CHAPTER 6.4

Gas Exchange

VENTILATION VS GAS EXCHANGE VS CELL RESPIRATION

Use your IB companion (p.311) and define the following terms:

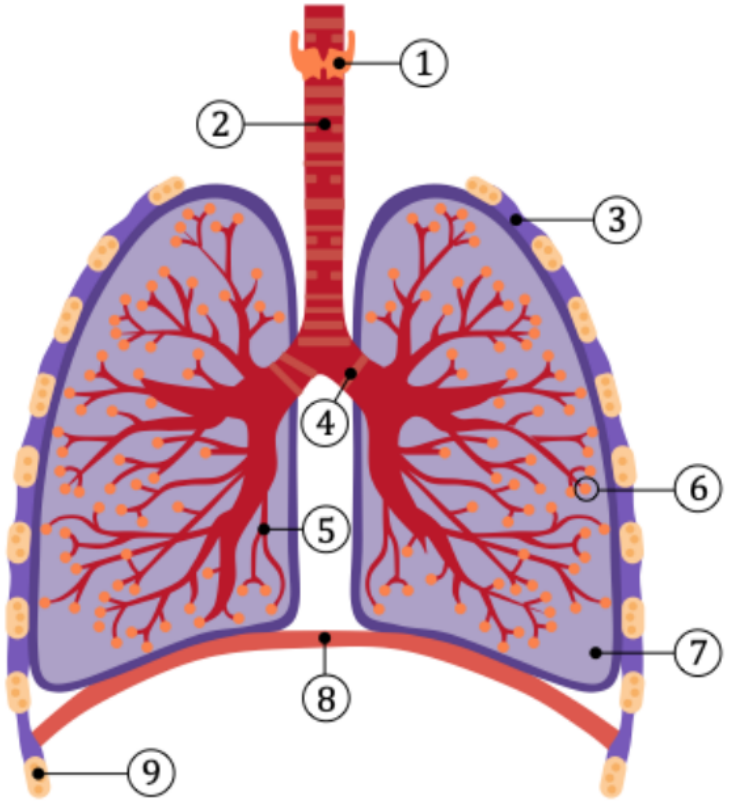
- ventilation
- gas exchange
- cell respiration

EXERCISE:

Explain why a ventilation system is needed to maintain a concentration gradient within the alveoli.

