

# Science KS4: Blended Learning Booklet

## B1 Cell Biology

Name:

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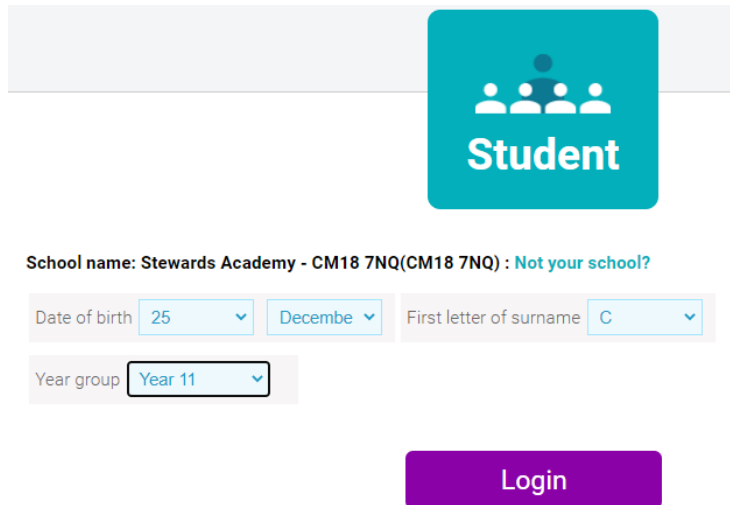
*Aim to complete four lessons each week. Watch the videos and follow the four part lesson plan*

*All video clips are online using the ClassCharts link. Upload all work onto ClassCharts for feedback.*

*The online textbook has all the key information and vocabulary to help you with this unit*

**To log on to the online textbook:**

- <https://connect.collins.co.uk/school/portal.aspx>
- Type in “stewards” and select Stewards Academy
- Login using your date of birth,  
initial of your surname and your  
academic year



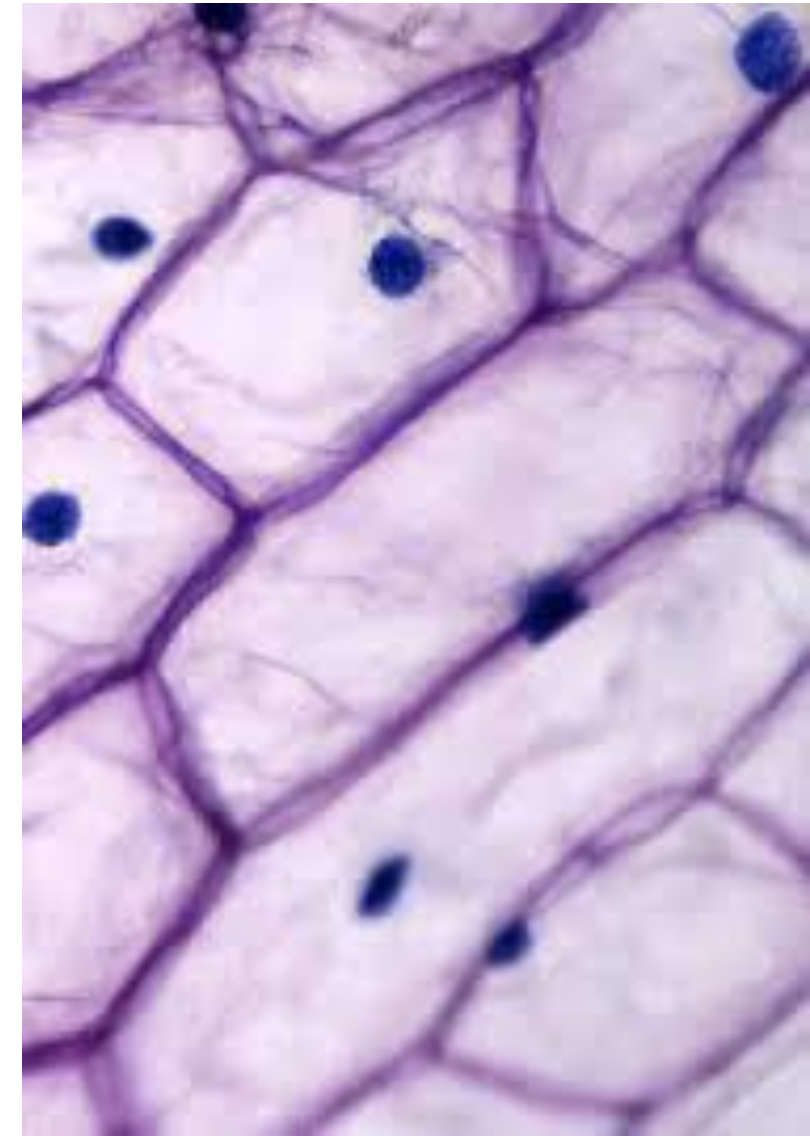
Student

School name: Stewards Academy - CM18 7NQ(CM18 7NQ) : [Not your school?](#)

Date of birth   First letter of surname

Year group

Login



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Knowledge Organiser (PiXL)

