OCR Cambridge Advanced National in Human Biology

Welcome

The Cambridge Advanced National in Human Biology is a fantastic qualification that is designed to help students progress into a career in biological sciences, life sciences, and human biology.

Students who take this qualification will leave with a well rounded skill set, able to complete practical work, carry out research, logically solve problems, carry out calculations, develop and execute a plan, write reports and deliver presentations.

How this course works

Unlike with A-levels, you will have an exam in January of year 12 and 13, and both years you will complete coursework assignments aka NEAs (Non examined assignments).

Year	Unit	Assessment method	Contribution to overall grade (%)
12	F170 Fundamentals of Human Biology	Exam	22
12	F172 Genetics	NEA	14
12	F173 Biomedical techniques	NEA	14
13	F171 Health and Disease	Exam	22
13	F174 Nutrition and Metabolism	NEA	14
13	F176 The brain	NEA	14

At the end of year 12 we will review each students progress and make sure that you are ready to move into year 13. There will be opportunities to resit exams in and every mark that you get counts towards your final grade.

F170 Fundamentals of human biology (Year 12)

This unit covers some of the biological principles that underpin human biology. You will study human body functions at a genetic, cellular, and tissue level. You will look at the nervous, hormonal, and reproductive systems, as well as covering the basics of microbiology

F172 Genetics (Year 12)

In this coursework unit you will learn about DNA, cell division, and inheritance. In your NEA you will take on the role of a genetic counsellor and further research a genetic disorder.

F173 Biomedical techniques (Year 12)

In this coursework unit you will discover biomedical techniques and develop your use of diagnostic techniques. In your NEA you will plan and carry out a clinical investigation leading to a diagnosis.

F171 Health and Disease (Year 13)
You will learn about the intriguing and challenging nature of diseases, including how they are cured, prevented, diagnosed, and monitored. You will find out about researching, referencing, and confidentiality.

Internally assessed unit (Year 13)
You will carry out three internally assessed assignments widening your knowledge of a particular area of the body. The unit content is to be confirmed but will focus on one of the following: Nutrition and Metabolism, Human Reproduction, The brain, Drug Development

Places to go for help

1. The exam board website is a good place to start
   Visit https://www.ocr.org.uk/qualifications/cambridge-advanced-nationals/human-biology-level-3-h049-h149/qualification-at-a-glance/#extended-certificate. The Biology webpages are aimed at teachers, but you may find them useful too. Information includes:
   - The specification – this explains exactly what you need to learn for your exams.
   - Specimen exam papers
2. Primrose Kitten revision resources https://www.primrosekittenacademy.com/course/ocr-level-3-alternative-academic-qualification-human-biology-revision-bootcamp.
3. 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.

Activities to help you prepare for year 12

We have put together this transition booklet to help you prepare for the move into year 12. It includes lots of short activities to help you recap key GCSE information. It is divided into 4 sections.

Topic	Tick when completed
1. Eukaryotic cells	
2. Stem cells	
3. Microscopy	
4. Cell transport	
5. Cell Division	
1. Organisation	
2. The heart	
3. Lungs	
4. Digestive system	
5. Organ failure	
1. The endocrine system	
2. The nervous system	
3. The reproductive system	
1. Prokaryotes and eukaryotes	
2. Routes of transmission	
3. Example pathogens	
4. Treating disease	
1. Protein Synthesis	
2. Structure of DNA	
3. Genetic key terms	
4. Inheritance of sex	
5. Punnet squares	

SECTION 1: HUMAN CELLS AND TISSUES

1. Eukaryotic cells

For Human Biology, the focus is on humans.

Human cells are Eukaryotic. What does this mean?

_____

_____

Match up the cell parts with their function:

Nucleus	Where chemical reactions occur.
Cytoplasm	Where protein synthesis occurs.
Mitochondria	Controls the cell. Contains the DNA in the form of chromosomes.
Cell Membrane	The site of aerobic respiration.
Ribosomes	Controls the movement of substances in and out of cells.

In the space below, draw and label a general, unspecialised human cell:

Write the definition of a stem cell below:

_____

_____

_____

3. Microscopy

For each of the microscopes below, fill in the table:

Photo		
Name		
Advantages		
Disadvantages		

Put the steps in order for how to use a light microscope

A. Place your slide on the stage
B. Look down the eyepiece lens
C. Use the fine focus wheel to make sure the image is as focused as possible
D. First, make sure you have the objective lens at the lowest power magnification
E. Move the mirror so that the light shines through the slide
F. Change the objective lens to a higher magnification
G. Use the coarse focus wheel to get the image into focus

Order of stages:

4. Cell transport

At GCSE you learnt about three types of cell transport: diffusion, osmosis, and active transport.

