

Biomedical Admissions Test (BMAT)

Section 2: Biology

Questions by Topic

B2 - Movement Across Membranes

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B2: Movement Across Membranes - Questions by Topic

(Mark Scheme and explanations at the end)

- 1 The following are all correct statements about factors affecting the rate of diffusion, except one.

Which one is incorrect?

- A The greater the concentration difference between the two particles at different locations the faster the rate of diffusion.
- B The greater the distance the particles have to travel the slower the rate of diffusion.
- C The rate of diffusion increases as the particle size decreases.
- D The smaller the surface area the faster the particles will diffuse.
- E As the temperature increases the kinetic energy of the particles increases, increasing the rate of diffusion.

- 2 The following statements are about active transport.

- 1 Cells that carry out active transport have large numbers of mitochondria.
- 2 Active transport is the movement of particles from an area of high concentration to an area of low concentration, down a concentration gradient.
- 3 The chemical energy from respiration is used for the movement of the particles.
- 4 Active transport can be affected by anything that affects respiration, such as lack of oxygen.
- 5 Carrier proteins are required for active transport, they are in the cell membrane and move particles from one side to the other.

Which of these statements are correct?

- A 1, 2, 3 and 4
- B 1, 2, 3 and 5
- C 1, 2 and 4
- D 1, 4 and 5
- E 2, 4 and 5
- F 2 and 4
- G 1 and 4
- H 2 and 5



3 The following statements are about the movement of particles.

- 1** Particles diffuse from an area of low concentration to high concentration.
- 2** Osmosis is the movement of water across a partially permeable membrane from an area of low concentration of solute to an area of high concentration of solute.
- 3** Active transport is the movement of particles from an area of high concentration to an area of low concentration, and this requires energy.
- 4** Carrier proteins are only able to move with the concentration gradient.
- 5** Osmosis plays a role in ensuring that a plant stays upright.

Which of the following statements about the movement of particles is correct?

- A** 1, 2, 4 and 5
- B** 1, 2 and 5
- C** 1, 4 and 5
- D** 3, 4 and 5
- E** 1 and 5
- F** 2 and 5
- G** 1 and 4
- H** 2 and 4





4 Below is a table with information on movement across membranes.

Select the row which is correct.

	Diffusion	Active Transport	Osmosis
A	Passive movement from a higher water potential to a lower water potential.	Active movement from a lower concentration to a higher concentration.	Passive movement from a higher concentration to a lower concentration of particles.
B	Passive movement from a higher concentration of particles to a lower concentration.	Active movement from a higher concentration to a lower concentration.	Passive movement from a higher water potential to a lower water potential.
C	Passive movement from a higher concentration of particles to a lower concentration.	Active movement from a lower concentration to a higher concentration.	Passive movement from a lower water potential to a higher water potential.
D	Passive movement from a higher concentration of particles to a lower concentration.	Active movement from a lower concentration to a higher concentration.	Passive movement from a higher water potential to a lower water potential.
E	Passive movement from a lower concentration of particles to a higher concentration.	Active movement from a higher concentration to a lower concentration.	Passive movement from a lower water potential to a higher water potential.





- 5 Which of the following is incorrect about active transport?
- A It involves the movement of particles from a lower concentration to a higher concentration.
 - B One example of active transport is the uptake of nitrates into plant root cells from soil.
 - C It requires energy generated by respiration.
 - D It is the process by which urea enters the bloodstream from animal liver cells.
 - E Substances move against their concentration gradient.

- 6 Which of the following is not a factor which increases the rate of diffusion?
- A An increased concentration gradient
 - B Higher temperature
 - C Larger distance
 - D Smaller particles
 - E A large surface area

- 7 Here are three statements about osmosis.
- 1 When animal cells fill with water, this creates turgor pressure.
 - 2 A lack of water in animal cells will cause them to become crenated.
 - 3 A salt solution has higher water potential than the cytoplasm.

Which of the following statements are true?

- A 1 only
- B 2 only
- C 3 only
- D 1 and 2 only
- E 1 and 3 only
- F 2 and 3 only
- G None of the above





8 A cell contains many mitochondria.

Which method of transport may this cell be adapted to carry out?

