Higher Combined version — Higher Tier (★) included; Separate-only (◆) removed.

Q1. Define diffusion and state whether energy is required.

[2 marks]

Q2. Describe how THREE factors affect the rate of diffusion.

[3 marks]

Q3. Explain how the alveoli in the lungs are adapted for efficient gas exchange by diffusion.

[4 marks]

★ HIGHER TIER

Q4. ★ State Fick's Law and use it to explain why large organisms need specialised exchange surfaces.

[2 marks]

Total: 11 marks

ME: Diffusion

Q1 (2 marks)

Define diffusion and state whether energy is required.

• Net movement of particles from a region of HIGH concentration to a region of LOW concentration (down a concentration gradient) [1]

• Passive process — no energy (ATP) required [1]

Q2 (3 marks)

Describe how THREE factors affect the rate of diffusion.

• Steeper concentration gradient → faster diffusion [1]

• Higher temperature → more kinetic energy → faster diffusion [1]

• Larger surface area → faster diffusion [1] — accept: shorter/thinner membrane

Q3 (4 marks)

Explain how the alveoli in the lungs are adapted for efficient gas exchange by diffusion.

• Large total surface area — millions of tiny alveoli [1]

• Thin walls — one cell thick, minimises diffusion distance [1]

• Dense capillary network — continuously removes O■ and delivers CO■, maintaining steep concentration gradient [1]

• Moist lining — gases dissolve before diffusing [1]

Q4 (2 marks) [★ HT]

★ State Fick's Law and use it to explain why large organisms need specialised exchange sur…

• Rate of diffusion ∝ (surface area × concentration difference) ÷ membrane thickness [1]

• Large organisms have a low SA:V ratio — diffusion alone is too slow; specialised exchange surfaces provide the large surface area and thin membranes required [1]