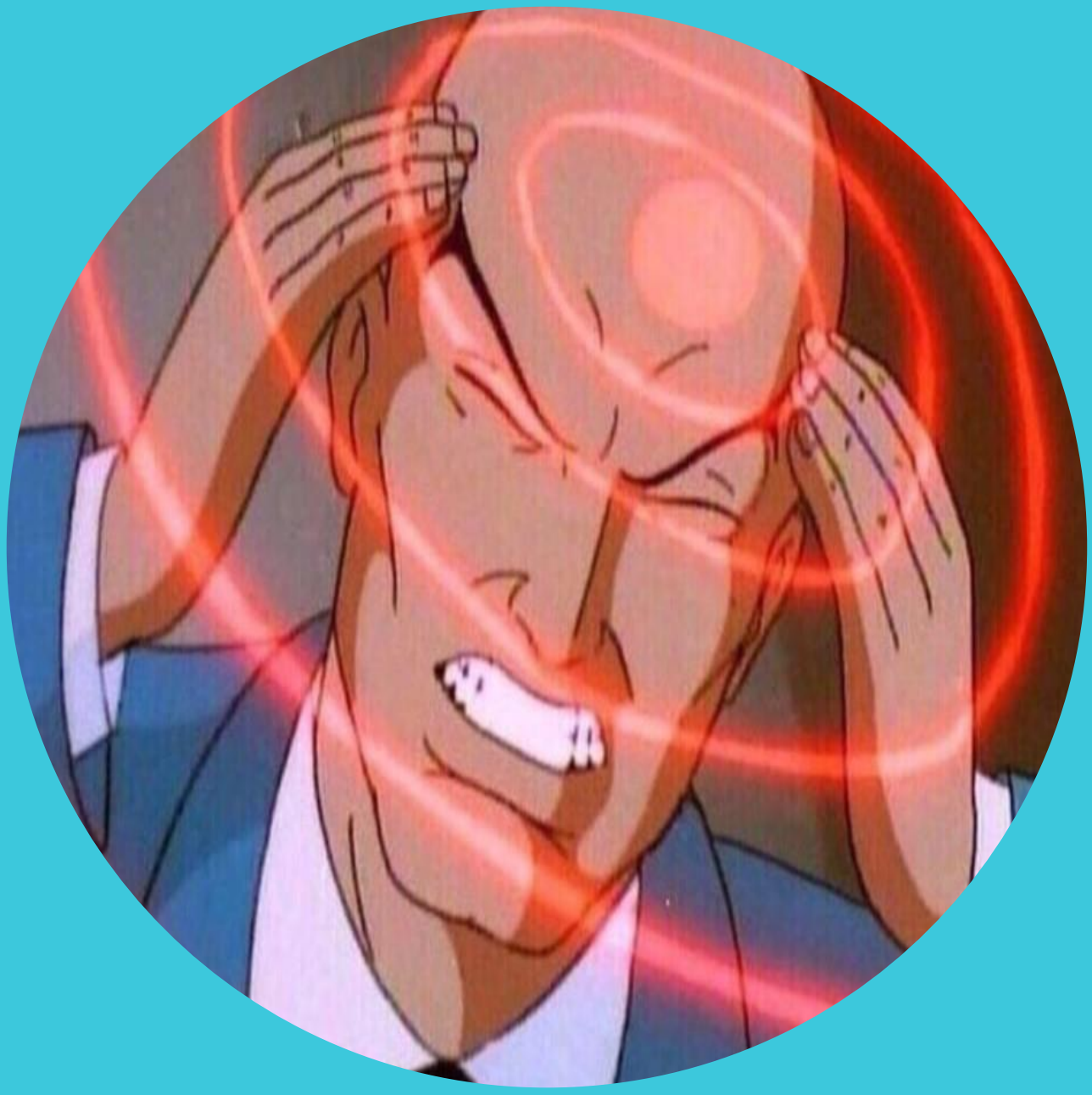
Researchers in Schools



Do X-men Get Sick?

Key Stage 4 Programme

Pupil Name	
Coursebook Designed by	Dr Scambler

Timetable and Assignment Submission

Timetable – Tutorials

Tutorial	Date	Time	Location
1			Science department
2		15:30-16:30	Science department
3		15:30-16:30	Science department
4		15:30-16:30	Science department
5		15:30-16:30	Science department
6 (Feedback)		15:30-16:30	Science department
7 (Feedback)		15:30-16:30	Science department

Timetable – Homework Assignments

Homework Assignment	Description	Due Date
Tutorial 1	Baseline Assessment	
Tutorial 2	How do antibodies *cause* disease?	
Tutorial 3	Natural selection	
Tutorial 4	Designer babies	
Tutorial 5	Final Assignment	

Assignment Submission – Lateness and Plagiarism

Lateness	
Submission after midnight on:	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

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Uni Pathways launch event

Welcome to Uni Pathways! We are delighted to be able to launch the Uni Pathways programme with you. We hope that you are ready to embark on your Uni Pathways journey and that you enjoy the video.
You will be asked to pause the video at times to complete some work in this workbook, so make sure you have a pen / pencil to hand when you start the video.

By the end of the video, you will have

- Learnt about what studying at university means
- Learnt about some of the skills that you will develop during Uni Pathways
- Heard from pupils who have participated in Uni Pathways or The Scholars Programme (which is the same programme!)
- Heard from current university students talking about what life is like at university

If you are in school your teacher will play the video. If you are at home and logged in to a session with your teacher, your teacher will play the video and show it to you. If you are participating independently your teacher will email you the link to the video or the video file. There are opportunities for you to answer some questions, and you will be told when to pause the video to answer them.

Introduction to Uni Pathways

1. Write down what you think a supra-activity is

_____
_____
_____

2. Independent learning is

_____
_____
_____

3. Write down in your own words what resilience means, and come up with a different example to the one mentioned in the PowerPoint.

_____
_____
_____
_____

4. Why do you think analysis and evaluation skills are useful in your academic career? _____
_____
_____
_____
_____
_____

5. Why do you think analysis and evaluation skills are useful in life in general? _____
_____
_____
_____

6. What are the different types of learning that university students do?

Pupils' experience of Uni Pathways
You will now watch some pupils talk about their experience of learning a PhD topic and producing a final assignment. Some may refer to The Scholars Programme rather than Uni Pathways. As you heard in the introduction PowerPoint, The Scholars Programme is a very similar programme to Uni Pathways. Listen carefully and then respond to the questions below. Be prepared to share some of your responses with your peers.

1. How did the pupils describe talking about writing a long essay for their final assignment?

2. Write down something that one of the pupils mentioned was particularly interesting in their course.

3. What were some challenges that the pupils met?

Virtual campus tours
You will now go on a virtual tour of some universities! Once you have seen some of the university campuses, respond to the questions below.
Note down something that you liked out of any of the campus tours you saw. It may be a particular building, space, city etc.

1. Were there any similarities between the different university campuses? If so, what are the similarities?

2. If you had to pick one of those universities to go and visit in person, which one would it be and why?

3. Note down some of the societies that you could join at different universities

Meet university students!
You are about to virtually meet or hear from some current university students.
If you are virtually meeting them, think about what questions you would like to ask the students, share your questions with a partner and note those questions down in the space below.

If you are not meeting them but watching some videos that they have made, use the space below to note down what else you would like to find out about university. You can then ask your teacher during Uni Pathways tutorials!

Reflection
Congratulations on completing the launch of the Uni Pathways programme. Before you go, take some time to reflect on what you have learnt by answering the following questions:

1. Are there any aspects of university style learning that you would look forward to? If so, what are they?

2. What challenges do you think students face when learning at university? How would you try to overcome these challenges?

3. What skills do you hope to develop during your Uni Pathways course?

4. What part of Uni Pathways seems the most challenging for you?

5. What are you most looking forward to about Uni Pathways?

Course Rationale

Does Wolverine ever get a cold? How about Mystique? When was the last time she had food poisoning? All the X-men have mutations that make them superhuman, but should they worry about coronavirus?

Like the X-men, we are all mutants. We have small changes in our DNA that make us unique. Some of us are tall and can dunk a basketball. Others are great at maths and can always 'find X'. This is because changes in our DNA, or mutations, determine how we look and what we are good at. So, can mutations make us good (or bad) at fighting disease?

