



Exchange Surfaces

1 Why do organisms like humans require specialised exchange systems, while organisms like bacteria do not?

Smaller organisms such as bacteria have a low surface area to volume ratio so can rely on diffusion, whereas larger organisms like humans cannot because the diffusion distances required would be too large.

This means that humans need mass transport systems to transfer substances around the body and exchange surface to exchange with the environment.

[3 marks]

2 Name an exchange surface and give 3 ways it is adapted for its function

Sample answer:

Exchange surface: Gas exchange surface in humans

- 1) Large because of multiple alveoli
- 2) Good supply of gas and blood to maintain concentration gradient
- 3) Thin for short diffusion distance
- 4) Moist so that gases dissolve

[4 marks]

3 Name three other exchange surfaces (can be in any organism)

- 1) Villi of small intestine
- 2) Root hair cells or leaves in plants
- 3) Gills in fish

[3 marks]

4 Rank the following organisms in order of their surface area to volume ratio, with 1 being the smallest ratio and 4 being the largest ratio

Lynx

Ant

Bacteria

Elephant

[2 marks]

GCSE Biology

- 5 A human cell can be represented by a $100\ \mu\text{m} \times 100\ \mu\text{m} \times 100\ \mu\text{m}$ cube. What is its surface area to volume ratio (remember to convert units to metres)?

$$\text{Surface area} = 6 \times (0.0001 \times 0.0001) = 0.00000006$$

$$\text{Volume} = 0.0001 \times 0.0001 \times 0.0001 = 0.000000000001$$

$$\text{Surface area to volume ratio} = 0.00000006 : 0.000000000001 = 60,000 : 1$$

Surface area to volume ratio: 60,000 : 1

[3 marks]

[Total - 15 marks]