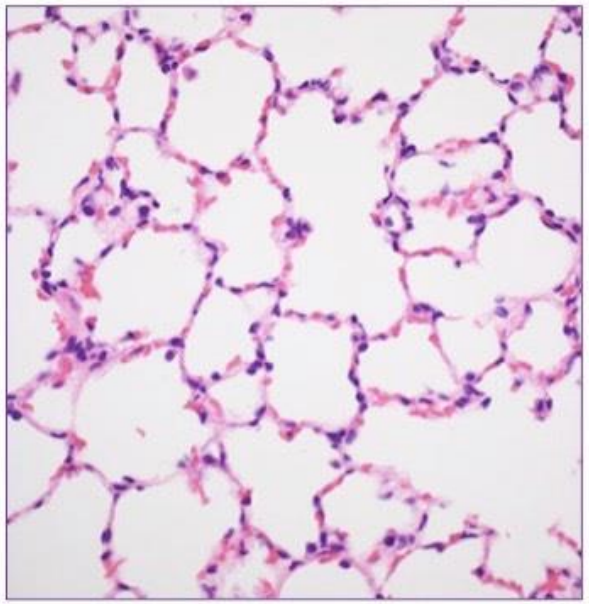
DIAGRAM OF THE HUMAN LUNG

Label a diagram of the human lung

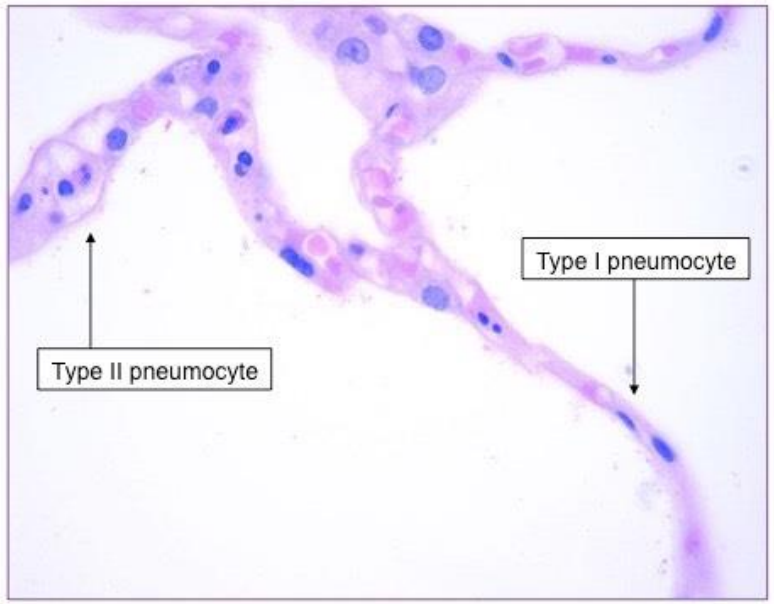


1. .....
2. .....
3. .....
4. .....
5. .....
6. .....
7. .....
8. .....
9. .....

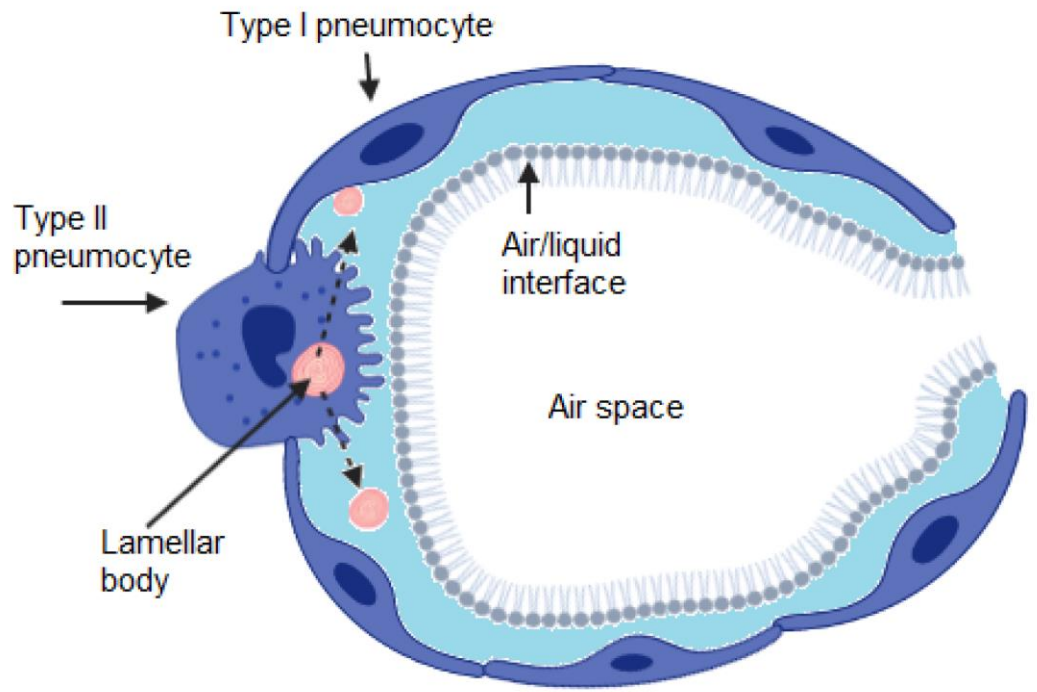
TYPE I VS TYPE II PNEUMOCYTES



Alveolar Air Spaces (Low Magnification)



Alveolar Air Spaces (High Magnification)



TYPE 1 PNEUMOCYTES

- alveolus wall = single layer (epithelium)
- flattened cells (very thin)
- capillaries wall also single layer of thin cells

  → blood in alveolus and capillaries are less than 0,5 µm apart.

