Centre of the Cell

Curriculum links – what you can expect to cover on a visit here

Key Stage 3

Introduction

Centre of the Cell contains a large amount of content, crossing many areas of the biology curriculum, as well as sections of the English, maths and citizenship curricula. This document aims to give teachers an idea of where the Centre of the Cell content fits in with what their pupils are learning. Links are given both to the National Curriculum and to the DFES standards (or to summaries of the Key Stage 4 curricula, as appropriate).

The map is presented in two sections:

- A summary by unit, showing which games hit which unit
- A comprehensive table showing which concepts within each unit are hit by each game/interactive

Careers

We have highlighted as careers-relevant all those games that feature a real scientist, or otherwise demonstrate what scientists do in their day-to-day research. The primary careers information is available in the Patient Journeys, but other information about possible careers can be gleaned from the scientist videos in the games.

Patient Journeys tell the story of a fictional 'typical' patient with a certain condition or situation: a cystic fibrosis patient, a couple going through IVF, a participant in a clinical trial, and someone with an acquired spinal cord injury. As they are followed through their treatment, real, non-fictional staff at the Barts and the London NHS Trust and Queen Mary University of London are profiled. These are the people the patients would meet were they following the same journey, and they discuss why they do their job, what the challenges are, and how they came to their career path.

The aim of the Patient Journeys is to introduce pupils to jobs in biomedicine other than doctor or nurse, and to put those jobs into the context of a working hospital or research facility.

Games/interactives by Key Stage

The target audience for Centre of the Cell is students aged 9 – 16. Games and interactives were designed with specific key stages in mind.

Games in bold are primarily for that key stage. Games that are not bolded are suitable for that key stage but their primary target audience is another key stage.

Key Stage 2	***Key Stage 3***		***Key Stage 4***	
Zooom **Organ Surgery** **Troublesome Twins** Cell to Baby Body Balance TB Invaders Beyond Brushing Cell Turnover Build an Organ What is a Cell Bioengineering Heart Disease	**Cell to Baby** **Lab Bench Chaos** **Body Balance** **TB Invaders** **Cell Turnover** **Build an Organ** **What is a Cell** **Bioengineering** **Microscopes** **Flu Epidemic** **Animal Experimentation** **Heart Disease**	Zooom Gene Search Beyond Brushing Mitosis Maker Organ Surgery Troublesome Twins Explore a Cell Ethics: Cloning Harlequin Disease Gut Infection Patient journey: Clinical Research	**Burns Clinic** **Gene Search** **Beyond Brushing** **Cancer Survivors** **Mitosis Maker** **Patient Journey: IVF** **Ethics: Stem Cells** **Genes and Your Cells** **Explore a Cell** **Ethics: Cloning** **Patient Journey: Spinal Cord Injury** **Detecting Cancer** **What is Cancer** **Ethics: PGD** **Harlequin Disease** **Gut Infection** **Patient Journey: Cystic Fibrosis** **Patient Journey: Clinical Research**	Lab Bench Chaos Body Balance Cell Trumps TB Invaders Build an Organ Troublesome Twins Flu Epidemic Heart Disease

Key stage 3 by unit

Unit	Game / interactive				
1.1 – Scientific thinking	Microscope				
1.2 – Applications and implications of science	Patient journeys	Ethics sections			
3.3 – Organisms, Behaviour and Health *3.3a* Life processes are supported by the organisation of cells into tissues, organs and body systems	Lab Bench Chaos	Zooom	Body Balance	Cell Trumps	Burns Clinic
	Cell Turnover	Mitosis Maker	Organ Surgery	Build an Organ	Ethics: stem cells
	Genes and Your Cells	Explore a Cell	What is a Cell?	Ethics: cloning	Bioengineering
	Detecting Cancer	What is Cancer?	Microscope	Gut Infection	Ethics: PGD
3.3 – Organisms, Behaviour and Health *3.3b* The human reproductive cycle includes adolescence, fertilisation and foetal development	Patient journey: IVF	Cell to Baby			
3.3 – Organisms, Behaviour and Health *3.3c* Conception, growth, development, behaviour and health can be affected by diet, drugs and disease	Troublesome Twins	Heart Disease	Patient journey: IVF	Beyond Brushing	Gut Infection
	TB Invaders	Patient journey: Cystic Fibrosis			
3.3 – Organisms, Behaviour and Health *3.3d* All living things show variation,	Gene Search	Harlequin Disease	Cell to Baby	Troublesome Twins	Heart Disease

