

# Edexcel (A) Biology A-level

## 7.8 + 7.9 - Cardiac Cycle and Ventilation

### Flashcards



State the name and location of the 2 nodes involved in heart contraction.



State the name and location of the 2 nodes involved in heart contraction.

- sinoatrial node (**SAN**): within the wall of the right atrium.
- atrioventricular node (**AVN**): near lower end of right atrium in the wall that separates the 2 atria.



Define myogenic.



Define myogenic.

Contraction of heart is initiated within the muscle itself rather than by nerve impulses.



Describe how heartbeats are initiated and coordinated.



## Describe how heartbeats are initiated and coordinated.

1. SAN initiates wave of depolarisation (WOD).
2. WOD spreads across both atria = atrial systole.
3. Layer of fibrous, non-conducting tissue delays impulse while ventricles fill & valves close.
4. AVN conveys WOD down septum via Bundle of His, which branches into Purkinje fibres along ventricles.
5. Causes ventricles to contract from apex upwards.



State the formula for cardiac output.





State the formula for cardiac output.

cardiac output (CO)

=

stroke volume (V) x heart rate (R)



Describe what happens during cardiac diastole.



Describe what happens during cardiac diastole.

The heart is relaxed. Blood enters the atria, increasing the pressure and pushing open the atrioventricular valves. This allows blood to flow into the ventricles. Pressure in the heart is lower than in the arteries, so semilunar valves remain closed.



Describe what happens during atrial systole.



Describe what happens during atrial systole.  
The atria contract, pushing any remaining blood into the ventricles.



Describe what happens during  
ventricular systole.



Describe what happens during ventricular systole.

The ventricles contract. The pressure increases, closing the atrioventricular valves to prevent backflow, and opening the semilunar valves. Blood flows into the arteries.



# What is an ECG?





## What is an ECG?

A graph showing the amount of electrical activity in the heart during the cardiac cycle.



# What does each element of an ECG represent?



## What does each element of an ECG represent?

- P-wave shows atrial systole caused by the SAN.
- QRS complex shows ventricular systole.
- T-wave shows systole as the ventricles repolarise.



Name some heart defects that ECGs can help to diagnose.



Name some heart defects that ECGs can help to diagnose.

Symptoms of cardiovascular disease, including arrhythmia (irregular beat), tachycardia (heart rate too fast).



# What controls heart and ventilation rate?



# What controls heart and ventilation rate?

autonomic nervous system



Why do heart and ventilation rate increase during exercise?





Why do heart and ventilation rate increase during exercise?

To increase oxygen supply for respiring tissues & rapidly remove carbon dioxide.



Name the receptors involved in changing heart rate and state their location.



Name the receptors involved in changing heart rate and state their location.

**Baroreceptors** (detect changes in blood pressure): carotid body.

**Chemoreceptors** (detect changes in pH e.g. due to increase in  $\text{CO}_2$  concentration): carotid body, aortic body and medulla oblongata.



Name the receptors involved in changing ventilation rate.



Name the receptors involved in changing ventilation rate.

- chemoreceptors
- stretch-mediated receptors in muscles & tendons



How does the body respond to an increase in blood pressure?



How does the body respond to an increase in blood pressure?

1. **Baroreceptors** send more impulses to **cardioinhibitory centre** in the **medulla oblongata**.
2. More impulses to SAN down vagus nerve via **parasympathetic nervous system**.
3. Stimulates release of **acetylcholine**, which decreases heart rate.



How does the body respond to a decrease in blood pressure?





How does the body respond to a decrease in blood pressure?

1. **Baroreceptors** send **more impulses** to **cardioacceleratory centre** in the **medulla oblongata**.
2. More impulses to SAN via **sympathetic nervous system**.
3. Stimulates release of **noradrenaline**, which increases heart rate and strength of contraction.



How does the body respond to an increase in  $\text{CO}_2$  concentration?



## How does the body respond to an increase in $\text{CO}_2$ concentration?

1. **Chemoreceptors** detect **pH decrease** and **send more impulses to cardioacceleratory centre & ventilation centre of medulla oblongata.**
2. More impulses to SAN via **sympathetic nervous system.**
3. **Heart rate** increases, so the rate of blood flow to the lungs increases and the rate of **gas exchange** and **ventilation** increase.



# What is tidal volume?



# What is tidal volume?

The volume of air we breathe in and out during each breath at rest.



# What is respiratory minute volume?



# What is respiratory minute volume?

The volume of air we inhale or exhale from the lungs per minute.



How do you calculate pulmonary ventilation rate?





How do you calculate pulmonary ventilation rate?

tidal volume x breaths per minute

These can be measured using a spirometer, a device which records volume changes onto a graph as a person breathes.