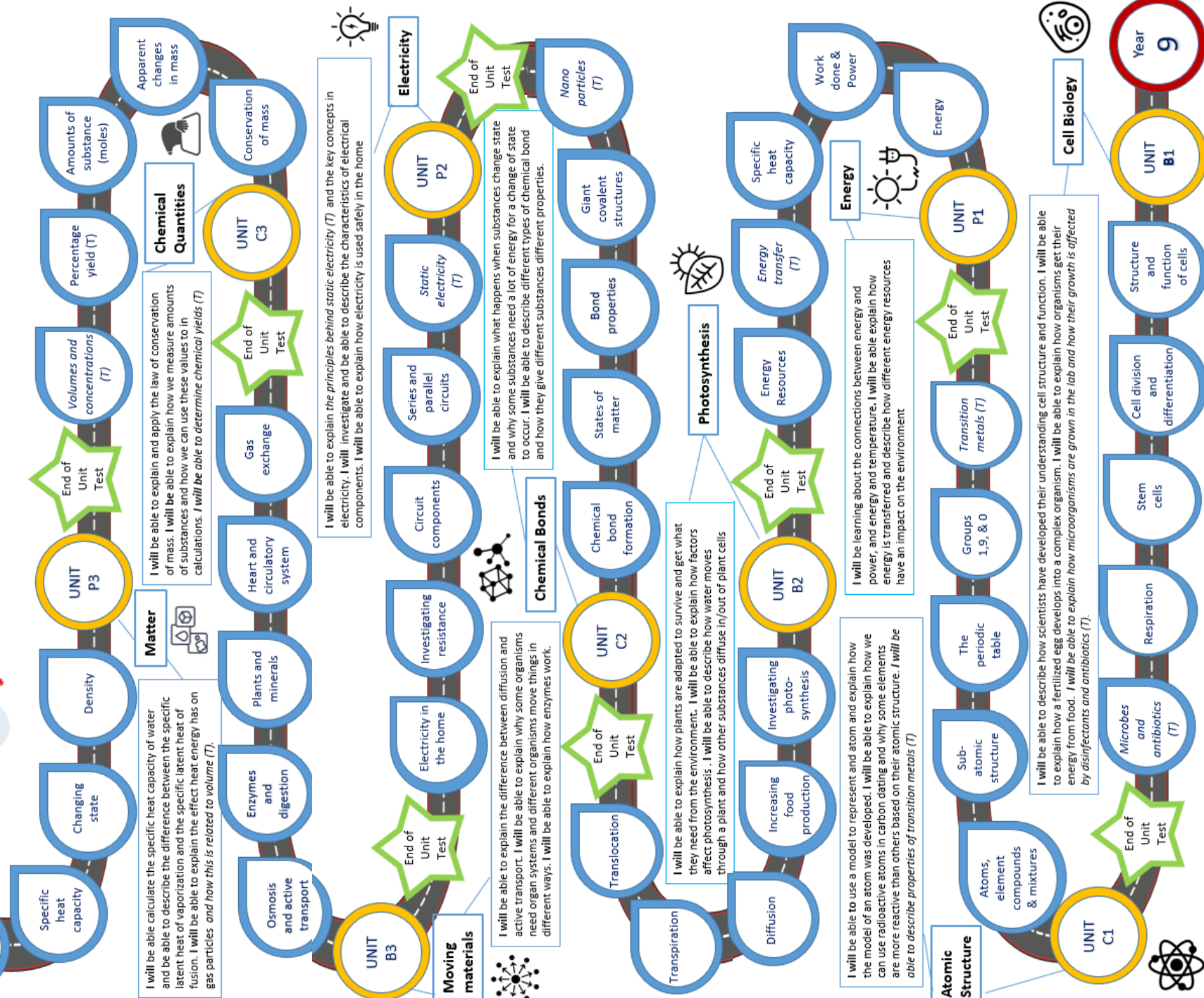
SAL

**(T) = Triple scientists only**



# Big Picture – Year 9 Overview

## Science



# ZOOM IN...

## MY LEARNING JOURNEY:

*Subject: Cell Biology Year: 9 Unit: B1*

### AIMS

To introduce students to the structure and functions of cells. To enable them to compare the use of light and electron microscopes and calculate magnification. They will describe how cells divide and how stem cells produce new tissues and organs. Stem Cell Therapy will be evaluated in terms of ethical and moral considerations. Students will consider the differences between aerobic and anaerobic respiration. *Triple scientists will investigate bacterial cell growth and the effect of antibiotics*

### DEVELOPING COURAGE

- C Scientists are working hard to understand and treat Cancer
- O To learn how to use a light microscope
- U How cells work together to form tissues and organs
- R To evaluate a new breakthrough in medicine (Stem Cell Therapy)
- A Cells have specialised structures for a specialised functions
- G The ethics of tissue/organ donation
- E Understanding how your body works

### PREVIOUS LEARNING

Pupils will have some knowledge of cells being the building blocks of all living organisms and that in multicellular organisms cells become specialised. Also, that cells require energy from respiration and that single celled organisms can be useful

### WHAT WE KNOW/ REMEMBER

- .....
- .....
- .....
- .....
- .....

### UP NEXT

#### Photosynthesis.

- How plants make their own food
- Factors affecting this process
- How this links to food production
- Structure and function of plants

### CAREERS

- IVF clinician
- Oncologist,
- Stem Cell Scientist....
- Microbiologist



### PERSONAL OBJECTIVES

- .....
- .....
- .....
- .....
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### RECOMMENDED READING

1. Cells for kids by N Singh,
2. How Stem Cells Are Disrupting Medicine and Transforming Lives by Neil H Riordan,
3. Biochemistry for Dummies..

## Connection

Have a look at the topic overview and the B1 zoom in.

Populate what you know and your personal objectives.

## Lesson 1: B1.1 - Looking at cells

### Activation

**LI: Describe the structure of eukaryotic cells, explain how structure relates to function**

<https://www.youtube.com/watch?v=ApvxVtBJxd0>

1. Make a note of the title and the LO
2. Read pages 14-15
3. Define keywords
4. Draw and label figure 1.1a&b



## Consolidation

Complete and self assess the relevant past paper question for this topic - From the B1 DIP file

## Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

## Demonstration

Attempt questions 1-8.  
In 15 mins answer as many questions as you can.  
Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:  
Green questions to GCSE Level 3  
Blue questions to GCSE Level 6  
Purple questions to GCSE Level 9



# Answers: B1.1 - Looking at cells

## Connection

- 1 NA
- 2 NA
- 3 NA

## Demonstration

- 1 cell membrane, nucleus (and mitochondria and ribosomes)
- 2 **a** chloroplasts, permanent vacuole  
**b** (nucleus) - controls the activities of the cell  
(cell membrane) - controls the passage of substances into and out of the cell
- 3 cell wall
- 4  $0.00004 \text{ m} / 4 \times 10^{-5} \text{ m}$
- 5  $10 - 100 \text{ } \mu\text{m}$
- 6  $0.007 \text{ } \mu\text{m}$
- 7 1 (=x10)
- 8 Oxygen and glucose pass in to supply muscle with reactants for respiration to make the energy needed for muscles to contract. Carbon dioxide passes out as this is a waste product of respiration.

