**Topic 6.4: Gas Exchange**

**Essential Idea: The lungs are actively ventilated to ensure that gas exchange can occur passively.**

​**Statements & Objectives:**

**6.4.U1 Ventilation maintains concentration gradients of oxygen and carbon dioxide between air and alveolu and blood flowing in adjacent capillaries.**

Define gas exchange and ventilation.

(**Define** Give the precise meaning of a word, phrase, concept or physical quantity.)

State the location of gas exchange in humans.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

Outline the mechanism of gas exchange in humans.

(**Outline** Give a brief account or summary.)

Draw a diagram showing the structure of an alveolus and an adjacent capillary

(**Draw** :Represent by means of a labeled, accurate diagram or graph, using a pencil. A ruler(straight edge) should be used for straight lines. Diagrams should be drawn to scale. Graphs should have points correctly plotted(if appropriate) and joined in a smooth curve.)

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**6.4.U2 Type I pneumocytes are extremely thin alveolar cells that are adapted to carry out gas exchange.**

Describe how the structure of the alveoli increases surface area for gas exchange.

**(Describe**: Give a detailed account)

Outline the structure of type 1 pneumocytes.

(**Outline** Give a brief account or summary.)

**6.4.U3 Type II pneumocytes secrete a solution containing surfactant that creates a moist surface inside the alveoli to prevent the sides of the alveolus adhering to each other by reducing surface tension.**

Outline the structure and function of type II pneumocytes.

(**Outline** Give a brief account or summary.)

Describe two functions of the fluid secreted by type II pneumocytes.

**(Describe**: Give a detailed account)

**6.4.U4 Air is carried to the lungs in the trachea and bronchi and then to the alveoli in bronchioles.**

Outline the flow of air into the lungs.

(**Outline** Give a brief account or summary.)

State the role of cartilage in the trachea and bronchi.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

State the role of smooth muscle fibres in the bronchioles.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

**6.4.U5 Muscle contraction causes the pressure changes inside the thorax that force air in and out of the lungs to ventilate them.**

State the relationship between gas pressure and volume.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

Outline the pressure and volume changes that occur during inspiration and expiration.​

(**Outline** Give a brief account or summary.)

**6.4.U6 Different muscles are required for inspiration and expiration because muscles only do work when they contract.**

Explain the contraction and relaxation of muscles through the use of antagonistic muscle pairs.

(**Explain**: Give a detailed account including reasons or causes)

**6.4.A1 External and internal intercostal muscles, and diaphragm and abdominal muscles as examples of antagonistic muscle action.**

Outline the direction of movement of the diaphragm and rib-cage during inspiration and expiration.

(**Outline** Give a brief account or summary.)

Describe the antagonistic muscle contraction and relaxation required to move the rib-cage and diaphragm during inhalation and expiration.

**(Describe**: Give a detailed account)

**6.4.A2 Causes and consequences of lung cancer.**

Outline the causes of lung cancer.

(**Outline** Give a brief account or summary.)

List symptoms of lung cancer.​

(**List** Give a sequence of brief answers with no explanation.)

**6.4.A3 Causes and consequences of emphysema.**

Outline the causes of emphysema.

(**Outline** Give a brief account or summary.)

State the symptoms of emphysema.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

Outline reasons why gas exchange and ventilation are less effective in people with emphysema.

(**Outline** Give a brief account or summary.)

List treatment options for people with emphysema.

(**List** Give a sequence of brief answers with no explanation.)

**6.4.S1 Monitoring of ventilation in humans at rest and after mild and vigorous exercise. (Practical 6)**

Identify the manipulated and responding variables in a test of the effect of exercise on ventilation.

(**Identify** Provide an answer from a number of possibilities. Recognize and state briefly a distinguishing factor or feature.)

Outline techniques for measuring ventilation rate or lung tidal volume.

(**Outline** Give a brief account or summary.)

**6.4.NOS Obtain evidence for theories- epidemiological studies have contributed to our understanding of the causes of the lung cancer.**

Define epidemiology.

(**Define** Give the precise meaning of a word, phrase, concept or physical quantity.)

Outline how epidemiological studies contributed to understanding the association between smoking and lung cancer

(**Outline** Give a brief account or summary.)

**Key Terms**

Respiratory

Respiration

Diaphragm

Pharynx

Alveoli

Inhalation

​gas volume

​antagonistic muscle

carbon dioxide

diffusion

intercostal muscles

larynx

lung capacity

type I pneumocytes

gas pressure

lung cancer

oxygen

ATP

abdominal muscles

trachea

air inhaled

type II ​pneumocytes

​inspiration

abdominal muscles

gas exchange

energy

concentration

bronchi

thoracic cavity

surfactant

emphysema

​lung tidal volume

ventilation

aerobic

capillary bed

bronchioles

expiration

​bronchi

ventilation rate

​​epidemiology