In this course you will explore how mutations in our DNA affect the immune system. We will discover how mutations can cause devastating disease as well as drive the evolution of a species. During these tutorials you will learn about cutting edge technology where scientists are now able to change our DNA! We will answer key questions like: How does the immune system actually fight disease? What happens when it goes wrong? Should we check our baby's DNA before they are born?

We will study examples of rare mutations that can be both beneficial and harmful to an organism, developing skills of scientific writing and presentation and even look at white blood cells down a microscope!

The course will be taught in the style of university tutorials and the final assignment will be just like one you will get at university.

The overall aims of this course are:

1. To understand how genetic mutations can affect our immune system
2. To evaluate the arguments for and against genetic testing and gene editing
3. Develop transferable skills of critical analysis, presenting, scientific writing and debate
4. Experience university-style teaching to give you an idea of what it would be like to progress into further education

Uni Pathways Mark Scheme 2020 – Essay-based assignments

	Subject Knowledge	Critical Thinking	Written Communication
1st	The essay shows a breadth of knowledge and understanding of **immunology, genetics and gene editing**, through engaging with and interpreting a wide range of relevant sources of information. Knowledge is used to build and support highly effective arguments around **gene editing.**	Analyses, key ideas, information, and arguments around **gene editing**. Interprets meaning and makes connections between **immunology**, **genetic** disease and therapy. Identifies and critically evaluates key arguments and statements, deciding on their credibility, strength and relative significance, drawing convincing conclusions.	The essay has a clear and engaging structure, taking the reader on a journey from the introduction to the conclusion. The writing style is appropriate; key terms are used with fluency. There are no, or very few, errors in spelling or grammar. Referencing is used consistently and matches the style taught in the course.
2:1	The essay shows an understanding of **immunology, genetics and gene editing**, drawing on a range of relevant sources Knowledge is used to build and support effective arguments around **gene editing.**	Analyses key ideas, information and arguments around **gene editing**. Identifies relevant arguments and statements, deciding on their credibility and strength, drawing reasonable conclusions. Shows some understanding of the relative importance of arguments.	The essay has a clear structure and the arguments are easy to follow. The introduction outlines the essay effectively and the conclusion summarises the arguments. The writing style is appropriate; key terms are used correctly. There are few errors in spelling or grammar. Referencing is mostly consistent and matches the style taught in the course.
2:2	The essay shows an understanding of **immunology, genetics and gene editing**, with no major misconceptions. Beginning to apply this knowledge to build and support arguments around **gene editing.**	Begins to analyse ideas, information and arguments around **gene editing**. Identifies some arguments and statements and attempts to evaluate their quality. Not yet showing understanding of the relative strengths and weaknesses of arguments.	The essay structure could be made clearer to better guide the reader through the arguments. The writing style can sometimes be informal. Occasionally key terms are not used when it would be appropriate to do so. There are some errors in spelling or grammar, but they do not get in the way of communicating the content.

			There is some consistency to the referencing.
3rd	Shows a developing understanding of **immunology, genetics and gene editing**, with some misconceptions. Not yet applying this knowledge to build and support arguments around **gene editing.**	Begins to analyse ideas and information. Describes statements and arguments around **gene editing** while not yet evaluating them.	The grammar, spelling, style, and structure of the work need improving in order to communicate ideas to the reader. The essay has no or a limited introduction and conclusion. Key terms and references are not always used correctly.

Baseline Assignment (essay based): Pupil Feedback Report

Name of Pupil	
Name of School	City of London Academy, Southwark
Name of RIS teacher	Dr Scambler
Title of Assignment	When you get sick

How your assignment is graded:

Grade	Marks	What this means
1st	70+	Performing to an excellent standard at A-level
2:1	60-69	Performing to a good standard at A-level
2:2	50-59	Performing to an excellent standard at GCSE
3rd	40-49	Performing to a good standard at GCSE
Working towards a pass	0-39	Performing below a good standard at GCSE
Did not submit	DNS	No assignment received by The Brilliant Club

Lateness	
Any lateness	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

Marks

OVERALL MARK / 100		FINAL MARK / 100 (including any deductions)	
DEDUCTED MARKS		FINAL GRADE	

If marks have been deducted (e.g. late submission, plagiarism) the teacher should give an explanation in this section:

Mark Breakdown and Feedback

Subject knowledge	
	mark
Critical thinking	
	mark
Written communication	
	mark

Final Assignment (essay based): Pupil Feedback Report

Name of Pupil	
Name of School	City of London Academy, Southwark
Name of RIS teacher	Dr Scambler
Title of Assignment	Do X-men get sick?

How your assignment is graded:

Grade	Marks	What this means
1st	70+	Performing to an excellent standard at A-level
2:1	60-69	Performing to a good standard at A-level
2:2	50-59	Performing to an excellent standard at GCSE
3rd	40-49	Performing to a good standard at GCSE
Working towards a pass	0-39	Performing below a good standard at GCSE
Did not submit	DNS	No assignment received by The Brilliant Club

Lateness	
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Marks

OVERALL MARK / 100		FINAL MARK / 100 (including any deductions)	
DEDUCTED MARKS		FINAL GRADE	

If marks have been deducted (e.g. late submission, plagiarism) the teacher should give an explanation in this section:

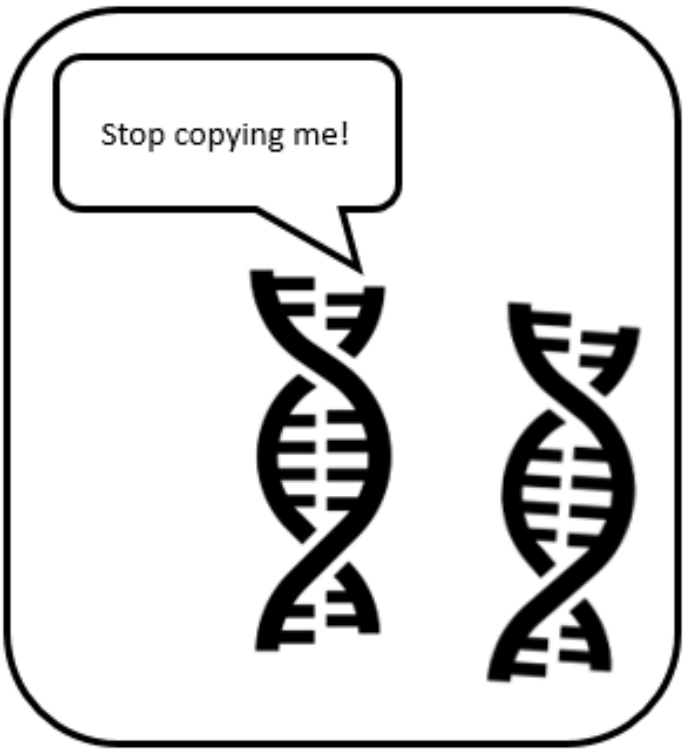
Mark Breakdown and Feedback

Subject knowledge	
	mark
Critical thinking	
	mark
Written communication	
	mark

Subject Vocabulary

Word	Definition	In a sentence
Antibody	A Y-shaped protein released into the blood by white blood cells, designed to bind to foreign substances.	
DNA	Stands for **D**eoxyribo**N**ucleic **A**cid. A molecule that acts as the instructions for making proteins, in ALL living organisms.	
Evolution	Darwin's accepted theory that the characteristics of a species gradually change over time to improve survival.	
Gene	Genes are made up of DNA and are passed on from parents to offspring. If DNA are the "words" of the instructions to make proteins, genes are the "paragraphs".	
Gene editing	The process scientists use to change DNA. The technology allows DNA to be deleted, replaced or inserted.	
Genetic disorder	A disease caused by a change in someone's DNA.	
Mutation	When DNA is changed or damaged, causing a change to the gene and protein that it codes for.	
Pathogen	A foreign microorganism, such as a bacterium or virus, that can cause disease.	
Protein	Large molecules that perform important jobs inside organisms. DNA provides the instructions to make all proteins.	
RNA	Stands for **R**ibo**N**ucleic **A**cid. RNA is a copy of DNA and delivers the instructions to the cell to make proteins.	
White Blood Cell (WBC)	Cells of the immune system. All WBCs are made in the bone marrow.	