## Connection

- Q1. What does eukaryotic mean?
- Q2. List 3x structures found in BOTH plant and animal cells
- Q3. List 3x structures found in plant cells ONLY

## Lesson 2: B1.2 – The light microscope

### Activation

#### LI: Looking at plant and animal cells with a light microscope

<https://www.youtube.com/watch?v=VBdVARYWq1c>

1. Make a note of the title and the LI
2. Read pages 16-17
3. Make a list of key words – define those you don't know
4. Copy the equation for total magnification (pg 16)
5. Draw figure 1.5 (page 17) copy the magnification of the image equation and use the information in the blue titled paragraph to explain why in real life those cells measure  $40\mu\text{m}$

## Consolidation

Complete and self assess the relevant past paper question for this topic - From the B1 DIP file

## Demonstration

Attempt questions 1-7.  
In 15 mins answer as many questions as you can.  
Self mark the questions you have done making any necessary corrections in blue pen

## Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Challenge yourself to answer as many as you can:  
Green questions to GCSE Level 3  
Blue questions to GCSE Level 6  
Purple questions to GCSE Level 9

# Answers: B1.2 - The light microscope

## Connection

- 1 with a nucleus
- 2 nucleus, cell membrane, cytoplasm
- 3 vacuole, chloroplasts, cell wall

## Demonstration

- 1 x600
- 2 x20
- 3 x1250
- 4 the magnification of an image in a book will give an accurate indication of true size; the size of an image on a computer will be different on different computers, depending on screen size and resolution. It is of little value, therefore, to show the magnification.
- 5  $0.2\text{ }\mu\text{m}/200\text{ nm}$
- 6 around x1500.
- 7 Pros: Easy and quick to use, inexpensive, able to view live specimens. Cons: high magnification not possible so cannot see very small structures, resolution restricted to 200nm, only 2D, not 3D.



### Lesson 3: B1.3 – Looking at cells in more detail

#### Connection

Q1. What is the equation for total magnification?

Q2. What is the equation for magnification of the image?

Q3. What does resolving power mean?

#### Activation

**LI: Compare a light and an electron microscope. Explain how electron microscopy has increased our understanding of cells**

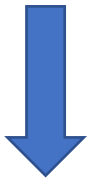
<https://www.youtube.com/watch?v=QYellGuyirs>

1. Make a note of the title and the LI
2. Read pages 18-19
3. Define “SEM” & “TEM”
4. Draw figure 1.10 (page 19) identify each subcellular structure and describe its key internal features which are visible only by electron microscopy



#### Consolidation

Complete and self assess the relevant past paper question for this topic -  
From the B1 DIP file



#### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

#### Demonstration

Attempt questions 1-6.

In 15 mins answer as many questions as you can.

**Self mark** the questions you have done making any necessary corrections in **blue pen**

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9



# Answers: B1.3 - Looking at cells in more detail

## Connection

- 1** total magnification = magnification of eyepiece x magnification of objective lens
- 2** magnification of image = size of the image / size of the real object
- 3** the ability to distinguish between two points clearly = ability to see detail

## Demonstration

- 1** <1 nm
- 2** non-living TEM is used to look at internal structure in fine detail. SEM is used to look at the surface of cells and small organisms.
- 3** It has enabled us to study cells in greater detail.
- 4** ribosome or mitochondria are visible when viewed with the light microscope.
- 5** protein synthesis
- 6** A Scanning Electron Microscope (SEM) as this uses electrons that bounce off the surface of the specimen to reveal the surface shape of structures such as very small organism and cells

## Lesson 4: B1.4 – Required practical – Using a light microscope

### Connection

Q1. Why does an electron microscope enable us to do that a light microscope does not?

Q2. What is difference between the image produced by a TEM and an SEM?

Q3. Name 3x intracellular structures that electron microscopy has enabled us to view in greater detail



### Consolidation

Complete and self assess the relevant past paper question for this topic -  
From the B1 DIP file

### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



### Activation

**L1: Use a light microscope to view slides of plant and animal slides. Record observations**

<https://www.youtube.com/watch?v=SX6mow1AExI>

1. Make a note of the title and the L1
2. Read pages 20-21
3. Define “field of view”

### Demonstration

[Video explaining how to use a light microscope \(use of microscope only - basics\)](#)

Use the videos and the relevant pages of the text book to write a step by step method of how to prepare a slide, view it through a light microscope and calculate its actual size.



# Answers: B1.4 - Using a light microscope

## Connection

- 1 EM = enough resolution to see subcellular structures
- 2 TEM = thin sections that electrons pass through to create 2D image  
SEM = electrons bounce off the surface of a specimen to produce a 3D image
- 3 Mitochondria, chloroplasts, ribosomes

## Demonstration

- 1 Sterile cotton swabs – to rub inside of cheek to get cells  
Glass microscope slides – to wipe swab to transfer cheek cells onto  
Methylene Blue solution – to stain cells  
Plastic pipette or dropper – to drop MB solution onto cells  
Plastic cover slips – to protect cells and microscope, keeps cells flat and retains liquid  
Paper towels or tissue – to remove excess MB solution
- 2 Cells are less likely to expand and burst in saline
- 3 a Red blood cell; Nucleus b Frog RBC contain a nucleus
- 4 Easier to locate cells; can see structure of tissue; can see different cell types and numbers of each
- 5 From middle diagram, top label – region of cell elongation; mid – meristem and bottom label – root cap
- 6 Difficult to say, as not looking at whole cells (have been sliced) and small image
- 7 Use equation  $\text{magnification} = \frac{\text{size of image}}{\text{size of real object}}$   
 $200 = \frac{34\text{mm}}{?} = 0.17\text{mm} = 170\mu\text{M}$

## Lesson 5: B1.5 – Primitive cells

### Connection

Q1. Why do cells need to be stained to view under a microscope?