  → small distance to diffuse

Type I Pneumocytes

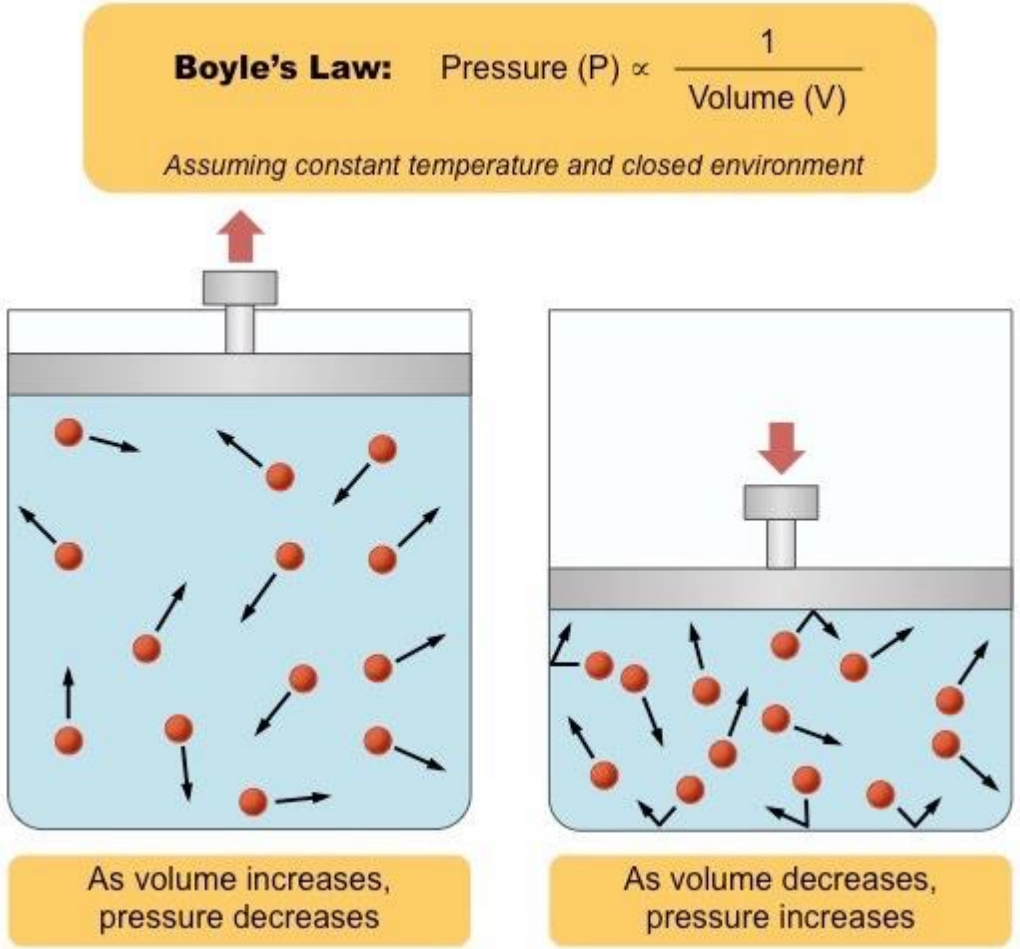
TYPE II PNEUMOCYTES

- rounded cells (roughly 5% of alveolus surface area)
- secrete a fluid which coats inner surface
  → oxygen dissolves and then diffuses to blood
  → area from which carbon dioxide can evaporate into air