Tutorial 1 – The central dogma of molecular biology



Credit: Noun Project

What is the Purpose of Tutorial 1?

The purpose of this tutorial is to explore how life actually works. Sounds cool huh! You are always taught that DNA "controls the cell" and that genes "determine your characteristics like eye colour". But HOW does DNA do this? You're about to find out!

By the end of this tutorial, you will know that:

- DNA provides the instructions to make proteins
- Mutations in the genetic code can cause problems with these proteins, sometimes leading to genetic disease
- Mutations are passed on to an organism's offspring, through inheritance

Activity 1-What are genes made of? (not denim)

In the space below, draw what you think DNA looks like. CLUE! Think of a ladder…

Activity 2- Who let the Dogmas out?

Draw a diagram describing the Central Dogma of Molecular Biology.

Activity 3- Blame the parents!

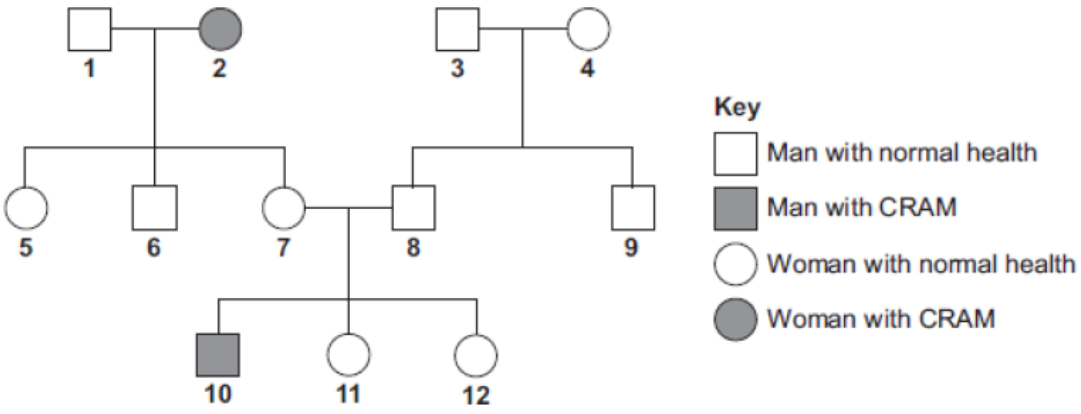
Draw the pedigree diagram for Cystic Fibrosis in the space below:

Activity 4- Put it into practise

Complete the exam style questions, looking at how many marks each question is worth.

CRAM is an inherited condition which causes muscle breakdown.
The breakdown products enter the urine, making it dark-coloured.
Figure 2 shows the inheritance of CRAM in one family.

Figure 2



CRAM is caused by a recessive allele, **n**.
The allele for normal health is **N**.

Give evidence from the diagram that CRAM is caused by a **recessive** allele.

[1 mark]

_____

None of person **2**'s children have CRAM.
Explain why.

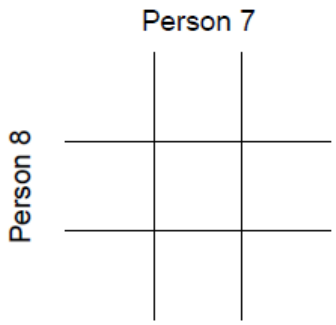
[1 mark]

_____

Persons **7** and **8** want to have another child.
What is the probability that this child will have CRAM?
Complete the Punnett square diagram in **Figure 3** to explain your answer.

[4 marks]

Figure 3



Probability = _____

Credit: Exampro

Tutorial Glossary

Use this space to write down any words you have learned today

Word	Definition	In a sentence

Homework- Baseline Assignment

Think about the last time you were ill. Could be a cold, flu, food poisoning or even COVID!
Write 500 words to answer the following questions:

1. **We all get sick; think about the last time you were. What were your symptoms? How long were you sick for?**
2. **How do you think you got better? Did you take medicine? What does your body do to fight infection?**

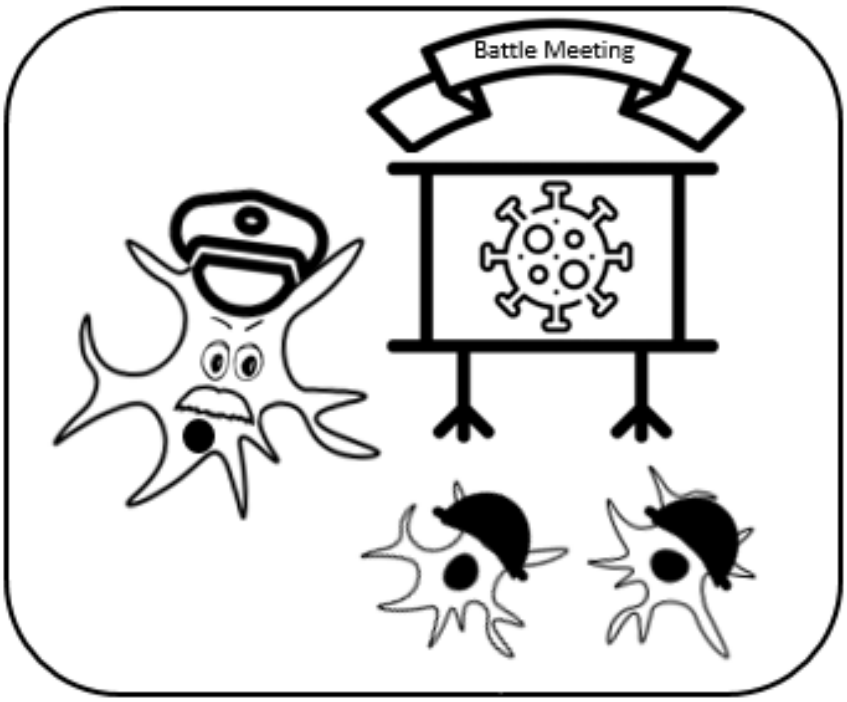
I'm interested to hear your ideas and opinions about these questions, just remember to PEE!

- Point – make the key point clearly
- Evidence – state the evidence for each point
- Explanation – explain why your point is relevant and important

Organise your writing into paragraphs:

- Include an introduction talking about the illness and your symptoms
- Explain why you think these symptoms occurred and how you got better
- Justify your reasoning for why you got better
- Summarise your key points in a conclusion

Tutorial 2 – The Immune System



Credit: Noun Project

What is the Purpose of Tutorial 2?

The purpose of this tutorial is to delve into the microscopic world of the human immune system. We will explore the inner workings of this vital system and learn about all of the key players that keep you and I fit and healthy day-to-day. During this tutorial we will discover the process of how our immune cells identify and kill germs and what they do when the same germ comes back a second time around! We will even take a look at real microscopic images of immune cells and identify them.

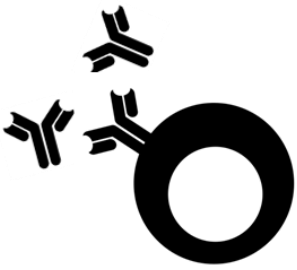
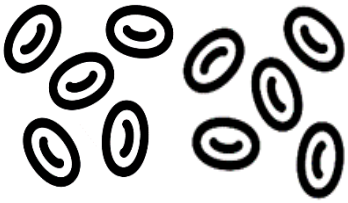
By the end of the tutorial, you will be able to:

1. Recall the two types of white blood cells and recall examples of each
2. Explain how the immune system protects us from infection by drawing an immune response graph
3. Draw a white blood cell and a red blood cell based on microscopic images

Word	Definition	In a sentence

Activity 1- Guess who

Using the table below, draw a line to link the correct artwork, cell type and function.

Artwork	Cell type	Function
	Granulocyte	Produces antibodies to kill and neutralise pathogens
	B cell	Detects and kills cancer and foreign cells coated in antibodies
	T cell	Capable of releasing granules and histamine to destroy parasites
	Phagocyte	Contain haemoglobin and are biconcave in shape
	Red blood cell	When they detect a pathogen, these cells "eat" and destroy them

Credit: Noun Project

Activity 2- Immune cells, Assemble!