Q2. How do you make an image under a microscope bigger?

Q3. How do you make an image under a microscope clearer?

### Activation

**LI: Describe the difference between prokaryotic and eukaryotic cells, relate structure to function**

<https://www.youtube.com/watch?v=Pxujitlv8wc>

1. Make a note of the title and the LI
2. Read pages 22-23
3. List all key words and define those you don't know.
4. Draw and label figure 1.16

<https://www.youtube.com/watch?v=Jd76li8JrZM>

Draw and label figure 1.17

### Consolidation

Complete and self assess the relevant past paper question for this topic -  
From the B1 DIP file

### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-7

In 10 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

# Answers: B1.5 - Primitive cells

## Connection

- 1 easier to see
- 2 use a lens with greater magnification  
eg 10x not 4x
- 3 use the coarse and fine focus wheels

## Demonstration

- 1 prokaryotic cells are much smaller/eukaryotic much larger.  
prokaryotic cells have no nucleus – the DNA is free in the cytoplasm/eukaryotic cells have a nucleus
- 2 as a single loop/chromosome free in the cytoplasm and in one or more structures called plasmids
- 3 Archaea, Bacteria and Eukaryota
- 4 Eukaryota
- 5 Accept example of extreme environment such as hot spring, salt lake, deep ocean etc. 6 chemical nature is different from Bacteria (chemicals in cell membranes of Archaea are unique to them; nucleic acid [of ribosomes] is closer to eukaryotes) 7 It has only been since we have had the technology and awareness of how to analyse DNA of different organisms that it has become evident that Archaea and genetic makeup distinct from bacteria and eukaryotes.

## Lesson 6: B1.6 – Cell division

### Connection

Q1. What does prokaryotic mean?

Q2. List 4x features unique to prokaryotic cells.

Q3. Name the 3x groups that Woese suggested all living things should be divided into.

### Activation

#### LI: Describe the process of mitosis

<https://www.youtube.com/watch?v=f-ldPgEfAHI>

1. Make a note of the title and the LI
2. Read pages 24-25
3. Define “mitosis”

<https://www.youtube.com/watch?v=HYKesI9jL8c>

4. Draw and label fig 1.20. Use the text above and below the figure to explain how mitosis produces daughter cells identical to the parent.
5. Draw figure 1.22. Label steps 1-6

### Consolidation

Complete and self assess the relevant past paper question for this topic -  
From the B1 DIP file

### Demonstration

Attempt questions 1-8

In 10 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen

### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

# Answers: B1.6 - Cell division

## Connection

- 1 without a nucleus
- 2 single loop DNA, flagellum, cell capsule, plasmid DNA
- 3 bacteria, archaea, eukaryota

## Demonstration

- 1 46 or 23 pairs
- 2 In pairs, in order of decreasing size. The sex chromosomes are displayed last.
- 3 growth; when cells need to be replaced, e.g. dead cells, cells that are damaged
- 4 same number of chromosomes as the parent cell, i.e. 46; two daughter cells
- 5 they have doubled their DNA (before dividing). So there are two molecules of DNA per chromosome
- 6 One-eighth/12.5%. Working out:  $45^\circ/360^\circ$
- 7 15 minutes. Working out:  $(45/360 \times 120)$  minutes
- 8 Repair and replacement of cells at site of wound or injury, during growth spurts, during production of red blood cells in bone marrow (happens all the time).



## Lesson 7 B1.7 – Cell differentiation

### Connection

Q1. Why is mitosis important?

Q2. What can you say about the daughter cells after mitosis compared to the parent cells?

Q3. List the 6x stages of the cell cycle

### Activation

**LI: Explain the process of cell differentiation and give some examples**

<https://www.youtube.com/watch?v=u87QpOOkdxI>

<https://www.youtube.com/watch?v=3CFsOAYbTO8>

1. Make a note of the title and the LI
2. Read pages 26-27
3. Draw and label figures 1.24, 1.25 and 1.26



### Consolidation

Complete and self assess the relevant past paper question for this topic -  
From the B1 DIP file



### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-5

In 10 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9



# Answers: B1.7 - Cell differentiation

## Connection

- 1 growth and repair
- 2 genetically identical
- 3 grows, DNA replicates, DNA checked, mitosis, cytoplasm/membrane separates, resting period/ no further division in some cells

## Demonstration

- 1 sperm cell – tail and mitochondria for swimming to fertilise the egg; sperm nucleus carries genetic material to combine with that of the egg
- muscle cell – protein fibres that move over each other and cause the muscle to contract; mitochondria to release energy.
- nerve cell – long, with extensions, to communicate with other nerve cells and muscles and sensory structures; gaps in the myelin sheath enable rapid conduction of impulses
- 2 have many ribosomes for protein synthesis; many mitochondria will supply the energy for protein synthesis
- 3 (smallest) cell tissue organ system human body
- 4 cell – red blood cell, white blood cell; tissue – blood
- 5 The biconcave shape increases the surface area which is important for the increases the rate of diffusion for oxygen and carbon dioxide , both of which are transported around the body by RBCs

## Lesson 8: B1.8 – Cancer

### Connection

Q1. Why are differentiated cells important?