can be classified and are interdependent, interacting with each other and their environment	Ethics: cloning				
4 – Curriculum opportunities *4c* Use real-life examples as a basis for finding out about science	Patient journeys	Cancer Survivors	Lab Bench Chaos	Harlequin Disease	TB Invaders
	Burns Clinic	Gene Search	Beyond Brushing	Flu Epidemic	Bioengineering
	Microscope	Gut Infection			
4 – Curriculum opportunities *4e* Experience science outside the school environment, including in the workplace, where possible	**All**				
4 – Curriculum opportunities *4i* Prepare to specialise in a range of science subjects at key stage 4 and consider career opportunities both within science and in other areas that are provided by science qualifications.	Lab Bench Chaos	TB Invaders	Burns Clinic	Detecting Cancer	Bioengineering
	Patient journeys				
4 – Curriculum opportunities *4j* - consider how knowledge and understanding of science informs personal and collective decisions, including those on substance abuse and sexual health.	Ethics sections	Patient journeys	Flu Epidemic	Heart Disease	Cancer Survivors
	Beyond Brushing				
Maths 2.3 – Interpreting & Evaluating	Gene Search	Harlequin Disease	Microscope	Heart Disease	Gut Infection
Maths 3.1 – Number & Algebra	Body Balance	Zooom			

Maths 3.3 – Statistics		Heart Disease				
Citizenship 1.1 – Democracy & Justice		Ethics sections				
Citizenship 1.2 – Rights & Responsibilities		Ethics sections	Patient journey: IVF			
Careers		Patient journeys	TB Invaders	Burns Clinic	Gene Search	Bioengineering
		Detecting cancer	Lab Bench Chaos	Beyond Brushing		
DFES Standards						
7	7A – Cells	Cell to Baby	Lab Bench Chaos	Zooom	Body Balance	Cell Trumps
		Cell Turnover	Organ Surgery	Build an Organ	Genes and Your Cells	Explore a Cell
		Microscope	What is a Cell?	Mitosis Maker		
7	7B – Reproduction	Cell to Baby	Troublesome Twins	Heart Disease	Patient Journey: IVF	
7	7D – Variation and Classification	Troublesome Twins	Gene Search	Harlequin Disease	Heart Disease	
8	8B – Respiration	Build an Organ	Heart Disease			
8	8C – Microbes and Disease	Build an Organ	TB Invaders	Burns Clinic	Flu Epidemic	Gut Infection
		Heart Disease				
8	8L – Sound and Hearing	Heart Disease				
9	9A – Inheritance and selection	Cell to Baby	Cell Trumps	Cell Turnover	Genes and Your Cells	Troublesome Twins
		Ethical sections	Gene Search	Beyond Brushing	Cancer Survivors	Harlequin Disease

		Heart Disease	Mitosis Maker	Patient Journey: IVF		
9	9B – Fit & Healthy	Ethical sections	Troublesome Twins	TB Invaders	Gene Search	Beyond Brushing
		Cancer Survivors	Bioengineering	Detecting Cancer	Harlequin Disease	Heart Disease
		Patient journey: Clinical trial	Patient journey: Cystic Fibrosis	Bioengineering		
9	9M – Investigating Scientifically	Heart Disease				

Key Stage 3

Scene	Game	Learning Aims	Year	Unit	Unit Name	Concept	Other
ALL	**ALL**						
				4	Curriculum opportunities	The curriculum should provide opportunities for pupils to experience science outside the school environment, including in the workplace, where possible.	
DFES Standards							
			7	7A	Cells	Understand, use and spell words relating to scientific enquiry, eg variable, sample size, evaluate, magnification	
			7	7A	Cells	Identify key points from a text	
			7	7B	Reproduction	Collaborate with others to share information and ideas, and solve problems	
			7	7B	Reproduction	Answer questions using relevant evidence or reasons	
			8	8B	Respiration	Summarise and make connections between ideas	
			9	9B	Fit & healthy	Locate information within a text and identify key points.	
02	**Cell to Baby**						
Learning aims: • *That you grew from a single cell into you* • *That you grew by your cells increasing in number*							
				3.3	Organisms,	Life processes are supported by the	

			Behaviour and Health	organisation of cells into tissues, organs and body systems
DFES Standards				
	7	7A	Cells	Know that living things are made of microscopic units called cells
	7	7A	Cells	Explain that growth of living things occurs by cells dividing to make new cells, and these cells increasing in size
	7	7A	Cells	Understand that cells make new cells by dividing
	7	7A	Cells	Understand that growth occurs when new cells are made and increase in size
	7	7A	Cells	Know that cell division and increased cell size lead to growth of the body
	7	7B	Reproduction	Know that fertilisation involves the fusion of the nuclei of sperm and egg
	7	7B	Reproduction	Know that the fertilised egg divides into 2, 4, 8 etc cells as it passes down the oviduct
	9	9A	Inheritance and selection	Know that during fertilisation genetic information from male and female parents is combined

02 **Lab Bench Chaos** Careers

Learning aims:

- *That cells need warmth, humidity, correct pH and food to make new cells*
- *That scientists mimic the conditions found inside the human body (warmth, humidity, pH, food) in order to grow cells for their experiments*

