A Level Physical Education Summer Independent Learning Yr11-Yr12

Welcome to A Level Physical Education! This pack contains a selection of tasks to help you prepare for the start of the course in September. Please complete ALL tasks ready for your first day at New College. You can print the booklet, write on the pdf file or answer the questions on paper or a Word document. Please be aware that you will have to sit an assessment on the knowledge and skills covered in these tasks within a week of you starting at New College. There will be an opportunity to review your Summer Independent Learning and answer any questions you may have in one of the lessons before you sit the assessment.

The tasks are split into 6 sections:

Section A- Cardiovascular system

GCSE recap and introduction into A Level anatomy. This section includes information and tasks for you to complete around the Cardiovascular system.

Section B- Respiratory System

GCSE recap and introduction into A Level anatomy. This section includes information and tasks for you to complete around the Respiratory system.

Section C- The Vascular System

GCSE recap and introduction into A Level anatomy. This section includes information and tasks for you to complete around the Vascular system.

Section D- Joints and Movement

GCSE recap and introduction into A Level anatomy. This section includes information and tasks for you to complete around joints and movements.

Section E- Skill Acquisition

This section includes information and tasks for you to complete around skill acquisition. This will be a new topic which you will study in Year 12.

Section F- Video and Book Task

This section requires you to watch a video or read a book and write a report around the video/book. You need to include the following information

(A01) Describes an overview of the Video/Book

(A02) Explains the relationship between the video/book and your OCR A level PE Specification

(A03) Analyses the video/book and discuss your opinion and conclusion

Tick the boxes of the ones you are completing. Feel free to each as many as you want if you have time

Learning Objectives

The link between the **Cardiac Cycle** and the **Conduction system of the heart.**

The relationship between **Stroke volume, Heart rate and Cardiac Output.**

The changes that occur to **SV**, **HR** and **CO** (Q) during exercise.

The **regulation of heart rate** during exercise.

Venous Return: maintenance, mechanisms and performance.

Distribution of cardiac output and **Vascular shunting** (Vasomotor control)

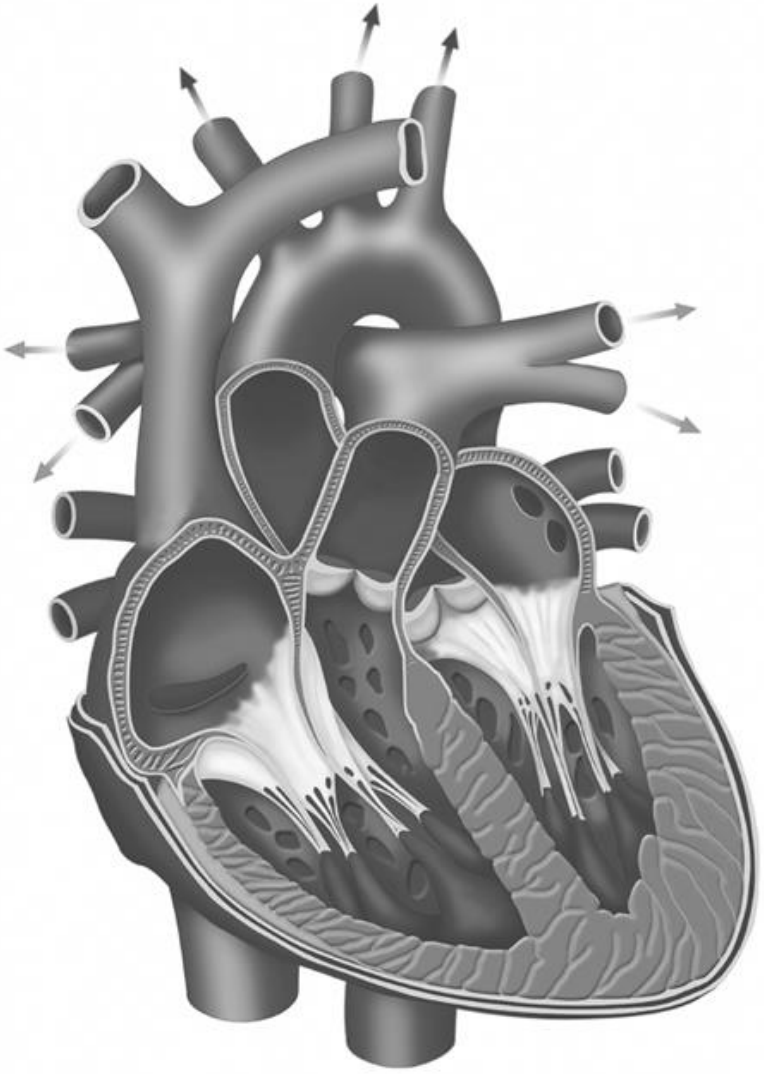
Oxygen and **Carbon dioxide transport**. **Effects of smoking.**

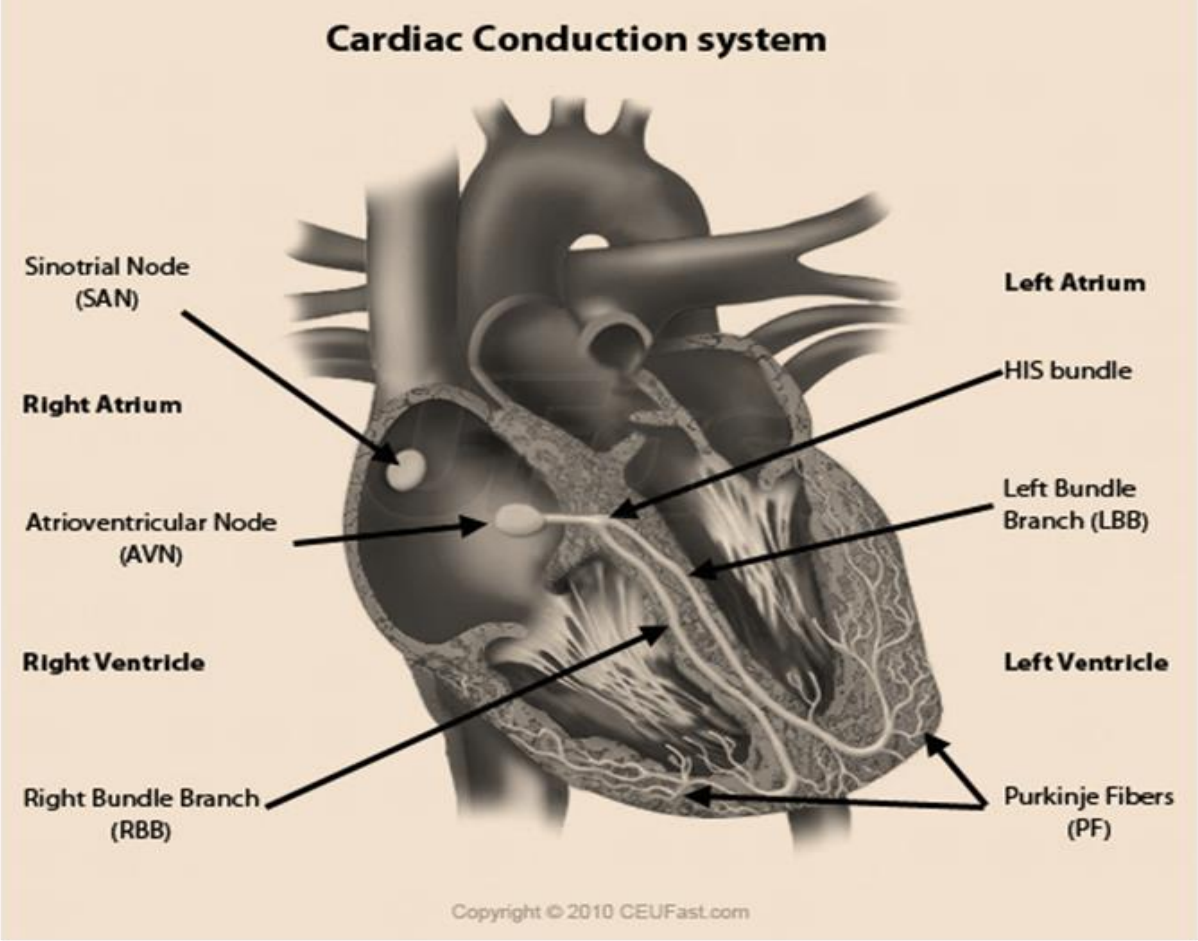
Effects of **Warm up and Cool down** on vascular system.

Blood Pressure. The impact of **Physical activity on the Cardiovascular system**.

Label the structure of the heart

Superior Vena Cava	Tricuspid valve
Pulmonary artery	Left atrium
Aorta	Right ventricle
Septum	Aortic valve
Bicuspid (mitral valve)	Pulmonary valve
Left ventricle	Inferior Vena Cava
Right Atrium	**Where is the Sinoatrial (SA) node located?**





The heart is ..... – it generates its own electrical impulse.

