Exam Ready

Memory and Revision

Lifestyle choices to improve your memory:

1. Eat Right

The foods you eat – and don't eat – play a crucial role in your memory. Fresh vegetables are essential, as are healthy fats and *avoiding* sugar and grain carbohydrates. For instance, curry, celery, broccoli, cauliflower, and walnuts contain antioxidants and other compounds that protect your brain health and may even stimulate the production of new brain cells.

2. Exercise

Exercise encourages your brain to work at optimum capacity by stimulating nerve cells to multiply, strengthening their interconnections and protecting them from damage. During exercise, nerve cells release proteins known as neurotrophic factors. One in particular, called brain-derived neurotrophic factor (BDNF), triggers numerous other chemicals that promote neural health, and directly benefits cognitive functions, including learning.

3. Stop multitasking

Research shows you actually need about eight seconds to commit a piece of information to your memory. If you find yourself trying to complete five tasks at once, stop yourself and focus your attention back to the task at hand.

4. Get a good night's sleep.

Research from Harvard indicates that people are 33 percent more likely to infer connections among distantly related ideas after sleeping, but few realise that their performance has actually improved. Sleep is also known to enhance your memories and help you "practice" and improve your performance of challenging skills. In fact, a single night of sleeping only four to six hours can impact your ability to think clearly the next day.

5. Play Brain Games

If you don't sufficiently challenge your brain with new, surprising information, it eventually begins to deteriorate. What research into brain plasticity shows us, however, is that by providing your brain with appropriate stimulus, you can counteract this degeneration. If you decide to try brain games, ideally it would be wise to invest at least 20 minutes a day, but no more than five to seven minutes is to be spent on a specific task. When you spend longer amounts of time on a task, the benefits weaken.

6. Master a New Skill

Engaging in "purposeful and meaningful activities" stimulates your neurological system, counters the effects of stress-related diseases, reduces the risk of dementia and enhances health and well-being. A key factor necessary for improving your brain function or reversing functional decline is the *seriousness of purpose* with which you engage in a task. In other words, the task must be important to you, or somehow meaningful or interesting — it must hold your attention.

Making it stick

When we have an experience that creates a deep emotional reaction, like saying I love you for the first time, we say the experience creates **emotional resonance**. And when that happens, it's more likely to stick in our minds. **Emotion triggers our amygdala to tell our brains *this is important.*** Keep it. Use it."

Other factors are also known to help make memories sticky for us, like **novelty**. **When something happens that is simply outside the norm, it has a tendency to stay with us**. Most of us build routines into our days—perhaps we take the same route to work every day. Or we stop at the same coffee shop every morning and order the same latte from the same barista. It may be hard to distinguish one day from any other until the one time we get to the register and realise the person in front of us paid for our coffee as a random act of kindness; the memory is formed and kept. That's **the power of novelty**.

Repetition can be another powerful memory booster. The more we bring a memory back to mind, the stronger it can become. Repetition engages the neural networks related to our attention system, and we remember what we pay attention to.

Association is another key factor in memory formation and retention. If something we experience can be linked to a group of related or associated items already in our memory—especially if those are things we really value—then it can be easier for us to store them as lasting memories. For example, if we relate learning to people we know, or TV shows or characters, we can recall them when we think of that person.

So, while there is no magic pill that will help you recall in vivid detail everything your mind takes in, **emotional resonance, novelty, repetition, and association are four keys that help make a memory stick.**

Top tips for revision and memory

These days, we understand more about the structure of memory than we ever have before, so we can find the best techniques for training your brain to hang on to as much information as possible. The process depends on the brain's neuroplasticity, its ability to reorganise itself throughout your life by breaking and forming new connections between its billions of cells.

How does it work? Information is transmitted by brain cells called neurons. When you learn something new, a group of neurons activate in a part of the brain called the hippocampus. It's like a pattern of light bulbs turning on.

Your hippocampus is forced to store many new patterns every day. This increases hugely when you are revising. Provided with the right trigger, the hippocampus should be able to retrieve any pattern. But if it keeps getting new information, the overworked brain might go wrong. That's what happens when you think you've committed a new fact to memory, only to find 15 minutes later that it's disappeared again.

So what's the best way to revise? Here are some top tips to get information into your brain and keep it there.

Repeat yourself

Pathways between neurons can be strengthened over time. Simple repetition – practising retrieving a memory over and over again – is the best form of consolidating the pattern.