Sort the statements below into the appropriate columns:

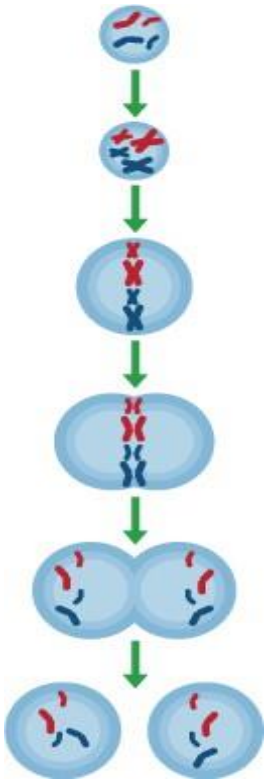
- Movement of water only
- Movement across a partially/ semi permeable membrane (use twice)
- How minerals enter root hair cells
- Does not require energy (use twice)
- How water enters root hair cells
- Passive (use twice)
- Requires energy
- Active
- How carbon dioxide enters a plant
- Substances move from an area of high concentration to an area of low concentration
- Only occurs in nature (use twice)
- Water moves from an area of high concentration of water to an area of low concentration of water
- Can happen in any gas or liquid
- Substances move from an area of low concentration to an area of high concentration

Diffusion	Osmosis	Active Transport

5. Cell Division

You looked at the cell cycle and mitosis in Yr 10 as part of the cells topic.

The cell cycle is made up of the 3 stages, I_____, Mitosis & C_____. Below is a simple diagram of mitosis. Add some descriptions to the side and then finish the sentences on the next page.



Interphase is the first stage of the cell cycle. During this stage….

The process of mitosis produces….

Cytokinesis is….

In mitosis, the chromosome number….

Meiosis is another type of cell division, and is used in the production of gametes. Read the statements below and decide whether they apply to mitosis or meiosis.

Statement	Mitosis	Meiosis
4 daughter cells produced		
2 daughter cells produced		
Gives variation		
1 division happens		
Chromosome number is halved		
Daughter cells are identical		
Produces gametes		
Chromosome number stays the same		
2 divisions happen		
Produces body cells		

Draw a simple diagram of meiosis:

SECTION 2: ORGANS

1. Organisation

Put the following structures in order from smallest to largest

Organism Cell Organ system Tissue Organ

_____ → _____ → _____ → _____ → _____

Identify the organ system described:

Name	Description
	responsible for the transport of blood, circulation of oxygen/carbon dioxide, antibodies, red and white blood cells, molecules including glucose and hormones and for
	supports movement and balance and the bones also act as a calcium storage site and produce blood cells
	responsible for the processes of thermoregulation, plasma glucose regulation and osmoregulation
	includes the sweat glands in the skin but also the kidneys for the excretion of urea
	consists of the trachea, bronchi, bronchioles, lungs, rib cage and intercostal/diaphragm muscles and carries out inspiration and expiration
	consists of the mouth, oesophagus, stomach and small and large intestines

Organ systems:

Lymphatic

Blood circulatory

Homeostatic

Gastrointestinal

Respiratory

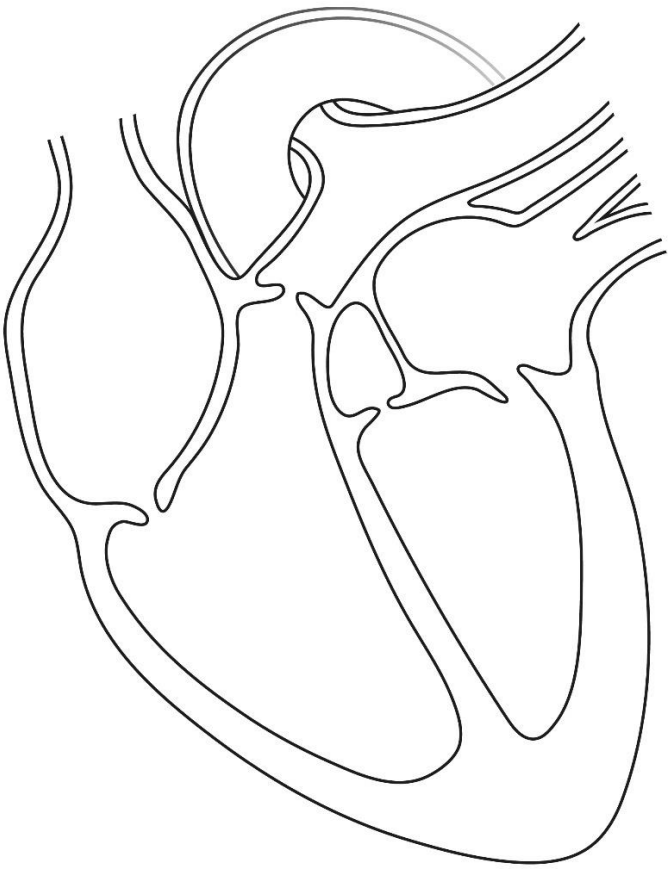
Excretory

Musculo-skeletal

2. The heart

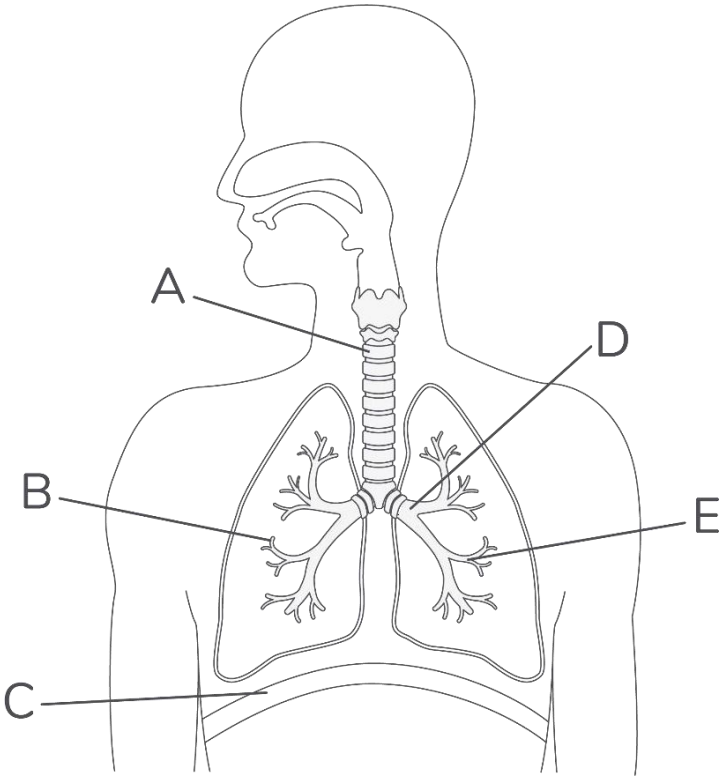
Label the diagram below. You should include the following labels:

- Right atrium
- Right ventricle
- Vena Cava
- Pulmonary artery
- Valve
- Right atrium
- Right ventricle
- Vena Cava
- Pulmonary artery
- Valve



3. Lungs

Label structures A to E



Describe the pathway taken by air after it enters via the mouth

Mouth → _____ → _____ → _____ → _____ → red blood cell

In the alveoli, gases are exchanged.

What gas diffuses into the blood? _____

What gas diffuses out of the blood? _____

Link the description to it's reason:

Description	**Adaptation**
Lots of, rounded	Maintains the concentration gradient
Close to capillaries, walls of the alveoli are only 1 cell thick.	Large surface area
Blood flows continuously through the capillaries	Short Diffusion path

4. Digestive system

Use the word bank below to complete the paragraph.

In the **mouth**, food is chewed as part of _____digestion. Chemical digestion also occurs as the enzyme _____is produced by the salivary glands, breaking down starch into _____.

Food then passes down the **osophagus** to the **stomach**. Here it is mixed with _____acid and the enzyme _____which breaks down proteins into _____.

Then the food moves into the **small intestine**. From the _____more enzymes are added, whilst bile is added from the _____. Bile has two purposes, firstly it _____the stomach acid to provide the _____pH for enzymes, and secondly it _____fats; breaking large lumps into smaller pieces to give a greater surface area for enzymes.

The small intestine actually has two functions. It carries out _____digestion using both the enzymes produced there and the enzymes from the pancreas. The 3 enzymatic reactions are:

1. _____breaks down starch into _____
2. _____breaks down protein into _____
3. _____breaks down lipids into _____and _____

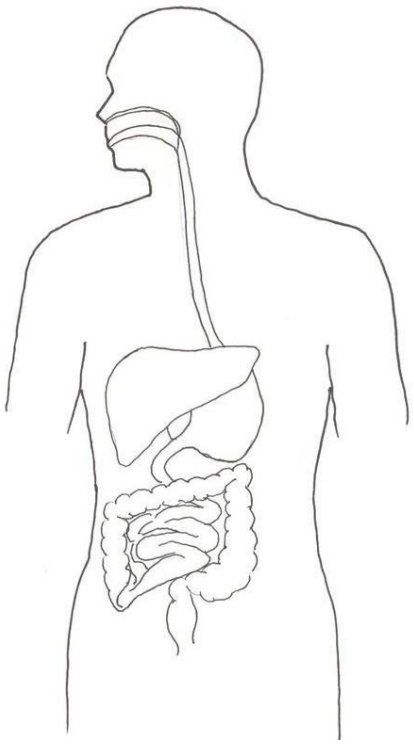
The second function is absorption. The small intestine is well adapted for this. Finger like projections called _____give a large _____area, and the close proximity to the _____means there is a very short _____path. Finally the excellent blood supply maintains the _____gradient.

In the **large intestine**, only waste products remain. Any excess _____is absorbed into the blood. The waste, known as faeces, is stored in the _____before being egested via the _____.