Explain how the heart generates its own contractions. Remember to refer to the structures above and the processes of **Atrial** and **Ventricular systole**

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You need to be able to link the cardiac **Conduction system** with the **Cardiac cycle**.

Diastole (0.5 s) (Heart fills)	Both atria fill with blood.
	Atrial blood pressure rises above ventricular blood pressure.
	Some blood is **passively** forced into ventricles.
Systole (0.3 s) (Heart empties)	
	Both atria contract (**atrial systole**) forcing remaining blood into the ventricles.
	Both ventricles contract (**ventricular systole**) increasing ventricular pressure.
	Increased pressure forces open the pulmonary and aortic valves.
	Blood is forced into the aorta and pulmonary artery (**stroke volume**)
	Diastole of the next cardiac cycle starts again
	Aortic and pulmonary valves close, to prevent backflow of blood.

Put the following into the table above to find the link between the conduction system and the cardiac cycle. (HINT: they aren't in the right order!)

- **SA Node** initiates cardiac impulse
- Impulse travels through **Purkinje fibres** in ventricle walls
- Impulse passes through AV node and through **Bundle of His**
- Cardiac impulse passes through **atria walls**
- The **impulse branches** into both the left and right ventricle

Stroke volume, Heart rate and Cardiac output at rest

	Definition	Values (UNITS?)
Stroke volume **(SV)**	SV = EDV - ESV	Rest – Sub-max – Max –
Heart rate **(HR)**		Rest – Sub-max – Max –
Cardiac output **(Q)**	Q =	Rest – Sub-max – Max –

What are EDV and ESV?

EDV -

ESV -

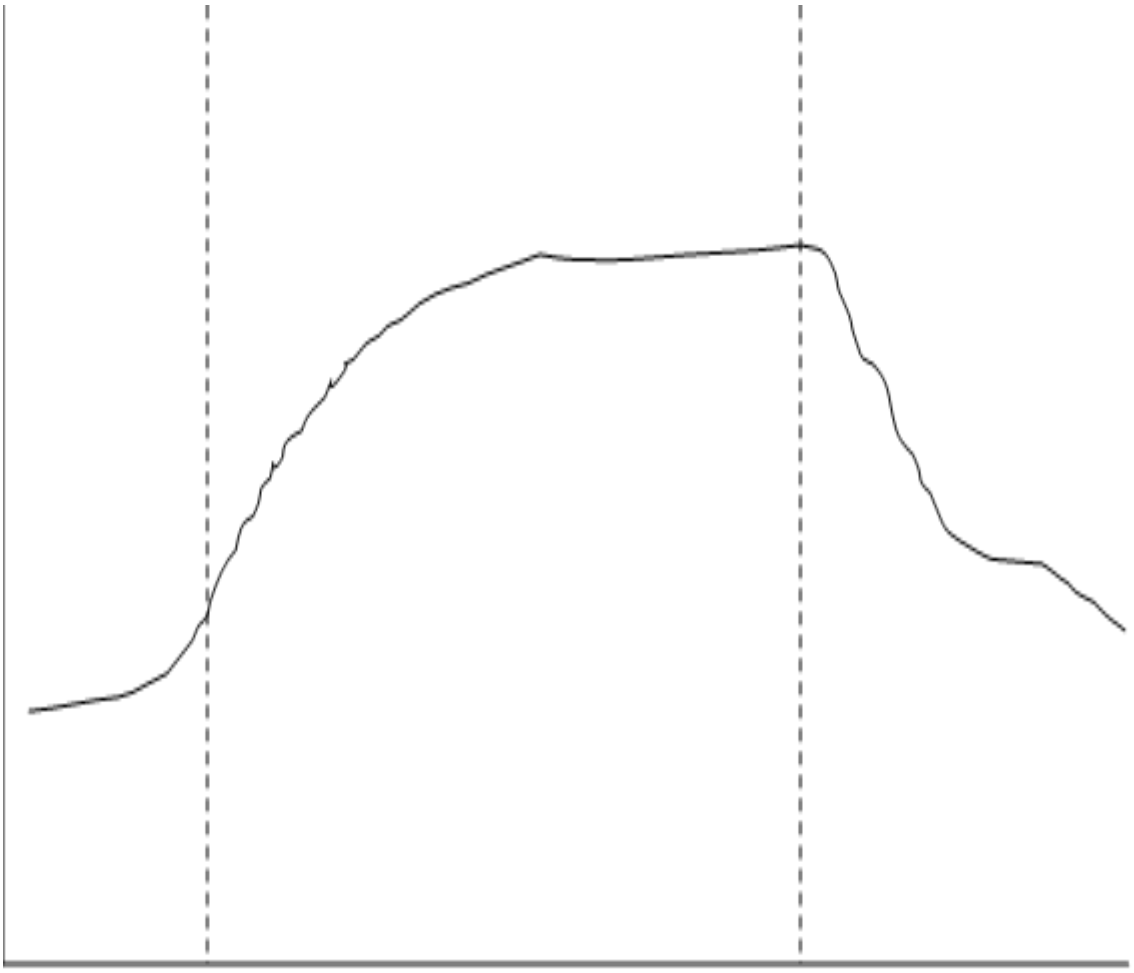
How is maximum Heart rate calculated?

What is bradycardia? Who might experience bradycardia?

How is it possible for an elite athlete to have a similar resting Cardiac Output as a sedentary individual?

Responses of HR, SV and CO to exercise

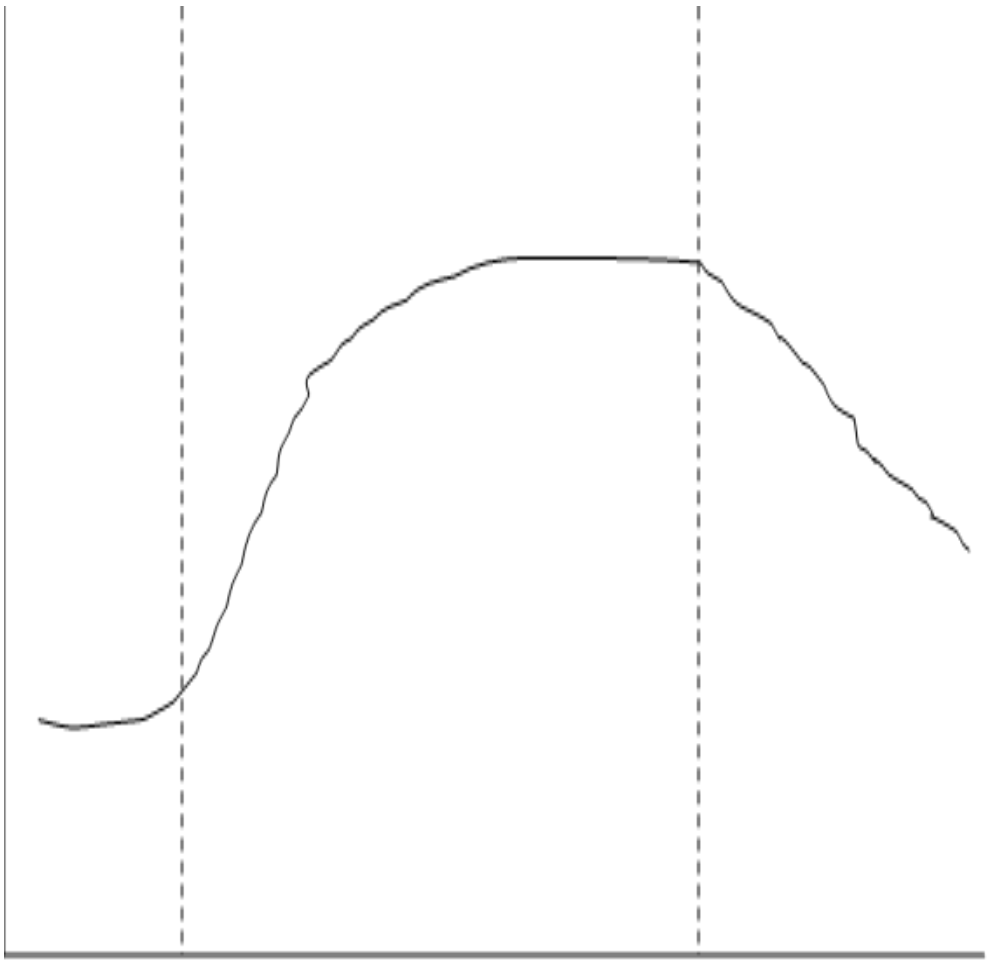
(Annotate the diagrams – what is happening at each stage?)



