

TRANSITION WORK



BIOLOGY 2020

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Please read the whole booklet before you begin.

Part 1 – Enrichment activities. Please log everything you read/watch/listen to in the table on page 4.

The minimum expectation –

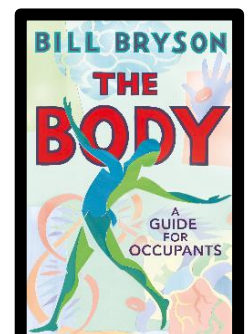
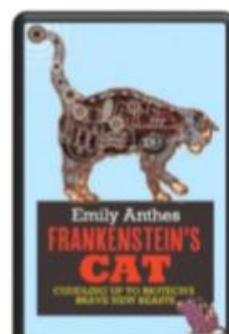
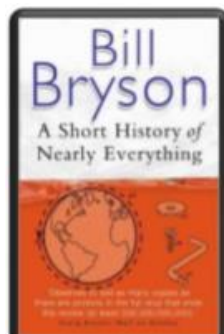
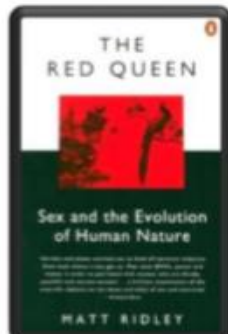
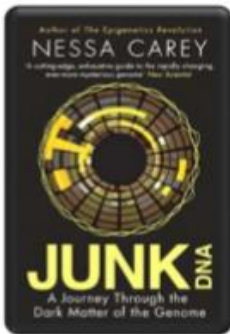
- Read one book
- Watch two documentaries or one documentary series
- Listen to two podcasts or one podcast series
- Listen to three Ted Talks

These can be from the suggested list, or something similar.

Book recommendations

The books below are popular science books, all linked to your studies and great for extending your knowledge and understanding! All available at amazon.co.uk.

Also, check out Audible! Some titles are free whilst schools are closed 🎧

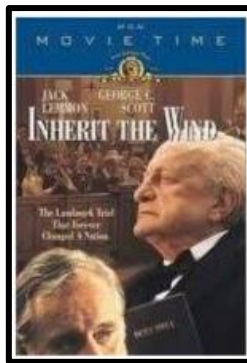


- **Junk DNA.** Explore the complexities of DNA in new depths.
- **The Red Queen.** It's all about sex. Well, sexual selection and its role in evolution.
- **A Short History of Nearly Everything.** A whistle-stop tour through many aspects of history! This book will introduce you to some of the more colourful characters from the history of science.
- **Frankenstein's Cat.** Discover how glow in the dark fish are made and more great biotechnology breakthroughs.
- **The Body.** A second Bill Bryson suggestion (can you tell I'm a fan?! Ever wondered how the body really works?

More books you can look at – The Chemistry of Life (Steven Rose), anything by the geneticist Steve Jones or biologist Richard Dawkins, Genome (Matt Ridley), The Wisdom of the Genes (Wills), Life on the Edge: Quantum Biology (Al-Khalili and MacFadden), Hacking The Code of Life (Carey), Life Ascending (Nick Lane), The Revenge of Gaia (Lovelock), 50 Genetic Ideas You Really Need To Know (Henderson), Zoobiqity (Horowitz and Bowers), Creation: The Origin of Life (Rutherford), The Sixth Extinction (Kolbert), Great Myths of the Brain (Jarrett), The Gene – an Intimate History (Mukherjee), How We Live and Why We Die (Wolpert) and Honeybee Democracy (Seeley).

Movie recommendations

Here are a selection of films based on real life scientific discoveries over the last 50 years! No Jurassic Park I'm afraid, although I always think that's worth a watch!



- **Gorillas in the Mist** (1988). This film retells the true story of the life of Dian Fossey and her work studying and protecting mountain gorillas from poachers and habitat loss. A real tear jerker!
- **Inherit the Wind** (1960). Great if you can find it! Based on a real life trial of a teacher accused of the crime of teaching Darwinian evolution to students in America.
- **Andromeda Strain** (1971). Science fiction written by the great thriller writer Michael Crichton (most famous for writing Jurassic Park). What happens when an alien microbe arrives on Earth? This scenario feels strangely familiar at the moment, one to avoid if you're experiencing 'corona overload'.
- **Lorenzo's Oil** (1992). Based on a true story – A young child suffers from an autoimmune disease. The parents research and challenge doctors to develop a new cure for his disease.
- **Something the Lord Made** (2004). The film tells the story of the scientists at the cutting edge of early heart surgery as well as issues surrounding racism at the time.

