

INKBIOLOGY FLASHCARDS

Exchange surfaces and gas exchange

Unit B07 · 21 cards · fronts and backs

Print double-sided, flipping on the long edge, and each answer lands behind its question. Cut along the card borders.

Definitions in mark-scheme wording, and the misconceptions that lose marks. These cards and each lesson's whole-lesson check run on the website with spaced-repetition scheduling, at inkphysics.co.uk/biology/flashcards.

DEFINITION

Define: Diffusion.

SURFACE AREA TO VOLUME RATIO: WHY SIZE LIMITS DIFFUSION

DEFINITION

Define: Exchange surface.

SURFACE AREA TO VOLUME RATIO: WHY SIZE LIMITS DIFFUSION

DEFINITION

Define: Diffusion distance.

SURFACE AREA TO VOLUME RATIO: WHY SIZE LIMITS DIFFUSION

DEFINITION

Define: Concentration gradient.

SURFACE AREA TO VOLUME RATIO: WHY SIZE LIMITS DIFFUSION

SPOT THE ERROR

Say what is wrong with this claim:

A large animal needs lungs because it has more cells to supply than a small one.

SURFACE AREA TO VOLUME RATIO: WHY SIZE LIMITS DIFFUSION

DEFINITION

Define: Cartilage.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

Define: Ciliated epithelium.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

Define: Goblet cell.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

A surface across which substances move between an organism and its environment, or between two compartments within it.

SURFACE AREA TO VOLUME RATIO: WHY SIZE LIMITS DIFFUSION

DEFINITION

The net movement of particles from a region of higher concentration to a region of lower concentration, down a concentration gradient, as a result of their random motion. It is passive and requires no metabolic energy.

SURFACE AREA TO VOLUME RATIO: WHY SIZE LIMITS DIFFUSION

DEFINITION

The difference in concentration between two points, divided by the distance between them.

SURFACE AREA TO VOLUME RATIO: WHY SIZE LIMITS DIFFUSION

DEFINITION

The thickness of the barrier a substance has to cross, sometimes called the length of the diffusion pathway.

SURFACE AREA TO VOLUME RATIO: WHY SIZE LIMITS DIFFUSION

DEFINITION

A firm, flexible supporting tissue. In the trachea it forms incomplete rings, and in the bronchi irregular blocks, holding the airway open against the pressure drop of inspiration.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

SPOT THE ERROR

The problem is the ratio, not the total. Double an animal's length and its volume rises eightfold while its surface rises fourfold, so every gram of tissue has half the surface serving it. Demand outgrows surface, not supply.

SURFACE AREA TO VOLUME RATIO: WHY SIZE LIMITS DIFFUSION

DEFINITION

A cell in the airway epithelium that secretes mucus, which traps dust, pollen and bacteria.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

An epithelium whose cells carry cilia that beat in a co-ordinated wave, sweeping mucus and trapped particles up towards the throat.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

Define: Smooth muscle.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

Define: Elastic fibres.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

Define: Squamous epithelium.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

Define: Tidal volume.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

Define: Ventilation rate.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

Define: Vital capacity.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

Define: Residual volume.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

SPOT THE ERROR

Say what is wrong with this claim:

Breathing in works by the lungs expanding and pulling air into themselves.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

Fibres that stretch as the lungs inflate and recoil as the muscles relax, providing most of the force for quiet expiration.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

Involuntary muscle in the airway wall; its contraction narrows the lumen, and it is the tissue that contracts inappropriately during an asthma attack.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

The volume of air moved in or out in one normal breath at rest, about 0.5 dm^3 in an adult.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

An epithelium of very flattened cells, giving a wall a fraction of a micrometre thick; the lining of an alveolus.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

The largest volume that can be breathed out after the deepest possible breath in; roughly 4.6 dm^3 in a young adult man and 3.1 dm^3 in a young adult woman.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

The number of breaths taken per minute, about 12 to 15 at rest. Also called breathing rate.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

SPOT THE ERROR

The lungs cannot ventilate themselves; their airway smooth muscle adjusts width, not airflow. The diaphragm and intercostal muscles enlarge the thoracic cavity, the lungs follow it, the pressure inside falls, and only then does air move in. Muscles, volume, pressure, air, in that order.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

The volume left in the lungs after the hardest possible breath out, about 1.2 dm^3 . It cannot be measured with a spirometer, because it never leaves the lungs.

LUNGS: SEVENTY SQUARE METRES, FOLDED INTO A CHEST

DEFINITION

Define: Gill filament.

THREE OTHER ANSWERS: TRACHEAE, GILLS AND STOMATA

DEFINITION

Define: Lamella.

THREE OTHER ANSWERS: TRACHEAE, GILLS AND STOMATA

DEFINITION

Define: Counter-current flow.

THREE OTHER ANSWERS: TRACHEAE, GILLS AND STOMATA

DEFINITION

Define: Operculum.

THREE OTHER ANSWERS: TRACHEAE, GILLS AND STOMATA

SPOT THE ERROR

Say what is wrong with this claim:

A fish's gills work well because water flows over a huge surface area, so plenty of oxygen has the chance to diffuse across.

THREE OTHER ANSWERS: TRACHEAE, GILLS AND STOMATA

DEFINITION

One of the thin plates set at right angles along a gill filament, one cell thick and richly supplied with blood; the actual exchange surface.

THREE OTHER ANSWERS: TRACHEAE, GILLS AND STOMATA

DEFINITION

One of the many thin projections from a gill arch, sometimes called a primary lamella.

THREE OTHER ANSWERS: TRACHEAE, GILLS AND STOMATA

DEFINITION

The bony flap covering the gills of a bony fish, acting as a valve and part of the pump that maintains the flow of water.

THREE OTHER ANSWERS: TRACHEAE, GILLS AND STOMATA

DEFINITION

An arrangement in which two fluids move past each other in opposite directions, so a concentration gradient is maintained along the whole length of the exchange surface.

THREE OTHER ANSWERS: TRACHEAE, GILLS AND STOMATA

SPOT THE ERROR

Area alone would not save the fish. Run water and blood the same way and they equalise part-way along the lamella, after which the remaining surface does nothing. Counter-current flow keeps the water richer in oxygen than the blood beside it the whole way.

THREE OTHER ANSWERS: TRACHEAE, GILLS AND STOMATA