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## **5.4 Gas exchange (2h)**

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- 5.4.1** Describe four features of alveoli that allow them to carry out gas exchange efficiently.
- 5.4.2** Explain the necessity for a ventilation system.
- 5.4.3** Draw a diagram of the gas exchange system including trachea, bronchi, bronchioles and lungs.  
The important points are the relative positions and relative sizes - not artistic accuracy.
- 5.4.4** State the difference between breathing and cell respiration.
- 5.4.5** State that exercise improves the functioning of the heart and lungs.  
Limited to increases in stroke volume of heart and increased tidal volume of lungs leading to a lowering of rate of both heart beat and ventilation rate.
- 5.4.6** Explain how and why breathing rate varies with exercise.  
Limited to the effects of changes in carbon dioxide concentration leading to a lowering of blood pH, which is detected by chemosensors (in the aorta and carotid arteries) that send impulses to the breathing centre in the brain (in the brain stem). This then sends nerve impulses to the diaphragm and intercostal muscles to increase contraction/relaxation rate. Emphasise that this is under involuntary control, but can be controlled voluntarily to some extent. Mention of inspiratory and expiratory centres, partial pressure, carotid and aortic bodies, and a formula for pulmonary ventilation is not required.
- 5.4.7** Outline one health problem concerned with gas exchange.  
An example could be chosen from smoking and cancer, tuberculosis, asthma, emphysema etc., according to needs/wishes of teachers. The specific problem could exemplify the main concepts in this topic.