Word bank

Mechanical	Amino acids	Villi	Optimum	**Pancreas**	Glucose	
Amylase	Water	Chemical	**Rectum**	Hydrochloric	Surface	Neutralise
Amylase	Fatty acids	Protease	**Anus**	Lipase	Protease	**Liver**
Concentration	Capillaries	Glucose	Glycerol	Emulsifies	Amino acids	
Diffusion						

Now label the organs of the digestive system. They are all listed in bold on the previous page.



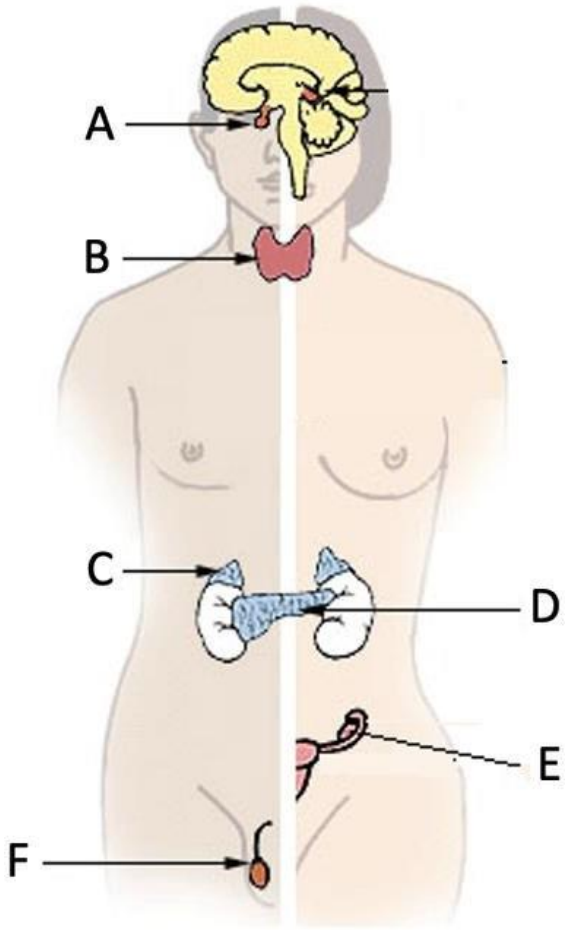
5. Organ Failure

Link the disease with its cause:

Disease	**Cause**
CHD	Genetics, high fat and salt diet
Liver Cirrhosis	Genetics, obesity
Lung cancer	Alcohol
Type 1 diabetes	Smoking