Documentary recommendations

There are some great TV series and documentaries available, all of which are linked to your A-level studies. These will deepen your understanding, as well as help to put the theory into context. Most are available on Netflix!

- Blue Planet
- Planet Earth I and II
- Icarus
- Blackfish
- The Ascent of Man
- Catastrophe
- Frozen Planet
- Life Story
- The Hunt and Monsoon.

Podcasts

- 'In Our Time' has podcasts and resources on a huge number of topics.
- Check out 'Geek Wrapped' for 20 of the best scientific (and witty) podcasts.

<https://www.geekwrapped.com/posts/the-20-best-science-podcasts>

TED Talks

Want to get those action potentials firing? Check out the TED Talks below, all are available at [ted.com/talks](https://www.ted.com/talks). There's something for everyone!

- **How does alcohol make you drunk?** Exploring the journey alcohol takes through the body.
- **Is marijuana bad for your brain?** Do the medicinal uses outweigh the effects?
- **The mysterious science of pain.** It's all in the name!
- **Why sleep matters now more than ever.** A slightly longer talk! Debunking the myths of sleep.
- **How bees can keep the peace between elephants and humans.** How do fences made of beehives keep elephants at bay?
- **Hacking bacteria to fight cancer.** Why did a bacterial skin infection reduce the growth of a tumour?
- **How to 3D print human tissue.** What if we could create new, customised organs, from scratch?

Please use the tracking sheet below to document the enrichment activities carried out.

To find out how it links to the A-level specification, click the link below. You can use 'ctrl F' to search for a particular word or phrase.

<https://www.aqa.org.uk/subjects/science/as-and-a-level/biology-7401-7402>

Was it a book, movie, documentary, podcast or Ted Talk?	What was it called?	What was it about? A brief summary.	Which topics in the A-level specification did it link to?

Please add any extras to the table on the next page.



Biology on Twitter

A-level Biology is not only interesting, but HUGELY relevant! There are constant advances in research, treatment and technology, all of which link to the A-level specification. Here are some of our top tips to keep up to date with developing news or interesting stories:

Follow on Twitter:

A level Biology – A hub for GCSE and A level biology students @flagellum_bio

A Level Biology – alevelbiology.co.uk provides resources for AQA, OCR and Edexcel A-Level Biology. @alevelbiologyuk

David Chalk –daily revision tips for AS and A2 Biology
@teacherchalky1

Understand Biology – news stories relating to A level knowledge and understanding
@a_level_biology

Sci Curious – feed from writer and Bethany Brookshire tweeting about good, bad and weird neuroscience
@scicurious

Carl Zimmer – Science writer Carl blogs about the life sciences @carlzimmer

Virginia Hughes – science journalist and blogger for National Geographic, keep up to date with neuroscience, genetics and behaviour
@virginiahughes

Maryn McKenna – science journalist who writes about antibiotic resistance @marynmck

Molecular Biology - latest news, research, books and journals in molecular biology, cell biology, genetics, stem cells, cancer and biotechnology @molecular

Part 2 – Written work to assess your prior knowledge and prepare you for your A-level studies.

The minimum expectation –

- **Complete two research projects from the list below. Use the guidance on page 8 when putting together your one page summary.**
- **Complete two of the assumed knowledge activities.**
- **Complete the 75 minute Baseline Assessment (a set of exam questions based on GCSE theory that you will need to know next year). *We will be marking these in September.***
- **If there are any exam questions that you're not sure of, complete a one page summary of this topic (GCSE knowledge).**

Research projects

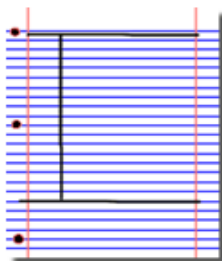
The Big Picture is a brilliant publication from The Wellcome Trust, with a range of resources aimed at students studying A level and beyond.

For two of the topics below, use the resources to produce a one page summary (using the guidance on the next page). You will need to go to <https://www.stem.org.uk/big-picture>, and click 'Explore our resources'. Here you can find the topic you're looking for.

