Researchers in Schools

Can healthy eating help prevent Alzheimer's disease?

Key Stage 4 Programme

Pupil Name

Coursebook Designed by Dr Keable

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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?

Timetable and Assignment Submission

Timetable – Tutorials

Tutorial	Date	Time	Location
What is Alzheimer's disease?			
The impact of Alzheimer's disease			
Risk factors for Alzheimer's disease			
Treatments for Alzheimer's disease			
Prevention vs cure – which approach works best?			
6 (Feedback)			
7 (Feedback)			

Timetable – Homework Assignments

Homework Assignment	Description	Due Date
Tutorial 1	Baseline assessment	
Tutorial 2	Write a short report on what you think the impact of Alzheimer's disease will be in 50 years' time based on projections from the WHO	
Tutorial 3	Write a letter to a patient advising them on how high their risk of Alzheimer's disease is and what they can do to reduce this risk	
Tutorial 4	Carry out research and construct an argument to support your side of the debate	
Tutorial 5	Final assignment	

Assignment Submission – Lateness and Plagiarism

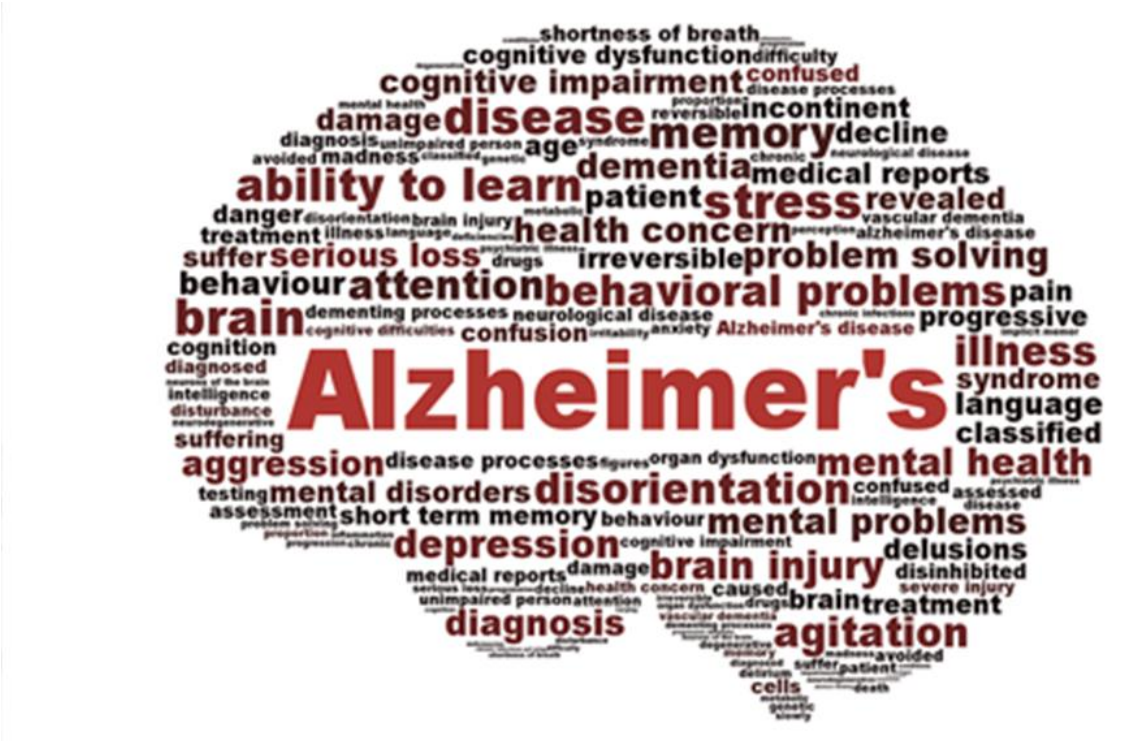
Lateness	
Submission after midnight on 9th August	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

Course Rationale

Alzheimer's disease is a devastating brain disorder that steals a person's memories and personality and eventually their life. Alzheimer's disease affects more than half a million people in the UK and as many as 50 million worldwide. Alzheimer's disease is linked to age and the older we are the more likely we are to be diagnosed. As the population lives longer the number of cases is predicted to rapidly increase and there is currently no cure. How do we stop this crisis from spiralling out of control?

This course will provide you with an introduction to the neurodegenerative disorder Alzheimer's disease. You will explore the signs and symptoms of Alzheimer's disease and look at what happens in to the brain as the disease progresses. You will also investigate the financial cost of care for Alzheimer's disease patients and the burden that families and carers face when looking after a relative with Alzheimer's.

You will explore how lifestyle choices in early years can have lasting effects in later life and can potentially help protect the brain from Alzheimer's disease. You will examine the current methods for treating Alzheimer's disease and look at a few examples of drugs that are currently being developed to potentially cure Alzheimer's disease in the future. You will develop your scientific writing skills and learn how to critically review scientific articles. You will also be taught to correctly reference your work which is expected in all scientific communications.



https://speciality.medicaldialogues.in/knee-replacement-timing-not-right-for-all-its-too-soon-or-too-late?infinitescroll=1

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 the key concepts and issues, through engaging with and interpreting a wide range of relevant sources. Knowledge is used to build and support highly effective arguments.	Analyses, key ideas, information, and arguments. Interprets meaning and makes connections. 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 key concepts and issues, drawing on a range of relevant sources Knowledge is used to build and support effective arguments	Analyses key ideas, information and arguments. 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 key concepts and issues, with no major misconceptions. Beginning to apply this knowledge to build and support arguments.	Begins to analyse ideas, information and arguments. 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 key concepts and issues, with some misconceptions. Not yet applying this knowledge to build and support arguments.	Begins to analyse ideas and information. Describes statements and arguments 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	
Name of RIS teacher	
Title of Assignment	

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	
Name of RIS teacher	
Title of Assignment	

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

Subject Vocabulary

Word	Definition	In a sentence
Neuron	The basic working unit of the brain. Cells within the nervous system that transmit signals all over the body	
Neurodegeneration	The progressive death and loss of structure of function of neurons including atrophy (cell death)	
Cerebrovascular	Made of two parts: 'cerebro' meaning brain and 'vascular' meaning blood vessels. Together this refers to the blood flow in the brain	
Sporadic	Typically means irregular or random but in this context, it means no specific cause of disease and it does not run in families	
Prevalence	The number of disease cases present in a population at a given time	
Incidence	The number of people who develop a disease over a specified period of time	
Pathology	A branch of medical science that involves the study and diagnosis of disease	
Pathogenesis	How a disease begins and develops	
Risk factor	Something that increases a person's chance of developing a disease	
Therapeutic	A treatment, therapy or drug that is used to restore health	
Cognition	Mental processes involved in gaining knowledge. These include: thinking, knowing, remembering, judging and problem solving	
Symptom	A physical or mental problem that is associated with disease. Symptoms cannot be seen and do not show up on medical tests	

Word	Definition	In a sentence

Use this blank glossary to write down any words that you do not know the meaning of. Find out the definitions and record them in the glossary.

Tutorial 1 – What is Alzheimer's disease?

What is the Purpose of Tutorial 1?

