Biology AQA Transition pack

Contents

You're studying A-level Biology, congratulations!

Biology is the study of living things, but not just animals and plants. You'll also learn about the molecules that make living things work, the cells that they're made from, the systems within plants and animals, and the interconnections between organisms.

Biology is different from physics and chemistry, in that living things don't always do what you expect them to do. You can't test one organism and assume all the rest will be the same, so you'll learn about the statistical analysis behind making claims.

At first, you may find the jump in demand from GCSE a little daunting, but if you follow the tips and advice in this guide, you'll soon adapt.

We recommend you keep this somewhere safe, as you may like to refer to the information in it throughout your studies.

Why study A-level Biology?

Biology A-level will give you the skills to make connections and associations with all living things around you. Biology literally means the study of life - and if that's not important, what is? Being such a broad topic, you're bound to find a specific area of interest, plus it opens the door to a fantastic range of interesting careers.

Many people use an AS or A-level in Biology in their future studies or work. Even if you don't decide to work in biology, studying it still develops useful and transferable skills for other careers. You'll develop research, problem solving and analytical skills, alongside teamwork and communication. Universities and business regard all of these very highly.

Possible degree options

According to bestcourse4me.com, the top seven degree courses taken by students who have A-level Biology are:

- Biology
- Psychology
- Sport and exercise science
- Medicine
- Anatomy
- Physiology and pathology pharmacology
- Toxicology and pharmacy chemistry.

This list is by no means exhaustive. Biology can prove useful for a wide variety of degree courses.

For more details, go to the bestcourse4me.com, or UCAS.

Which career appeals to you?

Studying Biology at A-level or degree opens up all sorts of career opportunities, such as:

- doctor
- clinical molecular geneticist
- nature conservation officer
- pharmacologist
- research scientist
- vet
- secondary school teacher
- marine biologist
- dentist.

Specification at a glance

First year of A-level

1 Biological molecules.

2 Cells.

3 Organisms exchange substances with their environment.

4 Genetic information, variation and relationships between organisms.

Second year

5 Energy transfers in and between organisms.

6 Organisms respond to changes in their internal and external environments.

7 Genetics, populations, evolution and ecosystems.

8 The control of gene expression.

The assessment for the A-level consists of three exams

Paper 1	+	Paper 2	+	Paper 3
What's assessed • Any content from topics 1–4, including relevant practical skills		What's assessed • Any content from topics 5–8, including relevant practical skills		What's assessed • Any content from topics 1–8, including relevant practical skills
Assessed • written exam: 2 hours • 91 marks • 35% of A-level		Assessed • written exam: 2 hours • 91 marks • 35% of A-level		Assessed • written exam: 2 hours • 78 marks • 30% of A-level
Questions • 76 marks: a mixture of short and long answer questions • 15 marks: extended response questions		Questions • 76 marks: a mixture of short and long answer questions • 15 marks: comprehension question		Questions • 38 marks: structured questions, including practical techniques • 15 marks: critical analysis of given experimental data • 25 marks: one essay from a choice of two titles

Places to go for help

1. AQA website

2. Royal Society of Biology

"A single unified voice for biology". They work with everyone from government policy makers to students, as well as universities and researchers studying biology. Their website includes a dedicated student section. Have a look at rsb.org.uk

3. The student room

Join the A-level Biology forums and share thoughts and ideas with other students if you're stuck with your homework. Just be very careful not to share any details about your assessments, there are serious consequences if you're caught cheating. Visit thestudentroom.co.uk

4. Textbooks

5. Revision guides

These are great if you want a quick overview of the course when you're revising for your exams. Remember to use other tools as well, as these aren't detailed enough on their own.

6. YouTube

YouTube has thousands of Biology videos. Just be careful to look at who produced the video and why because some videos distort the facts. Check the author, date and comments – these help indicate whether the clip is reliable. If in doubt, ask your teacher.

7. Magazines

Focus, New Scientist or Philip Allan updates can help you put the biology you're learning in context.