In the space below draw an immune response graph, including 2 infections, and then answer the questions below.

1. What is an antibody?

2. What is an antigen?

3. How are antibodies produced and how do they work? Include the names of all the cells are involved.

Activity 3- Eye spy

In the space below, sketch images of the immune cells you just saw. Make sure you label their features.

Homework

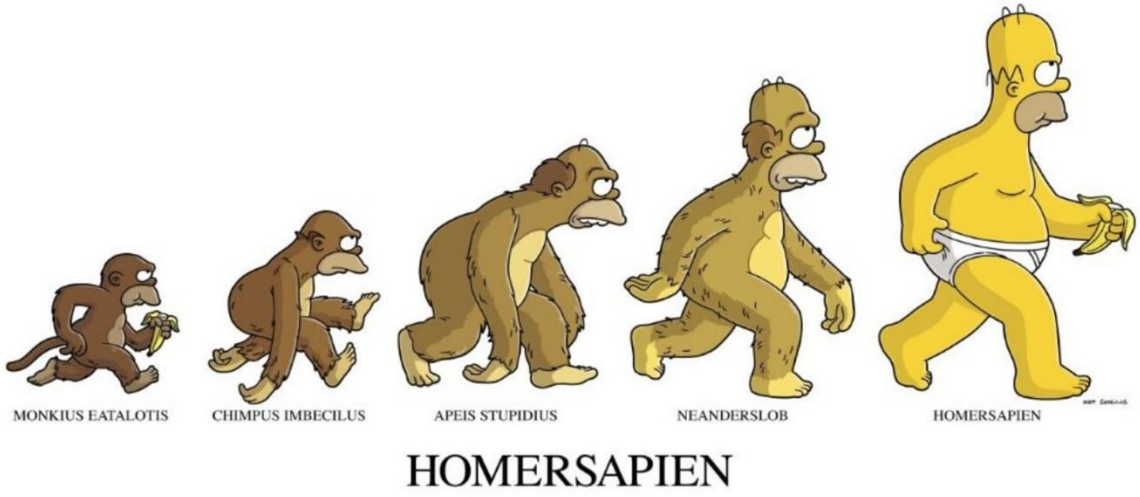
Answer the following exam style question.

Neuromyelitis Optic (NMO) is a disease that leads to damage to nerve cells in the spinal cord.

A person with NMO produces anti-Aquaporin-4 (AQP4) antibodies that attack only these nerve cells.

Explain why the anti-AQP4 antibody only damages these cells. (4)

Tutorial 3 – Evolution



Creative commons: Pixy.org; Evolution of Homersapien.

What is the Purpose of Tutorial 3?

In this programme Tutorial 3 will consider how organisms evolve and whether humans are still evolving, before a discussion on whether identifying mutations in embryos (genetic testing) is ethical. By the end of this tutorial, you will understand that, like X-men, we all have unique mutations that make us who we are and make our lives much easier (or harder).

By the end of the tutorial, you will be able to:

1. Recall how mutations drive evolution of a species
2. List examples of beneficial mutations found in human populations
3. Debate my view on genetic testing

Word	Definition	In a sentence

Activity 1- I will survive!

These are albino animals. Albinism is a type of mutation. Suggest whether this mutation is an advantage or a disadvantage. **Explain why.**

Creative commons:(jggrz, pixabay.com);(BockoPix Snowflake, Flickr.com);(WhiteLion, PickPic.com)

Activity 2- Paper hunters

You are the predators! Your prey? Paper. Collect as many as you can and observe the evolution.

1. Work in pairs with one student acting as the referee and the other as the predator.
2. Without the predator looking, the referee should arrange small circles of different coloured paper on a piece of patterned wrapping paper (use about 40 circles).
3. The referee counts the number of each colour circle that has been placed on the paper and records this in the Results table as Generation 1.
4. The predator then picks up as many as they can in 20 seconds using tweezers and places the circles in a Petri dish.
5. For each of the remaining circles, two more of that colour are added.
6. The referee then counts the numbers of each colour circle again, and records then in the Results table as Generation 2.
7. Do not point out any changes in number to the predator as this might bias their response.
8. The process (Steps 4–7) is repeated two more times.

Generation number	Number of circles of coloured paper			
	Colour 1 ……..	Colour 2 ……..	Colour 3 ……..	Colour 4 ……..
1				
2				
3				
4				

9. The pair discuss what has happened to the colour of the population and why this has happened. Answer the below questions.

a) This activity models evolution by natural selection.

b) Suggest why one variant in your population might have increased in number. (3 marks)

c) Suggest why one variant in your population might have decreased in number. (3 marks)

d) Predict what would be the eventual outcome if this activity was continued for several more generations. (1 mark)

Challenge Questions

e) What would happen in this activity if you changed the wrapping paper? Suggest a reason.

f) What would happen in this activity if you changed the shape or size of the tweezers? Suggest a reason.

Activity 3- The Big Debate

Should we use genetic testing on unborn babies' DNA?

1. Take a character card. You have 2 minutes to read through the card.

   What are your initial thoughts?

2. Read the first paragraph out loud and take notes on other people's cards.

   Do you disagree or agree with your own or other characters?

3. Read out your fact.

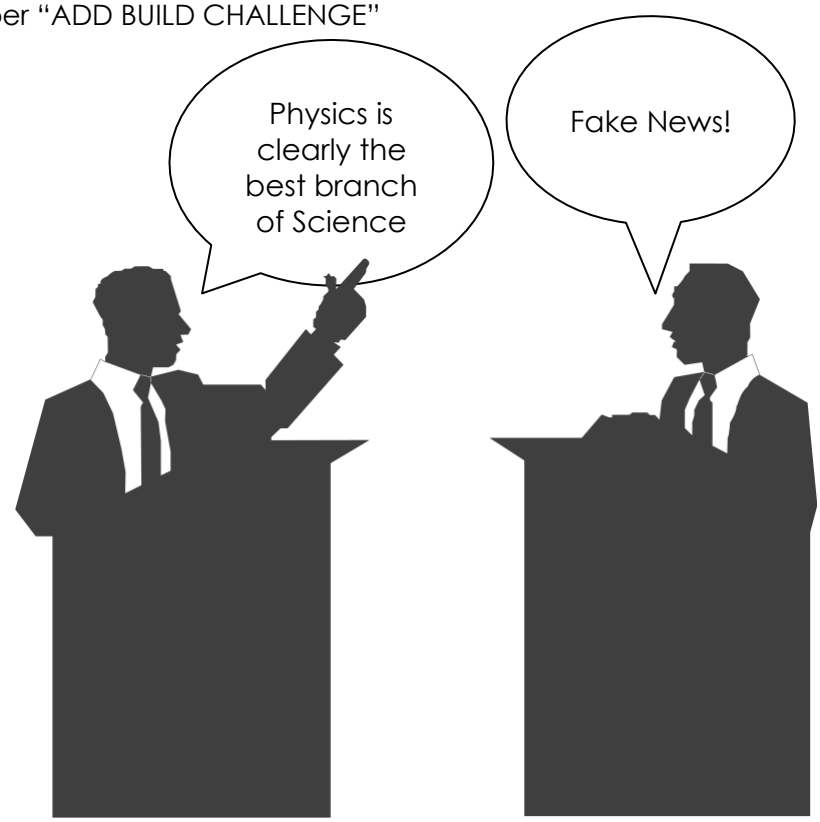
   Do other people's facts change your opinion?

4. Read the issue out loud.

   Do the issues change your opinion?

5. Question time. Take it in turns to ask questions to other characters.
   Remember "ADD BUILD CHALLENGE"

6. VOTE!



Creative Commons: Niaz, Wikipedia.com

Homework

Answer the following exam style question:

(1) What is a mutation?

Tick one box.