Heart

Rate

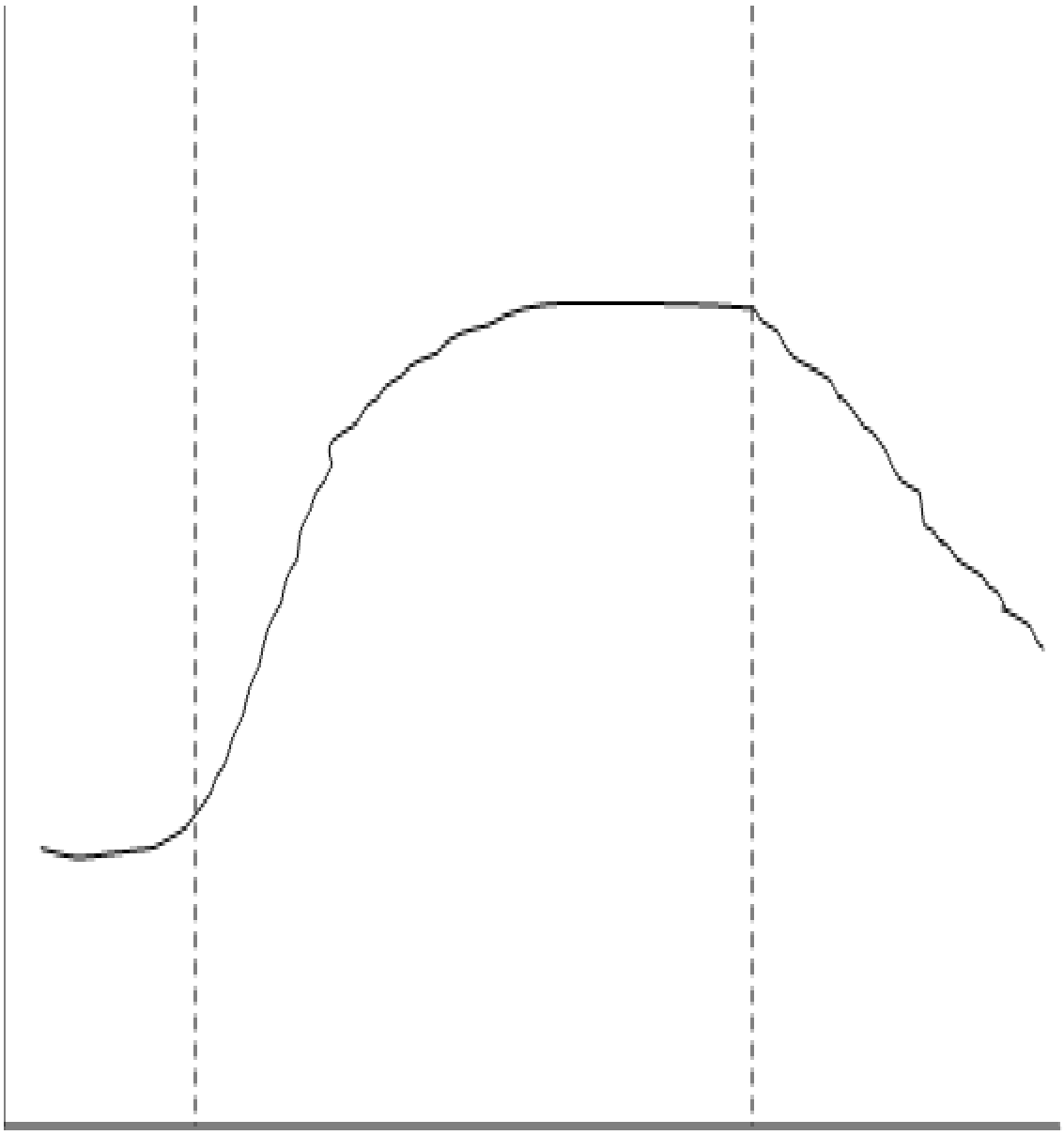
(BPM)



Stroke

Volume

(ml)



Cardiac

Output

(L/min)

Maximal

Sub-max

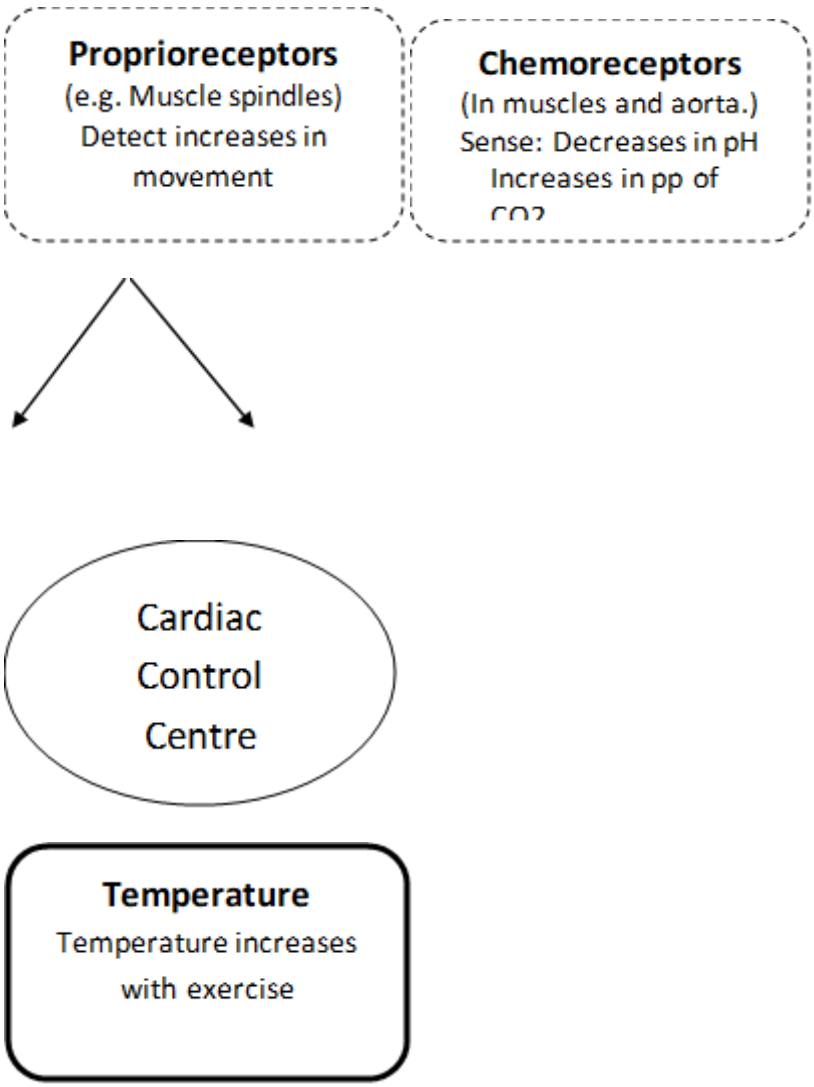
Control of Heart rate during exercise

Heart rate changes during exercise are controlled by three factors:

1. Neural control
2. Hormonal control
3. Intrinsic control

The control mechanisms act on the Cardiac Control Centre (CCC) in the Medulla Oblongata.

Which of the following control mechanisms increase HR (5), and which decrease it (1)?



Sympathetic and Parasympathetic control of heart rate

The ..... (ANS) consists of two parts:

1. The Sympathetic Nervous System (SNS) causes HR to ..... .
2. The Parasympathetic Nervous System (PNS) cause HR to ..... .
3. Describe how the cardiac control centre acts on the SA node during exercise.