SECTION 3: The endocrine, nervous and reproductive systems

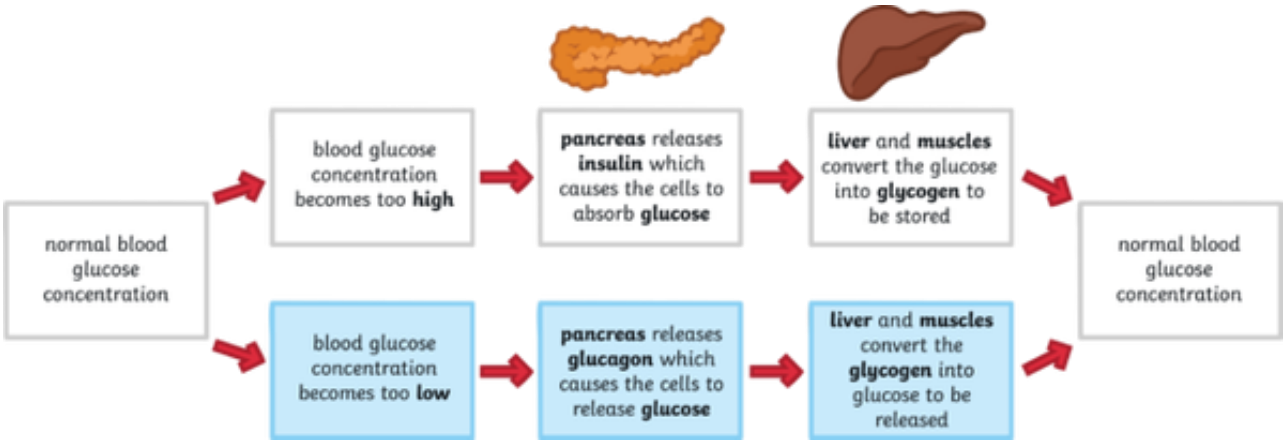
1. The endocrine system



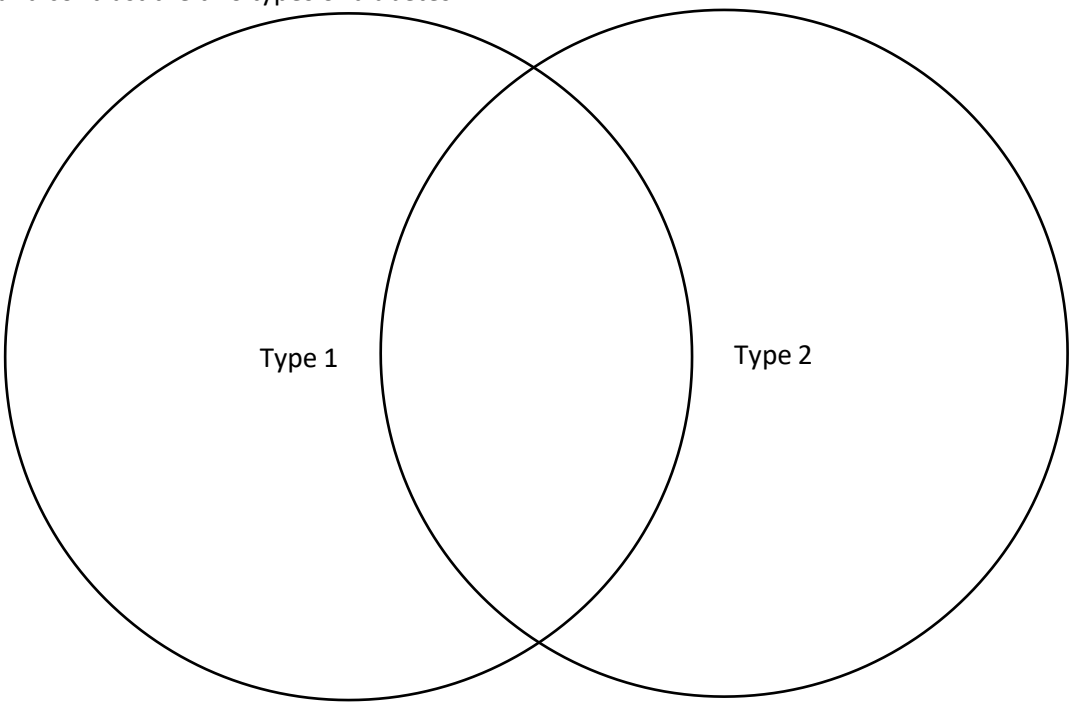
Complete the table below:

Label	Organ name	Function
A		
B		
C		
D		
E		
F		

Write a brief paragraph to explain how blood glucose is regulated:



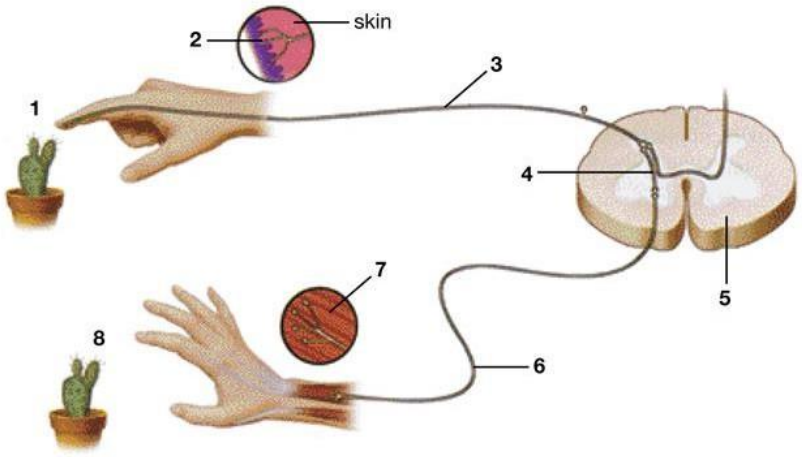
Compare and contrast the two types of diabetes



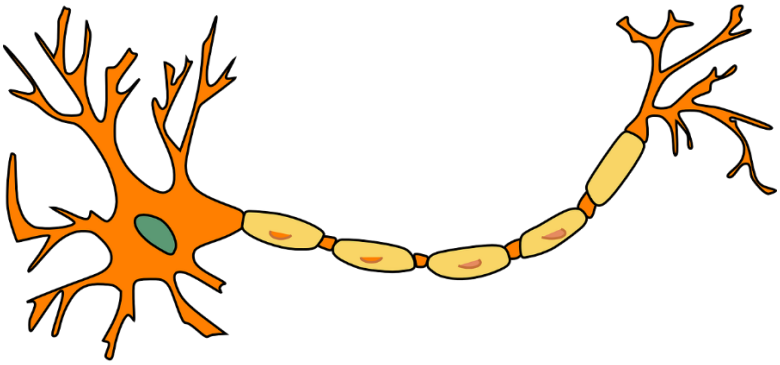
Consider- causes, symptoms, treatment

2. The nervous system

Identify the parts of a reflex arc. Then complete the paragraph.



A (1) _____like pressure from the cactus spines is detected by a (2) _____. From there the impulse travels along a (3) _____ neurone, then a (4) _____neurone which is found in the (5) _____ _____. Next the impulse travels along a (6) _____neurone to the (7)_____. This can be either a muscle or a gland and it carries out the (8)_____.