A change in a gene ☐

Accidental damage to an organism ☐

An organism with a new characteristic ☐

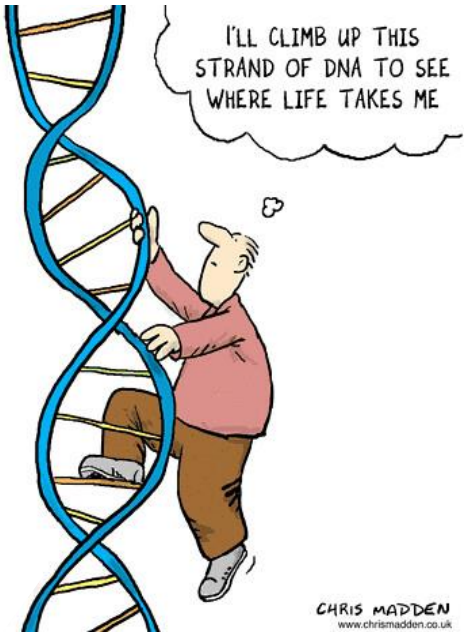
The loss of a species ☐

(1)

(2) Describe the process of natural selection.

(3)

Tutorial 4 – Gene Editing



Creative Coomons: Redondoself, gene-dna-climb, Flickr.com

What is the Purpose of Tutorial 4?

Gene editing is the discovery of the century so far! It is changing what scientists know about DNA and genes and lets us perform experiments that we never thought possible. Throughout this tutorial you will learn how scientists measure and edit DNA in the lab and you will get the chance to extract DNA from a living organism! Like any top scientist, you will be able to present your ideas on gene editing and decide as a class whether we agree to its use on humans…

By the end of the tutorial, you will be able to:

1. Recall scientific methods used to measure and edit DNA and explain how they work
2. Extract DNA and understand how DNA extraction works
3. Debate my view on gene editing using presentation/PowerPoint skills

Word	Definition	In a sentence

Activity 1- Feeling fruity!

It is possible to extract DNA from cells in a variety of ways. One of the simplest methods is to extract it from fruit.

Aim
The aim of this experiment is to extract DNA from some fruit.

Method

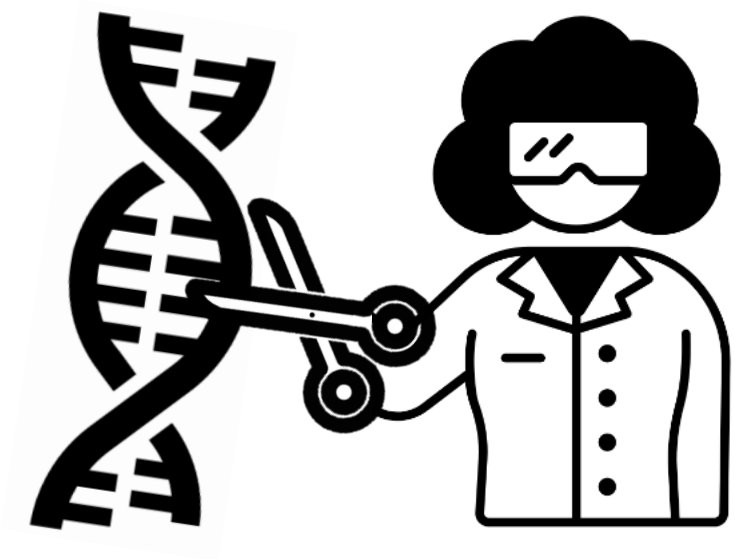
1. Peel the skin from half a kiwi fruit and mash it up
2. Mix a teaspoon of salt and small volume of washing up liquid into the fruit
3. Gently heat this mixture at about 60°C for five minutes
4. Filter the mixture and retain only the filtrate (the filtered liquid)
5. Cool using an ice bath and gently pour chilled ethanol onto the top of the filtrate
6. You will see strands of DNA with bubbles in them at the boundary between the filtrate and the chilled ethanol

The important aspect of this practical is the method you would use. This experiment is not like other practical lessons in that the results cannot really be evaluated.

Activity 2- Merry CRISPR-mas!

Make a poster describing how genetic scientists extract DNA from cells and edit genes. You should include:

1. A labelled diagram of a cell showing the nucleus
2. A labelled diagram of a chromosome, DNA strand and gene
3. A step-by-step method of how scientists (like you!) extract DNA
4. A paragraph of how scientists edit genes
5. Your opinion on whether scientists should be able to edit genes



Use Appendix 4 for notes and revision!

Credit: Noun Project

Homework

Using your notes, poster and your own knowledge of course, answer the questions below on DNA and gene editing.

What are genes?

What does the washing up liquid do in the DNA extraction experiment?

What does the ethanol do in the DNA extraction experiment?

If a scientist edited a gene, what could happen to the protein the gene codes for?

Read Appendix 2.

1. Summarise the article
2. Give arguments for and against gene editing in humans
3. Conclude your summary with your own opinion

Tutorial 5 – When the Immune System Goes Wrong

Credit: Noun Project

What is the Purpose of Tutorial 5?

Our beloved immune system keeps us safe every day and is in a constant battle, fighting foreign germs whilst making sure cancer doesn't develop. But it can go wrong. Badly wrong. During this tutorial we will explore how our immune cells can tell our own cells apart from foreign invaders. We will investigate examples of genetic diseases where the immune system is broken. You will have the chance to diagnose real cases where the patient's immune cells can no longer fight infections as well as cases where immune cells attack our own healthy cells and tissues! Finally, you will put your scientific presentation skills to the test and share your ideas on gene editing and whether we should be searching for a cure for the incurable.

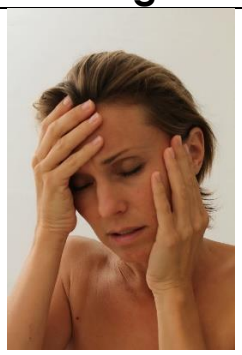
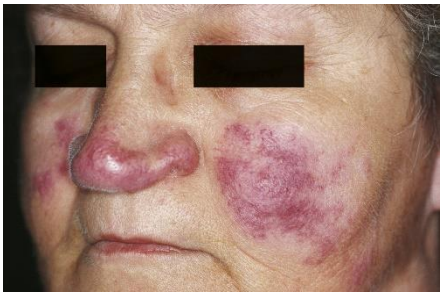
By the end of the tutorial, you will be able to:

1. Define Autoimmunity and Immunodeficiency
2. Diagnose a genetic disease of the immune system
3. Debate my view on gene editing using presentation/PowerPoint skills

Word	Definition	In a sentence

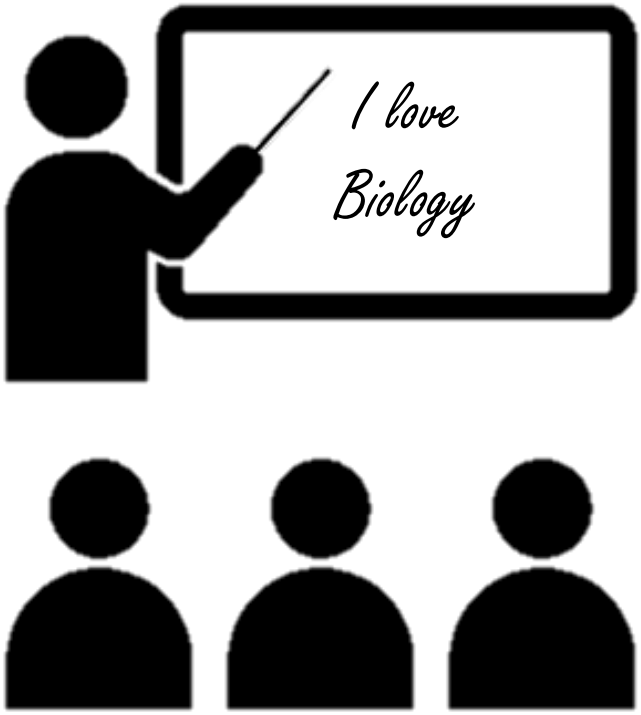
Activity 1- Diagnosis immunity

Complete the table with your diagnosis of either autoimmunity or immunodeficiency. Give your reasons why you came to this expert diagnosis.