- **Drug Development** – Investigate the role of pharmaceuticals in modern life and where we might go in the future.
- **Genes, genomes and health** – Explore how science can help us to understand our genes and genetic identity.
- **Health and climate change** – What can be done to minimise the risks?
- **Inside the brain** – Explore how imaging research has changed the way we look inside the brain.
- **Number crunching** – How can data and statistics be used to help us understand the world?
- **Populations** – Why is understanding them so important?
- **Space Biology** – Life in space, but how?
- **Proteins** – How can one polymer do it all?

Research, reading and note making are essential skills for A level Biology. For this task you are going to produce 'Cornell Notes' to summarise your reading. Full instructions are on the next page.

1. Divide your page into three sections like this



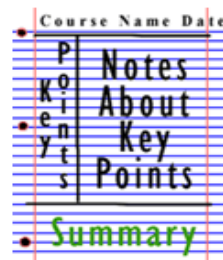
2. Write the name, date and topic at the top of the page



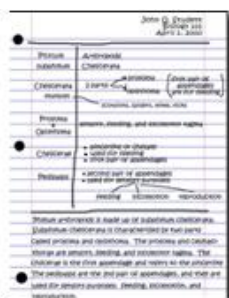
3. Use the large box to make notes. Leave a space between separate ideas. Abbreviate where possible.



4. Review and identify the key points in the left hand box



5. Write a summary of the main ideas in the bottom space



Images taken from <http://coe.jmu.edu/learningtoolbox/cornellnotes.html>

Assumed knowledge activities

There are certain topics we will assume you know when we begin the A-level course in September. This is called 'assumed knowledge'. Complete two of the following activities, honing your knowledge in preparation for A-level studies.

1. Scientific and investigative skills.

As part of your A level you will complete a practical assessment. This will require you to carry out a series of practical activities as well as planning how to do them, analysing the results and evaluating the methods. This will require you to: use appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature, length and pH), use appropriate instrumentation to record quantitative measurements, such as a colorimeter or photometer, use laboratory glassware apparatus for a variety of experimental techniques to include serial dilutions, use of light microscope at high power and low power, including use of a graticule, produce scientific drawing from observation with annotations, use qualitative reagents to identify biological molecules, separate biological compounds using thin layer/paper chromatography or electrophoresis, safely and ethically use organisms, use microbiological aseptic techniques, including the use of agar plates and broth, safely use instruments for dissection of an animal organ, or plant organ, use sampling techniques in fieldwork.

Task:

Produce a glossary for the following key words:

accuracy, anomaly, calibration, causal link, chance, confounding variable, control experiment, control group, control variable, correlation, dependent variable, errors, evidence, fair test, hypothesis, independent, null hypothesis, precision, probability, protocol, random distribution, random error, raw data, reliability, systematic error, true value, validity, zero error.

2. DNA and the Genetic Code

In living organisms nucleic acids (DNA and RNA) have important roles and functions related to their properties. The sequence of bases in the DNA molecule determines the structure of proteins, including enzymes.

The double helix and its four bases store the information that is passed from generation to generation. The sequence of the base pairs adenine, thymine, cytosine and guanine tell ribosomes in the cytoplasm how to construct amino acids into polypeptides and produce every characteristic we see. DNA can mutate leading to diseases including cancer and sometimes anomalies in the genetic code are passed from parents to babies in diseases such as cystic fibrosis, or can be developed in unborn foetuses such as Downs Syndrome.

Read the information on these websites (you could make more Cornell notes if you wish): <http://www.bbc.co.uk/education/guides/z36mmp3/revision>
<http://www.s-cool.co.uk/a-level/biology/dna-and-genetic-code>

And take a look at these videos:

<http://ed.ted.com/lessons/the-twisting-tale-of-dna-judith-hauck>

<http://ed.ted.com/lessons/where-do-genes-come-from-carl-zimmer>

Task:

Produce a wall display to put up in your classroom in September. You might make a poster or do this using PowerPoint or similar. Your display should use images, keywords and simple explanations to:

- Define gene, chromosome, DNA and base pair
- Describe the structure and function of DNA and RNA
- Explain how DNA is copied in the body
- Outline some of the problems that occur with DNA replication and what the consequences of this might be.