You should be able to:

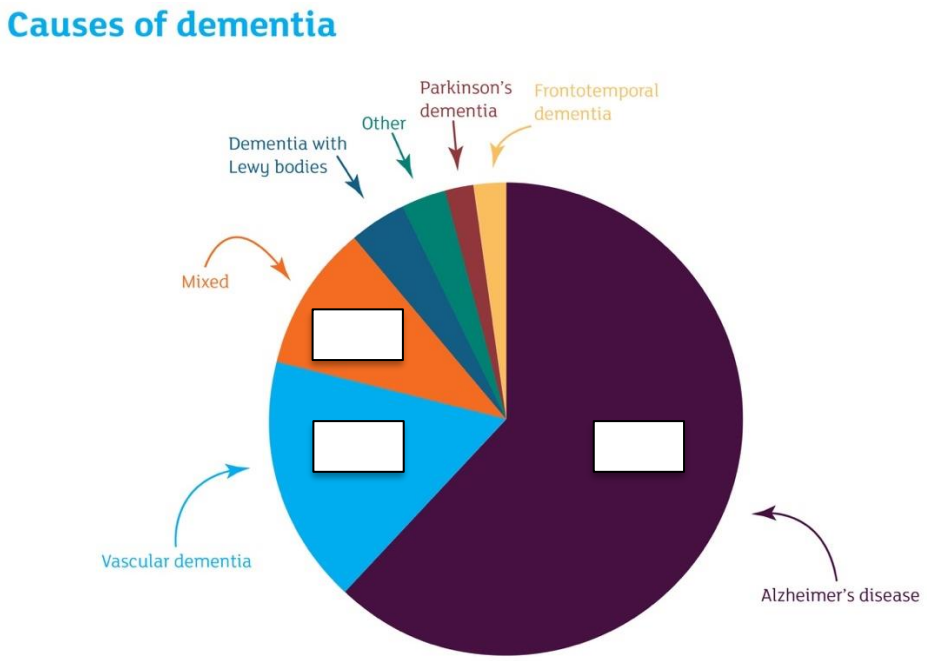
- Explain the link between Alzheimer's disease and dementia.
- Describe key pathological changes that occur in the brain in Alzheimer's disease.
- List the most common symptoms of Alzheimer's disease.

Starter activity – Group discussion

Discuss the following points:
Have you heard of Alzheimer's disease? If so in what context?
Do you know anyone that has Alzheimer's disease or another form of dementia?
Have you had any personal experience with Alzheimer's disease or dementia?
What does the above picture make you think?

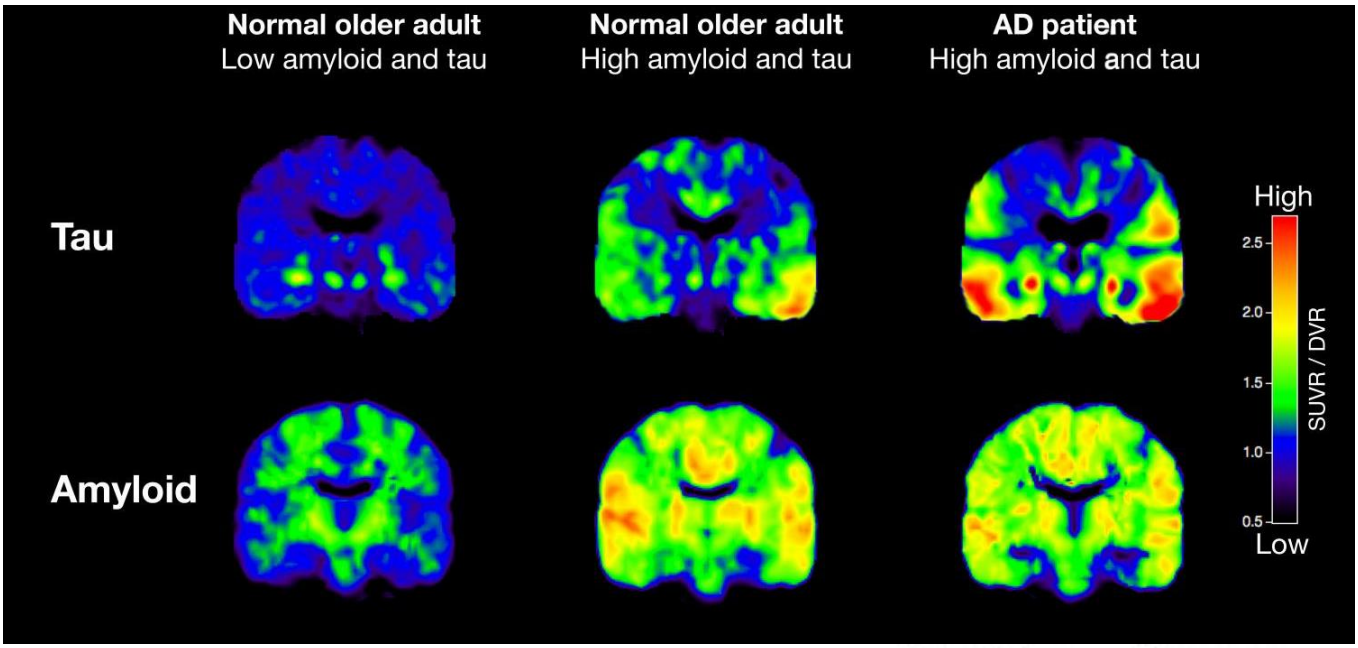
Activity 1: What is Alzheimer's disease and dementia?

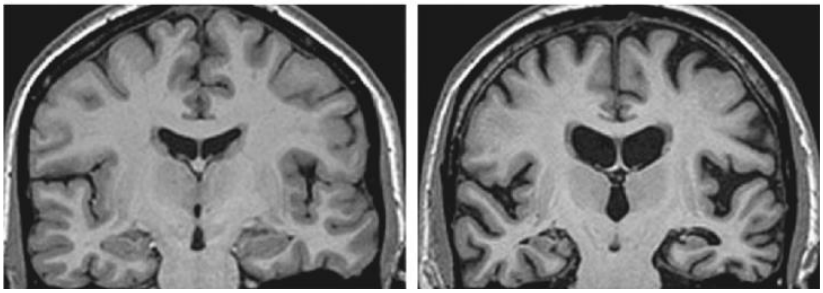
Alzheimer's disease is an irreversible and progressive brain disorder that disrupts the communication between neurons, resulting in loss of function and neuronal death. Alzheimer's disease is the most common cause of dementia and also the best understood.

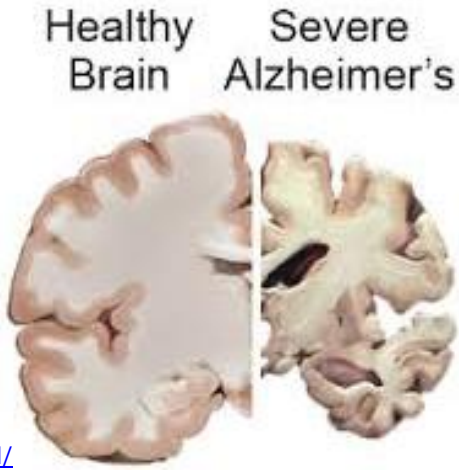


Add the percentages to the pie chart showing the most common causes of dementia.