Write a short paragraph to explain how a neurone is adapted for it's function:

_____

_____

_____

_____

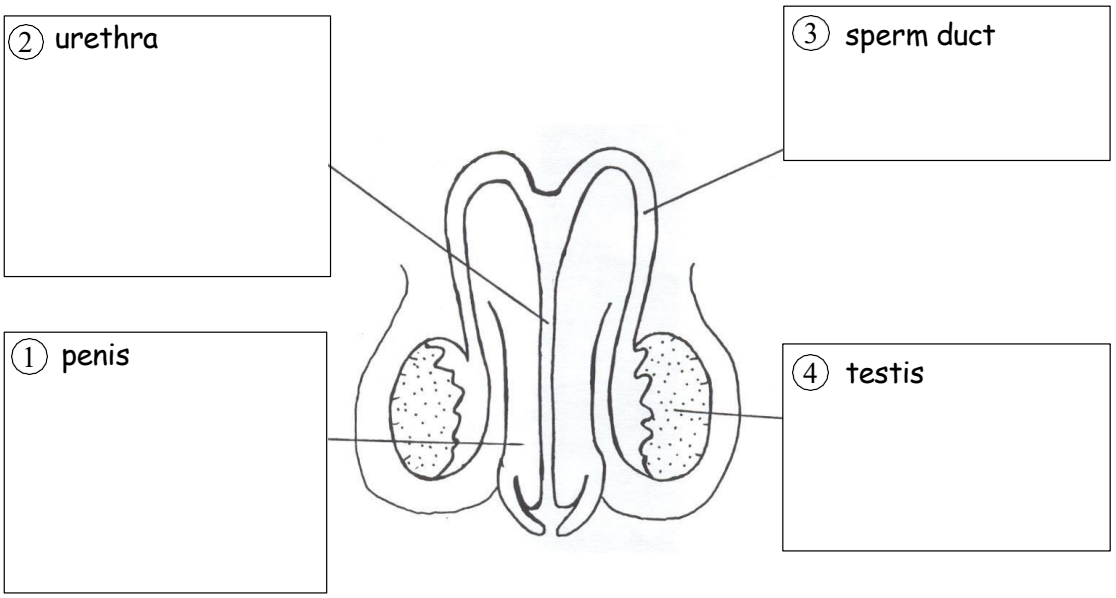
_____

Describe how a message is transmitted between 2 neurones at a synapse. Draw a diagram in the box to illustrate this

Key words: synapse, chemicals, diffuse, impulse

3. The reproductive system

Label the structure of the male reproductive system



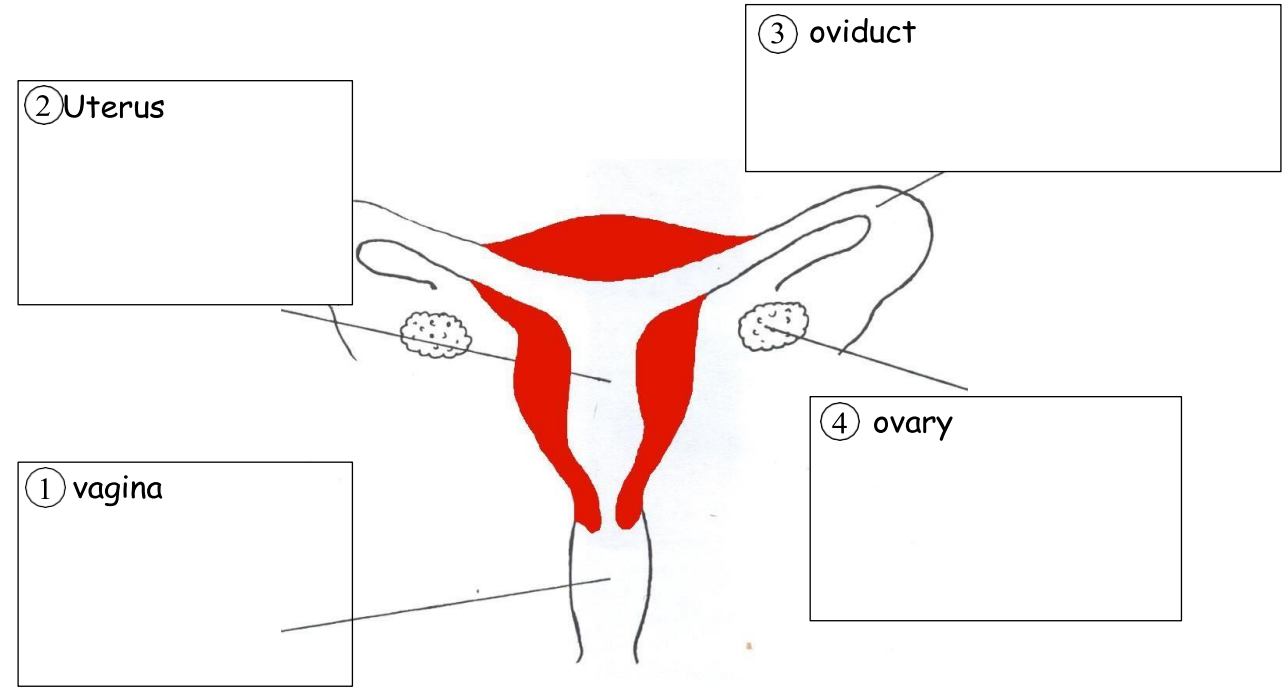
Carries semen containing sperm (when erect) and urine (when not erect).