3. Cells

The cell is a unifying concept in biology, you will come across it many times during your two years of A level study. Prokaryotic and eukaryotic cells can be distinguished on the basis of their structure and ultrastructure. In complex multicellular organisms, cells are organised into tissues, tissues into organs and organs into systems. During the cell cycle genetic information is copied and passed to daughter cells. Daughter cells formed during mitosis have identical copies of genes while cells formed during meiosis are not genetically identical.

Read the information on these websites (you could make more Cornell notes if you wish): <http://www.s-cool.co.uk/a-level/biology/cells-and-organelles>
<http://www.bbc.co.uk/education/guides/zvjycdm/revision>

And take a look at these videos:
<https://www.youtube.com/watch?v=gcTuQpuJyD8>
<https://www.youtube.com/watch?v=L0k-enzoeOM>
<https://www.youtube.com/watch?v=qCLmR9-YY7o>

Task:

Produce a one page revision guide to share with your class in September summarising one of the following topics: Cells and Cell Ultrastructure, Prokaryotes and Eukaryotes, or Mitosis and Meiosis.

Whichever topic you choose, your revision guide should include:

- Key words and definitions
- Clearly labelled diagrams
- Short explanations of key ideas or processes.

4. Control Systems

Homeostasis is the maintenance of a constant internal environment. Negative feedback helps maintain an optimal internal state in the context of a dynamic equilibrium. Positive feedback also occurs. Stimuli, both internal and external, are detected leading to responses. The genome is regulated by a number of factors. Coordination may be chemical or electrical in nature

Read the information on these websites (you could make more Cornell notes if you wish): <http://www.s-cool.co.uk/a-level/biology/homeostasis>
<http://www.bbc.co.uk/education/topics/z8kxpv4>

And take a look at these videos:

<https://www.youtube.com/watch?v=x4PPZCLnVkA>
<https://www.youtube.com/watch?v=x4PPZCLnVkA>

Task:

Produce a poster to display in your classroom in September summarising one of the following topics: Temperature Control, Water and the Kidneys, Glucose, or The Liver.

Whichever topic you choose, your poster or display should include: Key words and definitions

Clearly labelled diagrams

Short explanations of key ideas or processes.

A-level Biology Baseline Assessment

Please take 75 minutes to complete the questions below in exam conditions. If you run out of time, feel free to swap colours and continue. We will be marking this in September to assess your prior knowledge.

Q1.

A student carried out an investigation using chicken eggs.

This is the method used.

1. Place 5 eggs in acid for 24 hours to dissolve the egg shell.
2. Measure and record the mass of each egg.
3. Place each egg into a separate beaker containing 200 cm³ of distilled water.
4. After 20 minutes, remove the eggs from the beakers and dry them gently with a paper towel.
5. Measure and record the mass of each egg.

Table 1 shows the results.

Table 1

Egg	Mass of egg without shell in grams	Mass of egg after 20 minutes in grams
1	73.5	77.0
2	70.3	73.9
3	72.4	75.7
4	71.6	73.1
5	70.5	73.8

- (a) Another student suggested that the result for egg **4** was anomalous.

Do you agree with the student?

Give a reason for your answer.

(1)

(b) Calculate the percentage change in mass of egg 3.

Percentage change in mass = _____

(2)

(c) Explain why the masses of the eggs increased.

(3)

(d) Explain how the student could modify the investigation to determine the concentration of the solution inside each egg.

(3)

Chicken egg shells contain calcium. Calcium ions are moved from the shell into the cytoplasm of the egg.

Table 2 shows information about the concentration of calcium ions.

Table 2

Location	Concentration of calcium ions in arbitrary units
Egg shell	0.6
Egg cytoplasm	2.1

- (e) Explain how calcium ions are moved from the shell into the cytoplasm of the egg.

(3)

(Total 12 marks)

Q2.

Cell division is needed for growth and for reproduction.

- (a) The table below contains three statements about cell division.

Complete the table.

Tick **one** box for each statement.

Statement	Statement is true for		
	Mitosis only	Meiosis only	Both mitosis and meiosis
All cells produced are genetically identical			
In humans, at the end of cell division each cell contains 23 chromosomes			
Involves DNA replication			

(2)

Bluebell plants grow in woodlands in the UK.

- Bluebells can reproduce sexually by producing seeds.
 - Bluebells can also reproduce asexually by making new bulbs.
- (b) One advantage of asexual reproduction for bluebells is that only **one** parent is needed.