Activity 2: Pathology of Alzheimer's disease



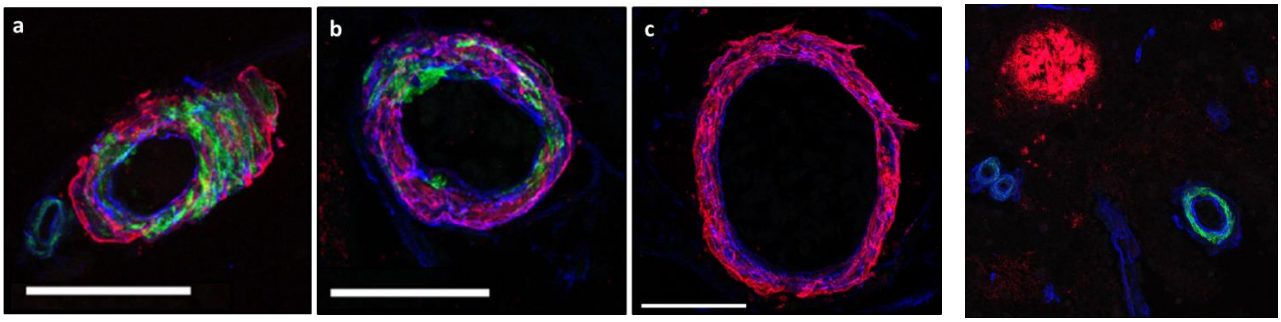


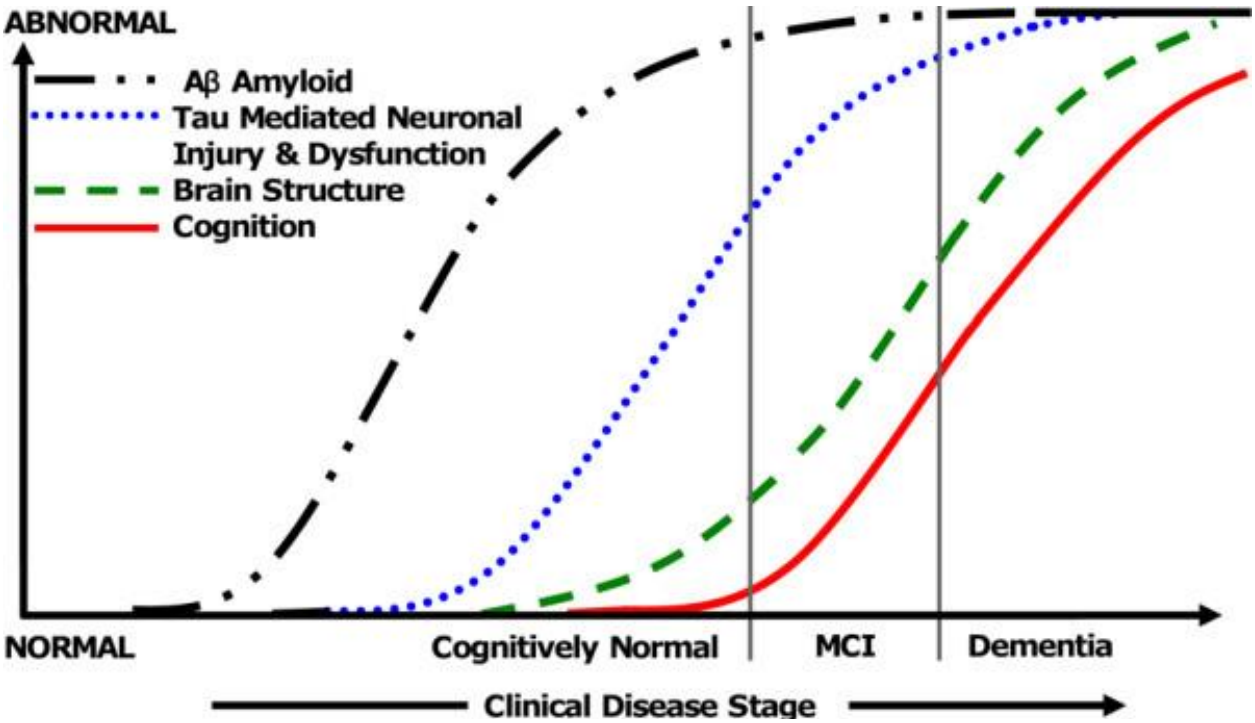


https://www.nia.nih.gov/health/alzheimers-disease-fact-sheet
https://news.berkeley.edu/2016/03/02/pet-scans-alzheimers-tau-amyloid/
https://www.omegapds.com/mri-can-help-diagnose-alzheimers-disease/

Compare the images of a healthy brain compared to an Alzheimer's brain.
What do you notice?

Alzheimer's disease is characterised by an excess of two key proteins in the brain tissue: amyloid beta and tau. Both of these proteins are found at low concentrations in healthy brains but in a diseased brain the concentrations are much higher. Amyloid beta accumulates as insoluble plaques in the brain tissue and also can be found surrounding the blood vessels in the brain (see images below). Threads of tau accumulate as neurofibrillary tangles inside the neurons.





All Answers Ltd. (November 2018). Biomarkers for Alzheimer's Disease Progression. Retrieved from https://nursinganswers.net/essays/biomarkers-alzheimers-disease-4235.php?vref=1

The graph above shows the timeline of progression of Alzheimer's disease. You can see how the levels of amyloid beta and tau change and the effect on brain structure and cognition.

Which two lines on the graph follow the same pattern?

Why do you think this is?

Accumulation of amyloid beta and tau begins many years before changes to the brain structure and cognition can be detected. This means that by the time someone has symptoms of Alzheimer's disease there is already significant damage to the brain.

Activity 3 - Symptoms of Alzheimer's disease

Generally, the symptoms of Alzheimer's disease can be divided into 3 main stages. As the disease progresses the symptoms worsen. A summary of the symptoms for each stage are shown below.

Early symptoms

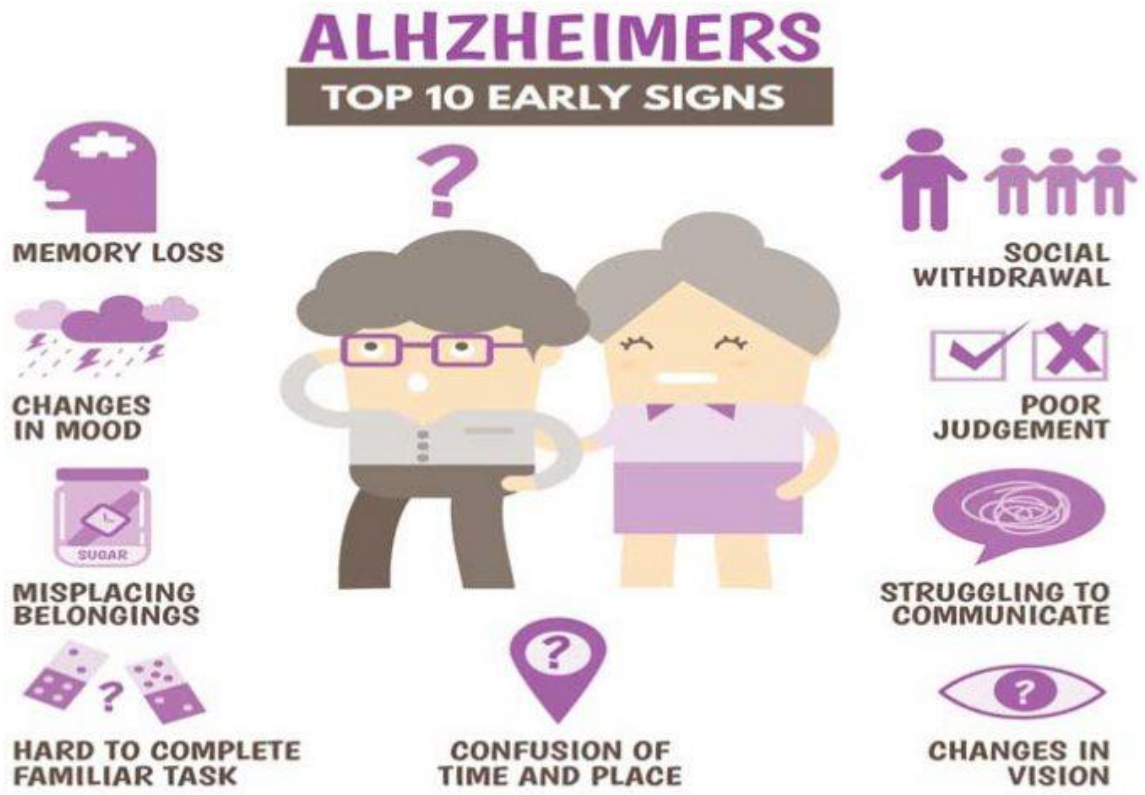
- Memory lapses (forgetting recent conversations, names, events etc)
- Misplacing items such as keys and purses
- Trouble finding the right word
- Difficult to make decisions
- Poor judgement
- Periods of confusion
- Increased anxiety and agitation

Middle-stage symptoms

- Increased memory lapses (not recognising people or places)
- Increased confusion `(getting lost, not knowing the date)
- Impulsive behaviour (loss of inhibitions)
- Delusions and paranoia
- Problems with speech (aphasia)
- Frequent mood swings including depression, anxiety, frustration and agitation
- Hallucinations
- Disturbed sleep

Late stage symptoms

- Hallucinations and delusions get worse
- Aggressive or violent behaviour
- Difficultly eating or swallowing (dysphagia)
- Loss of speech
- Significant problems with short- and long-term memory
- Difficulty moving
- Incontinence



https://www.theoldish.com/stages-of-alzheimers-disease/

The image above is a summary depicting the most common signs of Alzheimer's disease that occur in the early stage. Alzheimer's disease is often not diagnosed until the middle-late stages of the disease. Explain why you think this is.