Observations	Image	Diagnosis
Increased thirst. Frequent urination. Unintended weight loss. Fatigue and weakness. Blurred vision. **High blood glucose.** **High antibody levels.**	 Creative commons: Flickr.com	
Pneumonia. Repeated ear infections. Meningitis. Chronic skin infections. Yeast infection. Liver infection. **Very low WBC count.**	 Wikimedia commons	
Aching, tenderness and swelling in the joints. Symmetrical joints. Weight loss. Fever. Tired and weak. **High antibody levels.** **Lots of inflammation.**	 Wikimedia commons	
Butterfly-shaped rash. Sensitive to light. Ulcers in your mouth or nose. Arthritis in two or more joints. Seizures. **Protein in urine.** **Low blood cell counts.** **High antibodies levels.** **Anti-DNA antibodies.**	 Wikimedia commons	
Fever. Rash. Night sweats. Muscle aches. Sore throat. Fatigue. **Very low T cell count.** **High antibody levels.**	 Creative commons: Flickr.com	

Activity 2- Poster presentation

Time to present your posters! Pin them up and you will take turns to present everything you have learned so far about genetics, immunology and gene editing. You will have 5 minutes including a few questions, so use the below success criteria to make sure you nail it



Credit: Noun Project

Feature	Criteria
First Impression	• Easy to read • Attractive colours • Not too crowded
Layout	• Good flow of information • Easy to follow the information
Readability	• Writing not too small • Not too much text • No grammar and spelling mistakes
Scientific content	• Labelled diagrams • Diagrams not too complex • Clear images • Talk about the big picture • Suitable for non-experts • Good scientific explanation
Conclusions	• Do the conclusions use PEE? • Is there a take-home message?
Performance	• Good level of knowledge • Enthusiastic about the topic • Clear, slow and concise language
Questioning	• Detailed answers (even if wrong!) • Ability to stay calm • Polite and gracious

Homework- Final Assignment

Do X-men get sick?

Would you genetically modify your DNA to enhance your immune system?

A new gene altering technology has been made safe and available at the local pharmacy. You can fine tune your immune system at will to either increase or decrease inflammation. You can become an X-man!

You must decide whether to mutate your DNA or not.

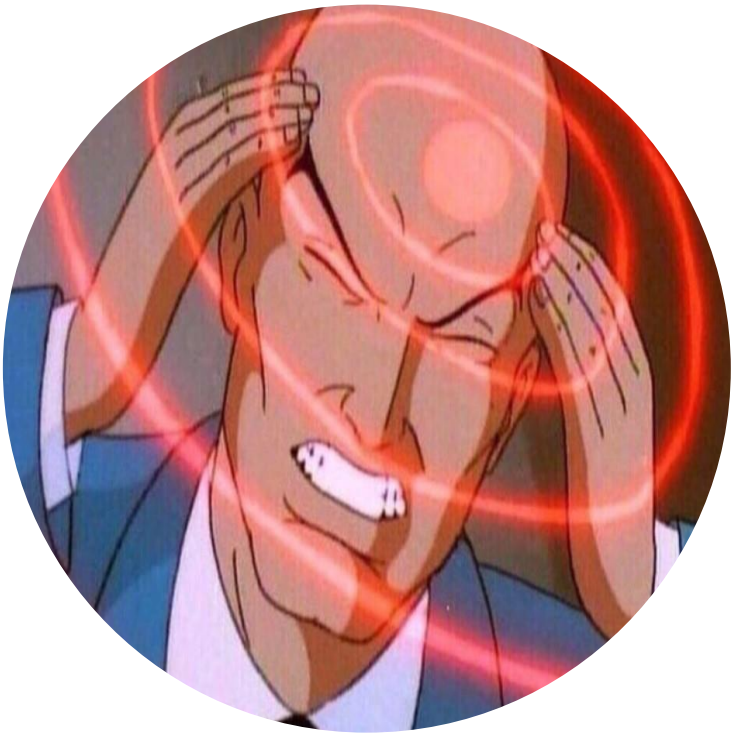
If you choose to, why and what will you mutate? If not, why not? What are your reservations?

Essay 2000 words

In your essay, include:

- An **introduction** to the immune system: what it does and how it does it.
- **What mutations are** and examples of how they are beneficial/harmful to an organism?
- **How gene altering technology works** to edit DNA.
- What **experiment** could we perform to check the technology has worked?
- The potential **side effects** of either enhancing or dulling your immune system.
- A **rationale** for your decision to edit your DNA.
- Provide **details** on what aspects of your immune system you will/won't change.
- What are the **ethical** problems with editing DNA?

Please use the mark scheme to ensure you get all of the marks possible for your essay. Ensure that you use at least 10 references (see appendix 1) from websites, books and articles that you have used to help you write your essay.



Homework- Final Assignment

Tutorial 6 – Feedback tutorial

What is the Purpose of Tutorial 6?

- To receive feedback on your final assignment
- To respond to the feedback from your Uni Pathways teacher
- To write targets for improvement on your final assignment

Final assignment feedback from your Uni Pathways Teacher

(Remember to look at the mark scheme to help you understand what you have done well so far, and how you can do even better in your final assignment)

Here are three things that my Uni Pathways Teacher thought I did well in my draft assignment
•   •   •

Here are three things that my Uni Pathways Teacher thinks that I could do to get a higher mark in my final assignment
•   •   •

Tasks from my Uni Pathways Teacher to do during the feedback tutorial to help me improve
•   •   •
My response:

Actions I will take to improve my final assignment after this tutorial…
•   •   •

Hand in date for my final assignment:	

Tutorial 7 – Final tutorial

What is the Purpose of Tutorial 7?

- To receive feedback and a grade on your final assignment
- To reflect on the programme including what you enjoyed and what was challenging
- To ask any questions you may have about university

Final assignment feedback from my Uni Pathways Teacher

Final mark:	University style grade:
Feedback: Here are three things that my Uni Pathways teacher thought I did well in my final assignment • • •	

Here are three things that my Uni Pathways teacher thinks I should remember for when I am doing this kind of study in the future
• • •

University

What questions do you still have about University after taking part in Uni Pathways?
•   •   •

Reflecting on Uni Pathways

What did you most enjoy about Uni Pathways?
•   •   •

What did you find challenging about the programme?	How did you overcome these challenges?
• • •	• • •

Appendix 1 – Referencing correctly

When you get to university, you will need to include references in the assignments that you write, so we would like you to start getting into the habit of referencing in your Brilliant Club assignment. This is really important, because it will help you to avoid plagiarism. Plagiarism is when you take someone else's work or ideas and pass them off as your own. Whether plagiarism is deliberate or accidental, the consequences can be severe. In order to avoid losing marks in your final assignment, or even failing, you must be careful to reference your sources correctly.

What is a reference?

A reference is just a note in your assignment which says if you have referred to or been influenced by another source such as book, website or article. For example, if you use the internet to research a particular subject, and you want to include a specific piece of information from this website, you will need to reference it.

Why should I reference?

Referencing is important in your work for the following reasons:

- It gives credit to the authors of any sources you have referred to or been influenced by.
- It supports the arguments you make in your assignments.
- It demonstrates the variety of sources you have used.
- It helps to prevent you losing marks, or failing, due to plagiarism.

When should I use a reference?

You should use a reference when you:

- Quote directly from another source.
- Summarise or rephrase another piece of work.
- Include a specific statistic or fact from a source.

How do I reference?

There are a number of different ways of referencing, and these often vary depending on what subject you are studying. The most important to thing is to be consistent. This means that you need to stick to the same system throughout your whole assignment. Here is a basic system of referencing that you can use, which consists of the following two parts:

1. **A marker in your assignment**: After you have used a reference in your assignment (you have read something and included it in your work as a quote, or re-written it your own words) you should mark this is in your text with a number, e.g. [1]. The next time you use a reference you should use the next number, e.g. [2].
2. **Bibliography**: This is just a list of the references you have used in your assignment. In the bibliography, you list your references by the numbers you have used, and include as much information as you have about the reference. The list below gives what should be included for different sources.

    a. **Websites** – Author (if possible), title of the web page, website address, [date you accessed it, in square brackets].

    E.g. Dan Snow, 'How did so many soldiers survive the trenches?', http://www.bbc.co.uk/guides/z3kgjxs#zg2dtfr [11 July 2014].

    b. **Books** – Author, date published, title of book (in italics), pages where the information came from.

    E.g. S. Dubner and S. Levitt, (2006) *Freakonomics*, 7-9.

    c. **Articles** – Author, 'title of the article' (with quotation marks), *where the article comes from* (newspaper, journal etc.), date of the article.