Q2. Give 3 adaptations of a sperm cell

Q3. State how cells form an organism

### Activation

**LI: Explain the process by which cells become cancerous**

<https://www.youtube.com/watch?v=8LhQllh46yI>

1. Make a note of the title and the LI
2. Make a list of the key words - define any you don't understand at the end of the lesson
3. Read pages 28-29
4. Copy the grey table on page 28
5. Draw figure 1.29



### Consolidation

Complete and self assess the relevant past paper question for this topic -  
From the B1 DIP file

### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-7

In 15 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9



# Answers: B1.8 - Cancer

## Connection

- 1** allows for specialised function
- 2** acrosome (enzymes), nucleus (genetic information), mitochondria (energy), tail (movement)
- 3** cells > tissues > organs > organ system > organism

## Demonstration

- 1** when cells divide uncontrollably (and do not fulfil their normal function, and spread throughout the body)
- 2** leukaemia
- 3** benign, malignant
- 4** to supply it with food and oxygen
- 5** secondary
- 6** of the cervix/cervical
- 7** The graph shows a positive correlation. As animal fat intake increases the breast cancer death rate increases. The graph suggests there is a link between animal fat intake and breast cancer. The higher a person's fat intake the greater their risk of breast cancer. Note this is only a theory as it is impossible to establish a causal link between the two variables without further research

## Lesson 9: B1.9 – Stem Cells

### Connection

Q1. Are benign or malignant tumours more harmful? Why

Q2. Give 6 steps to describe the transformation from malignant cell to secondary tumour

Q3. How many triggers for cancer can you list?

### Activation

**LO: Explain the function of stem cells in embryonic and adult animals**

<https://www.youtube.com/watch?v=K7D6iA7bZG0>

1. Make a note of the title and the LO
2. Read pages 30-31
3. Make a list of the key words - define any you don't understand at the end of the lesson
4. Draw and label figure 1.33



### Consolidation

Complete and self assess the relevant past paper question for this topic -  
From the B1 DIP file

### Demonstration

Attempt questions 1-7

In 15 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen



### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9



# Answers: B1.9 - Stem cells

## Connection

- 1** malignant as cells can detach and set up secondary tumours
- 2** Damaged DNA generates a malignant cell, cells divide, tumour secretes chemicals that develop a blood supply, cells detach transported in the blood, cells pass through capillary wall, make a secondary tumour in a new location
- 3** viruses, carcinogenic chemicals, ionising radiation, UV radiation, lifestyle choices eg smoking, alcohol

## Demonstration

- 1** replace body cells lost through injury or disease.
- 2** embryonic
- 3** Alzheimer's disease, diabetes, other disease resulting from cells that have been destroyed, injured, or have degenerated
- 4** chemotherapy destroys bone marrow, where blood cells are produced, so these patients need stem cell transplants to be able to produce new blood cells
- 5** (embryonic) stem cells have to be removed from an embryo
- 6** requires growth of an embryo, and removal of cells from the embryo The embryo is destroyed in the process
- 7** Benefits: Potential role in treating injuries where certain body cells degenerate, treatment of alzheimers, diabetes, cancer, burn victims, etc Drawbacks: Moral and ethical questions raised particularly for the use of embryonic stem cells. Costs of stem cell research and therapies

## Lesson 10: B1.10 – Stem Cell Banks

### Connection

Q1. Why are embryonic stem cells more useful than adult stem cells?

Q2. List 3 diseases stem cells could treat

Q3. What is the main ethical objection to the use of stem cells

### Activation

**LI: Discuss the potential benefits and risks associated with the use of stem cells in medicine**

[https://www.youtube.com/watch?v=X0GMp8oM\\_2E](https://www.youtube.com/watch?v=X0GMp8oM_2E)

<https://www.youtube.com/watch?v=qS9ZH1yGYfo>

1. Make a note of the title and the LI
2. Read pages 32-33
3. Draw and label figure 1.36



### Consolidation

Complete and self assess the relevant past paper question for this topic -  
From the B1 DIP file



### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-6

In 15 mins answer as many questions as you can.

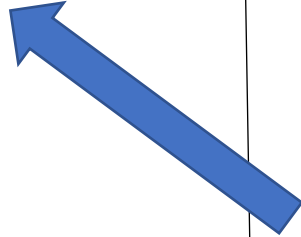
Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9



# Answers: B1.10 -Stem cell banks

## Connection

- 1 embryonic stem cells can become any type of cell (pluripotent) whereas adult stem cells are more limited.
- 2 spinal injuries, degenerative diseases eg alzheimers, diabetes, multiple sclerosis, cancer or to support post cancer treatment
- 3 that an embryo has the potential to form a human life.

## Demonstration

- 1 an identical twin, twin, close member of the family (in that order).
- 2 Advantages – from the patient, so there will be no problem with rejection, or ethical issues. Disadvantages – cost, problems with storage (possible changes to cells; keeping conditions stable).
- 3 the production of an embryo from a patient's body cell, to generate stem cells for therapy. The nucleus from the body cell is removed and inserted into an egg cell that has had its nucleus removed.
- 4 after 4-5 days.
- 5 safety – have there been any mutations; have the cells been transformed into cancer cells? is it morally/ethically correct to produce an embryo with the intent of destroying it? could embryos just become a resource for research? could people be exploited for eggs? could an embryo be implanted to produce a cloned human?
- 6 Risks – We don't know how safe or successful therapeutic cloning will be. Benefits: If successful therapeutic cloning could produce stem cells that could be used to treat patients. Ethics – should we be creating an embryo with the intent of then destroying it? When does life start?



## Lesson 11: B1.11 – Cell Development

### Connection

Q1. Why is it important for stem cells to be tissue matched to the recipient?