Baseline assignment title: Why is Alzheimer's disease so difficult to accurately diagnose?

Write a short essay (500 word limit) that answers the above question.

Success criteria:

Content
Your essay should include:
- an explanation of what Alzheimer's disease is
- details on the progression of Alzheimer's disease, including the symptoms and pathology
- why Alzheimer's disease is often mistaken for other types of dementia or normal aging

Structure
- Write in clear and concise sentences.
- Make sure spelling and grammar are correct (do not rely on spell check as it can be wrong for scientific words).
- Use appropriate scientific terminology where possible (make use of the glossary).
- Give reasons and evidence to back up the points you make (remember to PEE).

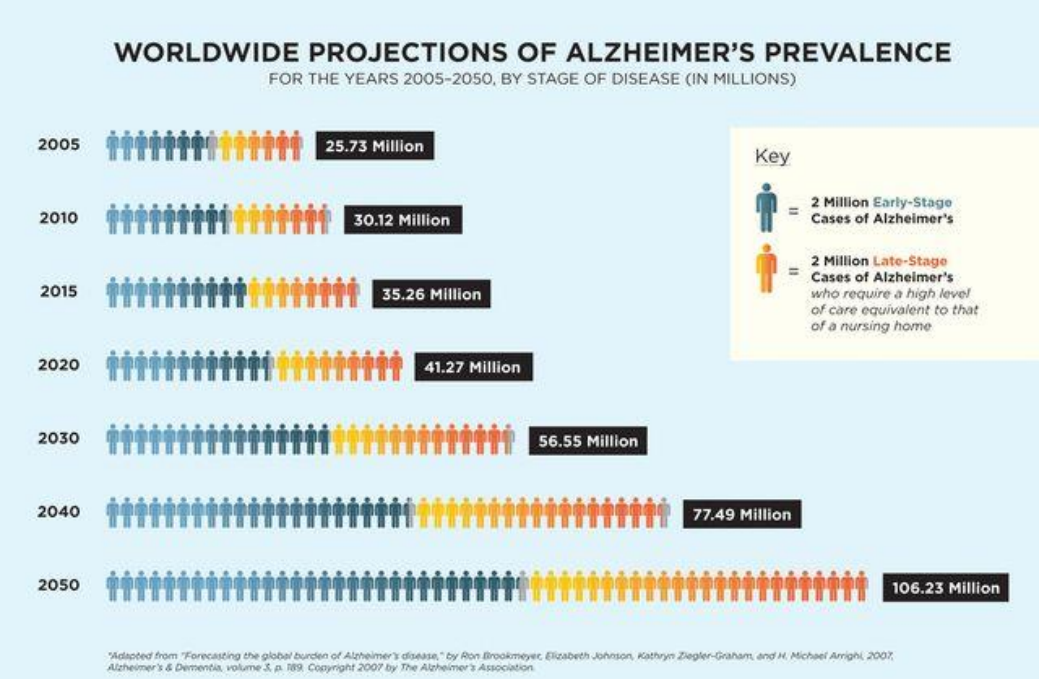
o Point – make the key point clearly

o Evidence – explain the evidence for the point

o Explanation – explain why your point is relevant and important

- Show a depth and breadth of knowledge that goes beyond the tutorials (this is accomplished by independent reading and research).
- Make sure your essay flows. It should follow a logical order and tell a story as to how you arrived at your conclusion.

Tutorial 2 – The impact of Alzheimer's disease



https://newsroom.ucla.edu/stories/sounding-the-alarm-on-a-future-epidemic:-alzheimer-s-disease

What is the Purpose of Tutorial 2?

You should be able to:

- Explain why Alzheimer's disease cases are predicted to rise dramatically.
- Summarize the personal, social and economic impacts of Alzheimer's disease.
- Evaluate the future impact of Alzheimer's disease based on projections of case numbers.

Starter – take 5

Q1 _____

Q2 _____

Q3 _____

Q4 _____

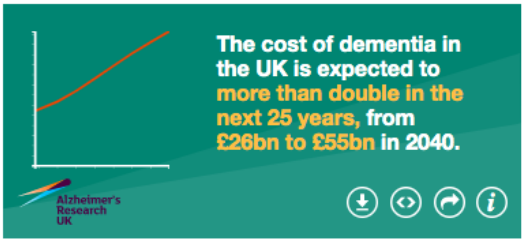
Q5 _____

Activity 1 – economic impact of Alzheimer's disease

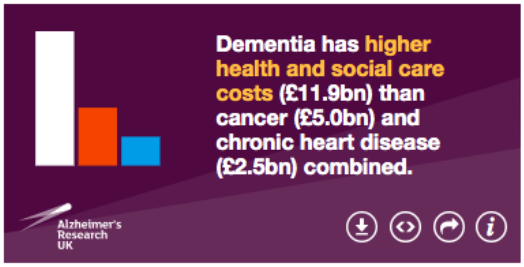
Alzheimer's disease and other types of dementia are some of the most expensive diseases in terms of health and social care costs. The length of time that a person suffers (typically around 10 years) and the progressive degeneration means that patients require constant care over a long period of time. This care is expensive. According to Alzheimer's Society: 'The total cost of care for people living with dementia is typically £100,000, but can cost as much as £500,000.'

Have a look at the figure below that shows some of the costs associated with dementia and Alzheimer's disease.

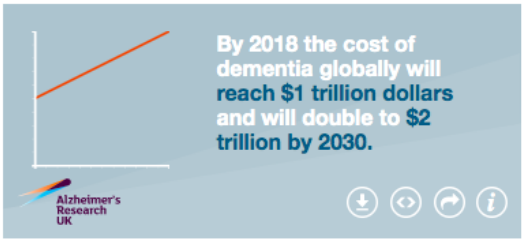
Source: Lewis et al (2014). Trajectory of Dementia in the UK – Making a Difference, report produced the Office of Health Economics for Alzheimer's Research UK



Source: Prince, M et al (2014) Dementia UK: Update Second Edition report produced by King's College London and the London School of Economics for the Alzheimer's Society



Source: Luengo-Fernandez R, et al. (2015) UK research spend in 2008 and 2012: comparing stroke, cancer, coronary heart disease and dementia BMJ Open 2015;5:e006648. doi: 10.1136/bmjopen-2014-006648



Source: Prince, M et al (2015). World Alzheimer's Report 2015, The Global Impact of Dementia: An analysis of prevalence, incidence, cost and trends. Alzheimer's Disease International

Which of these statistics surprised you the most and why?

Which of these statistics did you find the most alarming and why?

https://www.alzheimers.org.uk/sites/default/files/2019-09/The%20economic%20cost%20of%20dementia%20to%20English%20businesses%20-%20edited.pdf

Read the executive summary of the Alzheimer's society report. Note down any facts and figures related to finance in the space below.

Activity 2 – Social impact of Alzheimer's disease

https://www.alzheimers.org.uk/get-involved/our-campaigns/fix-dementia-care
https://www.alzheimersresearchuk.org/about-us/our-influence/policy-work/reports/carers-report/

Watch the videos from the Alzheimer's Society charity about the impact of a dementia diagnosis and Pedro's story presented by Alzheimer's Research UK.

What words does Pedro use to describe being a carer?

Relative of patients with Alzheimer's disease face a difficult choice when deciding who should look after the patient.