    E.g. Maev Kennedy, 'The lights to go out across the UK to mark First World War's centenary', Guardian, 10 July 2014.

Appendix 2- Gene edited babies

Chinese scientist who produced genetically altered babies sentenced to 3 years in jail

By Dennis NormileDec. 30, 2019 , 8:15 AM

He Jiankui, the Chinese researcher who stunned the world last year by announcing he had helped produce genetically edited babies, has been found guilty of conducting "illegal medical practices" and sentenced to 3 years in prison.

A court in Shenzhen found that He and two collaborators forged ethical review documents and misled doctors into unknowingly implanting gene-edited embryos into two women, according to Xinhua, China's state-run press agency. One mother gave birth to twin girls in November 2018; it has not been made clear when the third baby was born. The court ruled that the three defendants had deliberately violated national regulations on biomedical research and medical ethics, and rashly applied gene-editing technology to human reproductive medicine.

"Sad story—everyone lost in this (JK, his family, his colleagues, and his country), but the one gain is that the world is awakened to the seriousness of our advancing genetic technologies. I feel sorry for JK's little family though—I warned him things could end this way, but it was just too late," wrote bioethicist William Hurlbut at Stanford University, whom He consulted on the embryo-editing experiment.

In November 2018, He announced that he had modified a key gene in a number of human embryos in a way thought to confer resistance to HIV. The modification might be passed on to the descendants of children born with it. He recruited couples in which the father was infected with HIV and the mother was not. In a talk at the International Summit on Human Genome Editing in Hong Kong, China, He said he wanted to spare the babies the possibility of becoming infected with HIV later in life. The technique could be used to reduce the HIV/AIDS disease burden in much of Africa, he argued, where those infected often face severe discrimination.

The announcement touched off a firestorm of criticism from scientists and ethicists in attendance at the summit and around the world. Experts agree there are safer and more effective ways to prevent HIV infections, and the experiment was deemed premature, irresponsible, and unjustified because it exposed the babies to risks associated with gene editing for little, if any, benefit.

"The field of gene editing will carry the hashtag #CRISPRbabies in the mind of the public for a period longer than He's sentence, and that is an additional crime he committed but was not formally charged with," says Fyodor Urnov, a CRISPR researcher at University of California, Berkeley. "I hope that this stain will soon diminish relative to the positive impact that gene editing is likely to have in ethically treating existing disease. Moving forward, the real threat of severe legal action is the right deterrent for future Herostratus-like individuals whose hubris could drive them to follow in He's footsteps."

Lovell-Badge hopes all three babies are happy and healthy and says they deserve privacy. But, "There are still many details of the case that have yet to be released," he says. These include confirmation of the edits made to the target gene and whether the editing affected other parts of the genome, among other technical issues. There is also the question of how He "could have proceeded with what he did with so much secrecy."

With reporting by Jon Cohen.
Posted in: **Asia/Pacific Scientific Community** doi:10.1126/science.aba7347

Appendix 3- Debate Cards

Debate

Dr Jean Histone- Geneticist

Identifying genetic diseases early is so important for parents. By testing the foetus early on, parents have all the information regarding their new child's health and can prepare well in advance of the due date. We can't cure genetic diseases so it is important that parents learn as much as they can about their child's needs and begin to make arrangements to ensure their child can have a full and rich life. Children with Down's syndrome for example, often attend school and are employed as adults but need extra care and support from their parents.

Fact: Around 1 in 25 children are affected by a genetic disorder.

Issue: Parents of children with genetic diseases cannot afford to wait until the child is born to know their child's condition. They need time to prepare.

Question: Why shouldn't parents have all the information available before the birth of their child?

I'm a Scientist Get me out of here

Debate

Dr Dee Enay- GP

Some women are at an increased risk of giving birth to a child with a genetic disease. Older mothers, mothers with genetic diseases in their family and parents who have had children before with a genetic disease are all recommended to genetically screen their foetus. Many mothers choose to abort their child if the foetus tests positive for a genetic disease. They often feel that their child will have a poor quality of life due to their disease. Some mothers also worry that they will end up neglecting their other children if they are spending all their time caring for their new child. However, amniocentesis is not without risks. There is a risk of miscarriage, so only mothers at high risk should receive the procedure.

Fact: 1 in 100 mothers miscarry after amniocentesis

Issue: Mothers should have the choice whether they are ready to bring up a child with a genetic disease

Question: Should mothers be forced to have a child when it'll have a poor quality of life?

I'm a Scientist Get me out of here

Debate

Ricky Sumac MP- Politician

I don't mean to sound insensitive but you have to think about the money involved in all of this. The cost of treating individuals with genetic diseases is in the billions of pounds per year to the NHS. Not only the cost of healthcare, these individuals often are unable to work and pay taxes due to their disabilities. This is lost money to the economy. In comparison, the cost of screening foetuses before they are born gives the parents the option to abort and try for a new, healthy child. The government could spend all this money on police, schools and other good causes that improve everyone's lives.

Fact: In the UK, we give the NHS £15,000,000,000 per year to treat patients with genetic diseases. That is 10% of all NHS spending.

Issue: It is too expensive not to screen foetuses for genetic diseases.

Question: How can we afford to keep on treating patients with genetic diseases? Shouldn't we spend this money on cancer research and other causes?

I'm a Scientist Get me out of here

Debate

Paige Turner- Fiction Author

Are we living in some other dimension where we just kill babies for being sick? This isn't some dystopian novel by Orwell or Huxley where the government are in control of us! These poor babies lose out no matter what happens. If they are aborted they never get the chance to live and if they do make it and are born, they are forever branded with the genetic disease that these so called doctors have decided they have before they were even born! They'll be paying for this financially too. As soon as insurance companies are told these poor kids have a disease they will charge them through the roof! I'm sorry but we cannot let the government decide if children deserve to live or not. This isn't China!

Fact: Between 1979 and 2015, China imposed a one-child policy. This led to 336 million abortions of female foetuses due to sex-selective genetic screening.

Issue: Everyone deserves to get the chance to live a full life, no matter their genetics

Question: What if a mother decides to abort their child due to their sex or eye colour? Should this be allowed?

I'm a Scientist Get me out of here

Debate

Max Salt- Cystic Fibrosis Patient

Genetic screening is so important. I have a genetic disease called Cystic Fibrosis where my cells can't transport salt. This means I get lots of lung infections and have too much sticky mucous. Although I do have many bad days, my quality of life is good because my parents screened me when I was born and I started my treatment straight away, including physiotherapy and new drugs. My parents where then able to educate themselves about my condition so they were fully prepared to help me through life.

Fact: In the UK, all new-born babies are screened for cystic fibrosis as part of the new-born blood spot test (heel prick test) carried out shortly after they're born.

Issue: It is important to screen babies for Cystic Fibrosis so that they can start their treatment straight away.

Question: Isn't it better to know you have a genetic disease early in your life and start treatment before it is too late?

Debate

Dave Vine- Reverend

It is against God to kill a child. As soon as an egg is fertilised it is alive and has human rights. By genetically screening unborn children, we give wicked people the opportunity to murder children. Thou shalt not kill (Exodus 20:13) is one of the ten commandments of God in the Bible. These are the rules of God and we must obey them. These scientists and mothers who perform such cruel acts will surely be judged and sent to hell!

Fact: 60% of the UK population identify themselves as being religious.

Issue: It is against all religious texts, not just the Christian Bible, to abort a child because they have a genetic disease.

Question: Should people have to renounce their faith if they have an abortion?

Debate

Professor Ian Van Fleet- IVF Scientist

I was involved in the early studies that looked into how we detect DNA of the foetus and check it for potential disease. Every day we get closer and closer to being able to develop technology to cure genetic diseases. In the next 20 years we will be able to change a foetus' DNA so it is healthy. However, in order for us to do this we need to know which foetuses have what mutations. I believe we should extend screening to all foetuses, not just those at increased risk. That way we will never miss any genetic disease and we can start treatment straight away. We may even have the chance to discover new genetic diseases and learn more about them.

Fact: Scientists have discovered over 6000 genetic disorders thanks to modern biomedical science.

Issue: Without genetic testing many of these children would go undiagnosed and their quality of life seriously impaired.

Question: Why don't we test every foetus for genetic disease? We will learn more about them and develop cures.

