urea diffuses from the higher to the lower concentration, into the blood. **04** In the hot water the particles have more energy, so they move faster and spread out faster.

**05 (Level 3)** Respiration in the cells uses oxygen all the time, so the oxygen concentration inside the cells stays low. The blood keeps flowing, pumped by the heart, so fresh blood with a high oxygen concentration keeps arriving. This keeps the oxygen gradient between the blood and the cells steep. Respiration also makes carbon dioxide, so its concentration inside the cells is high, and the flowing blood carries it away to the lungs, so its concentration in the blood stays low. Steep gradients mean fast diffusion. This is important because the cells need oxygen quickly for respiration, which releases the energy they need, and carbon dioxide is a waste product that must not build up.

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