Suggest **two** other advantages of asexual reproduction for bluebells.

1.

2.

(2)

- (c) Explain why sexual reproduction is an advantage for bluebells.

(4)

(Total 8 marks)

Q3.

A student carried out an investigation using leaf epidermis.

This is the method used.

1. Peel the lower epidermis from the underside of a leaf.
2. Cut the epidermis into six equal sized pieces.
3. Place each piece of lower epidermis into a different Petri dish.
4. Add 5 cm³ of salt solution to the six Petri dishes. Each Petri dish should have a different concentration of salt solution.

5. After 1 hour, view each piece of epidermis under a microscope at $\times 400$ magnification.
6. Count and record the total number of stomata present and the number of open stomata that can be seen in one field of view.

The student's results are shown in the table.

Concentration of salt solution in mol / dm^3	Number of stomata in field of view	Number of open stomata in field of view	Percentage (%) of open stomata in field of view
0.0	7	7	100
0.1	8	8	100
0.2	7	6	X
0.3	9	6	67
0.4	10	4	40
0.5	9	2	22

- (a) Calculate value **X** in the table above.

X = _____ %

(1)

- (b) Give **one** conclusion from the results in the table above.

(1)

- (c) How could the student find out what concentration of salt solution would result in half of the stomata being open?

(1)

- (d) The student measured the real diameter of the field of view to be 0.375 mm.

Calculate the number of open stomata per mm^2 of leaf for the epidermis placed in 0.4 mol / dm^3 salt solution.

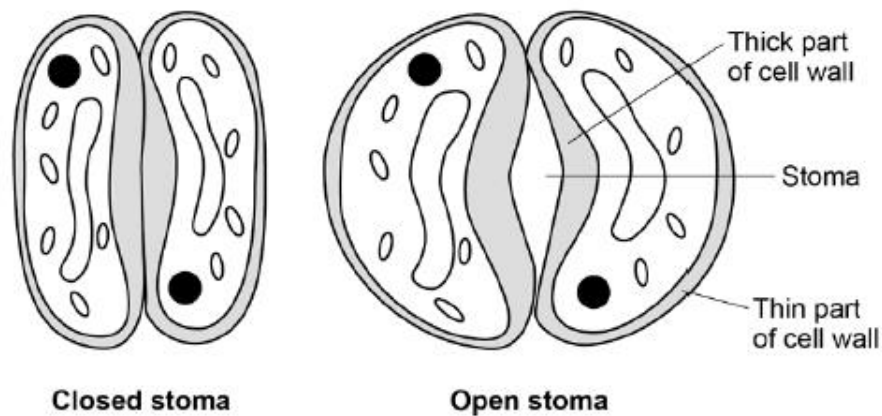
Use information from the table above.

Take π to be 3.14

Number of open stomata = _____ per mm^2

(3)

- (e) The diagram below shows two guard cells surrounding a closed stoma and two guard cells surrounding an open stoma.



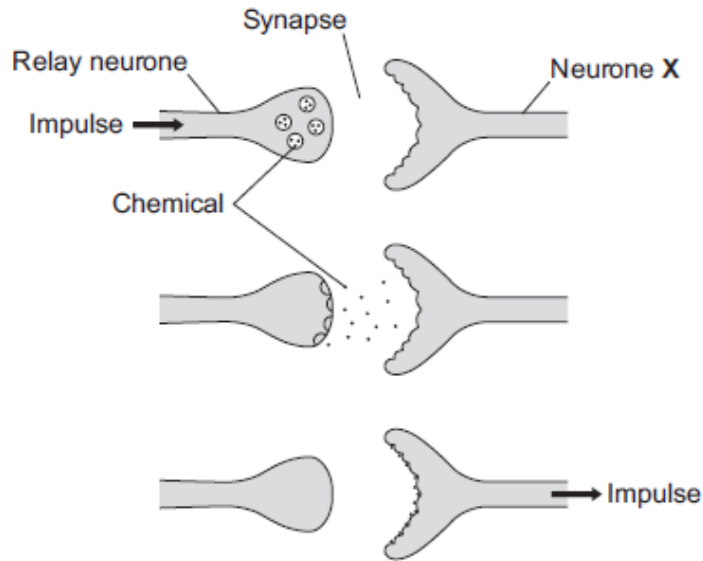
When light intensity is high potassium ions are moved into the guard cells.