Why might some relatives choose to look after the patient themselves at home rather than using a care home?

Suggest a challenge that carers face when taking care of a person with Alzheimer's disease.

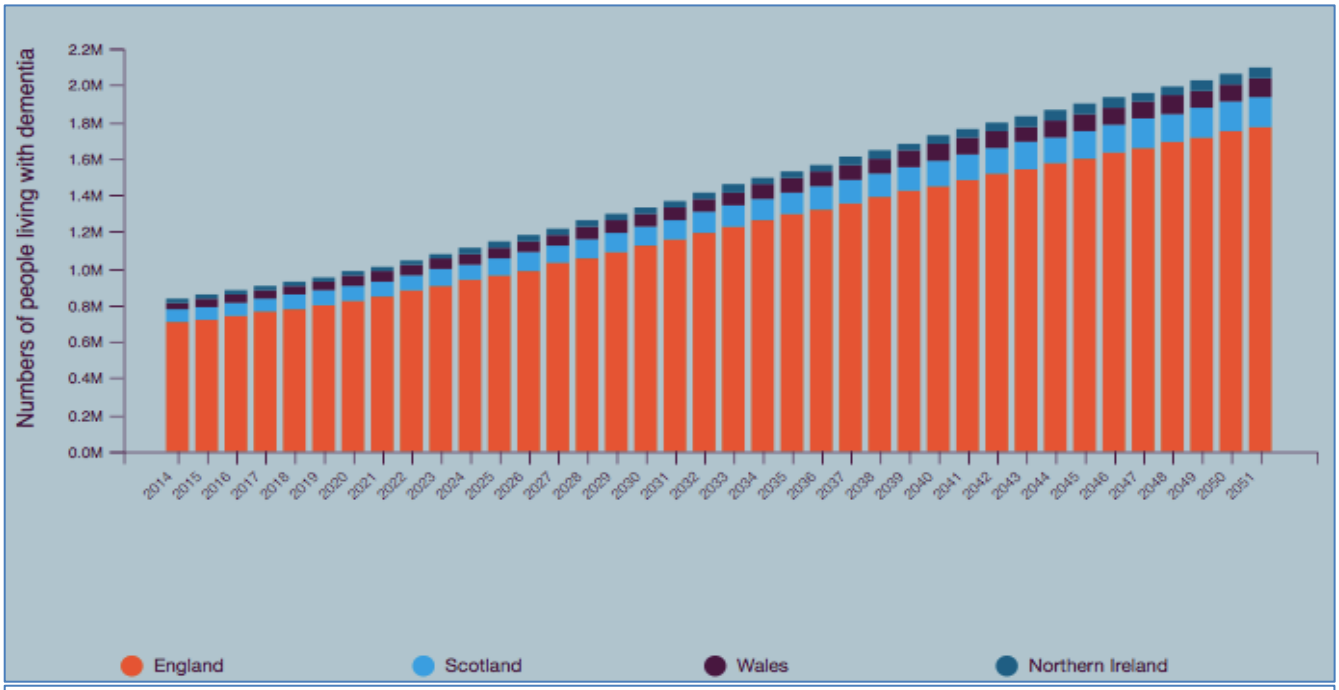
Give an advantage and a disadvantage of using social care and placing a person with Alzheimer's disease into a care home.

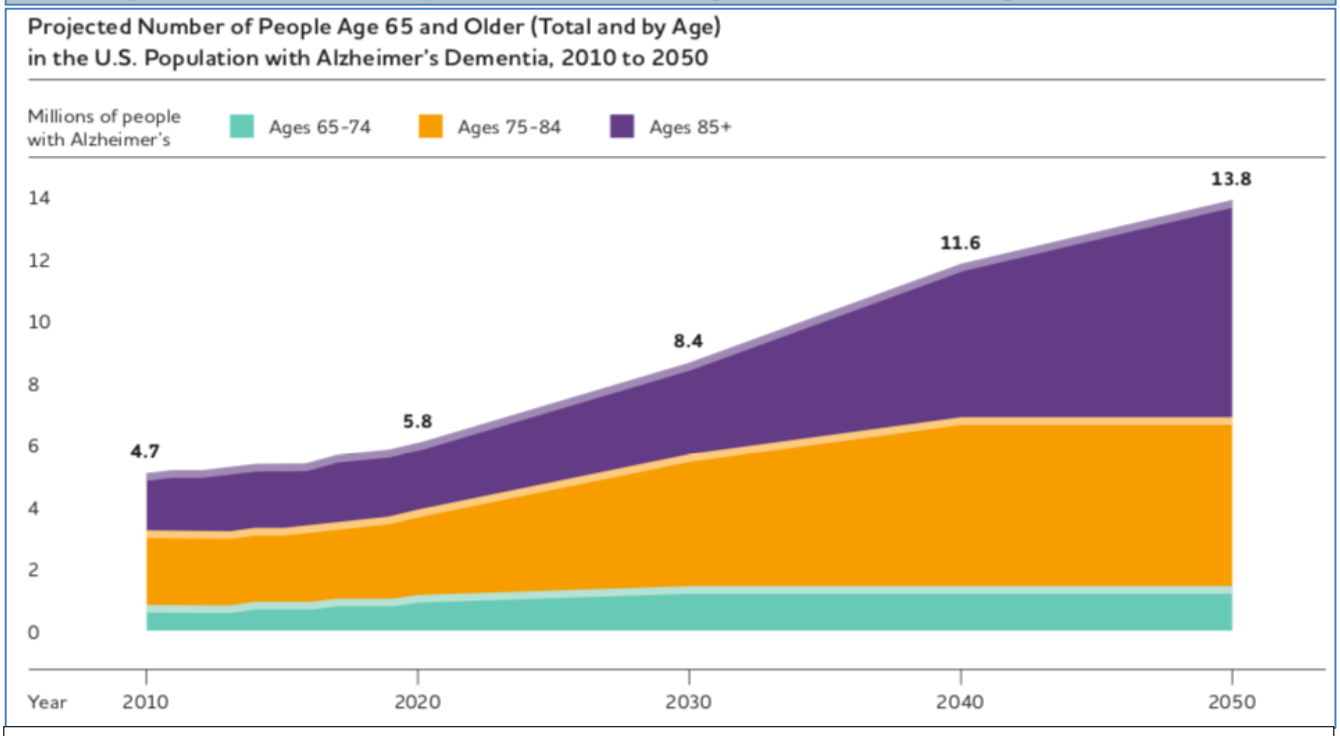
Advantage:

Disadvantage:

Activity 3 – Worldwide projections for Alzheimer's disease

The graphs below show the predicted increase in the number of people in the UK and USA living with dementia, including Alzheimer's disease, up until the year 2050.





https://www.dementiastatistics.org/statistics/cost-and-projections-in-the-uk-and-globally/
https://alz-journals.onlinelibrary.wiley.com/doi/full/10.1002/alz.12068

The following sentences describe the trend shown in these two graphs. Select which word you think is correct in each sentence and delete the other.

The graphs show an **increasing/decreasing** trend.

There is a **positive/negative** correlation between number of cases and time.

The rate of change is **rapid/slow**.

The trend is **linear/ exponential**.

There are approximately 900,000 cases of dementia in the UK. Use the graph to estimate how many years it will be before this number has doubled.

years

We can calculate the percentage increase in cases using the following equation:

$$\%\ change = \frac{\text{new number of cases} - \text{previous number of cases}}{\text{previous number of cases}}\ x\ 100$$

Calculate the percentage change in Alzheimer's cases in the USA for every decade up until 2050. The first one has been done for you.

2010 – 2020

5.8 - 4.7= 1.1

1.1/4.7 = 0.234 (3sf)

0.234 x 100 = 23.4 23.4% increase in number of cases

2020-2030

2030-2040

2040-2050

The cost of dementia in the UK in 2014 was £26 billion for the 800,000 cases of dementia in the UK. Approximately how much was spent on each patient?