Debate

Abby Bort- Pro-life Campaigner

It is morally wrong to look at someone else's DNA. The baby doesn't even get a choice in the matter. You just stick the needle in and violate its privacy. Foetuses should have basic human rights and certainly should have the right to live! How does anybody think they have the right to judge whether a child lives or dies? Even if they have a disability they still should have the chance to grow up and be loved and love others. To experience happiness. We live in a civilised society and a very rich country. We can afford to treat and care for these sick children and give them a good life.

Fact: 9 in 10 UK adults are pro-choice or pro-abortion

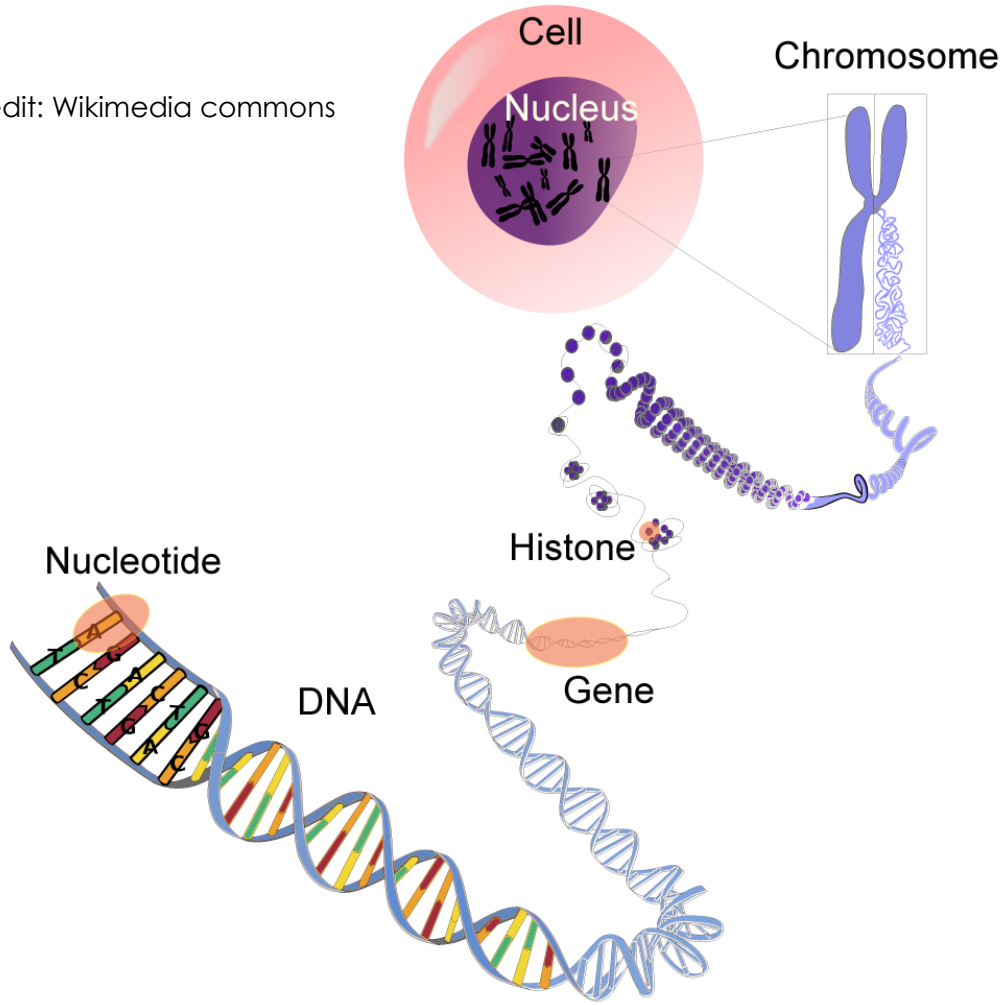
Issue: It should be against the law to test somebody's DNA without their permission. It is a breach of their privacy and human rights.

Question: Should abortions be banned in the UK?

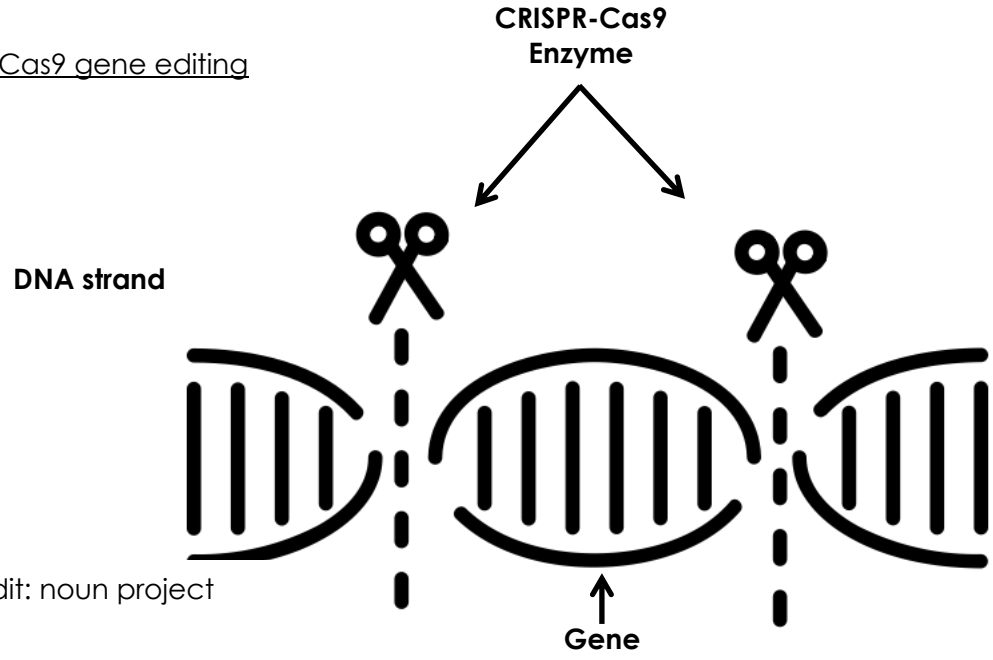
Appendix 4- Gene editing revision

Structure of genetic material

Credit: Wikimedia commons



CRISPR-Cas9 gene editing



Credit: noun project

Appendix 5- Further reading

Website: BBC Bitesize
Search terms: *BBC gene expression higher biology*
Content: KS4 level information on the central dogma of molecular biology

Website: YouTube
Search terms: GCSE Biology - Family Trees / Family Pedigrees
Content: Information regarding genetic pedigree diagrams

Website: British society of immunology (Immunology.org)
Search terms: Bitesized immunology
Content: General content on all-things immunology

Website: National Multiple Sclerosis Society
Search terms: Neuromyelitis Optica (NMO) National Multiple Sclerosis Society
Content: Details on NMO and how it is caused

Website: Youtube
Search terms: David Attenborough explaining the tree of life
Content: David Attenborough explaining evolution

Website: Youtube
Search terms: Debating Embryonic Genetic Testing -- The Doctors
Content: An introduction to the debate around genetic testing

Website: Youtube
Search terms: Designer Babies: The Science and Ethics of Genetic Engineering
Content: Genetic engineering and CRISPR

Website: Youtube
Search terms: The ethical dilemma of designer babies | Paul Knoepfler
Content: Lecture on the debate of genetic modification and CRISPR

Website: Youtube
Search terms: How CRISPR lets you edit DNA - Andrea M. Henle
Content: How CRISPR was discovered and how it works

Website: Diabetes.org
Search terms: Type 1 diabetes | What it is and what causes it | Diabetes UK
Content: Explanation of what causes diabetes and its symptoms

Website: Gosh.nhs.uk
Search terms: Severe combined immunodeficiency (SCID) | Great Ormond street
Content: Details on SCID disease and how it is treated

Website: artritis.org
Search terms: Rheumatoid Arthritis - Arthritis Foundation
Content: What causes RA and the current treatments

Website: versusarthtitis.org
Search terms: Lupus (SLE) | Causes, symptoms, treatment | Versus Arthritis
Content: What lupus is and its symptoms

Website: WHO
Search terms: HIV/AIDS - World Health Organization
Content: The global picture of the HIV pandemic

Notes

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