Sperm produced here along with testosterone.

Spongy tissue fills with blood to make the penis hard and erect so it can enter the vagina.

Carries sperm from testes.

Label the structure of the female reproductive system



Sperm enters the body and baby exits here.

Embryo develops into baby here.

Mature egg is produced here along with oestrogen and progesterone.

Sperm meets egg and fertilisation takes place here.

Complete the mnemonic for the female reproductive hormones

	Hormone name		Made in the…
F		P	
O		O	
L		P	
P		O	

1. The menstrual cycle is the reproductive cycle in women, which starts with a period (menstruation), if the woman is not pregnant.
2. There are four hormones involved: FSH, LH, oestrogen & progesterone.
3. FSH (released by the pituitary gland) causes eggs to mature in the ovaries.
4. FSH stimulates ovaries to produce oestrogen.
5. Oestrogen (made by the ovaries) inhibits further release of FSH and stimulates release of LH. It stimulates the lining of the uterus to grow again.
6. LH (released by the pituitary gland) stimulates the release of an egg (ovulation) from an ovary.
7. LH stimulates secretion of progesterone by the empty ovary.
8. Progesterone inhibits the release of LH and FSH.
9. Progesterone maintains the lining of the uterus.
10. If the egg is not fertilized the levels of progesterone decrease. The thick womb lining starts to break down. This is the start of your period.

1. Highlight/colour the 4 different hormones names wherever you find them in the text. Fill in the key below:

   - ❑ FSH
   - ❑ LH
   - ❑ Oestrogen
   - ❑ Progesterone

2. Where are FSH and LH made? _____
3. Where are oestrogen and progesterone made? _____
4. Which hormone makes eggs mature? _____
5. Which hormones are involved in making the womb lining thick? _____
6. Which hormone inhibits FSH? _____
7. Which hormone stimulates LH? _____
8. Which hormone causes egg release? _____
9. What is the scientific term for a period? _____
10. What is the scientific term for the release of an egg? _____
11. What happens if the egg is not fertilized?

_____

SECTION 4: MICROBIOLOGY

1. Prokaryotes and Eukaryotes

What is the key difference between a eukaryotic and a prokaryotic cell?

_____

_____

In the space below, draw and label a diagram of a bacterium (a typical prokaryote)

What is the function of a flagella?

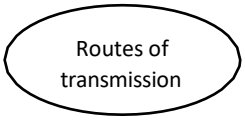
_____

Why do some bacteria have a slime capsule?

_____

2. Routes of transmission

Create a mindmap to show the different ways that diseases can be spread



3. Treating disease

Fill in the gaps:

_____are used for treating infections caused by bacteria. Bacteria live and reproduce outside of cells and make us feel ill due to the _____ they produce. The first example of this type of drug is _____which was discovered by Alexander Fleming. This used to be very effective against gonorrhoea but this is no longer the case due to the bacteria gaining m_____which made them r_____.

_____are hard to treat as they live and reproduce inside cells. Antiviral drugs do exist for some diseases. HIV cannot be cured but antiretroviral drugs are used to manage it.