Calculate the percentage increase in cases from 2014 (800,000 cases) to 2050 (2.1 million).

Using your answer from the previous question calculate to calculate the amount of money the UK will spend on dementia care in 2050.

Homework title: Predicting the future.

Homework Instructions:
Write a short report (~250 words) on what you think the impact of Alzheimer's disease will be in 50 years' time based on projections from the World Health Organisation.

Success criteria:
In your report you should include the predicted trend in number of Alzheimer's cases over the next 50 years and suggest the effect increasing numbers of Alzheimer's patients will have on the economy and society. Use facts and figures to back up your points where possible.

Tutorial 3 – Risk factors for Alzheimer's disease

What is the Purpose of Tutorial 3?

You should be able to:

- Explain the difference between a modifiable and a non-modifiable risk factor
- Give examples of modifiable and non-modifiable risk factors for Alzheimer's disease

Starter – take 5

Q1 _____

Q2 _____

Q3 _____

Q4 _____

Q5 _____

Activity 1 – what is risk?

To understand risk factors, we must first understand what is meant by risk. We define risk as the probability that a person will be harmed (likelihood) and how serious the consequences may be (severity).

Identify the potential hazards for the following activities and use the risk assessment matrix below assign a risk score:

Making a hot drink

_____

_____

_____

Crossing the road

Skydiving

Eating at a restaurant

Climbing a mountain

Swimming in the sea

		Reasonably foreseeable worst-case consequence				
		Minor (1)	Moderate (2)	Major (3)	Critical (4)	Catastrophic (5)
Likelihood of hazard event occurring	Likely (5) 1 in 10 or once every 2 weeks	Medium risk (5)	High risk (10)	High risk (15)	Very high risk (20)	Very high risk (25)
	Possible (4) 1 in 100 or once every six months	Low risk (4)	Medium risk (8)	High risk (12)	High risk (16)	Very high risk (20)
	Unlikely (3) 1 in 1,000 or once every 4 years	Low risk (3)	Low risk (6)	Medium risk (9)	High risk (12)	High risk (15)
	Rare (2) 1 in 10,000 or once in a decade	Low risk (2)	Low risk (4)	Low risk (6)	Medium risk (8)	High risk (10)
	Almost never (1) 1 in 100,000 or once a century	Low risk (1)	Low risk (2)	Low risk (3)	Low risk (4)	Medium risk (5)

Activity 2 – Risk factors

A risk factor is something that increases the chance of a person developing a disease. Modifiable risk factors are behaviours and exposures that can raise or lower a person's risk of developing a disease. Examples include alcohol consumption and excess body weight. Some risk factors are fixed (age, gender etc) and because they cannot be altered they are known as non-modifiable.

Suggest some examples of modifiable and non-modifiable risk factors for cancer.

Modifiable _____

_____

_____

Non-modifiable _____

_____

_____

Most risk factors for Alzheimer's disease are modifiable so we can do something about them. Place a tick below the risk factors that you think are modifiable.

ApoE4 genotype	Advanced age	Traumatic brain injury	Hypertension (high blood pressure)	Latino/African American ethnicity
High cholesterol	Smoking	Excessive alcohol intake	Obesity	Cystatin C levels

Age
Age is the biggest risk factor for Alzheimer's disease. The natural changes that occur in the brain with age make it more vulnerable to injury and disease. Alzheimer's disease is a disease of aging so with increasing age the likelihood of developing the disease also increases. 15% of those with Alzheimer's disease are ages 65-74 and this increases to 44% for those ages 75- 84 (AlzheimersAssociation, 2016). A person's risk of developing Alzheimer's doubles roughly every 5 years beyond age 65 (NIH, 2017).

ApoE4 genotype
Apolipoprotein E is an important cholesterol transporter in the brain. There are three different types of Apolipoprotein E and these are known as ApoE2, ApoE3 and ApoE4. Each person has two copies of the gene that codes for Apolipoprotein E (one from each parent) so there are six potential genotypes. These are shown in the table below.

ApoE genotype	**ApoE2**	**ApoE3**	**ApoE4**
ApoE2	(E2/E2) 4x less risk	(E2/E3) 2x less risk	(E2/E4) 2.5x increased risk
ApoE3	(E2/E3) 2x less risk	(E3/E3) neutral	(E3/E4) 5x increased risk
ApoE4	(E2/E4) 2.5x increased risk	(E3/E4) 5x increased risk	(E4/E4) 20x increased risk

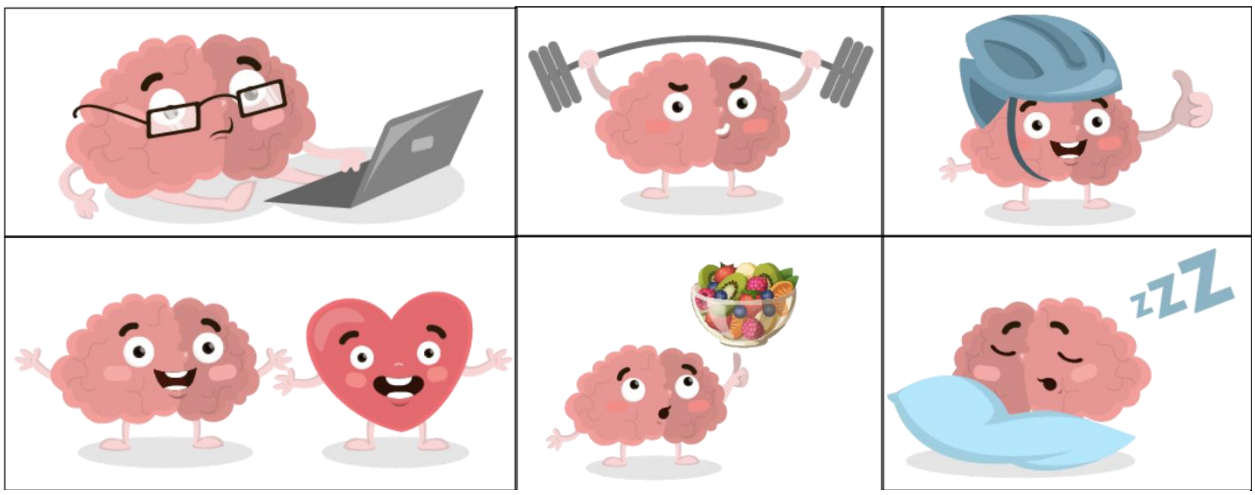
A person who has one copy of the ApoE4 gene (E3/E4)is five times more likely to develop Alzheimer's disease and a person with two copies (E4/E4) is twenty times more likely when compared to someone who is E3/E3. The ApoE2 genotype is thought to offer some protection against Alzheimer's disease, reducing the risk by half.

Traumatic brain injury
There is strong evidence to suggest a causal link between traumatic brain injury and Alzheimer's disease. Traumatic brain injury can be defined as a violent blow or jolt to the head that usually results in a loss of consciousness. The more severe the brain injury is and the greater the number of injuries, the greater the risk of developing Alzheimer's disease. A study carried out on war veterans in North Carolina showed that moderate head injury resulted in a 2.3 fold increase in risk and severe head injury more than quadrupled the risk (Gottlieb, 2000).

Lifestyle

There is a growing body of evidence to suggest the health of the brain is linked to the health of the heart and blood vessels (Sabayan *et al.*, 2016; Hooghiemstra *et al.*, 2017; Moroni *et al.*, 2018). According to Dementia UK 'what is good for the heart is good for the brain'. Leading a healthy lifestyle by stopping smoking, reducing alcohol intake, eating healthily and exercising regularly can help to decrease the likelihood of developing Alzheimer's disease and other types of dementia (Valenzuela *et al.*, 2012; Iwamoto, 2014; Orrell *et al.*, 2015). Controlling cholesterol and lowering blood pressure will also have a positive effect as it has been shown that high levels results in significantly higher risk of Alzheimer's disease in later life (Kivipelto et al., 2001). There is also evidence that making effort to continue to use the fullest range of human memory abilities may somewhat offset the clinical symptoms of Alzheimer's disease (Cabeza et al., 2002).