		3.3	Organisms, Behaviour and Health	Life processes are supported by the organisation of cells into tissues, organs and body systems
		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to use real-life examples as a basis for finding out about science.
		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to prepare to specialise in a range of science subjects at key stage 4 and consider career opportunities both within science and in other areas that are provided by science qualifications.
DFES Standards				
	7	7A	Cells	Know that living things are made of microscopic units called cells

02 **Zooom**

Learning aims:

- *How small cells are*
- *How big one million million is*

		Ma3.1	Number & Algebra	Applications of ratio and proportion
DFES Standards				
	7	7A	Cells	Know that living things are made of microscopic units called cells
	7	7A	Cells	Explain that growth of living things occurs by cells dividing to make new cells, and these cells increasing in size

02 **Body Balance**

Learning aims:

- *How the increase in number of cells in a body relates to growth*
- *That cell death in the body is natural and useful*

		Ma3.1	Number & Algebra	Applications of ratio and proportion
DFES Standards				
	7	7A	Cells	Explain that growth of living things occurs by cells dividing to make new cells, and these cells increasing in size
	7	7A	Cells	Understand that cells make new cells by dividing
	7	7A	Cells	Understand that growth occurs when new cells are made and increase in size
	7	7A	Cells	Know that cell division and increased cell

				size lead to growth of the body
02 **Cell Trumps** *Learning aims:* • *That you have different cells to do different tasks in your body* • *That cells work together to create body parts*				
		3.3	Organisms, Behaviour and Health	Life processes are supported by the organisation of cells into tissues, organs and body systems
DFES Standards				
	7	7A	Cells	Know that humans have different types of cells and these cells carry out specialised functions
DFES Standards				
	7	7A	Cells	Identify specialised features in different types of cell, and relate these to the function of a cell
	7	7A	Cells	Know that we are made up of different types of tissue
	7	7A	Cells	Name some examples of tissues
	7	7A	Cells	Know that tissue is made up from very small units
	7	7A	Cells	Know that cells form tissues [and tissues form organs]
	7	7A	Cells	Know that sperm and egg cells are specially adapted for their functions, eg tail for propulsion, strengthened head that contains chemicals to aid penetration and beak-down of the outer layers of the egg / enlarged cell

				with food reserves
	9	9A	Inheritance and selection	Understand how sperm and egg cells are specialised

02 **Cell Turnover**

Learning aims:

- *To understand that cells are being produced and are dying inside you all of the time*
  - *To understand that some cells need to replace themselves all the time*
  - *To understand that some cells change their rate of production to respond to the body's needs*
  - *To understand that some cells never replace themselves; if you lose these cells you are permanently damaged*

	3.3	Organisms, Behaviour and Health	Life processes are supported by the organisation of cells into tissues, organs and body systems

DFES Standards

7	7A	Cells	Know that we are made up of different types of tissue
7	7A	Cells	Know that tissue is made up from very small units
7	7A	Cells	Know that cells form tissues [and tissues form organs]
7	7A	Cells	Explain that growth of living things occurs by cells dividing to make new cells, and these cells increasing in size

02 **Mitosis Maker**

Learning aims:

- *Cell have a cycle – growth, rest, copy DNA, divide, growth, etc*
- *New cells are formed when old cells divide in two*
- *Cytoplasm and the nucleus divides in two during cell division*

7	7A	Cells	Explain that growth of living things occurs by cells dividing to make new cells, and these cells increasing in size
7	7A	Cells	Understand that cells make new cells by dividing
7	7A	Cells	Understand that growth occurs when new cells are made and increase in size
7	7A	Cells	Know that cells have nuclei containing the information that is transferred from one generation to the next
7	7A	Cells	Represent the process of cell division as a sequence that begins with the division of the nucleus
9	9A	Inheritance and selection	Know that cells have nuclei which contain information that is transferred from one generation to the next

02 **Organ Surgery**

Learning aims:

- *to name the major body organs*
- *to know what other organs they are linked to form organ systems*
- *to know where the major body organs are in the body*
- *understand that each organ system is involved in a set of functions*

	3.3	Organisms,	Life processes are supported by the

			Behaviour and Health	organisation of cells into tissues, organs and body systems
DFES Standards				
	7	7A	Cells	Know that we are made up of different types of tissue
	7	7A	Cells	Name some examples of tissues
	7	7A	Cells	Know that cells form tissues [and tissues form organs]
	7	7A	Cells	Identify, locate and describe the functions of a range of organs

02 **Build an Organ**

Learning aims:

- *We can divide ourselves up into*
  - *Cells*
  - *Tissues*
  - *Organs*
- *Our cells are organised into tissues*
- *Our organs are made up of different types of tissue*
- *Each type of tissue has a different job to do*
- *The tissues have specific properties and structures so that they can do these different jobs*

		3.3	Organisms, Behaviour and Health	Life processes are supported by the organisation of cells into tissues, organs and body systems
DFES Standards				
	7	7A	Cells	Know that we are made up of different types of tissue