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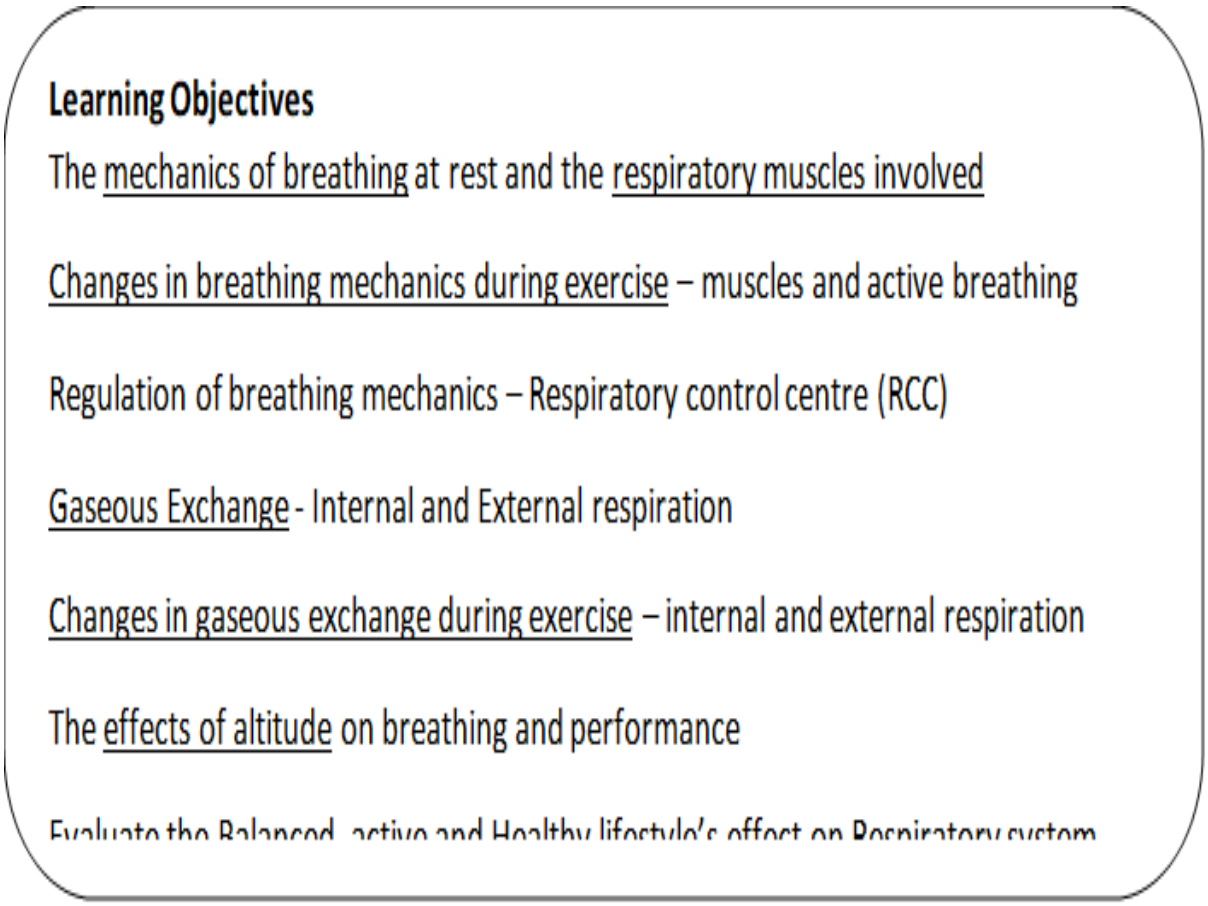
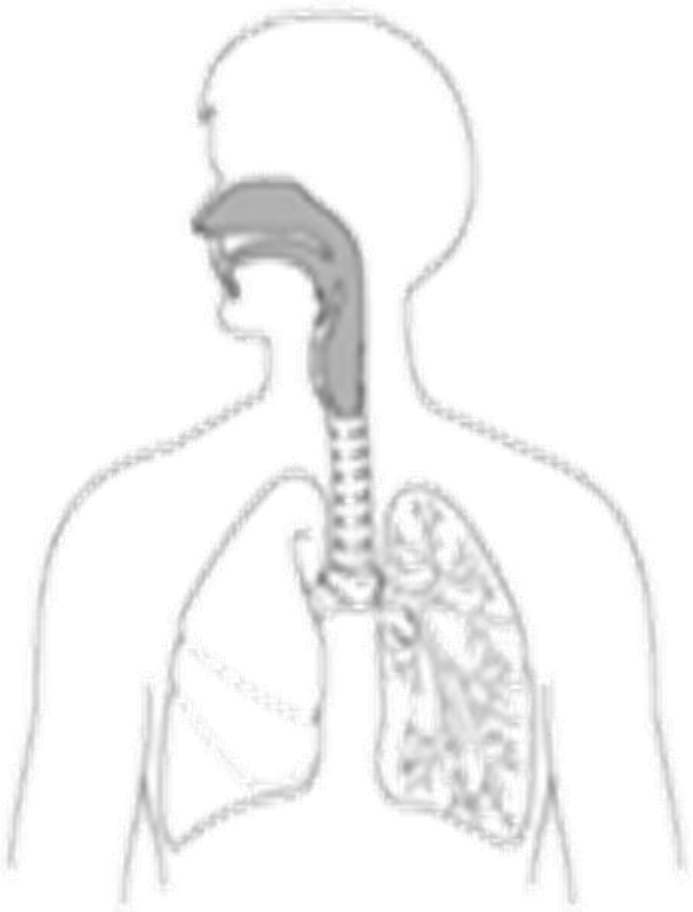
You should now be able to describe and explain:

- The cardiac cycle
- The conduction system of the heart
- The link between the cardiac cycle and conduction system
- The relationships of stroke volume, heart rate and cardiac output
- The changes that occur to SV, HR and CO.
- The regulation of Heart rate during exercise

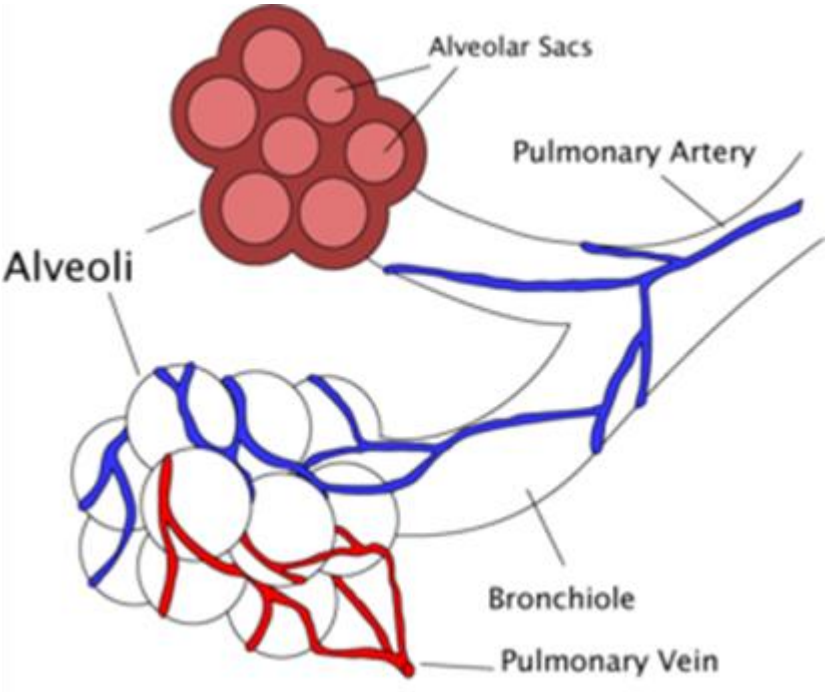
Section B- Respiratory System

GCSE recap and introduction into A Level anatomy. This section includes information and tasks for you to complete around the Respiratory system.





Remind yourself of the structure of the lungs by listing (in order) all of the structures that an oxygen molecule would pass through on its journey from the air outside to the bloodstream.



How are the alveoli adapted to maximise gaseous exchange?

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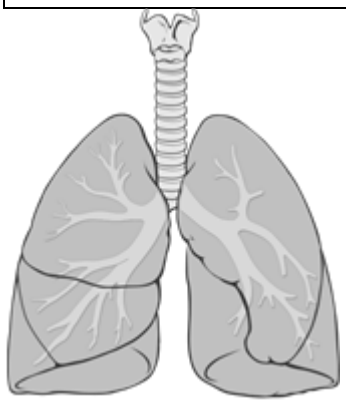
Breathing Mechanics – Pulmonary ventilation (REST)

Remember – Air only moves in and out of our lungs due to changes in the pressure of the thorax.

In order for this to happen, muscles have to contract first.

Inspiration (active)	Expiration (passive)
Diaphragm - ..... **External** intercostals -	



Remember the five steps to get the correct order of inspiration/expiration

1. Muscles – contract/relax
2. Movement of ribs
3. Thoracic volume change
4. Lung air pressure change
5. Air movement in/out

Breathing Mechanics – Exercise

What happens to the depth and rate of breathing during exercise?

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Which extra muscles are involved in breathing during exercise?

Inspiration Expiration

Now describe the mechanics of breathing (inspiration and expiration) during exercise

Remember the five steps to get the correct order

1. Muscles – contract/relax
2. Movement of ribs
3. Thoracic volume change
4. Lung air pressure change
5. Air movement in/out

Respiratory Volumes

You need to know about the following three volumes measured in our lungs: (Fill out table: Include a description, units and typical values)

➢ Tidal Volume (TV)	
➢ Frequency (f)	
➢ Minute Ventilation (VE) (VE = TV x f)	

If a person has:

- a Tidal volume of 600ml and
- a breathing frequency of 16 breaths per minute

What is their Minute Ventilation (VE)?

During maximal exercise, why is it not possible to increase your tidal volume towards its maximum value?