Activity 3 - How can we reduce risk?



https://www.ottawapublichealth.ca/en/public-health-topics/brain-health.aspx

The cartoons above illustrate some ways that you can reduce the risk of developing Alzheimer's disease in later life. Discuss in pairs what you think each one means and which risk factor it relates to. Record your thoughts below.

Homework title: Advice column

Imagine you are a medical professional working for the advice column in a health magazine. You receive the following letter:

To Dr Phil,

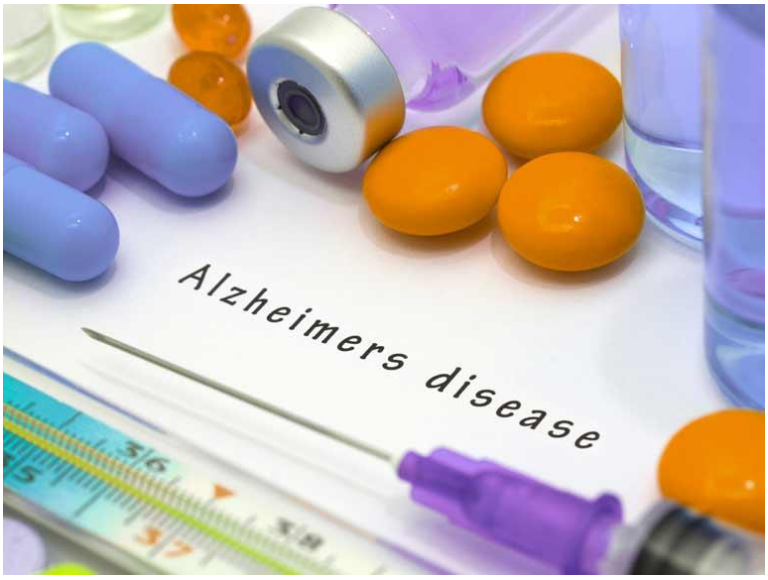
Last year my grandfather lost his battle with Alzheimer's disease and now I am concerned about being diagnosed with Alzheimer's disease in the future. I am a 24-year-old university student who enjoys BMX and I try to stay fit and healthy so I don't smoke and rarely drink. My schedule is quite hectic and when I'm not playing rugby for the University or studying I work nights at McDonalds. Is there anything I can do to prevent me getting Alzheimer's disease when I am older?

John Smith

Write a short response (no more than 200 words) to the above letter advising the person on how high you think their risk of Alzheimer's disease is and what they can do to reduce this risk.

Success criteria:
Identify what John is doing to minimise his risk of Alzheimer's disease
Suggest at least two ways John might further reduce his risk of Alzheimer's disease

Tutorial 4 – Treatments for Alzheimer's disease



What is the Purpose of Tutorial 4?

You should be able to:

- Recall the current therapeutics used to treat Alzheimer's disease and recognise their limitations
- Summarise the timeline for drug development
- Identify a drug that is in clinical trials and explain its mechanism of action

Starter – take 5

Q1 _____

Q2 _____

Q3 _____

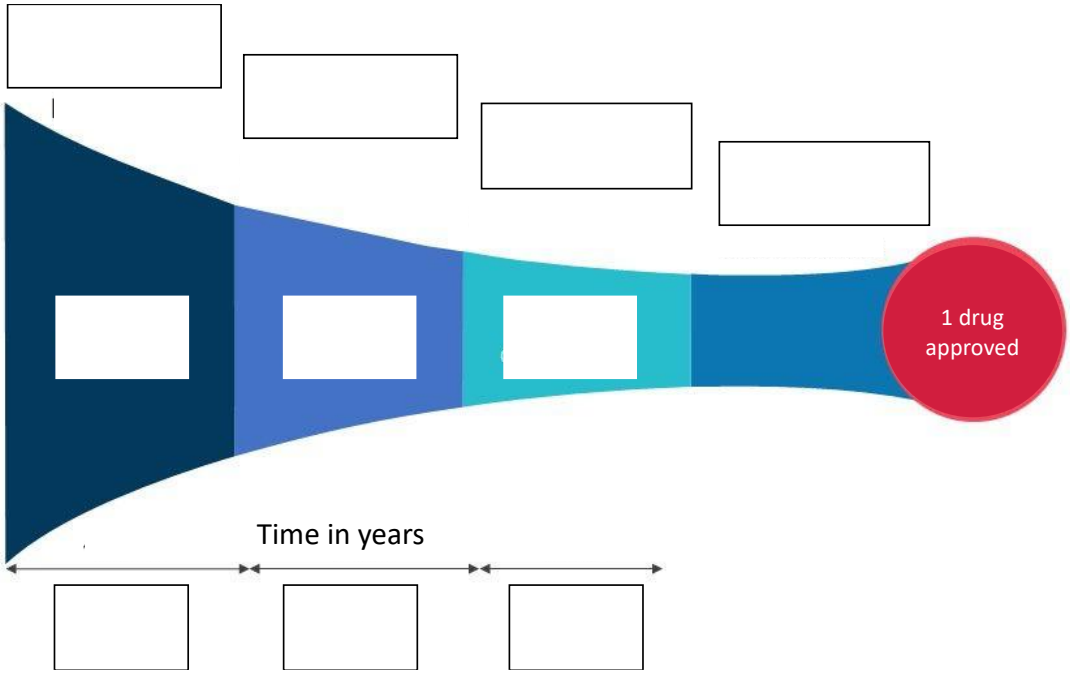
Q4 _____

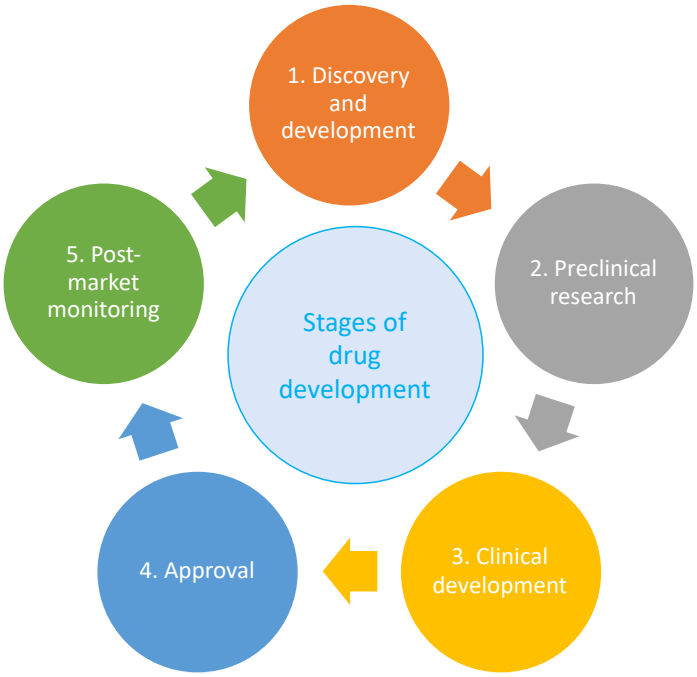
Q5 _____

Activity 1 – the drug development process

The process of discovering, refining and testing a new drug to treat a disease is long and complicated. It takes an average of 15 years of research and clinical development efforts and cost approximately $2 billion (US) to bring a new drug to the market. There are five key stages in the development of new drugs for treating diseases.

Annotate the timeline for the development of new drugs adding the average number of compounds tested at each phase and the time taken.





Summarise what happens during each of the stages of drug development.