		7	7A	Cells	Know that tissue is made up from very small units	
		7	7A	Cells	Know that humans have different types of cells and these cells carry out specialised functions	
		7	7A	Cells	Identify specialised features in different types of cell, and relate these to the function of a cell	
		7	7A	Cells	Name some examples of tissues	
		7	7A	Cells	Know that cells form tissues [and tissues form organs]	
		8	8B	Respiration	Blood is a transport medium	
		8	8C	Microbes and Disease	Identify natural barriers against infection [ie skin]	
		9	9B	Fit & healthy	Describe how a joint, eg knee, functions	
02	**Patient Journey: IVF**					Careers
			1.2	Applications and implications of science	Exploring how the creative application of scientific ideas can bring about technological developments and consequent changes in the way people think and behave.	
			1.2	Applications and implications of science	Examining the ethical and moral implications of using and applying science.	
			4	Curriculum opportunities	The curriculum should provide opportunities for pupils to use real-life examples as a basis for finding out about science.	
			4	Curriculum	The curriculum should provide	

			opportunities	opportunities for pupils to prepare to specialise in a range of science subjects at key stage 4 and consider career opportunities both within science and in other areas that are provided by science qualifications.
		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to consider how knowledge and understanding of science informs personal and collective decisions, including those on substance abuse and sexual health.
	Citizenship 1.2			Exploring different kinds of rights and obligations and how these affect both individuals and communities
	Citizenship 1.2			Understanding that individuals, organisations and governments have responsibilities to ensure that rights are balance, supported and protected
	Citizenship 1.2			Investigating ways in which rights can compete and conflict, and understanding that hard decisions have to be made to try to balance these
DFES Standards				
	7	7B	Reproduction	Pupils will learn to understand, use and spell: the names of the reproductive organs, eg ‘ovary’, ‘testis’, ‘oviduct’, ‘uterus’; specialised terms, eg ‘menstruation’, ‘ovulation’, ‘fertilisation’, ‘placenta’, ‘mammary glands’, ‘sperm’, ‘gestation’; words with similar but distinct meanings, eg

				‘hereditary/inherited’, ‘baby/foetus’,’ puberty/adolescuence’; words with different meanings in scientific and everyday contexts, eg ‘cell’, ‘fuse’; words relating to scientific enquiry, eg ‘reliability’, ‘sample size’, ‘national data’.
	7	7B	Reproduction	State that a new life starts when a sperm fertilised an egg
	7	7B	Reproduction	State that human young are fertilised internally and develop in the uterus
	7	7B	Reproduction	Explain that an advantage of internal development over external is that there is a greater chance of eggs surviving to become independent young
	7	7B	Reproduction	Describe fertilisation in terms of the fusion of cells
	7	7B	Reproduction	Know that ferilisation involves the fusion of the nuclei of sperm and egg.
	7	7B	Reproduction	Know that fertilisation involves the combination of characteristics of both parents
	9	9A	Inheritance and selection	Know that during fertilisation genetic information from male and female is combined
	9	9A	Inheritance and selection	Understand that the fusion of male and female sex=cell nuclei in both animals and plants produces a new individual that is genetically unique

02	**Ethics: Stem Cells**			
		1.2	Applications and implications of science	Exploring how the creative application of scientific ideas can bring about technological developments and consequent changes in the way people think and behave.
		1.2	Applications and implications of science	Examining the ethical and moral implications of using and applying science.
		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to consider how knowledge and understanding of science informs personal and collective decisions, including those on substance abuse and sexual health.
		Citizenship 1.1		Participating actively in different kinds of decision-making and voting in order to influence public life
		Citizenship 1.1		Weighing up what is fair and unfair in different situations, understanding that justice is fundamental to a democratic society and exploring the role of law in maintaining order and resolving conflict
		Citizenship 1.2		Exploring different kinds of rights and obligations and how these affect both individuals and communities
		Citizenship 1.2		Understanding that individuals, organisations and governments have

				responsibilities to ensure that rights are balance, supported and protected
	Citizenship 1.2			Investigating ways in which rights can compete and conflict, and understanding that hard decisions have to be made to try to balance these
DFES Standards				
	9	9B	Fit & healthy	Recognise that there are ethical issues involved in scientific research, e.g. not subjecting people to harmful experiences
02 **Genes and Your Cells**				
Learning aims: • *Genes contain the information that is used to tell cells how to work* • *Every nucleus of every cell in your body has the same genes* • *Different types of cell use different genes because they do different jobs*				
DFES Standards				
	7	7A	Cells	Know that we are made up of different types of tissue
	7	7A	Cells	Name some examples of tissues
	7	7A	Cells	Know that tissue is made up from very small units
	7	7A	Cells	Know that humans have different types of cells and these cells carry out specialised functions
	7	7A	Cells	Identify specialised features in different types of cell, and relate these to the function of a cell
	9	9A	Inheritance and selection	Understand that genes are instructions that control the characteristics that develop

02 **Troublesome Twins**

Learning aims:

To show that we are all a unique combination of our genes and the environmental factors that affect us. Identical twins are used by scientists to study this 'nature/nurture' effect because they share exactly the same genes.

