Respiratory failure

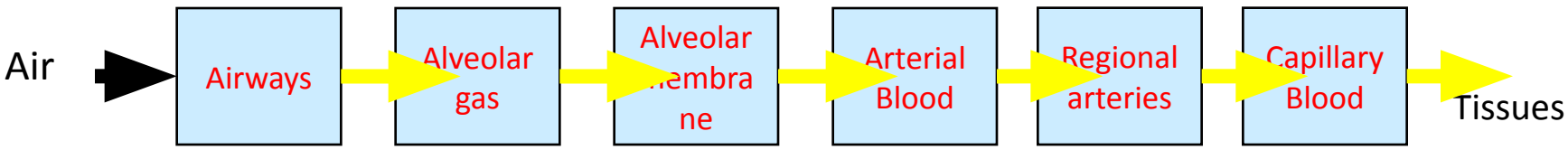
Kufa Medical College

In Respiratory System Ensures

- Oxygen enters the blood at the same rate as metabolism utilises it
- Carbon Dioxide leaves the blood at the same rate as metabolism produces it

Oxygen Transport System

Respiratory Failure



In Respiratory Failure

- Not enough oxygen enters the blood
- Not enough CO_2 leaves it
- Do not necessarily occur together

Type 1

- Not enough oxygen enters
- CO_2 loss not compromised
- pO_2 of arterial blood low
- pCO_2 normal or low

Remind yourself

- *Normal values*
- *Hb O_2 dissociation curve*

Type 2 Respiratory Failure

- Not enough oxygen enters the blood
- Not enough CO_2 leaves it
- pO_2 low
- pCO_2 high

- *Remind yourself*
  - *Normal values*
  - *CO_2 transport*
  - *Blood buffers*

Type 1 Respiratory Failure

- Oxygen cannot get from alveoli to blood
  - Some alveoli
  - Most alveoli

Remind yourself
- *Structure of alveoli*
- *Pulmonary circulation*
- *Barriers to diffusion*

Symotoms

- Breathlessness
- Exercise intolerance
- Cyanosis

Remind yourself
- *Central & peripheral cyanosis*
- *Assessing exercise tolerance*

- Some alveoli
  - Pulmonary embolism
- Ventilation perfusion matching
  - Poor O_2 uptake in some alveoli cannot be compensated by increased uptake in others

- *Remind yourself*
  - *Pressures/flow in pulmonary circulation*
  - *Vascular control of pulmonary circulation*
  - *Pulmonary hypertension*

Type 1 Resp. failure

- Some alveoli
  - Pneumonia
  - consolidation

- Remind yourself
  - Range of infecting organisms
  - Pathological mechanisms
  - Clinical signs
  - investigations

Type 1 respiratory failure

- Most alveoli
  - Pulmonary oedema
    - Lengthen diffusion pathway

- Remind yourself
  - Mechanism tissue fluid formation
  - Reasons for increased filtration pressure in lung capillaries
  - Left heart failure

Type 1 respiratory failure

- Most alveoli
  - fibrosis
    - Fibrosing alveolitis
    - Extrinsic allegic alveolitis
    - pneumoconiosis

- Remind yourself
  - Pathological mechanisms
  - Defence mechanisms of the airways

Hypoxia

- Acute hypoxia
  - pO_2<8.0kPa
  - Peripheral chemoreceptors
  - Increased ventilation
  - Effects on pCO_2
  - Central chemoreceptors

- Remind yourself
  - Functions of chemoreceptors
  - Respiratory alkalosis and acidosis

Chronic hypoxia

- Renal correction of acid base balance
- Increased ventilation
- Increased oxygen transport capacity
  - Hb increased
  - DPG

- Remind yourself
  - Mechanism renal excretion HCO_3^-
  - Assessing acid-base status
  - Control of red cell production
  - Factors affecting unloading of Hb

Type 2 respiratory failure

- Alveolar pO_2 down
- Alveolar pCO_2 up
- Pump failure

- Remind yourself
  - Muscles of respiration and their control
  - Structure of airways
  - Mechanics of ventilation

Type 2 respiratory failure

- Ineffective respiratory effort
  - Poor respiratory effort
  - Chest wall problems
  - Hard to ventilate lungs

- Remind yourself
  - Lung compliance
  - Airway resistance
  - Lung function testing

Type 2 respiratory failure

- Poor respiratory effort
  - Respiratory depression
    - Narcotics
  - Muscle weakness
    - Upper motor neurone
    - Lower motor neurone

- Remind yourself
  - Effects of narcotics
  - Upper/lower mn defects
  - Neuromuscular transmission

Type 2 respiratory failure

- Chest wall problems
  - Scoliosis/ kyphosis
  - Trauma
  - Pneumothorax

- Remind yourself
  - Anatomy of the chest wall
  - Role of pleural seal
  - Treatment of pneumothorax
    - Chest drains

Type 2 respiratory failure

- Hard to ventilate lungs
  - High airway resistance
  - COPD
  - Asthma

- Remind yourself
  - Factors affecting airway resistance
  - Acute/chronic bronchitis
  - emphysema
  - Pathophysiology of asthma

Chronic Obstructive Pulmonary Disease

- Role of smoking
- Epidemiology
  - 18% male smokers
  - 14% female smokers
- Chronic bronchitis
  - Productive cough