Getting prepared

All sciences at A-level are very demanding and require commitment, hard work and resilience. Here are a few activities to prepare you for this course

Complete this course in which you will learn the physical processes behind climate variation around the world to better understand the causes of climate change. Causes of Climate Change *University of Bergen and Bjerknes Centre for Climate Research*	**Listen** to this radio programme in which BBC security correspondent Gordon Corera goes inside Britain's secret listening station. GCHQ Cracking the Code *BBC Sounds*	**Read** this article in which evolutionary biologist Barbara Natterson-Horowitz and writer Kathryn Bowers make the case for why parents — animal *and* human — should remain involved in the lives of their full-grown offspring. Humans aren't the only ones that help out their adult kids *Ideas TED*	**Watch** this TED talk in which neuroscientist Robert Sapolsky asks the question: How can humans be so compassionate and altruistic -- and also so brutal and violent? The biology of our best and worst selves *TED Talks – Robert Sapolsky*	**Complete** this course, which aims to demystify the ageing process, and learn how our everyday behaviours are likely to affect our long-term musculoskeletal health. The science of staying active in old age *The Universities of Leeds, Sheffield and Newcastle*
Listen to this radio programme which explores why NASA's third bid to land on the moon was flawed from the start. 13 Minutes to the Moon *BBC Sounds*	**Read** this article from a clinical psychologist which provides practical ways to overcome whatever life throws your way. 8 tips to help you become more resilient *Ideas TED*	**Listen** to this radio programme in which Brian Cox meets some celebrity physics enthusiasts, including Alan Alda and Eddie Izzard. Physics Rocks *BBC Sounds*	**Complete** this course which explores the organic chemistry behind everyday things such as perfume, medicine and sport. Exploring Everyday Chemistry *University of York (starts 29th June)*	**Watch** this TED talk which explores the science behind making cookies. Once you have watched this, why not try and make your own? The chemistry of Cookies *TED Talks – Stephanie Warren*
Complete this course which is an entertaining and illuminating exploration into the impact dentistry has on our lives. Discover Dentistry *The University of Sheffield Available now or 15th June 2020*	**Watch** this TED talk which explains why surfers are masters of complicated physics. The Physics of surfing *TED Talk – Nick Pizzo*	**Listen** to this radio programme in which Susan Marling asks why the UK has the lowest proportion of female engineers in Europe. Britain's Hidden Talent: Women Engineers *BBC Sounds*	**Listen** to this radio programme which explores all sorts of science-related topics (including the Coronavirus). BBC Inside Science *BBC Sounds*	**Watch** this TED talk in which George Zaidan describes the physics behind this frustrating phenomenon. Why is ketchup so hard to pour *TED Talk – George Zaidan*

Read this article from marine scientist Roger Hanlon. In it he explores how the heck colour-blind cephalopods — octopus, squid and others — achieve such a good colour match when they camouflage (in short: amazing, distributed brains).

Oddballs with high-level intelligence: a Q & A with Roger Hanlon about the amazing octopus

Complete this course which will teach you how to solve encrypted maths puzzles, in which numbers are replaced by letters or symbols.

Maths Puzzles: Cryptarithms, Symbologies and Secret Codes

Watch this TED talk in which Angelina Arora shares how a lasting combination of curiosity and strategically applied science could help solve the world's problems.

What creating a toxin-free plastic taught me about problem-solving
TED Talk – Angelina Arora

Complete this course and explore the diverse skills and knowledge required to be a nurse and find out where a career in nursing could take you.

Introduction to Nursing: Bioscience, Psychology, and Sociology

Listen to this radio programme which tackles the big issue of lack of diversity in engineering. In the UK, 91% of jobs in the engineering industry are filled by men and 92% of jobs are filled by white people. So what can we do about it?

BBC Live Wires
How can we make UK engineering more diverse?
BBC Sounds

Watch this TED talk which examines the pharmaceutical industry and its impact on doctors and the wider medical world.

What doctors don't know about the drugs they prescribe
TED Talk – Ben Goldacre

Complete this course which is ideal for anyone considering working in residential care homes or nursing. You will also learn about the 6 'Rs' of medicine administration: right patient, right medicine, right route, right dose, right time and resident's right to refuse.

Understand the key principles of medicine administration
University of East Anglia

Useful information and activities

There are a number of activities throughout this resource. The answers to some of the activities are available on our secure website, e-AQA. Your teacher will be able to provide you with these answers.

SI units

Every measurement must have a size (eg 2.7) and a unit (eg metres or °C). Sometimes, there are different units available for the same type of measurement. For example, ounces, pounds, kilograms and tonnes are all used as units for mass.