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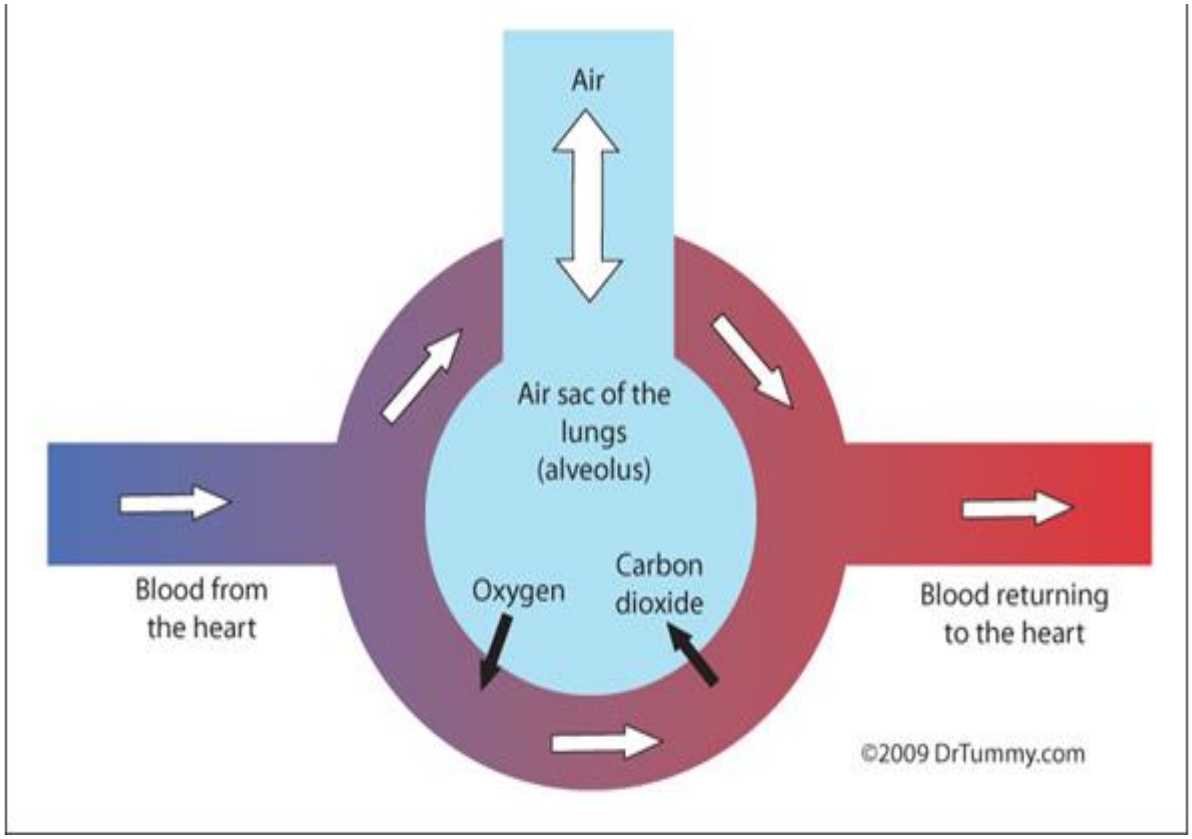
Gaseous Exchange

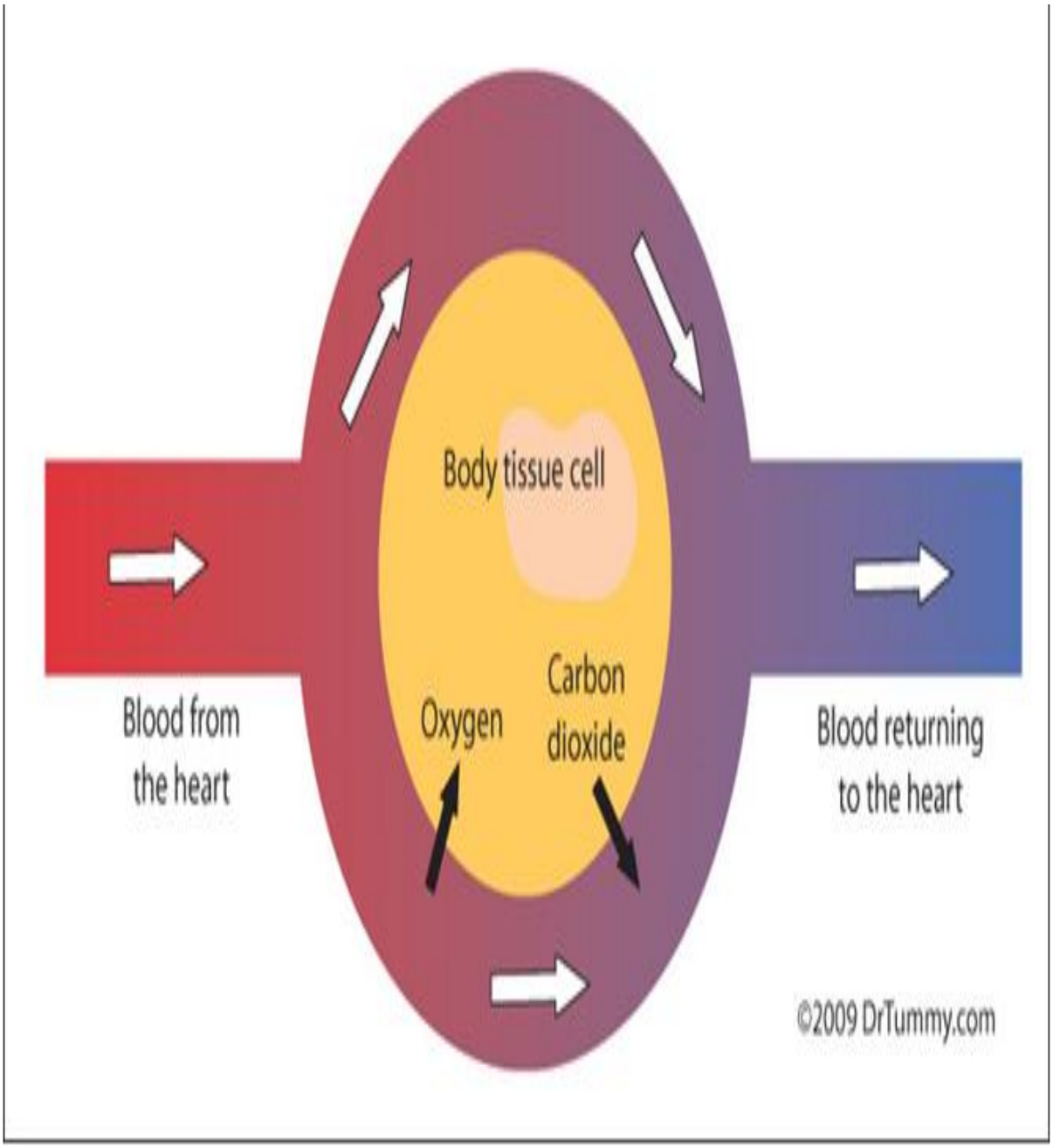
External respiration

This is the process of diffusion that occurs in the alveoli, where oxygen enters to the blood from the alveoli and carbon dioxide enters the alveoli from the blood.



Internal respiration

This is the process of diffusion that occurs in the muscle/tissue, where oxygen enters the muscle/tissue and carbon dioxide enters the blood stream.



Partial Pressure

When you answer questions about gaseous exchange (internal or external) you **must** talk about partial pressure.

Basically partial pressure refers to the concentration of a gas in a mixture.

- ✓ A gas with a high concentration has a high Partial Pressure.
- ✓ A gas with a low concentration has a low Partial Pressure.