What made the twins identical at birth? What makes the twins different from one another as they go through life?

- *Their identical genes*
- *The food that their mother ate when she was pregnant is needed to make cells grow by multiplying in number*
- *What makes you similar to your family – your genes and your environment*
- *You share the same environment as your family, where you live, the food you eat etc. it all has an effect on the cells in your body*
- *How does the environment affect our cells? Food, infections, hygiene, smoking, pollution. How does the environment affect us? Cultural and emotional?*
- *Some conditions have a genetic predisposition but they are heavily influenced by the environmental factors e.g. Alcoholism*

		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to consider how knowledge and understanding of science informs personal and collective decisions, including those on substance abuse and sexual health.
DFES Standards				
	7	7B	Reproduction	Understand that sperm and egg each contain half the inherited information needed and relate this to the concept of identical and non-identical twins
	7	7D	Variation and classification	Suggest ways in which environmental difference may result in variation, eg height, weight
	9	9A	Inheritance and selection	Identify some characteristics that are influenced by environmental factors

	9	9A	Inheritance and selection	Explain why individuals with the same genetic information may vary
	9	9A	Inheritance and selection	Consider whether identical twins really are identical and how any differences between them arise
	9	9B	Fit & healthy	Identify factors that can affect fitness and health, relating these to scientific knowledge and understanding

02 **Explore a Cell**

Learning aims:

- *To understand that cells are 3 dimensional*
- *To understand that cells are dynamic structures*
- *To understand that a cell has discrete organelles which carry out specific tasks and work together to help the cell perform its function*

	3.3	Organisms, Behaviour and Health	Life processes are supported by the organisation of cells into tissues, organs and body systems

DFES Standards

7	7A	Cells	Identify that cells have a cytoplasm, cell membrane and a nucleus
7	7A	Cells	Relate parts of model cells to diagrams and pictures of cells
7	7A	Cells	Know that cells have a cell surface membrane which keeps the cell together and controls what enters and leaves
7	7A	Cells	Know that cells have a cytoplasm which occupies most of the cell
7	7A	Cells	Cell models are useful to appreciate the 3D structure of cells but have limitations, ie

					present a static rather than dynamic model of the cell (NB: Explore a Cell is dynamic)
		7	7A	Cells	Know that cells have nuclei containing the information that is transferred from one generation to the next
		7	7A	Cells	Know that humans have different types of cells and these cells carry out specialised functions
		7	7A	Cells	Identify specialised features in different types of cell, and relate these to the function of a cell
02	**What is a Cell?**				
Learning aims: • *To understand that a biological cell is an independently functioning unit* • *To understand that each cell works together as part of a larger structure*					
			3.3	Organisms, Behaviour and Health	Life processes are supported by the organisation of cells into tissues, organs and body systems
DFES Standards					
		7	7A	Cells	Know that we are made up of different types of tissue
		7	7A	Cells	Know that tissue is made up from very small units
02	**Ethics: Cloning**				
			1.2	Applications and	Exploring how the creative application of scientific ideas can bring about

		implications of science	technological developments and consequent changes in the way people think and behave.
	1.2	Applications and implications of science	Examining the ethical and moral implications of using and applying science.
	4	Curriculum opportunities	The curriculum should provide opportunities for pupils to consider how knowledge and understanding of science informs personal and collective decisions, including those on substance abuse and sexual health.
Citizenship 1.1			Participating actively in different kinds of decision-making and voting in order to influence public life
Citizenship 1.1			Weighing up what is fair and unfair in different situations, understanding that justice is fundamental to a democratic society and exploring the role of law in maintaining order and resolving conflict
Citizenship 1.2			Exploring different kinds of rights and obligations and how these affect both individuals and communities
Citizenship 1.2			Understanding that individuals, organisations and governments have responsibilities to ensure that rights are balance, supported and protected
Citizenship 1.2			Investigating ways in which rights can compete and conflict, and understanding that hard decisions have to be made to try to

				balance these
DFES Standards				
	9	9A	Inheritance and selection	Identify ethical issues relating to cloning of animals
	9	9A	Inheritance and selection	Understand why clones are genetically identical
	9	9B	Fit & healthy	Recognise that there are ethical issues involved in scientific research, e.g. not subjecting people to harmful experiences

04 **TB Invaders** Careers

Learning aims:

- *That TB is a lung disease caused by TB bacteria being passed in the air from person to person*
- *That scientists study TB in the laboratory and investigate weak points at which they can target new drugs*