To reduce confusion, and to help with conversion between different units, there is a standard system of units called the SI units which are used for most scientific purposes.

These units have all been defined by experiment so that the size of, say, a metre in the UK is the same as a metre in China.

The seven SI base units are:

Physical quantity	Usual quantity symbol	Unit	Abbreviation
mass	m	kilogram	kg
length	l or x	metre	m
time	t	second	s

electric current	I	ampere	A
temperature	T	kelvin	K
amount of substance	N	mole	mol
luminous intensity	(not used at A-level)	candela	cd

All other units can be derived from the SI base units.

For example, area is measured in square metres (written as m^2) and speed is measured in metres per second (written as ms^{-1}).

It is not always appropriate to use a full unit. For example, measuring the width of a hair or the distance from Manchester to London in metres would cause the numbers to be difficult to work with.

Prefixes are used to multiply each of the units. You will be familiar with centi (meaning 1/100), kilo (1000) and milli (1/1000) from centimetres, kilometres and millimetres.

There is a wide range of prefixes. The majority of quantities in scientific contexts will be quoted using the prefixes that are multiples of 1000. For example, a distance of 33 000 m would be quoted as 33 km.

The most common prefixes you will encounter are:

Prefix	Symbol	Multiplication factor		
Tera	T	10^{12}	1 000 000 000 000	
Giga	G	10^{9}	1 000 000 000	
Mega	M	10^{6}	1 000 000	
kilo	k	10^{3}	1000	
deci	d	10^{-1}	0.1	1/10
centi	c	10^{-2}	0.01	1/100
milli	m	10^{-3}	0.001	1/1000
micro	μ	10^{-6}	0.000 001	1/1 000 000
nano	n	10^{-9}	0.000 000 001	1/1 000 000 000
pico	p	10^{-12}	0.000 000 000 001	1/1 000 000 000 000
femto	f	10^{-15}	0.000 000 000 000 001	1/1 000 000 000 000 000

Activity 1

Which SI unit and prefix would you use for the following quantities?

1. The time between heart beats
2. The length of a leaf
3. The distance that a migratory bird travelled each year
4. The width of a cheek cell
5. The mass of a rabbit
6. The mass of iron in the body
7. The volume of the trunk of a large tree

Sometimes, there are units that are used that are not combinations of SI units and prefixes.

These are often multiples of units that are helpful to use. For example, one litre is 0.001 m^3, or one day is 86 400 seconds.

Activity 2

Choose the most appropriate unit, and estimate the size of each of the following.

1. The mass of an elephant
2. The mass of an earthworm
3. The volume of water in a teardrop
4. The volume of water in a pond
5. The time taken for a sunflower to grow
6. The temperature difference between the blood in the heart and in the ear on a cold day
7. The width of a hair
8. The length that your fingernails grow each day
9. The total length of each of the hairs on your head

Task 1: Exam technique

A key area of exam technique is understanding the **command words** in the question.
1. Define the following keywords:
a) Describe

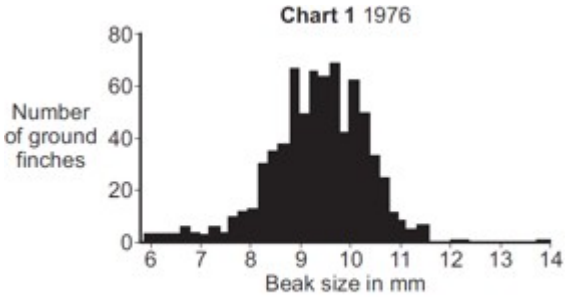
b) Explain

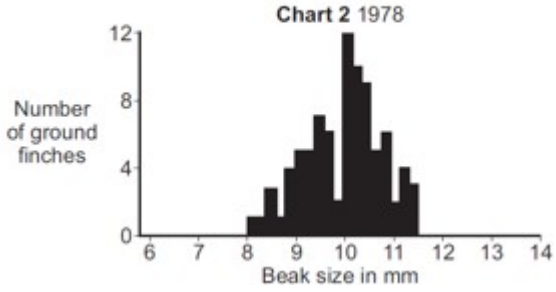
c) Suggest

d) Evaluate

2. The Galapagos Islands are in the Pacific Ocean, 1400 km from South America. A type of bird called a ground finch lives on the islands. The picture shows a ground finch.