Q2. List the 6 stages of therapeutic cloning

Q3. How can stem cell treatment be responsible for causing an infection?

### Activation

**LI: Discuss the potential benefits and risks associated with the use of stem cells in medicine**

<https://www.youtube.com/watch?v=-8xHWhg6YQA>

1. Make a note of the title and the LI
2. Read pages 34-35
3. B1 DART



### Consolidation

Complete and self assess the relevant past paper question for this topic -  
From the B1 DIP file

### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-6

In 15 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9



# Answers: B1.11 - Cell development

## Connection

- 1** unmatched cells could cause rejection by the immune system
- 2** human egg (nucleus removed), nucleus removed from patient cell and placed into egg, stimulate to divide, embryo develops, stem cells removed from embryo, stem cells grown in culture
- 3** the stem cells can contain a virus

## Demonstration

- 1** skeletal muscle
- 2** They have no sub-cellular structures to perform normal cell functions. They have only nucleic acid for reproduction.
- 3** cell replacement; asexual reproduction (eukaryotes); cancer cells; cloned cells
- 4** cells producing gametes
- 5** embryonic stem cells cannot differentiate into cells of the placenta
- 6** Stem cells give scientists a more accurate prediction of a drugs' potential toxicity than rat cells.

## Lesson 12: B1.12 – Cells at work

### Connection

- Q1. Which cells are produced by meiosis?
- Q2. Why is mitosis important?
- Q3. Why is differentiation important?

### Activation

#### LI: Describe the process of aerobic respiration

<https://www.youtube.com/watch?v=ZkqEno1r2jk>

1. Make a note of the title and the LI
2. Read pages 36-37
3. Copy the word and balanced symbol equation for aerobic respiration from page 37



### Consolidation

Complete and self assess the relevant past paper question for this topic - From the B1 DIP file

### Demonstration

Attempt questions 1-7

In 15 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen



### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

# Answers: B1.12 – Cells at work

## Connection

- 1 sperm or egg
- 2 it produces genetically identical cells for growth and repair
- 3 to produce specialised cells capable of a specialised function, vital for the formation of multicellular organisms

## Demonstration

- 1 drive chemical reactions needed for them to live, cell division, movement, to keep warm, active transport, transmit nerve impulses, maintaining a constant environment
- 2 drive chemical reactions needed for them to live, cell division, transport, active transport (mineral ions and opening and closing stomata), maintaining a constant environment
- 3 to provide energy
- 4 to keep warm/maintain a constant body temperature.
- 5 Respiration takes place in all cells all the time
- 6 have many mitochondria.
- 7 Respiration produces thermal energy, and during exercise, respiration increases as the muscles need more energy to contract.

## Lesson 13: B1.13 – Living without oxygen

### Connection

Q1. What is the word equation for aerobic respiration?

Q2. Write a balanced symbol equation for respiration

Q3. List as many processes that you can remember that need energy produced by aerobic respiration

### Activation

#### LI: Describe the process of anaerobic respiration

<https://www.youtube.com/watch?v=HZtXLhm7ISA>

1. Make a note of the title and the LI
2. Read pages 38-39
3. Copy the word equation for fermentation from page 38
4. Copy the word equation for anaerobic respiration from page 38



### Consolidation

Complete and self assess the relevant past paper question for this topic -  
From the B1 DIP file

### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-9

In 15 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9



# Answers: B1.13 – Living without oxygen

## Connection

1 glucose + oxygen > carbon dioxide + water

2  $C_6H_{12}O_6 + 6O_2 > 6CO_2 + 6H_2O$

3 chemical reactions, movement, warmth, cell division, active transport, transmit nerve impulses, homeostasis

## Demonstration

1 glucose → ethanol + carbon dioxide (+energy released)

2 The yeast divide so rapidly that the oxygen runs out and therefore the yeast switch to anaerobic respiration.

3 for the yeast to be able to respire/a respiratory substrate

4 because of the carbon dioxide produced (you can see where bubbles of the gas have been in the baked bread)

5 It evaporates off in the oven.

6 They have to grow down through the tissue of the female reproduction system, where there will be little oxygen.

7  $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$  (+energy released)

8 glucose → lactic acid (+energy released)  $C_6H_{12}O_6 \rightarrow 2C_3H_6O_3$  (+energy released) Note that you do not need to know the symbol equation for this process.

9 Reactants for aerobic respiration are glucose and oxygen. Reactants for anaerobic respiration are only glucose. Products for aerobic respiration are carbon dioxide and water. Products for anaerobic respiration are ethanol and carbon dioxide. Both reactions produce energy, but aerobic respiration produces more than anaerobic respiration.

## Lesson 14: B1.14 – Growing Microorganisms (Triple only)

### Connection

Q1. What is the word equation for anaerobic respiration in animals?

Q2. What is the word equation for anaerobic respiration in yeast/plants?

Q3. What is an oxygen debt and how does the body deal with it?

### Activation

**LI: Describe the techniques used to create uncontaminated cultures of microorganisms**

<https://www.youtube.com/watch?v=Uf8a7cCVjM4>

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

1. Make a note of the title and the LI
2. Read pages 40-41
3. <https://www.youtube.com/watch?v=u84bTjqrt7k> Use this video or the text in the green section on page 40 to explain how to safely culture bacteria on an agar plate



### Consolidation

Complete and self assess the relevant past paper question for this topic -  
From the B1 DIP file

### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-7

In 15 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9



# Answers: B1.14 – Growing microorganisms (Triple)

## Connection

- 1 glucose > lactic acid
- 2 glucose > ethanol + carbon dioxide
- 3 when exercise is over lactic acid must be removed by being taken to the liver and turned into carbon dioxide and water or converted back to glucose and stored as glycogen

## Demonstration

- 1 to study the organism under investigation, and not have results affected by microorganisms that could disrupt the cultures environment
- 2 inoculating loop
- 3 6 h 40 min/400 min (to produce 1 048 576 bacteria)
- 4  $1.05 \times 10^{-6}$  g/1.05 µg Possible shortage of food; build-up of waste products.
- 5 Exponential growth is ever increasing growth. An example is binary fission.
- 6 the food has run out; build-up of toxic waste products.
- 7 Resources would no longer be scarce so the bacteria would begin to divide again and grow exponentially until the food supply runs low at which point the stationary phase would happen a second time, followed by the death phase.