	4	Curriculum opportunities	The curriculum should provide opportunities for pupils to use real-life examples as a basis for finding out about science.
	4	Curriculum opportunities	The curriculum should provide opportunities for pupils to prepare to specialise in a range of science subjects at key stage 4 and consider career opportunities both within science and in other areas that are provided by science qualifications.
8	8C	Microbes and Disease	Recognise that micro-organisms can cause infections
8	8C	Microbes and Disease	Describe a range of mechanisms by which micro-organisms enter the body, e.g. droplet/air-borne

04 **Burns Clinic**					Careers
Learning aims: • *That you use healthy skin to heal burns* • *That you can grow more skin in the laboratory if you want* • *That QMUL scientists are trying to improve the skin grown*					
		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to use real-life examples as a basis for finding out about science.	
		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to prepare to specialise in a range of science subjects at key stage 4 and consider career opportunities both within science and in other areas that are provided by science qualifications.	
	8	8C	Microbes and Disease	Identify natural barriers to infection [ie skin]	
04 **Gene Search**					Careers
Learning aims: • *That deafness can be caused by genes in your cells working differently* • *That scientist use pattern matching techniques to find genes that are working differently*					
		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to use real-life examples as a basis for finding out about science	
		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to prepare to	

				specialise in a range of science subjects at key stage 4 and consider career opportunities both within science and in other areas that are provided by science qualifications
		Ma2.3	Interpreting & Evaluating	Pupils should be able to look at data to find patterns and exceptions
	7	7D	Variation and classification	Suggest reasons why differences and similarities exist within families
	9	9A	Inheritance and selection	Understand that some characteristics are inherited and identify some
	9	9A	Inheritance and selection	Know that cells have nuclei which contain information that is transferred from one generation to the next
	9	9A	Inheritance and selection	Understand how offspring inherit characteristics from their parents
	9	9A	Inheritance and selection	Relate characteristics to genetic information passed from both parents
	9	9A	Inheritance and selection	Know that offspring are similar but not identical to their parents
	9	9A	Inheritance and selection	Identify some inherited characteristics
	9	9A	Inheritance and selection	Explain why individuals from the same parents may vary
	9	9B	Fit & healthy	Indentify trends in quantitative data

4	**Beyond Brushing**				Careers

Learning aims:

- *That bacteria can destroy your tissue including bone tissue*
- *That QMUL scientists are trying to use stem cells to grow bone to repair damage*

		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to use real-life examples as a basis for finding out about science.
		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to prepare to specialise in a range of science subjects at key stage 4 and consider career opportunities both within science and in other areas that are provided by science qualifications.
		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to consider how knowledge and understanding of science informs personal and collective decisions, including those on substance abuse and sexual health.

DFES Standards

9	9A	Inheritance and selection	Identify some characteristics that are influenced by environmental factors
9	9B	Fit & healthy	Identify factors that can affect fitness and health, relating these to scientific knowledge and understanding

04	**Cancer Survivors** *Learning aims:* • *That people can get cancer and survive to live normal lives* • *That much research has been done to create treatments and now scientists are doing more research to create and improve treatments.*		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to use real-life examples as a basis for finding out about science.	
			4	Curriculum opportunities	The curriculum should provide opportunities for pupils to consider how knowledge and understanding of science informs personal and collective decisions, including those on substance abuse and sexual health.	
		9	9A	Inheritance and selection	Identify some characteristics that are influenced by environmental factors	
04	**Patient Journey: Spinal Cord Injury**					Careers
			4	Curriculum opportunities	The curriculum should provide opportunities for pupils to use real-life examples as a basis for finding out about science.	
			4	Curriculum opportunities	The curriculum should provide opportunities for pupils to prepare to specialise in a range of science subjects at key stage 4 and consider career	

				opportunities both within science and in other areas that are provided by science qualifications.	
		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to consider how knowledge and understanding of science informs personal and collective decisions, including those on substance abuse and sexual health.	
04 **Bioengineering**					Careers
Learning aims: • *Your body can't replace cartilage tissue if you damage it because adult cartilage cells only make new cartilage tissue very slowly* • *Scientists use tissue engineering to grow body parts to help your body heal*					
		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to use real-life examples as a basis for finding out about science.	
		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to prepare to specialise in a range of science subjects at key stage 4 and consider career opportunities both within science and in other areas that are provided by science qualifications.	
DFES Standards					
	9	9B	Fit & healthy	Describe how a joint, eg knee, functions	