The size of the seeds the ground finch can eat depends upon the size of the beak. To eat large seeds, a large beak is needed. The bar charts show the sizes of the beaks of ground finches on one island, in 1976 and in 1978.





7

2 (a) The population of the ground finches and their beak sizes changed between 1976 and 1978.
Describe these changes.

2 b) In 1977 there was very little rain on the island. The lack of rain affected the seeds that the finches ate. The table below shows how the seeds were affected.

Year	Mean number of seeds per m^2	Mean mass of each seed in mg
1976	8.5	3.5
1978	2.8	4.2

Suggest an explanation for the changes in beak sizes between 1976 and 1978.

8

Task 2 Enzymes & the digestive system

1. Match each part of the body to its correct function:

Part of the body	Function
The large intestine	Makes digestive enzymes, and is where digested food is absorbed into the blood
The oesophagus (gullet)	Contains teeth to cut and grind food
The mouth	Is where water is absorbed
The stomach	Joins the mouth with the stomach
The small intestine	Makes digestive enzymes and acid
The liver	Makes insulin and digestive enzymes
The pancreas	Makes bile

2. What is the function of digestive enzymes?

3. How does chewing food help to speed up digestion?

4. Complete the following table:

Enzyme	Where is this enzyme produced?	What food group does the enzyme break down?	What are the products of the breakdown?
Carbohydrase			
Amylase			
Protease			
Lipase			

5. Which one of the following structures is not part of the alimentary canal?
(a) duodenum (b) mouth (c) liver (d) stomach:
6. What name is given to the muscular contraction which moves food along the alimentary canal?

7. Are the contents of the stomach (a) acid, (b) alkaline,{c) neutral?
8. What is the function of bile in digestion?

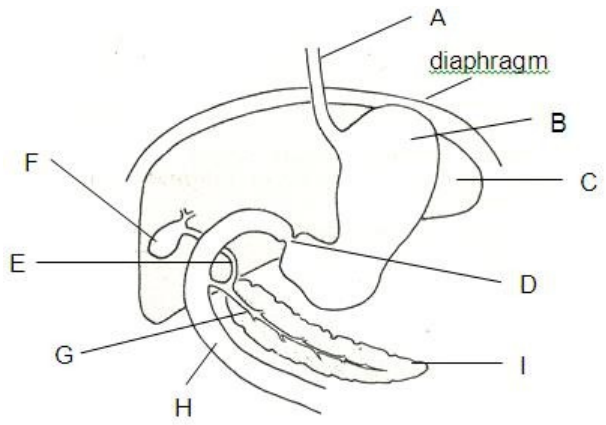
10

9. How is the surface area of the small intestine increased?

10. Describe how you would test for:

Fat	Starch	Protein

11. Name the structures labelled A to I.



12. Find out what the following mean and give one example for each one:
a) Monosaccharide
b) Disaccharide

c) Polysaccharide

Task 3: Factors affecting enzymes

1. What two things affect the activity of enzyme?

2. Enzymes in the human body have an optimum of 37°C. What does this mean?

3. What is the minimum amount of energy required for a reaction to take place called?

4. How do enzymes speed up chemical reactions?

5. If an enzyme-controlled reaction normally takes place at 10ºC, in general terms how will the reaction be affected by:
(a) a fall in temperature to 2°C

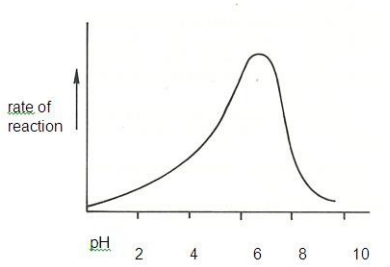
(b) a rise in temperature to 20°C.

(c) a rise in temperature to 65°C?

6. If an enzyme is denatured, why does it no longer work?

12

7. The graph shows the rate of an enzyme reaction at different levels of acidity or alkalinity (pH).



From the graph, what is the optimum pH for this enzyme?
(a) pH 2 (c) pH 10
(b) pH 7 (d) none of these.