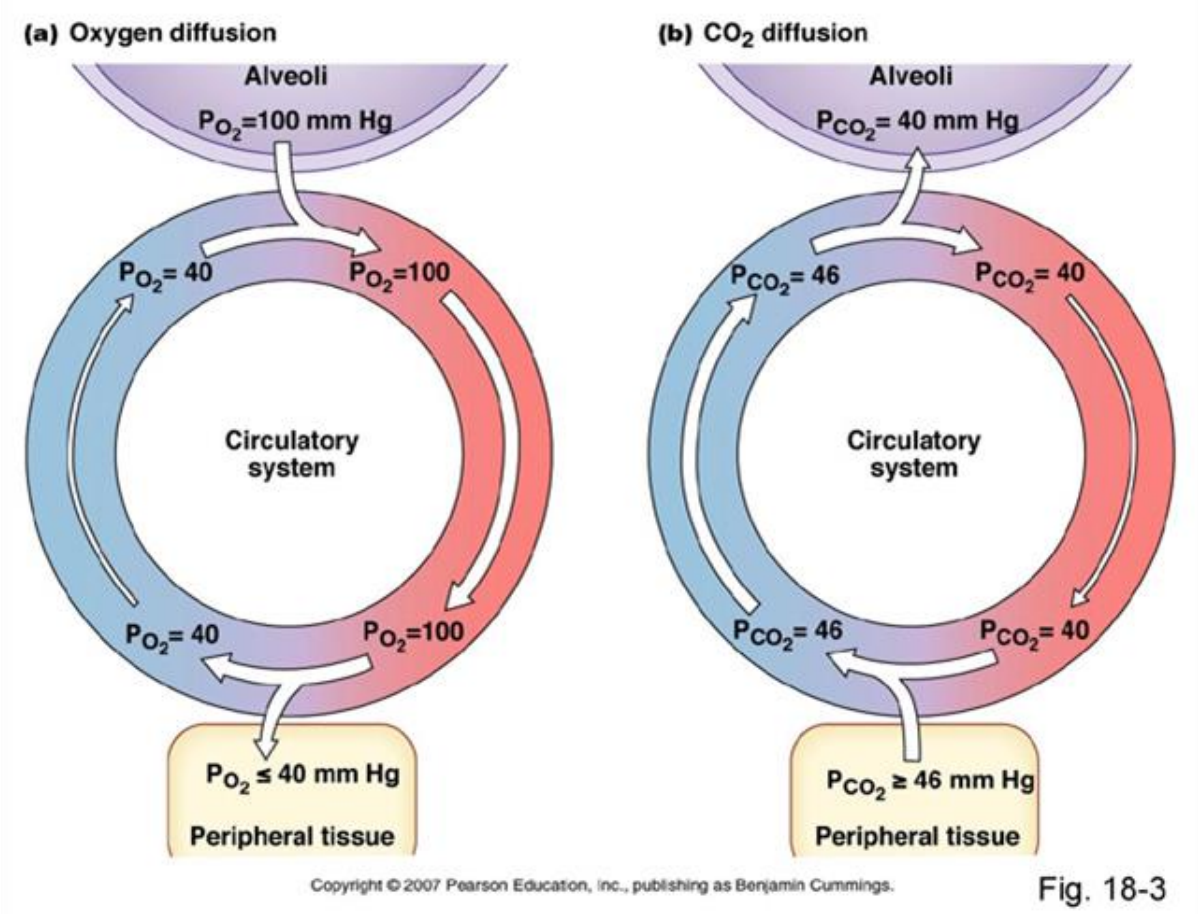


Fig. 18-3

Describe the diffusion of Oxygen in terms of its partial pressure

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Changes to Gaseous Exchange in Exercise

Simply, both internal and external respiration **must** increase during exercise?

Why?.....
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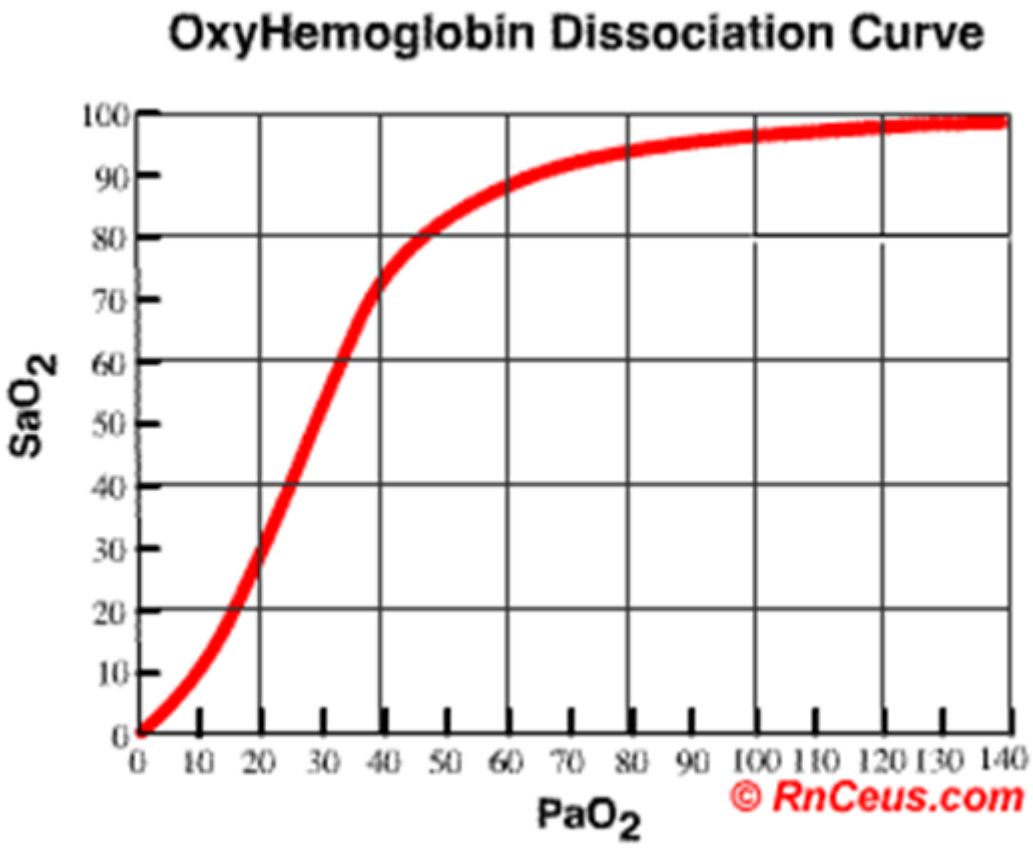
The more difficult question is *How?*



(Partial Pressure)

Saturation %

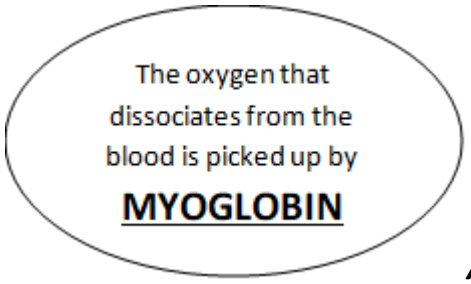
This curve represents "oxygen saturation" at <u>rest</u>. That is the amount of oxygen that has been taken up by haemoglobin.

The Partial pressure of Oxygen in the arteries is **<u>100mmHg</u>**. If you read off 100mmHg on the graph, you will see that haemoglobin is saturated about **<u>98%</u>** with oxygen.

The Partial pressure of Oxygen in the muscle is **<u>40mmHg</u>**. If you then read off 40mmHg on the graph, you will see that haemoglobin is saturated about **<u>75%</u>** with oxygen.

Therefore, 13% of the total oxygen in the haemoglobin has entered the muscle (at rest)

Changes to Gaseous Exchange in Exercise

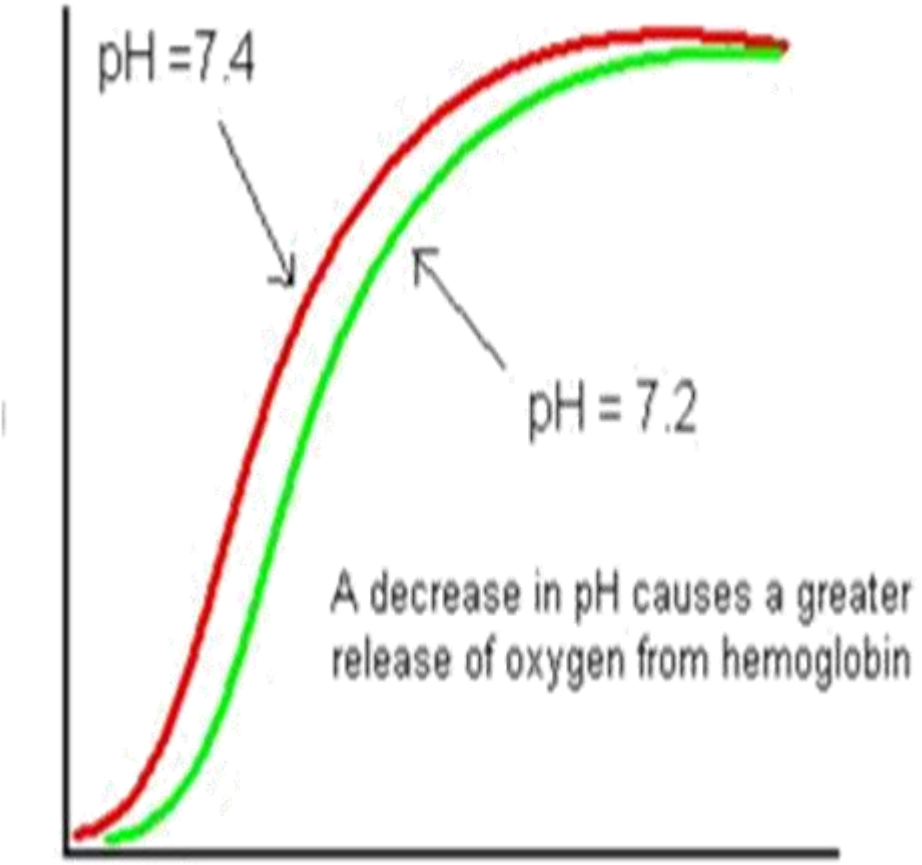


*As our need for oxygen increases with exercise, something has to happen to get more than just **13%** of the oxygen out of the blood!*

During Exercise...