- A Diffusion
- B Active transport
- C Osmosis
- D Cannot tell





Answers and Explanations

1 The answer is D

- A** is correct - as **concentration difference** affects the rate of diffusion. The greater the difference in concentration between the particles in two different locations.
- B** is correct - distance between the two locations also affects the rate of diffusion. The **smaller the distance** between the two locations of the particles the **less time** it takes for the particles to travel.
- C** is correct - the smaller the particle size the faster the rate of diffusion.
- D** is incorrect - as the **surface area to volume ratio** affects the rate of diffusion, therefore the greater the surface area the faster the rate of diffusion. As there is a greater area present for diffusion to take place.
- E** is correct - **kinetic energy** affects the rate of diffusion. With the increase in temperature the amount of kinetic energy in the particles also increases, thus increasing the rate of reaction.

Since **A, B, C and E** are the only correct statements, **D** must be the correct answer.

Exam Tip - it is essential to remember the factors that will affect the rate of diffusion:

- Concentration gradient
- Temperature
- Distance
- Size
- Surface area



2 The answer is D

- 1 is correct - as active transport is not passive, the particles move in the opposite direction to how particles move in diffusion, this **requires energy** in the form of ATP from respiration. Therefore cells carrying out active transport require a **lot of mitochondria to provide the ATP**.
- 2 is incorrect - this is because the statement is describing the process of diffusion, where particles move from an area of high concentration to an area of low concentration, therefore the particle moves down the concentration gradient. However, active transport is the opposite, particles move from an **area of low concentration to an area of high concentration**, therefore the particles **move up/against the concentration**, and this **requires energy**.
- 3 is incorrect - as the chemical energy produced from respiration is **converted into kinetic energy**, this is what enables the movement of the particles to carry out active transport, not the chemical energy itself.
- 4 is correct - as active transport is dependent on energy in the form of ATP from respiration, any factor that will affect the rate of respiration will affect active transport, such as **toxins** or **lack of oxygen**.
- 5 is correct - the cell membrane is partially permeable and lets small particles diffuse through, however **carrier proteins are required for active transport**. These allow particles to be actively transported to the other side.

Since **1**, **4**, and **5** are the only correct statements, **D** must be the correct answer.

3 The answer is F

- 1 is incorrect - particles diffuse from an area of high concentration to low concentration aerobic respiration.
- 2 is correct.
- 3 is incorrect - active transport is the movement of particles from an area of low concentration to an area of high concentration (the opposite of passive diffusion), and this therefore **requires energy**.
- 4 is incorrect - the purpose of **carrier proteins** is that they **allow specific molecules to move against the concentration gradient**.
- 5 is correct - water moves into plants via osmosis, making them stiff and turgid, which allows the plant to stay upright.



4 **D is the answer.** This is the only row in the table which correctly describes each of the three processes.

- A is incorrect because it switches the definitions of diffusion and osmosis.
- B is incorrect because it has the wrong definition for active transport.
- C is incorrect because it has the wrong definition for osmosis
- E is incorrect because it has the wrong definition for all three.

5 **D is the answer.** This is the only statement which is incorrect.

- A is true because active transport occurs against the concentration gradient.
- B is true – nitrates are necessary but there is a higher concentration in the root hair cells so their uptake is by active transport.
- C is true – active transport requires energy.
- E is true because, again, active transport occurs against the concentration gradient.

6 **C is the answer.** A larger diffusion distance decreases the rate of diffusion.

- A is incorrect because a greater concentration gradient increases the rate of diffusion.
- B is incorrect because a higher temperature increases the kinetic energy of particles, increasing the rate of diffusion.
- D is incorrect because smaller particles diffuse more easily.
- E is incorrect because this increases the area across which diffusion can occur.

7 **B is the answer.** Only statement 2 is correct.

- Statement 1** is incorrect – turgor pressure is created when plant cells fill with water as the cell membrane pushes onto the cell wall whilst animal cell's cell membrane can burst with excess water.
- Statement 2** is correct. When animal cells are placed in more concentrated solutions, it has a lower water potential than the cytoplasm and so the water will move out of the cytoplasm which is crenation.
- Statement 3** is incorrect. A salt solution is a vague concept and whilst it is possible that it will have a higher water potential, it is not always true.





8 **B is the answer.** Cells involved in active transport require large amounts of energy and so have many mitochondria to generate this.

A and **C** are incorrect as they are passive processes which do not require energy.