8. A protein-digesting enzyme when mixed with starch solution would:
(a) have no action (c) produce glucose
(b) produce amino acids (d) digest the starch

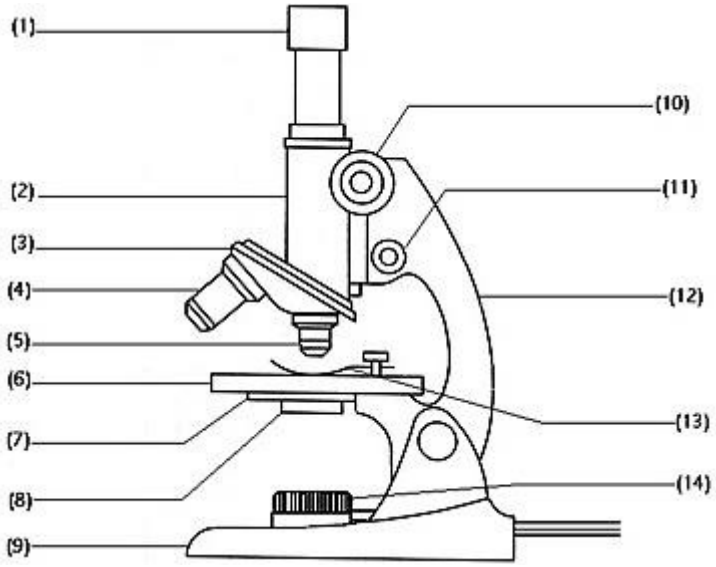
9. What are the 2 models for enzyme action?

10. In enzyme inhibition there are 2 inhibitors, find out what these are called

13

Task 4: Microscopes& Organelles

1. Label the microscope below:



2. Find out the difference between light microscopes and electron microscopes.
Light microscopes:

Electron microscopes:

14

3. You will be using lots of new scientific vocabulary on the biology course find out the meanings of the following keywords:

a) Resolution:

b) Magnification:

c) Nucleolus:

d) Golgi apparatus:

e) Lysosome:

f) Ribosome:

g) Rough endoplasmic reticulum:

4..You must know the following units of measurement when working with microscopes. They are all in comparison to a metre. Complete the table below.

Unit	Symbol	Equivalent in metres
kilometre	km	
metre		1
	mm	10^{-3}
micrometre		10^{-6}
nanometre	nm	

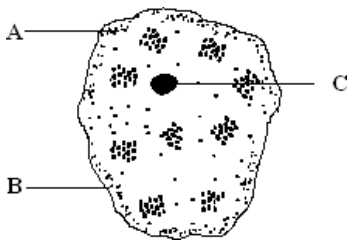
5. Place a tick in the box to indicate where the organelle is found. Some organelles can be found in both plant and animal cells.

Organelle	**Plant Cell**	**Animal Cell**
Cell Wall		
Chloroplast		
Cytoplasm		
Endoplasmic reticulum		
Golgi apparatus		
Lysosome		
Nucleolus		
Nucleus		
Plasma membrane		
Ribosome		
Vacuole		
Mitochondria		

6. Cells are categorised as either prokaryotes or eukaryotes. Find out what this means and give 1 example for each of these categories.
Prokaryote:
Eukaryote:

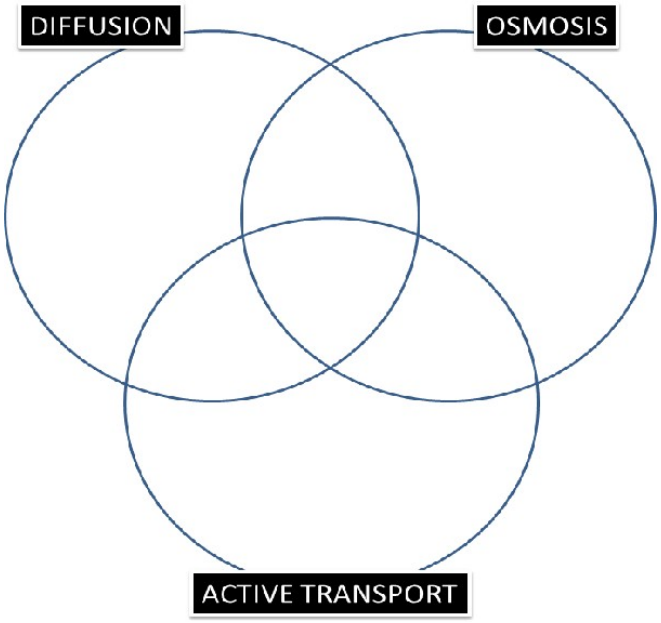
16

7. The diagram shows an animal cell
a) Name each labelled part and give its function
A Name _____
Function_____
_____
B Name_____
Function_____
_____
C Name_____
Function _____
_____