Describe how the movement of potassium ions into the guard cells causes the stoma to open.

(4)
(Total 10 marks)

Q4.

The diagram below shows how a nerve impulse passing along a relay neurone causes an impulse to be sent along another type of neurone, neurone X.



(a) What type of neurone is neurone X?

(1)

(b) Describe how information passes from the relay neurone to neurone X. Use the diagram to help you.

(3)

- (c) Scientists investigated the effect of two toxins on the way in which information passes across synapses. The table below shows the results.

Toxin	Effect at the synapse
Curare	Decreases the effect of the chemical on neurone X
Strychnine	Increases the amount of the chemical made in the relay neurone

Describe the effect of each of the toxins on the response by muscles.

Curare

Strychnine

(2)

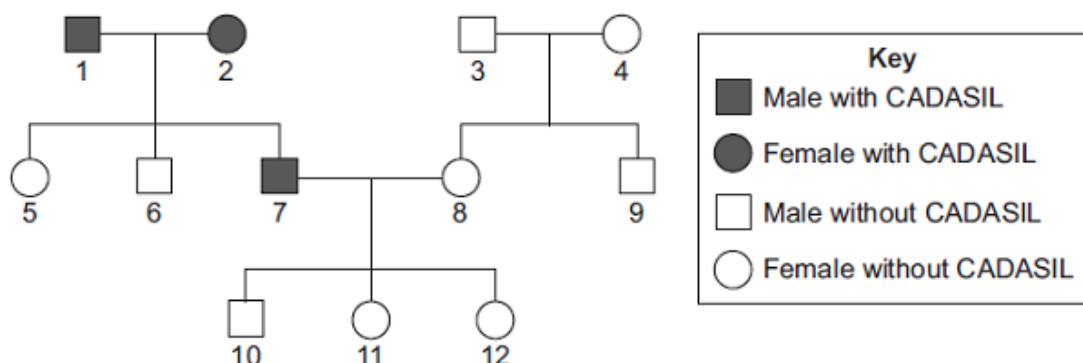
(Total 6 marks)

Q5.

CADASIL is an inherited disorder caused by a dominant allele.

CADASIL leads to weakening of blood vessels in the brain.

The diagram shows the inheritance of CADASIL in one family.



- (a) CADASIL is caused by a *dominant allele*.

- (i) What is a *dominant allele*?

(1)

- (ii) What is the evidence in the diagram that CADASIL is caused by a dominant allele?

(1)

- (iii) Person 7 has CADASIL.
Is person 7 homozygous or heterozygous for the CADASIL allele?
Give evidence for your answer from the diagram.

(1)

- (b) Persons 7 and 8 are planning to have another baby.
Use a genetic diagram to find the probability that the new baby will develop into a person with CADASIL.

Use the following symbols to represent alleles.

D = allele for CADASIL

d = allele for not having CADASIL

Probability = _____

(4)

- (c) Scientists are trying to develop a treatment for CADASIL using stem cells.

Specially treated stem cells would be injected into the damaged part of the brain.

- (i) Why do the scientists use stem cells?

(2)