- Body Temperature increases
- Blood Acidity increases

These two changes make oxygen dissociate from haemoglobin more easily at **the same** partial pressure!



When the pH goes down, the oxygen dissociation curve shifts to the right.

This is called the BOHR EFFECT. It means that when the partial pressure of oxygen is 40mmHg (as in the muscle) more oxygen gets unloaded from the blood ***(~50%)****.*

<u>The same effect happens when body temperature rises.</u>

- The curve shifts to the right, and more oxygen 'dissociates' from haemoglobin when it reaches the muscle.

Changes to External Respiration in Exercise

[Remember** – external respiration is gas exchange in the lungs**]

***NB.** The speed of diffusion depends on the **'diffusion gradient'**; the difference between gas concentrations one side of a membrane and the other.*

The larger the gradient, the faster the rate of diffusion.

During exercise, the muscles are using much more oxygen, and producing much more carbon dioxide.

Therefore, the concentration of oxygen in venous blood (returning to the heart) is lower (lower PPO_2), and concentration of carbon dioxide is higher than normal (high PP CO_2).

What does this mean for the diffusion rate of O_2 and CO_2 in the lungs?

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Gas	**Alveoli PP**	**Diffusion Direction**	**Capillary PP**	**Gradient**
O_2	100 (high)	→	40 (low)	60
CO_2	40 (low)	←	46 (high)	6

Using the information above, describe the changes in external respiration <u>in your own words</u>:

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Changes to Internal Respiration in Exercise

***[Remember** – internal respiration occurs in the muscle tissue]*

Of course we need more oxygen in the muscle in order to prolong exercise. We know that in order for this to happen increased temperature and acidity cause increases in oxygen dissociation.

The following **four** factors all increase oxygen dissociation:

- ✓ Increase in blood/muscle temperature
- ✓ Decrease in O_2 pp within muscle, increases diff gradient
- ✓ Increase in CO_2 pp, increases CO_2 diff gradient
- ✓ Bohr Effect – increased acidity

Look at the following partial pressure differences in rest and exercise

Gas	**Capillary pp**	**Diff Direction**	**Muscle pp**	**Diff Gradient**
$O_{2\ Rest}$	100	→	40	60
$O_{2\ Ex}$	100	→	5	**95**
$CO_{2\ Rest}$	40	←	46	6
$CO_{2\ Ex}$	40	←	80	**40**

If you can remember these values there are usually marks available.

Using the above information, describe **and** explain the differences in rest and exercise <u>in your own words</u>:

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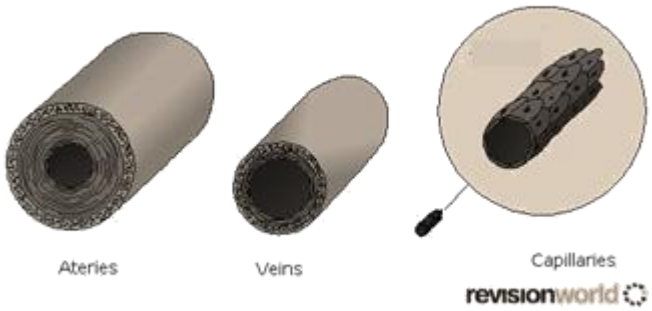
Section C- The Vascular System

Describe the structures.



Venous Return (VR)

Describe VR

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How is VR linked to Stroke Volume? (Hint: STARLING'S LAW)

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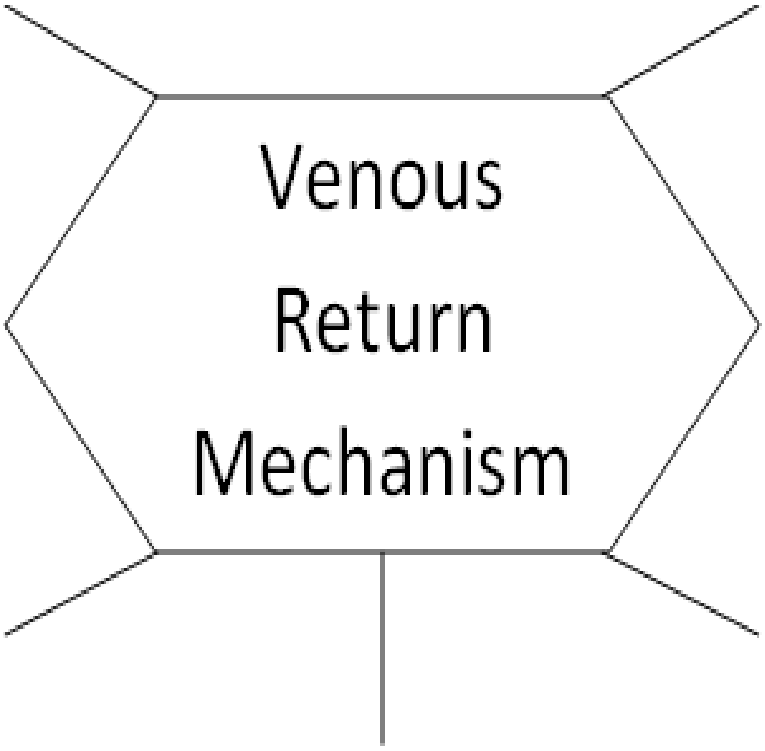
State and describe the mechanisms that maintain VR.



The Impact of Venous Return on Performance

(Fill in the gaps, or delete as appropriate)

.....'s Law states that when venous return increases, stroke volume ..... .

As Cardiac output = SV x HR, the increased blood returning to the heart means that **more / less** blood will be pumped out each beat.

If VR decreases, CO will ....., which means that **more / less** oxygen will be delivered to the

..... .

A good VR will obviously help aerobic athletes to supply oxygen to their working muscles, but how does it help anaerobic athletes?

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Describe how a good venous return would benefit the performance of a midfielder in football/hockey/netball?

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..... What is blood pooling and how is it prevented?

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Redistribution of Cardiac Output

Why do we faint?

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Cardiac output at rest = _____Litres/min

Cardiac output during exercise = _____Litres/min

Which is muscle bloodflow and which is organ bloodflow?

REST→VO_2 →MAX

At rest .....% of Cardiac output goes to ..... and .....% goes to ..... .

During exercise the majority (.....%) of Cardiac output goes to ....., and .....% goes to the ..... . Blood supply to the ..... is maintained, in order to keep up vital functions.

Vasomotor Control & Vascular Shunting

Vasodilation, Vasoconstriction & Pre-capillary Sphincters

Exam questions that ask about the redistribution of blood are most likely looking for you to talk about **vascular shunting.**

The vascular shunt mechanism is controlled by the **Vasomotor control centre (VCC)** in the Medulla Oblongata.

The VCC receives information from ***Chemoreceptors*** and ***Baroreceptors*** about chemical and pressure changes.

The VCC uses the Sympathetic Nervous System (SNS) to either vasodilate or vasoconstrict ***arterioles*** and ***pre-capillary sphincters,*** meaning blood is *shunted* from one location to where it is required (from organs to working muscles).

During exercise:

1. The VCC *increases* sympathetic stimulation of *arterioles* and *pre-capillary sphincters* leading to **organs**. = VASOCONSTRICTION
2. The VCC *decreases* sympathetic stimulation of *arterioles* and *pre-capillary sphincters* leading to **muscles**. = VASODILATION

Oxygen and Carbon Dioxide Transport

Haemoglobin is the protein molecule found in

Red blood cells, which carries Oxygen.

Oxygen transport	Carbon dioxide transport
➢ -	- - -

How does an efficient oxygen/carbon dioxide transport affect performance?

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How does smoking reduce the capacity to transport oxygen?

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<u>Effects of a Warm up on the Vascular System</u>

The overall effect of performing a warm-up on the vascular system is to gradually **<u>increase cardiac output</u>** and **<u>muscle bloodflow</u>**. This is achieved as follows (spider diagram):

<u>Questions</u>

What would happen to blood pressure if ***"blood viscosity"*** increased?

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What happens to blood pressure when cardiac output decreases?