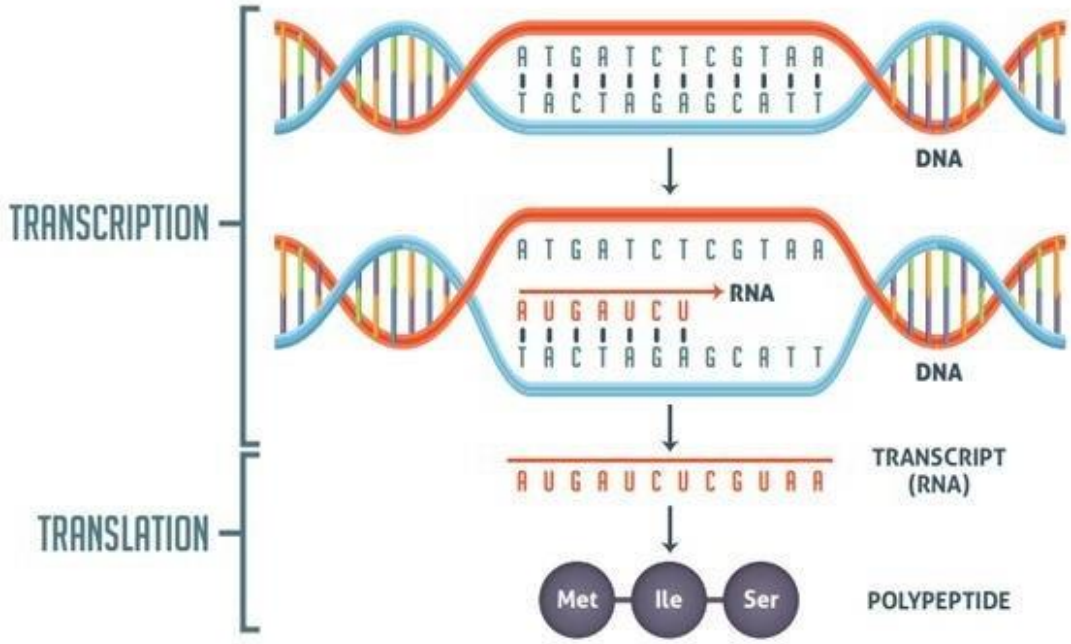
To treat the symptoms of a disease, you might be given _____. These won't cure you but will make you feel better. An example of a painkiller is _____.

SECTION 5: GENETICS

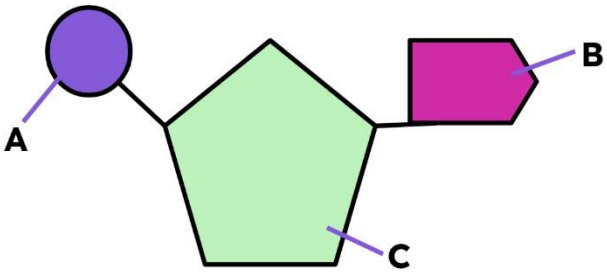
1. Protein Synthesis

Protein synthesis was only covered by triple students so if you did Combined science then it would be helpful for you to watch https://www.youtube.com/watch?v=1GgNNYZ47rk

Transcription occurs in the n_____and is when the DNA message is turned into _____.
This then leaves the n_____and goes to the c_____.
Translation then occurs. A r_____joins onto the messenger and reads it three letters at a time. A carrier brings in a_____a_____which are joined together to form a p_____.



2. Structure of DNA



Here is a single DNA nucleotide. What are parts A, B, and C?

A: _____

B: _____

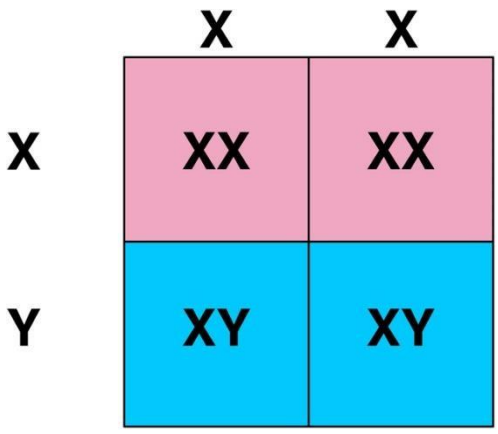
C: _____

3. Genetics key terms

Match the key word with its definition:

Gene	An allele that is expressed even if only one copy is present.
Allele	An individual who has two alleles that are the same.
Dominant	The genes that an individual has
Recessive	A section of DNA that codes for a protein
Homozygous	The observable characteristics of an individual
Heterozygous	An individual who has two alleles that are different
Phenotype	A version of a gene
Genotype	An allele that is only expressed if two copies are present.

4. Inheritance of sex



Explain why the probability of a family having 2 consecutive boy children is 0.25

5. Punnet squares

Huntington's disease is an example of a disease where the mutation causing the disease is dominant.

h: normal (recessive)

H: mutation (dominant)

		Paternal alleles	
		H	h
Maternal alleles	h		
	h		

Cystic fibrosis is an example of a disease where the mutation causing the disease is recessive.

F: normal (recessive)

f: mutation (dominant)

		Paternal alleles	
		F	f
Maternal alleles	F		
	f		

For each of the Punnett squares:

1. Complete the diagrams to show the alleles for each child.
2. State which parent and child is:
   - healthy
   - has the disease
   - a carrier.

Each of the following statements is false. Re-write each one so that it becomes true.

1. The first Punnett square shows that one in every four children from this couple will have Huntington's disease.

2. The second Punnett square shows that there is a one in three chance that a child born to this couple will have cystic fibrosis.

3. All children of the second couple will either be carriers or suffer from cystic fibrosis.

4. The percentage of children who are sufferers on the diagram is the same as the percentage of children each couple will have who are sufferers.

5. Having one child who is born with cystic fibrosis means that the next three children will not have the disease.

6. A 50:50 chance is the same as a 0.25 probability.