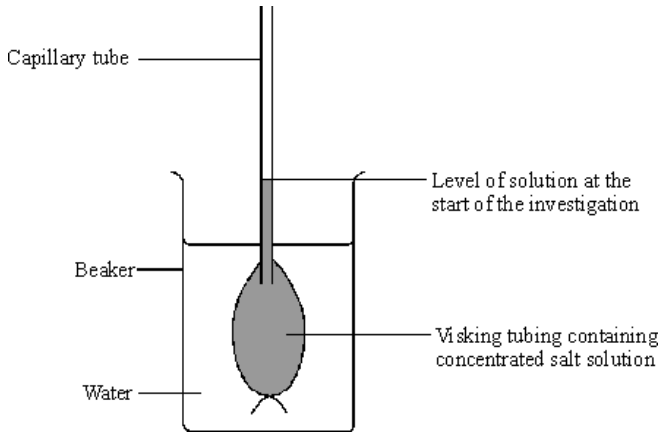
Task 5: Movement across membranes

1. Place the following features in the correct part of the Venn Diagram using the letters given.



A Involveswateronly
B Requiresenergy
C Ispassive
D Movementofparticles
E Howmineralsgetintoroothaircells
F Hightolowconcentration
G Againstaconcentrationgradient

2. Why does active transport require energy?
3. What is this energy in the form of?
4. Some students set up the experiment below to investigate osmosis



18

a) What is osmosis?

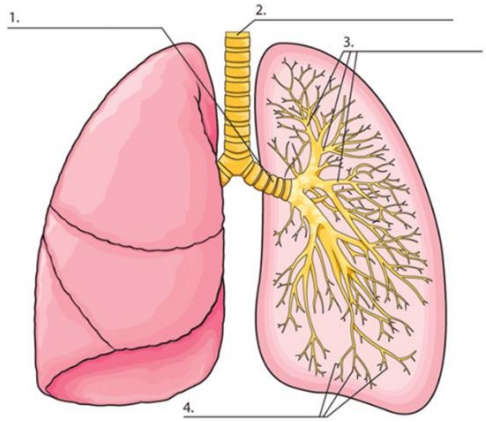
b) What will happen to the water level in the capillary tube during the investigation? Explain why this happens

c) Describe two examples where osmosis is used in living things

Task 6: Gas exchange

1. Where does gas exchange take place in humans?
2. Describe how the lungs are adapted for gas exchange

3. Label the parts of the lung in the diagram below:



4.Describe the process of breathing in (inspiration)

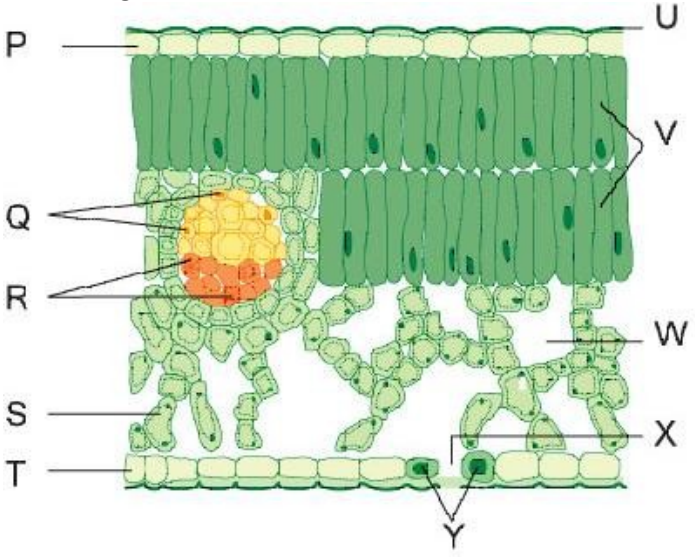
5.Smoking causes emphysema, what is emphysema?

6. Tuberculosis is caused by two species of bacteria. Find out the name for both these bacteria

20

7.Pulmonary ventilation is the total volume of air that is moved into the lungs in one minute. Find out the equation for pulmonary ventilation.