04	**Detecting Cancer**				Careers
Learning aims: • *Cancer cells behave differently to normal cells* • *Scientists create radioactive chemicals to identify where cancer cells are* *DFES Standards*					
		9	9B	Fit & healthy	Describe the tale of different scientists in a medical development
04	**What is Cancer?**				
Learning aims: • *Normal cells become cancer cells when their genes get damaged* • *Normal cells need to accumulate a lot of damage over years before they become cancer cells* • *Cancer cells multiply more than they should and don't die when they should* • *Cancer cells harm you because they move to vulnerable parts of your body where they grow uncontrollably and stop parts of your body from working*					
04	**Ethics: PGD**				
	(Pre-implanation genetic diagnosis)	1.2		Applications and implications of science	Exploring how the creative application of scientific ideas can bring about technological developments and consequent changes in the way people think and behave.
		1.2		Applications and implications of science	Examining the ethical and moral implications of using and applying science.
		4		Curriculum opportunities	The curriculum should provide opportunities for pupils to consider how knowledge and understanding of science

				informs personal and collective decisions, including those on substance abuse and sexual health.
			Citizenship 1.1	Participating actively in different kinds of decision-making and voting in order to influence public life
			Citizenship 1.1	Weighing up what is fair and unfair in different situations, understanding that justice is fundamental to a democratic society and exploring the role of law in maintaining order and resolving conflict
			Citizenship 1.2	Exploring different kinds of rights and obligations and how these affect both individuals and communities
			Citizenship 1.2	Understanding that individuals, organisations and governments have responsibilities to ensure that rights are balance, supported and protected
			Citizenship 1.2	Investigating ways in which rights can compete and conflict, and understanding that hard decisions have to be made to try to balance these
DFES Standards				
	9	9B	Fit & healthy	Recognise that there are ethical issues involved in scientific research, e.g. not subjecting people to harmful experiences

04 **Harlequin Disease**

Learning aims:

- *You get your genes from your parents. Your mum and your dad each give you one copy so you have two copies of every gene*
- *If there is a mistake in your genes then the cells that use that gene might not work properly*
- *You need to have a change in one or both copies of that gene to have a genetic disease*

		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to use real-life examples as a basis for finding out about science.
		Ma2.3	Interpreting & Evaluating	Pupils should be able to look at data to find patterns and exceptions
DFES Standards				
	7	7D	Variation and classification	Suggest reasons why differences and similarities exist within families
	9	9A	Inheritance and selection	Understand that some characteristics are inherited and identify some
	9	9A	Inheritance and selection	Know that cells have nuclei which contain information that is transferred from one generation to the next
	9	9A	Inheritance and selection	Understand how offspring inherit characteristics from their parents
	9	9A	Inheritance and selection	Relate characteristics to genetic information passed from both parents
	9	9A	Inheritance and selection	Explain why individuals from the same parents may vary
	9	9A	Inheritance	Know that offspring are similar but not

			and selection	identical to their parents
	9	9A	Inheritance and selection	Identify some inherited characteristics
	9	9B	Fit & healthy	Identify factors that can affect fitness and health, relating these to scientific knowledge and understanding
04 **Microscope**				
		1.1	Scientific thinking	Critically analysing and evaluating evidence from observations and experiments.
		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to use real-life examples as a basis for finding out about science.
		Ma2.3	Interpreting & Evaluating	Pupils should be able to look at data to find patterns and exceptions
DFES Standards				
	7	7A	Cells	Describe cells seen down a microscope
	7	7A	Cells	Focus a microscope
	7	7A	Cells	Describe how objects appear under low magnification

04 **Flu Epidemic**

Learning aims:

- *Viruses infect cells. The flu virus specifically destroys the cells of the lung tissues*
- *If your immune system does not recognise a virus, then your body will not know how to make antibodies to attack it*
- *People can catch flu from birds but they can't give it to other humans unless the flu virus picks up genes from a human virus that let them do that*
- *Flu is mainly spread by touch – transmitting fluids from an infected person to you by touching something they've touched and then touching your mouth, nose or eyes*
- *Vaccines only protect you against the particular type of flu that they are made for*
- *Virus treatments stop the virus replicating or infecting other cells. They make you less likely to die from the flu. These treatments, called antivirals, are only effective if you take then as soon as the symptoms start*

		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to consider how knowledge and understanding of science informs personal and collective decisions, including those on substance abuse and sexual health.
DFES Standards				
	8	8C	Microbes and Disease	Recognise that micro-organisms can cause infections
	8	8C	Microbes and Disease	Describe the contributions of different scientists in dealing with an outbreak of disease
	8	8C	Microbes and Disease	Understand how scientists today tackle the spread of infectious disease
	8	8C	Microbes and Disease	State that antibiotics are effective against bacteria but ineffective against viral infections
	8	8C	Microbes and Disease	Explain that immunisation protects the body against some diseases because antibodies

				are made more quickly in response to infection	
04	**Gut Infection** *Learning aims:* • *That the immune cells in your intestines work together to protect your body from infections from your food and drink* • *That you have bacteria in your intestines that are useful to you* • *That scientists study how immune cells work to help them find treatments for disease*				
			Ma2.3	Interpreting & Evaluating	Pupils should be able to look at data to find patterns and exceptions
DFES Standards					
		8	8C	Microbes and Disease	Describe antibody action, eg marking infected micro-organisms, entangling micro-organisms
04	**Patient Journey: Cystic Fibrosis**				Careers
			4	Curriculum opportunities	The curriculum should provide opportunities for pupils to use real-life examples as a basis for finding out about science.
			4	Curriculum opportunities	The curriculum should provide opportunities for pupils to prepare to specialise in a range of science subjects at key stage 4 and consider career opportunities both within science and in other areas that are provided by science qualifications.
			4	Curriculum opportunities	The curriculum should provide opportunities for pupils to consider how knowledge and understanding of science informs personal and collective decisions,