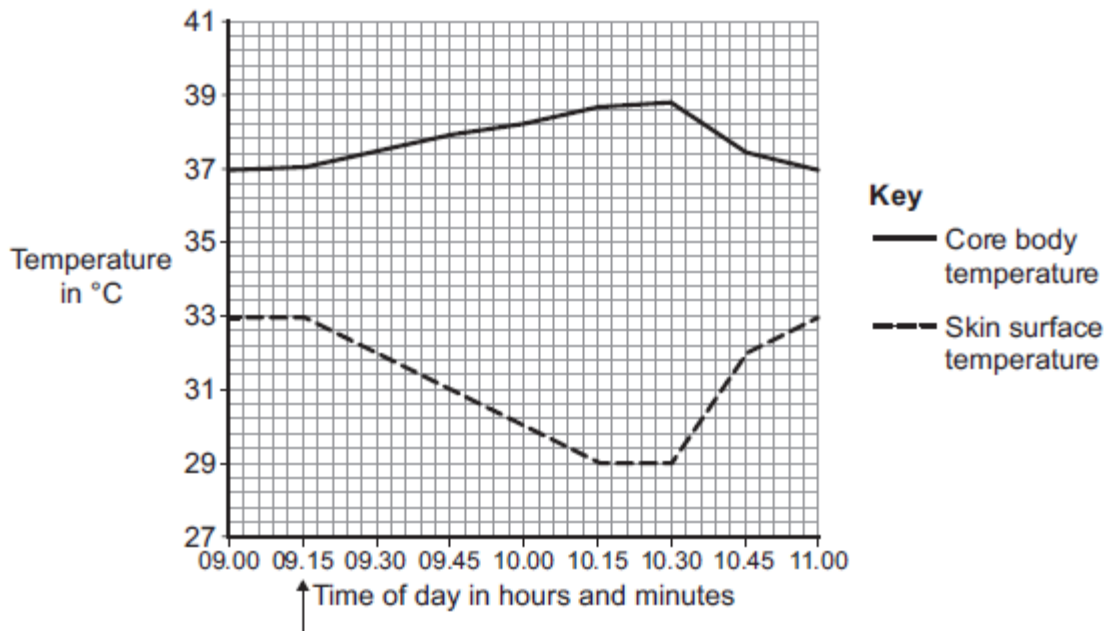
- (ii) Embryonic stem cells can be obtained by removing a few cells from a human embryo. In 2006, scientists in Japan discovered how to change adult skin cells into stem cells. Suggest **one** advantage of using stem cells from adult skin cells.

(1)

(Total 10 marks)

Q6.

The graph shows the core body temperature and the skin surface temperature of a cyclist before, during and after a race.



Start
of race

- (a) (i) When the cyclist finished the race, his core body temperature started to decrease.

How long did the race last?

(1)

- (ii) Describe and explain the different patterns shown in the core body temperature and skin surface temperature between 09.15 and 10.15.

(6)

(iii) After 10.30, the core body temperature decreased.

Explain how changes in the blood vessels supplying the skin caused the skin surface temperature to increase.

(2)

(b) During the race, the cyclist's blood glucose concentration began to decrease.

Describe how the body responds when the blood glucose concentration begins to decrease.

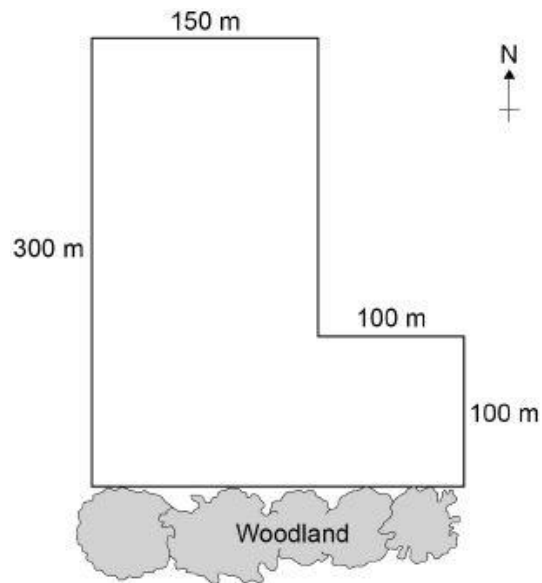
(3)

(Total 12 marks)

Q7.

Some students investigated the size of a population of dandelion plants in a field.

The diagram below shows the field.



The students:

- placed a 1 m × 1 m square quadrat at 10 random positions in the field
- counted the number of dandelion plants in each quadrat.

The table below shows the students' results.

Quadrat number	Number of dandelion plants
1	6
2	9
3	5
4	8
5	0
6	10
7	2
8	1
9	8
10	11

(a) Why did the students place the quadrats at random positions?

(1)

(b) Estimate the total number of dandelion plants in the field.

Calculate your answer using information from the diagram and the table above.

Give your answer in standard form.

Total number of dandelion plants = _____

(5)

Quadrats **5**, **7** and **8** were each placed less than 10 metres from the woodland. These quadrats contained low numbers of dandelion plants.

The students made the hypothesis:

‘Light intensity affects the number of dandelion plants that grow in an area.’

(c) Plan an investigation to test this hypothesis.

(6)

(d) Light is an environmental factor that affects the growth of dandelion plants.

Give **two** other environmental factors that affect the growth of dandelion plants.

1.

2.

(2)

(Total 14 marks)

END OF BOOKLET

Well done!