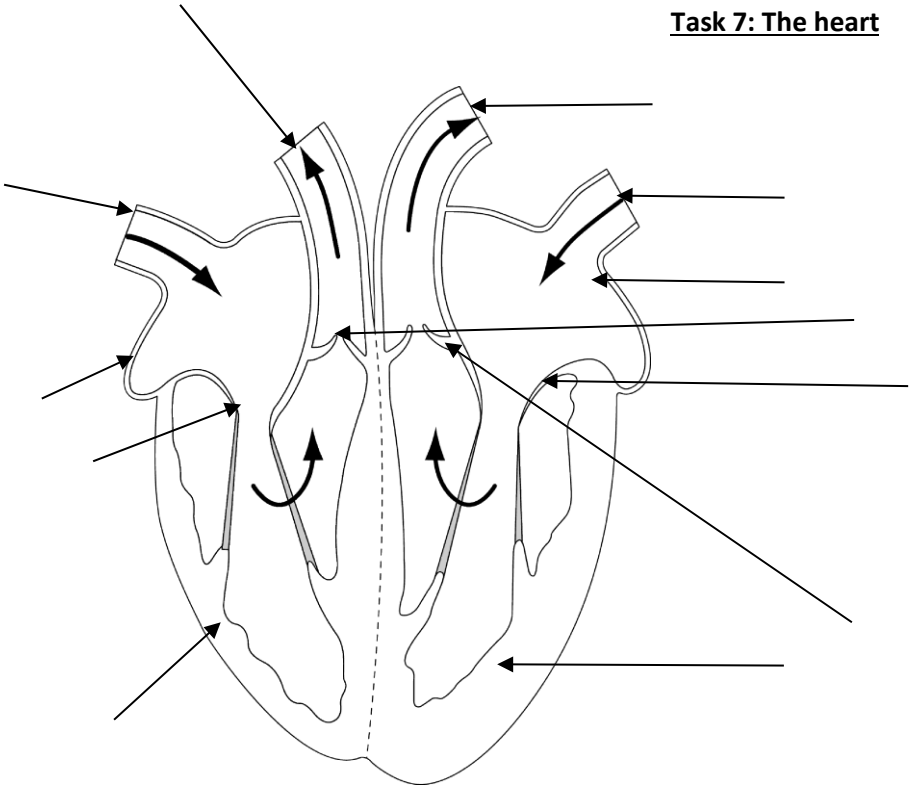
8. The diagram below shows a vertical section of a leaf. Name structures



9.Where does gas exchange take place in a leaf?

10. What is the role of the stomata in gas exchange

Task 7: The heart



1. Label the parts
(don't get the Right and Left confused)

.

2. Complete the passage below:

The heart is made out of_____muscle. It is a double_____that squeezes the blood around the _____ and to the_____. The_____side pumps blood to the lungs to pick up_____. The_____side pumps blood around the rest of the body.

3. Find out another term that is used for a heart attack

4. Which side of the heart is thicker and why?

6. Name the artery that only supplies the heart?

7. Name 3 types of blood vessels

8. Which blood vessel contains valves?

9. What is the function of valves?

10. List three causes of heart disease?

Task 8: Causes of disease & immunity

1. What are the three main types of microorganisms?
2. What is a pathogen?
3. Define the term antigen

4. List 3 things that white blood cells do

5. What is the difference between an antibiotic and an antibody?

10. What is found in a vaccination?

11. Match the description on the left with the term on the right by writing the correct letter in each space.

Letter	Statement	Keyword
	1. A disease that destroys the immune system	a. active
	2. a disease causing bacteria	b. antigens
	3. traps pathogens in the respiratory system	c. passive
	4. proteins and chemicals that are foreign to the body	d. mucous
	5. contains weakened antigens	e. lymphocytes
	6. immunity provided when your body makes it's own antibodies	f. antibody
	7. substance made in response to an antigen	g. enzymes
	8. immunity occurring when antibodies are introduced from another organism	h. pathogens
	9. cells attacked by AIDS virus	i. vaccine
	10. destroy pathogens in stomach, pancreas and liver	j. AIDS

8. Find out what causes cholera and describe the symptoms of this disease.

9. Oral rehydration therapy is used to treat cholera. Find out what this rehydration solution contains.

10. What is the name of the chemical found in cigarettes that causes cancer?

11. Disease causing microorganisms gain entry into the body via one of its interfaces with the environment such as the skin. Name 2 other examples of interfaces through which microorganisms may gain entry into the body.

12. How do pathogens cause disease?