					including those on substance abuse and sexual health.
DFES Standards		9	9B	Fit & healthy	Identify factors that can affect fitness and health, relating these to scientific knowledge and understanding
04	**Ethics: Animal Experimentation**				
			1.2	Applications and implications of science	Exploring how the creative application of scientific ideas can bring about technological developments and consequent changes in the way people think and behave.
			1.2	Applications and implications of science	Examining the ethical and moral implications of using and applying science.
			4	Curriculum opportunities	The curriculum should provide opportunities for pupils to consider how knowledge and understanding of science informs personal and collective decisions, including those on substance abuse and sexual health.
		Citizenship 1.1			Participating actively in different kinds of decision-making and voting in order to influence public life
		Citizenship 1.1			Weighing up what is fair and unfair in different situations, understanding that justice is fundamental to a democratic society and exploring the role of law in maintaining order and resolving conflict

		Citizenship 1.2		Exploring different kinds of rights and obligations and how these affect both individuals and communities
		Citizenship 1.2		Understanding that individuals, organisations and governments have responsibilities to ensure that rights are balance, supported and protected
		Citizenship 1.2		Investigating ways in which rights can compete and conflict, and understanding that hard decisions have to be made to try to balance these
DFES Standards				
	9	9B	Fit & healthy	Recognise that there are ethical issues involved in scientific research, e.g. not subjecting people to harmful experiences

04 **Heart Disease**

Learning aims:

- *Scientists find out what the risk factors for heart disease are by studying large numbers of people*
- *You must design an experiment to match your hypothesis to make valid conclusions*
- *The risk factors for heart disease can weaken or damage your heart and the blood vessels as well as blocking the blood vessels*

	4	Curriculum opportunities	The curriculum should provide opportunities for pupils to consider how knowledge and understanding of science informs personal and collective decisions, including those on substance abuse and sexual health.
	Ma2.3	Interpreting & Evaluating	Pupils should be able to look at data to find patterns and exceptions
	Ma2.3	Interpreting & Evaluating	Pupils should be able to relate findings to the original context, identifying whether

				they support or refute conjectures
		Ma3.1	Statistics	Experimental and theoretical probabilities, including those based on equally likely outcomes.
DFES Standards				
	7	7B	Reproduction	Understand the importance of sample size in obtaining reliable evidence
	7	7D	Variation and classification	Frame questions that can be investigated
	7	7D	Variation and classification	Choose a sufficiently large sample size to be confident in their conclusions
	7	7D	Variation and classification	Interpret graphs and draw conclusions from them
	7	7D	Variation and classification	Interpret their graphs and say how strong they think an association or correlation is
	8	8B	Respiration	Use controls for comparisons
	8	8B	Respiration	Recognise that theories change when they are not supported by evidence
	8	8C	Microbes and Disease	Consider the number of measurements needed for reliable data
	8	8L	Sound and Hearing	Decide on appropriate measurements to answer a question
	8	8L	Sound and Hearing	Identify factors which need to be controlled if they are to make a fair test
	8	8L	Sound and Hearing	Look critically at results and decide how strongly they support a relationship
	9	9A	Inheritance	Be able to decide which observations and

				and selection	measurements to make	
		9	9A	Inheritance and selection	Identify some characteristics that are influenced by environmental factors	
		9	9B	Fit & healthy	Identify factors that can affect fitness and health, relating these to scientific knowledge and understanding	
		9	9B	Fit & healthy	Describe how diet and lack of exercise can worsen heart and circulation conditions	
		9	9M	Investigating Scientifically	Evaluate a conclusion by considering how good the model and data were	
		9	9M	Investigating Scientifically	Consider the limitations of the evidence	
04	**Patient Journey: Clinical Research**					Careers
			1.2	Applications and implications of science	Exploring how the creative application of scientific ideas can bring about technological developments and consequent changes in the way people think and behave.	
			1.2	Applications and implications of science	Examining the ethical and moral implications of using and applying science.	
			4	Curriculum opportunities	The curriculum should provide opportunities for pupils to use real-life examples as a basis for finding out about science.	
			4	Curriculum opportunities	The curriculum should provide opportunities for pupils to prepare to specialise in a range of science subjects at	

				key stage 4 and consider career opportunities both within science and in other areas that are provided by science qualifications.
		4	Curriculum opportunities	The curriculum should provide opportunities for pupils to consider how knowledge and understanding of science informs personal and collective decisions, including those on substance abuse and sexual health.
DFES Standards				
	9	9B	Fit & healthy	Describe the tale of different scientists in a medical development