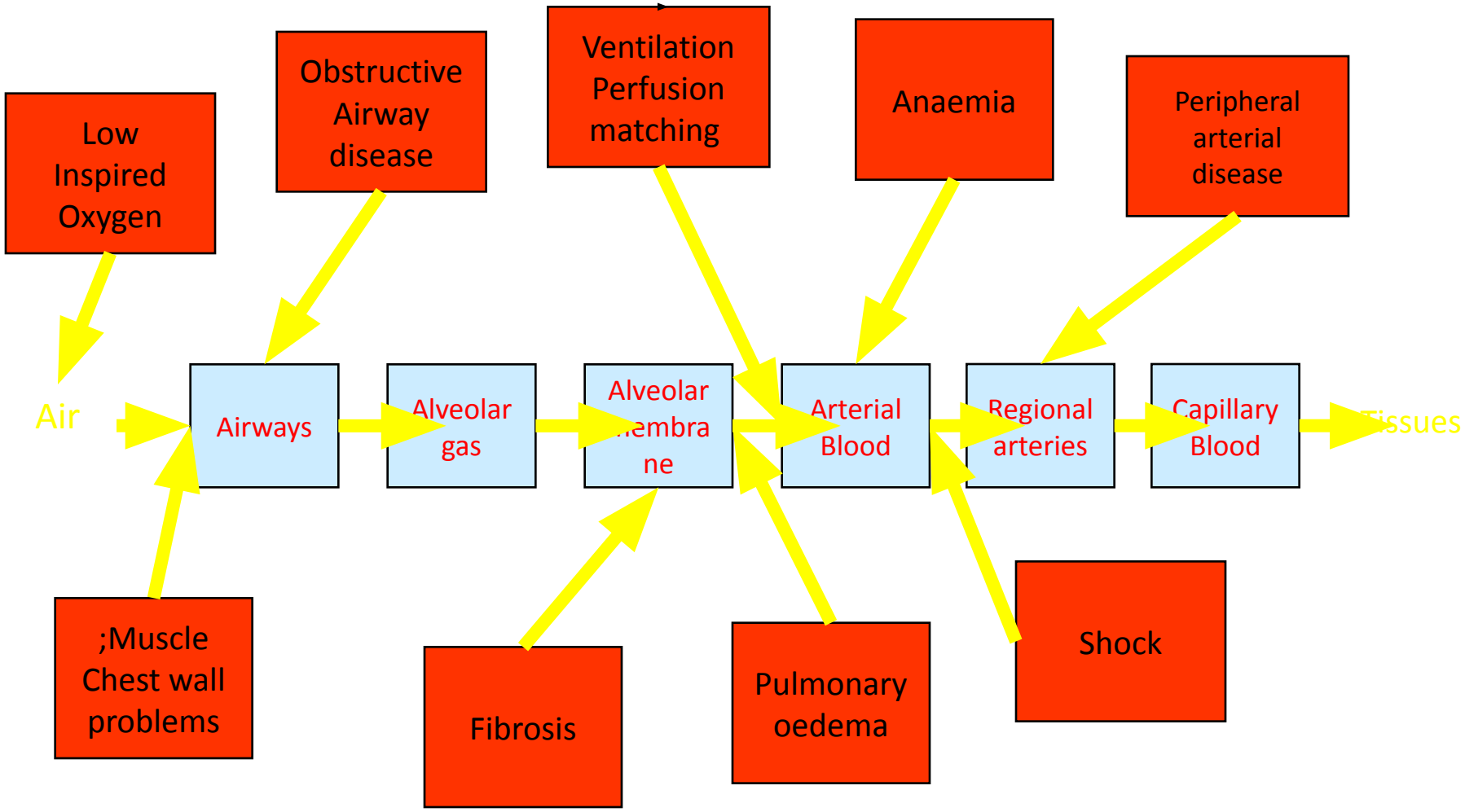
- remind yourself
  - Histology of mucus production
  - Infecting organisms in acute bronchitis
  - Health behaviours
  - Smoking cessation

Chronic Obstructive Pulmonary Disease

- Emphysema
  - Destruction of lung tissue
  - Changes in compliance
  - Ventilation perfusion mismatch
  - Affects oxygen supply
  - Type 1 failure initially

- Remind yourself
  - Antitrypsin deficiency

Oxygen transport chain



Acute effects of respiratory failure

- pCO_2 rises, pO_2 falls
- Central chemoreceptors
- Breathlessness
  - Some compensation

- Remind yourself
  - Central chemoreceptors
  - Role of choroid plexus

Chronic respiratory failure

- CO_2 retention
  - CSF acidity corrected by choroid plexus
  - Initial acidosis corrected by kidney
  - Reduction of respiratory drive
  - Persisting hypoxia

- Remind yourself
  - Role of central & peripheral chemoreceptors
  - Renal compensation mechanisms
  - Normal values
  - Assessing acid base status

Chronic respiratory failure

- Pulmonary circulation
  - Effects of hypoxia on pulmonary arterioles
  - Pulmonary hypertension
  - Right heart failure
    - Cor pulmonare

- Remind yourself
  - Pressures in pulmonary circulation
  - Effects of right heart failure
    - Systemic oedema

Disability

- Chronic respiratory failure severely disabling
  - Assessment
  - Care teams

- Remind yourself
  - Medical/social models of disability
  - Effects on family
  - Health policy issues

Management of respiratory failure

- Oxygen therapy
- Removal of secretions
- Assisted ventilation
- Treat acute exacerbations

- Remind yourself
  - Techniques of assisted ventilation
  - Antibiotics for acute exacerbations

At the end

- Intensive care
- Decisions about treatment
  - Ethical issues
  - DNR

- Remind yourself
  - Ethical principles
  - Legal issues
  - Cultural & religious issues around death & dying

Questions for formative assessment

- 1- what are the compensatory steps occurs in acute type 1 respiratory failure.?
- 2-what are the compensatory steps occurs in acute type 2 respiratory failure
- 3- what do you think?. Is the central chemoreceptor sensetive more to H+ Co2 or O2?.