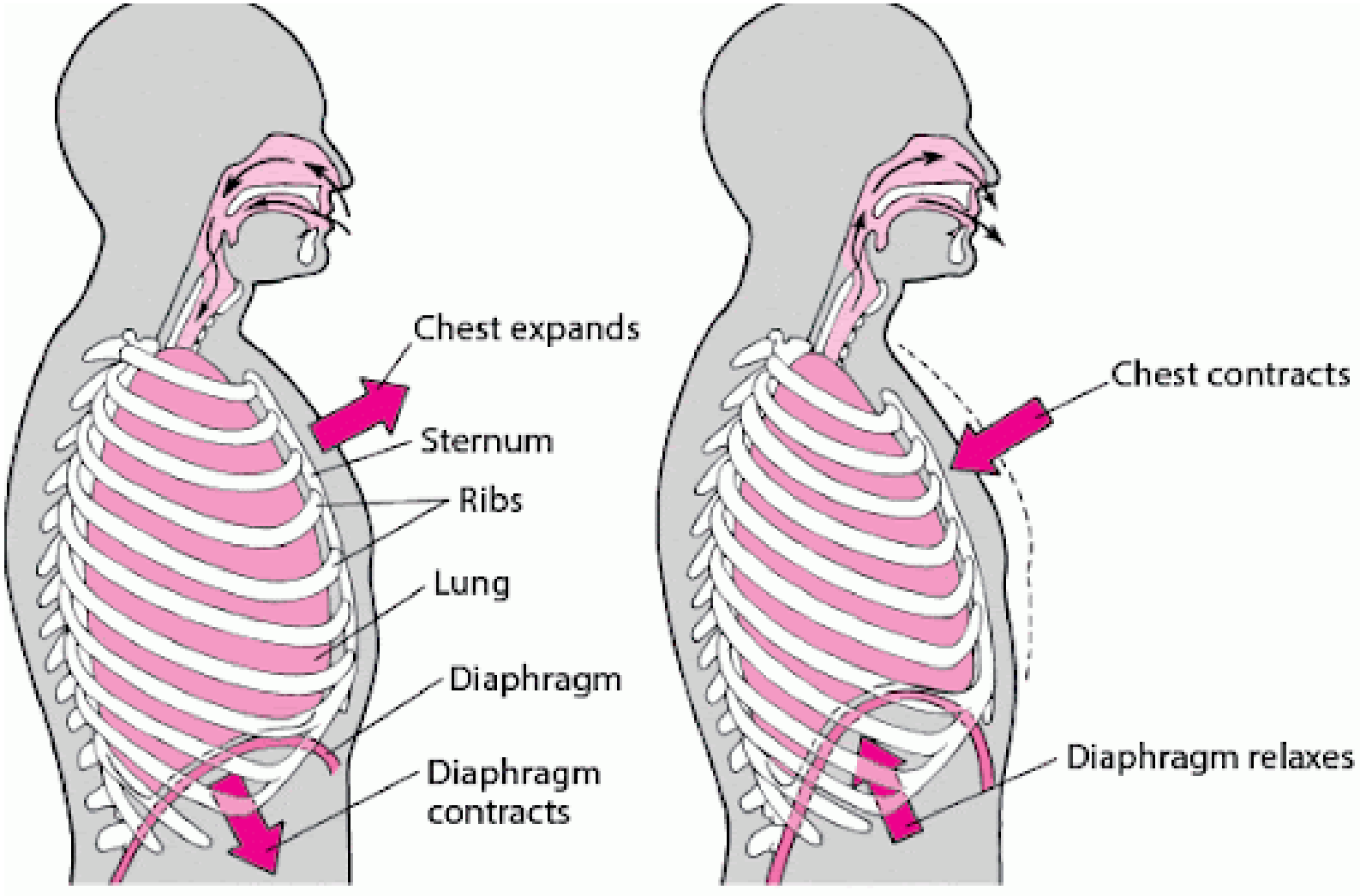
Type II Pneumocytes

- reduces surface tension
- reduces risk of lung collapse

BREATHING MECHANISM: BOYLE'S LAW

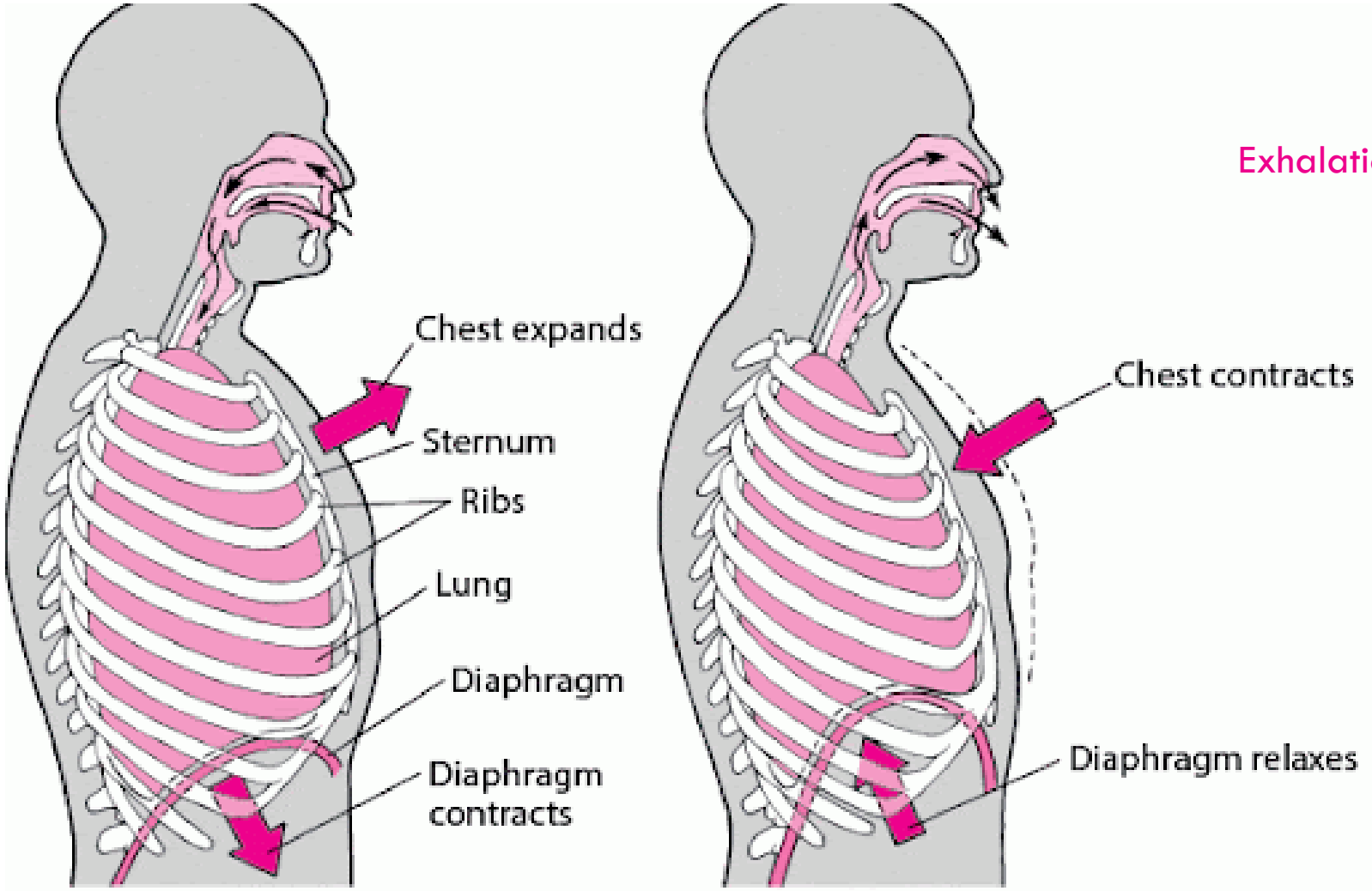


BREATHING MECHANISM



BREATHING MECHANISM

Inhalation

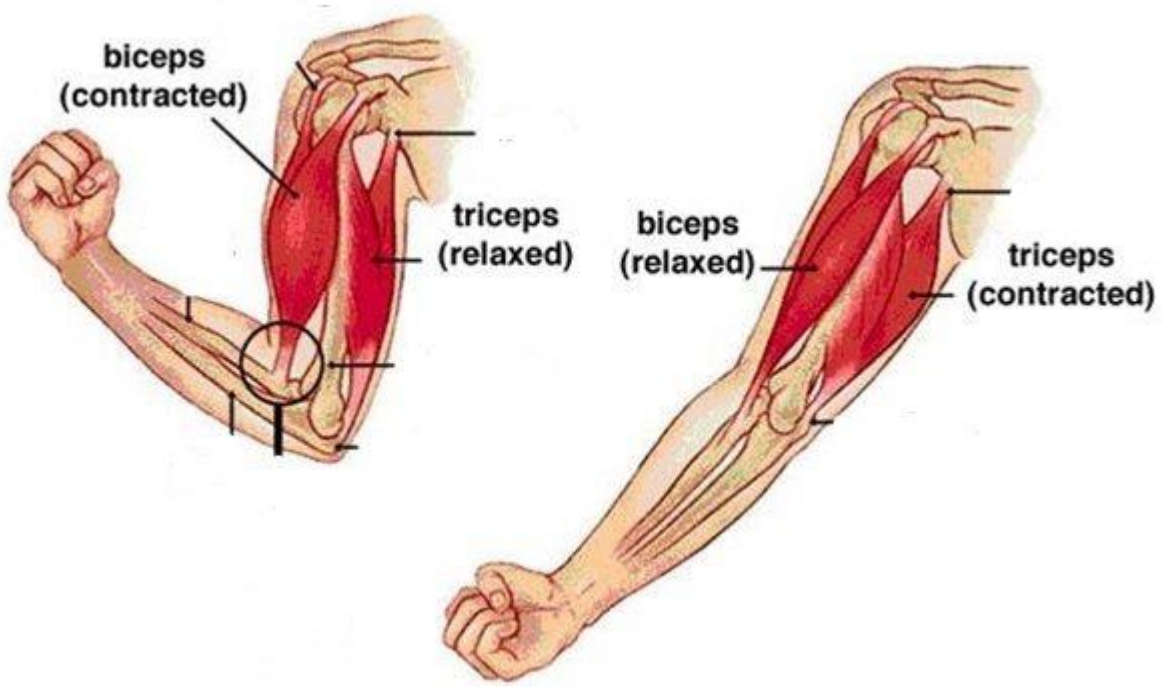


Exhalation

ANTAGONISTIC MUSCLES

How do antagonistic muscles work?

ANTAGONISTIC MUSCLES



ANTAGONISTIC MUSCLE ACTION IN VENTILATION

With the help of your IB Companion (p. 315-316) find out which muscles are involved and needed to cause to cause these movements.

LUNG DISORDERS

Lung cancer

Emphysema

CAUSES OF LUNG CANCER

- smoking causes 87% of cases
- passive smoking causes roughly 3% of cases
- air pollution about 5%
- radon gas (depending which part of the world)
- asbestos, silica …

CONSEQUENCES OF LUNG CANCER

- difficulties with breathing
- persistent coughing
- coughing up blood
- chest pain
- loss of appetite
- weight loss
- general fatigue

CONSEQUENCES OF LUNG CANCER

ONLY 15% survive for more than 5 years

Why do you think lung cancers are the most common cause of cancer-related death worldwide?

EMPHYSEMA

- instead of small thin-walled alveoli → fewer but larger air sacs + thicker wall
- lower surface area for gas exchange
- longer diffusion distances
- gas exchange not very effective
- lungs also become less elastic
- main cause: smoking

EMPHYSEMA