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Blood pressure measurement

Measuring Blood pressure

Traditional method

1. Wrap cuff around upper arm and inflate to 180mmHg (higher than Systolic BP, preventing blood to flow past the cuff)
2. Place a stethoscope over the brachial artery (below the cuff). Release the pressure on the cuff.
3. Listen for the first audible noise (blood flow) after releasing the pressure, and take a reading. This is the **systolic pressure**.
4. Continue to release the pressure until the sound disappears. Note this point – this is **diastolic pressure**.

Modern method

Use an electrical blood pressure monitor and it does it all for you!

The blood pressure cuff is also known as a .....

Changes to Blood Pressure

There are many fluctuations

In blood pressure during the

day.

↑ During stress

As we age

In warm temperatures

↓ When we sleep

The smaller we are

In cold temperatures

We need to know what happens during exercise:

Give some values as well as just saying “It increases/It decreases”

	Endurance exercise	Isometric/resistance exercise
Systolic		
Diastolic		

Exercise can be used to great advantage for people with High blood pressure:

- Systolic blood pressure decreases for up to 12 hrs post-exercise
- Diastolic blood pressure also decreases for hours after exercise

What is Hypertension?

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Typical value - ..... mmHg

True or False

1. Hypertension is only present if blood pressure is measured as high over a prolonged period. **TRUE / FALSE**
2. “Real Hypertension” is 140/90 mmHg. **TRUE / FALSE**
3. Hypertension increases the workload of the heart. **TRUE/FALSE**

4. Developing Hypertension slows down development of atherosclerosis. **TRUE / FALSE**
5. Hypertension increases the risk of stroke and heart failure. **TRUE/FALSE**
6. Obesity is a common cause of Hypertension. **TRUE / FALSE**
7. Regular exercise can reduce Hypertension. **TRUE / FALSE**
8. A well-trained athlete will have a lower exercising blood pressure than a sedentary individual. **TRUE / FALSE**

Impact of Physical activity on Cardiovascular System

The ***FOUR*** key cardiovascular diseases are:

Arteriosclerosis	
Atherosclerosis	
Angina	
Heart Attack	

Movement Analysis:

Task: Complete a movement analysis for as many joints as you can in the two images below;

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Exam style question:

During a race, a 100m sprinter will continually use their hips to generate movement. Below, analyse the different movements that will take place at the hip (10 marks).

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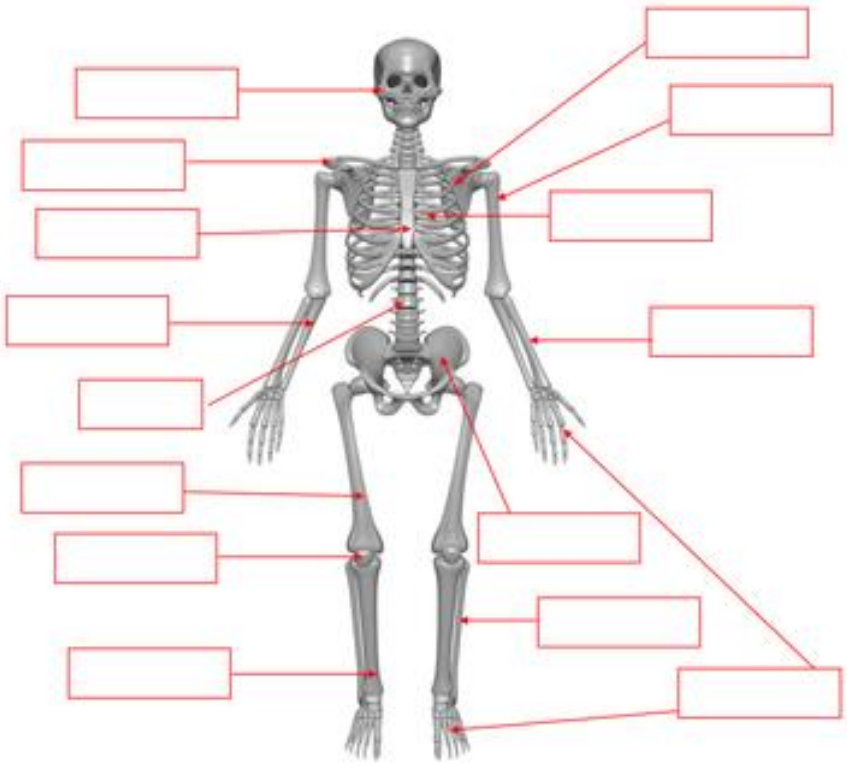
Joints, Movements and Muscles: Task.

Label the skeleton below, identifying where each bone is located.



Describe the frontal and sagittal planes of movement and give a sporting example for each.

Frontal

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Sagittal

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Fig. 1 shows a performer doing a sit up.

Complete the table below to show the movements that take place at the hip joint during both the upward and downward phases.

Phase	Agonist	Movement produced	Type of contraction
Upward			
Downwards			

Section E- Skill Acquisition

This section includes information and tasks for you to complete around skill acquisition. This will be a new topic which you will study in Year 12.

Starter: How can we classify a skill? (What must we consider about it…?)

Motor / Movement Skills:

_____

_____

Difficulty - (Simple - Complex skills continuum):

Simple skills:

- Straightforward skill without many decisions to make.

- E.g. _____

Complex skill:

- Harder skill, where lots of decisions must be made.
- E.g. _____

Environmental influence – (The Open-Closed Skills Continuum):

Open skills:

- Affected by the environment. Externally paced.

- E.g. _____

Closed skills:

- Not affected by the environment. Self-paced. Clear beginning and end.
- E.g. _____

Pacing – (The self - externally paced continuum):

Self-Paced Skills:

- The performer controls the rate at which the skill is executed.

- E.g. _____

Externally-paced skills:

- The environment (e.g. opponent) controls the rate of performing a skill.
- E.g. _____

Pacing – (The Gross - Fine Skill continuum):

Gross skills:

- Involves large muscle movements. Power over precision.

- E.g. _____

Fine Skills:

- Involves more intricate movements. Often needs good co-ordination.
- E.g. _____

Continuity - The discrete-serial-continuous skill continuum:

Discrete skills:

- Clear beginning and end. E.g. _____

Serial skills:

- Several discrete elements put together to make up a sequence of movements.

  E.g. _____

Continuous skills:

No obvious beginning and end.

E.g. _____ etc...

Organisation – (High organisation - Low organisation continuum):

High organisation:

- The skill has subroutines that are difficult to separate.

  E.g. _____

Low organisation:

Skill is split into subroutines that are easily identifiable.

E.g. _____

OCR A LEVEL PHYSICAL EDUCATION

DEVELOP YOUR KNOWLEDGE OF SPORTING CONTEXT IN PREPARATION FOR YOUR 2 YEAR COURSE

NETFLIX

The English Game

(Sport and Society)

Unstoppable (Sport Psychology)

Icarus (Drugs/Performance)

Stop at Nothing (Doping in Sport)

Coach Carter (Sport Psychology)

The Game Changers (Diet and Nutrition)

Supersize Me

(Diet and Nutrition)

Blindside (American Football)

Last Chance U (American Football)

The Last Dance (Michael Jordan)

Losers

(Adversity in Sport)

Moneyball

Formula 1 Drive to Survive

All or Nothing Manchester City

All or Nothing

New Zealand All Blacks

This is Football

4 Minute Mile

The Program (Lance Armstrong)

Andy Murray – Resurfacing (Injury Rehabilitation)

Dan Carter – Perfect 10

The Unknown Runner

The Race to Dope (Doping System in Sport)

Muscle and Medals

YouTube

Subscribe to the Body Coach (Joe Wicks) (Types of Training/Nutrition)
Kobe Bryant Black Mamba Doc
Being Serena Series
"Is Professionalism Killing Sport" BBC Documentary
The Psychology of a Winner 2020 Documentary
Trent Alexander Arnold Living the Dream
Tyson Fury
Road to Redemption
Crossing The Line Australian Cricket
Jurgen Klopp Journey to Top
Strive for Greatness Lebron James

Books to Read
Shoe Dog – Phil Knight History/Story of Nike
Bounce – Matthew Syed Neuroscience/Psychology
Black box thinking Matthew Syed Psychology
Unbeatable – Jessica Ennis
No Limits – Michael Phelps
My Time– Bradley Wiggins
Between the lines – Victoria Pendleton
Legacy – James Kerr *All Blacks (New Zealand Rugby)*
The Secret Race –Tyler Hamilton and Daniel Coyle Drugs/Energy Systems/Deviance

Keep up to date with all the latest news in the world of sport, there is always something happening that links to the course……

Choose a min of 3/ Max of 5 from the lists above and write a report (minimum 1 xA4 for each) which;

(A01) Describes an overview of the Video/Book

(A02) Explains the relationship between the video/book and your OCR A level PE Specification

(A03) Analyses the video/book and discuss your opinion and conclusion

Tick the boxes of the ones you are completing. Feel free to each as many as you want if you have time