## Lesson 15: B1.15 – Testing new antibiotics (Triple only)

### Connection

Q1. What is the name given to growing uncontaminated cultures of bacteria?

Q2. Define binary fission and give an example.

Q3. List the 4 key phases of bacterial growth

### Activation

#### LI: Investigate the effects of antibiotics on bacterial growth

<https://www.youtube.com/watch?v=Np87w5kCL-4>

1. Make a note of the title and the LI
2. Read pages 42-43
3. Use the video above and the text in the green section on page 42-43, including figures 1.48 & 1.49 to explain using bullet points how to test bacteria on an agar plate for antibiotic sensitivity.



### Consolidation

Complete and self assess the relevant past paper question for this topic -  
From the B1 DIP file

### Demonstration

Attempt questions 1-7

In 15 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen



### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



# Answers: B1.15 – Testing new antibiotics (Triple)

## Connection

- 1 aseptic technique
- 2 bacterial cells divide in two so  
2>4>8>16 etc
- 3 lag, exponential, stationary, death

## Demonstration

- 1 heated, so as not to transfer bacteria from the environment; cooled, so as not to kill the bacteria being tested
- 2 it is important that bacteria are present, but have not begun to grow
- 3 agar, beef, milk protein (not blood – that is an added extra)
- 4 the clear zones may overlap each other and make measurement impossible
- 5 a sample that is typical of the whole. A representative sample is important to ensure the characteristics and behaviour of the bacteria sample are the same as the rest of the population.
- 6 choosing a colony on the culture plate that looks identical to – and not different from – the others.
- 7 MRSA shows antibiotic resistance and is therefore difficult to treat

## Lesson 16: B1.16 – Investigating disinfectants (Triple only)

### Connection

Q1. What is observed if one antibiotic is more effective against a bacteria than another?

Q2. List three ingredients in Mueller-Hinton agar.

Q3. Why must school experiments not be incubated above 25°C?

### Activation

#### LI: Evaluate and experiment to test the effects of disinfectants on bacterial growth

<https://www.youtube.com/watch?v=Np87w5kCL-4>

1. Make a note of the title and the LI
2. Read pages 44-45
3. Use the video to write a step by step method for carrying out this experiment include figure 1.51.



### Consolidation

Complete and self assess the relevant past paper question for this topic - From the B1 DIP file

### Demonstration

Attempt questions 1-11

In 15 mins answer as many questions as you can.

Self mark the questions you have done making any necessary corrections in blue pen



### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



# Answers: B1.16 – Investigating disinfectants (Triple)

## Connection

- 1** the more effective disc will be surrounded by a bigger zone of inhibition
- 2** beef and milk protein and blood
- 3** to prevent pathogens that could survive in humans being cultured

## Demonstration

- 1** independent variable – concentration of disinfectant dependent – size/diameter/area of clear zone
- 2** size of filter paper disc, volume of disinfectant, species of bacterium, size of agar plate, number of discs applied, depth of agar, duration of incubation.
- 3** learner answer
- 4** Mueller-Hinton agar would grow pathogens Again, if the plate was incubated at body temperature, pathogens may grow
- 5** Using the formula  $\pi r^2$
- 6** 500, 550, 570, 580, 580, 580 (note that these are all to three significant figures)
- 7** 470 (2.0 g/dm<sup>3</sup> , Test 1) It is not consistent with the other two results.
- 8** 4.5 g/dm<sup>3</sup>
- 9** student answer
- 10** collect more data in the area of the graph where there is a sharp increase in clear zone diameter observed in the graph; at appropriate, e.g. 0.1 g/dm<sup>3</sup> intervals of concentration
- 11** Collect a sample from a clear zone (with a sterilised inoculating loop) and transfer it to a fresh agar plate. If any bacteria grow, they were inhibited from growing by the antibiotic; if none grow, the bacteria must have been killed by the antibiotic.

## B1 - Revision

### Connection

Q1. Define dependent and independent variable.

Q2. How do you calculate the area of a circle?

Q3. How do you identify an anomalous result and what do you do with it?

### Activation

#### LO: Create a topic summary sheet

1. Fold an A3 sheet so it is divided into 8 sections
2. Look back over your lesson and group them into 8 main headings
3. Summarise the key points into each section, use keywords and diagrams and symbols rather than sentences



### Consolidation

Look through the relevant past paper questions for this topic - From the B1 DIP file – see if you can complete any additional questions

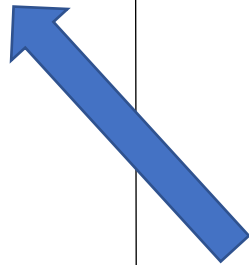


### Extension

Make a list of anything that you would like to ask your teacher to go over again

### Demonstration

Test yourself by working with the person sitting next to you by talking through each box on your summary sheet and seeing how many key facts you can remember



# Answers: B1.16

## Connection

**1** Independent = the factor you change/investigate  
dependant = the factor that you measure

**2** Use the formula  $\pi r^2$

**3** A result that doesn't fit the trend.  
You should repeat it or ignore it. It should not be used in your calculations

### **DART B1: Stem Cells**

Anyone between the ages of 18-55 and in general good health can become a potential donor. A match is made on the basis of human leukocyte antigen type, or tissue type, rather than on the basis of blood type.