Stage 1: _____

_____

_____

_____

_____

Stage 2: _____

_____

_____

_____

_____

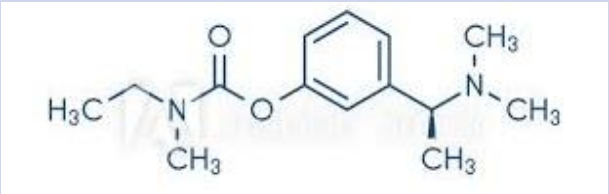
Stage 3:

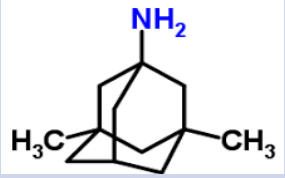
Stage 4:

Stage 5:

Activity 2 - Current drugs used to treat Alzheimer's disease

There is no known cure for Alzheimer's disease and there are limited treatment options available. Currently there are two main classes of drugs that are licensed for the treatment of Alzheimer's disease; these are cholinesterase inhibitors and NMDA inhibitors. The drugs used to treat Alzheimer's disease provide short-term relief of symptoms and can slow down disease progression but they become less effective as time goes on. Read through the factsheets below on Rivastigmine and Memantine below.

Drug factsheet	
Drug name	Rivastigmine
Other names/trade names	Exelon, Prometax,
Molecular formula	$C_{14}H_{22}N_2O_2$ 
Drug class	Reversible non-competitive cholinesterase inhibitor
Mechanism of action	Inhibits the breakdown of acetylcholine by acetylcholinesterase, increasing the levels of acetylcholine available for nerve signaling
Produced by	Novartis Pharmaceuticals Corporation
Side effects	Nausea, vomiting, weight loss, decreased appetite

Drug factsheet	
Drug name	Memantine
Other names/trade names	Ebixa, Namenda, Axura, Akatinol, Memary
Molecular formula	$C_{12}H_{21}N$ 
Drug class	NMDA inhibitor
Mechanism of action	Prevents prolonged electrical current flowing (excitotoxicity) through neurons by blocking NMDA receptors
Produced by	Merz Pharmaceutical
Side effects	confusion, dizziness, drowsiness, headache, insomnia, agitation, hallucinations

The nerve agent Novichok is also a cholinesterase inhibitor and has the same mechanism of action as Rivastigmine. Suggest why doctors only prescribe Rivastigmine to patients with a firm diagnosis of Alzheimer's disease and why the dose must be carefully monitored.

Points to consider:

- How cholinesterase inhibitors work
- The effect of a cholinesterase inhibitor in an Alzheimer's brain
- The effect of a cholinesterase inhibitor in a cognitively normal brain
- The potential dangers of giving a cholinesterase inhibitor when it is not needed
- The side effects of rivastigmine

Activity 3 – experimental drugs to treat Alzheimer's disease

Using iPads research the immunotherapy drug aducanumab and fill in the drug factsheet below.

Some useful sites:
https://www.alzforum.org/therapeutics/aducanumab
https://alzheimersnewstoday.com/aducanumab/
https://www.dementiacarecentral.com/aboutdementia/treating/aducanumab

Drug factsheet	
Drug name	
Other names/trade names	
Molecular formula	
Drug class	
Mechanism of action	
Produced by	
Side effects	

Homework title: Independent research

In preparation for the debate in the next tutorial you will be split into two teams and assigned to one side of the debate. Prepare a list of advantages and disadvantages of using a prevention or cure approach to tackle Alzheimer's disease. Make a note of any sources of information that you use (websites, books etc)

Success criteria

- Well-balanced argument that considers both the advantages and disadvantages of each specific approach
- Use of facts from reputable sources to support your argument

Advantages of prevention	Disadvantages of prevention
Advantages of cure	Disadvantages of cure

Tutorial 5 – Prevention vs cure – which approach works best

What is the Purpose of Tutorial 5?

You should be able to:

- Construct a logical argument that is well reasoned using relevant points.
- Effectively argue points using scientific evidence to defend your opinions.
- Correctly reference your work.

Starter – Preparation time

Use this time to discuss your arguments with the other people on your team. Decide who will speak first and how you will structure your arguments as a team. Think about the order in which you would like to present your points and how to respond to your opponent's points.

My team is as follows:

1.
2.
3.

We will be arguing that prevention/cure is the best approach (delete as appropriate)

Rules:
The debate will be chaired by your teacher. They are not on any person's side and are simply there to maintain order. Their role is to introduce each team and go through each round making sure each team has equal time. They may also act as facilitator to keep the debate going and may challenge points that you make.
Only one person will be allowed to speak at any given time – you will not be allowed to interrupt. If you have a question write it down and it can be revisited later.
Respect each other's opinions. Do not say anything that may be viewed as disrespectful or nasty.
Ensure everyone has an equal opportunity to contribute. Each team will only have a limited time to talk so it is important that one person does not take up all of a team's allotted time.
There will be time for conferring with your team mates before the start of each round to compare notes but it is important that you note down any key points or questions you want to address.

Activity 1 – Round 1

Every person will present one advantage to their approach and any relevant evidence to support this. Only the current nominated person may speak so there are no interruptions.

Make notes on any questions you would like to ask the other team based on what they have said.

Activity 2 – Round 2

Each person on a team may present one disadvantage of the opposing team's approach as further evidence to support their side of the argument.

Make notes on any questions you would like to ask the other team based on what they have said.

Activity 3 – Rebuttal and closing statements

Each team will be allowed the opportunity to challenge any of the opposing teams points if they feel the evidence to support them was weak. This is also an opportunity to ask questions if any points need clarifying.

Final assignment title: What can we do to reduce the incidence of Alzheimer's disease and why is it necessary?

Details of final assignment:

Your task is to write a 2000-word essay answering the above research question.
Your essay should include an introduction to Alzheimer's disease including an overview of disease progression (symptoms and pathology), facts and figures showing the prevalence of Alzheimer's disease and future projections (graphs may be useful here), the impact of Alzheimer's disease (think about how it affects the patient, their family, the economy etc) and strategies for reducing the incidence of Alzheimer's disease. It is important that you critically evaluate different strategies for reducing Alzheimer's disease stating why they would work (supported by scientific evidence) and giving your opinion on how effective they would be. Your conclusion should summarise your findings and provide an answer to the research question.

You may structure your essay however you like (the use of headings is recommended) but it should include the following:

What is Alzheimer's disease?
A brief description of Alzheimer's disease and dementia should serve as the opening to your essay

Symptoms and pathology of Alzheimer's disease
A description of the progression of Alzheimer's disease including the pathology seen in the brain and the symptoms exhibited by the patient.

Incidence of Alzheimer's disease
Include statistics of how many cases of Alzheimer's there are and what the projections for the future are.

Impacts of Alzheimer's disease
Social and economic impacts of Alzheimer's disease. (you could link this to the previous paragraph and explore the future impacts of Alzheimer's disease based on the projections for the future.

Risk factors
Include at least two modifiable and one non-modifiable risk factor and explain the difference.

Potential strategies for reducing incidence of Alzheimer's disease
Discuss at least two different strategies for reducing the incidence of Alzheimer's disease and give your opinion on their effectiveness.

Conclusion
A summary of your findings which should answer the research question.

Success criteria:

- Write in clear and concise sentences.
- Make sure spelling and grammar are correct (do not rely on spell check as it can be wrong for scientific words).
- Use appropriate scientific terminology (make use of the glossary).
- Use appropriate scientific figures (images, graphs, diagrams) to help make your points. These must be appropriately labelled and referred to in the text (ie: as shown in figure 1, please see figure 2).

- Give reasons and evidence to back up the points you make (remember to PEE).

- Point – make the key point clearly

- Evidence – explain the evidence for the point

- Explanation – explain why your point is relevant and important

  - Any references and sources of information should be properly acknowledged and referenced. There will be penalties for plagiarism.
  - Show a depth and breadth of knowledge that goes beyond the tutorials (this is accomplished by independent reading and research).
  - Make sure your essay flows. It should follow a logical order and tell a story as to how you arrived at your conclusion.
  - Stay within the word limit (most universities will dock marks if assignments are unnecessarily long as you should be able to get your point across concisely).

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 you 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.

Notes

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