When this happens, blood stem cells are collected from a donor. In 90% of cases, a thin needle takes blood from their arm and a machine extracts the stem cells. The blood is then returned to them through their other arm. The other 10% involves taking bone marrow from the hip. Once extracted, the blood stem cells are infused into the patient through a drip in the arm, where they move through the bloodstream to the bone marrow where they belong. From there, they produce red and white blood cells and platelets, resulting in the donor's healthy blood stem cells replacing the patient's diseased cells.

For Gary, the results were as he had hoped.

"The stem cells populated and started producing bone marrow within a couple weeks," he said.

"I can't describe how it feels when the doctors say they have detected white blood cells, it was quite an exciting, quite a moving moment. "Gary and Karen had returned to their respective homes at different ends of the country after the procedures and, to all intents and purposes, normal life. But both were anxious to know more about each other.

For Karen, there was an element of frustration - under UK law, there is a two-year window of anonymity from the date of a transplant and contact can only be made with the patient's consent. "The only thing I knew was that it was a male over 18 in the UK, that was all the information I had," she said.

Survival after a transplant depends on many different factors, including the age and health condition of the patient, the timing of the donation, the type of underlying disease and on the emergence of potential complications.

Reference: BBC News – 'I call my stem cell donor my sister' 9<sup>th</sup> June 2019

URL: <https://www.bbc.co.uk/news/uk-england-48543424>

### **DART Questions – B1 Stem Cells**

1a) Identify the ages when you can become a stem cell donor.

1b) Describe how a donor match is made.

1c) Name the types of cells produced when blood stem cells are infused into a patient.

2a) Explain the process of how blood stem cells are collected from 90% of donors.

2b) Quote the 'UK Law' regarding patient anonymity.

2c) Summarise the factors that are dependant for a patient's survival.

3a) Do you agree with the UK Law regarding patient and donor anonymity? Explain your reason.

3b) Assess the importance of blood stem cell donors in the UK.

3c) Create an argument for more people to become stem cell donors.

## **DART Answers– B1 Stem Cells**

**1a) Identify the ages when you can become a stem cell donor.**

*Anyone between the ages of 18-55*

**1b) Describe how a donor match is made.**

*A match is made on the basis of human leukocyte antigen type, or tissue type, rather than on the basis of blood type.*

**1c) Name the types of cells produced when blood stem cells are infused into a patient.**

*red and white blood cells and platelets*

**2a) Explain the process of how blood stem cells are collected from 90% of donors.**

*In 90% of cases, a thin needle takes blood from their arm and a machine extracts the stem cells. The blood is then returned to them through their other arm.*

**2b) Quote the 'UK Law' regarding patient anonymity.**

*Under UK law, there is a two-year window of anonymity from the date of a transplant and contact can only be made with the patient's consent.*

**2c) Summarise the factors that are dependant for a patients survival.**

*Survival after a transplant depends on many different factors, including the age and health condition of the patient, the timing of the donation, the type of underlying disease and on the emergence of potential complications.*

**3a) Do you agree with the UK Law regarding patient and donor anonymity? Explain your reason.**

*I do agree that there should be protection regarding the donor and the patients anonymity. People may be happy to donate stem cells to help another person in need but may want no further physical or emotional attachment especially during the early phase when the treatment may or may not work.*

**3b) Assess the importance of blood stem cell donors in the UK.**

*Blood stem cell donors are very important in the UK. It is one of the most effective treatments available for patients suffering from Leukaemia*

**3c) Create an argument for more people to become stem cell donors.**

*If you could save a life would you, should you?*

*Yes – we have a moral obligation to our fellow humans to act to relieve pain and suffering if we are able. We don't need all of our stem cells and the ones that are remain will regenerate and so we should share.*





Attainment Band -	
B1 Cell Biology (AQA)	
Knowledge and Understanding	
Yellow Plus/ Yellow	<p>Carry out order of magnitude calculations when comparing cell size; calculate with numbers in standard form.</p> <p>Explain limitations of light microscopy and advantages of electron microscopy.</p> <p>Explain why scientists have now separated organisms into three domains using evidence from chemical analysis.</p> <p>Describe the events of the cell cycle and explain the synthesis of new sub-cellular components and DNA.</p> <p>Understand size and scale in the components of organ systems.</p> <p>Evaluate scientific and ethical issues involved with stem cell therapies.</p> <p>Use symbol equations for aerobic and anaerobic respiration and be able to compare the two processes.</p> <p><i>Be able to calculate numbers of microorganisms produced given the mean generation time. (7)</i></p>
Blue	<p>Understand the size and scale of cells and be able to use and convert units.</p> <p>Calculate the magnification of a light or electron micrograph.</p> <p>Describe the differences between eukaryotic and prokaryotic cells.</p> <p>Describe how chromosomes double their DNA and are pulled to opposite ends of the cell, before the cytoplasm divides, during mitosis.</p> <p>Explain the importance of differentiation and explain how cells are specialised for their functions.</p> <p>Understand the potential of stem cell therapies.</p> <p>Use word equations to describe the processes of aerobic and anaerobic respiration.</p> <p><i>Describe the process of binary fission. (7)</i></p>
Green	<p>Describe the functions of the sub-cellular structures found in eukaryotic cells.</p> <p>Calculate magnification used by a light microscope using eyepiece and objective lens magnifications.</p> <p>Describe the structure of a prokaryotic cell.</p> <p>Recall that cells must divide for growth and replacement of cells.</p> <p>Recall that organism development is based on cell division and cell specialisation.</p> <p>Recall where stem cells are found.</p> <p>Recall that organisms can respire with oxygen (aerobic respiration) or without oxygen (anaerobic respiration).</p> <p><i>Describe equipment, materials and procedures required to work with microorganisms. (7)</i></p>
White	<p>Some elements of the above have been achieved</p>