Use science to help you retrieve info

Science tells us the ideal time to revise what you've learned is just before you're about to forget it. And because memories get stronger the more you retrieve them, you should wait exponentially longer each time – after a few minutes, then a few hours, then a day, then a few days. This technique is known as spaced repetition.

Take regular breaks

Breaks are important to minimise interference. When your hippocampus is forced to store many new (and often similar) patterns in a short space of time, it can get them jumbled up. Plan your revision so you can take breaks and revise what you've just learned before moving on to anything new.

Avoid distractions

Attention is the key to memorising. By choosing to focus on something, you give it a personal meaning that makes it easier to remember. In fact, most of our problems when it comes to revision have very little to do with the brain's capacity for remembering things; we just struggle to devote our full attention to the task in hand.

Sleep is vital

We spend approximately a third of our lives sleeping and it's never as important as during revision time. Sleep plays a critical role in memory consolidation – this is when the brain backs up short-term patterns and creates long-term memories.

Control your emotions

We remember emotionally charged events far better than others, and this is especially the case if the emotion was a positive one. It is not always possible to have warm feelings about your revision, but if you can associate a particular fact with a visual, auditory or emotional experience from the past, then you have a better chance of remembering it, as you have created multiple pathways for retrieval.

Short term and long term memory

Short-term memory – like writing your name with a sparkler

We've all heard about short-term and long-term memory. While people tend to use the phrase "short-term memory" to refer to our recall of things that happened recently – in the last hour or day – technically speaking, it's actually far more fleeting. Short-term memory typically lasts between 15 and 30 seconds: it's a bit like writing your name in the air with a sparkler. Any memory that can be recalled after that length of time is a long-term memory.
In computer terms, short-term memory is like the RAM – it holds the information we're currently working with or using for cognitive tasks (thinking). This can be new information delivered by our senses, for example, or old information retrieved from the long-term memory. Neuroscientists theorise that all this thinking is supported by patterns of neuron activity in the prefrontal cortex (that bit at the front of your brain).

Long-term memory - information becomes a physical 'thing'

Luckily, for memories we actually want to keep, there's also long-term memory. If short-term memory is the RAM of a computer, long-term memory is the hard drive, which keeps everything in storage. Unlike short-term memories, long-term memories have a physical presence in the brain, and aren't dependant purely on specific patterns of activity. Neurons make new physical connections and synapses with each other when a new long-term memory is formed. This connection endures whether it's being used or not.
Long-term memory can be split into explicit and implicit memory. Implicit memories include habits and skills that we can do automatically, such as rolling a cigarette, driving a car, forging your boss's signature on expense forms. Explicit memories are things we're consciously aware of and are intentionally trying to remember.

Encoding

When we actually want to learn something, it is long-term memories we are interested in. So how are they formed? The first step is to encode a piece of information – otherwise it quickly disappears, like breath on a mirror.
Information is channelled to the hippocampus, the brain region crucial for the formation of new memories and one of the only places in the brain where brand new neurons are regularly generated. The hippocampus links all of the relevant information together and encodes it into a new memory by forming new synapses. It's basically like someone knitting a terrifyingly complex tapestry in real time.
But not all information is equal in the eyes of the hippocampus. "Important" things are encoded more readily and effectively than routine or incomprehensible things, like an uneventful daily commute, or the lyrics of a dance song in a language you don't recognise. The hippocampus will prioritise those that have been rehearsed repeatedly in the short-term memory, or those with a strong emotional component. So, when revising, you will need to make sure that your memories become long term memories rather than short term.

How to recall memories

Finding a home for your memories

Similar memories tend to clump together – spoken memories near the language centres, visual memories near the visual cortex – and there's a lot of redundancy too; you can have several memories for the same thing. Every time they are activated they are strengthened. Human memories aren't stored like books in a library; they're constantly being updated and tweaked.

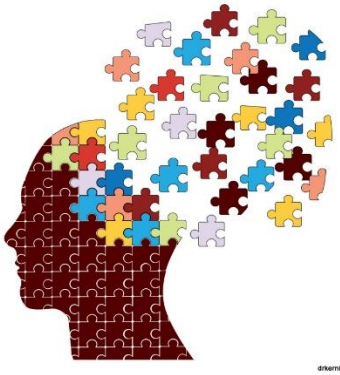
Recalling memories you've forgotten you forgot

So how do you go about getting the bits you need out of this weird, ever-shifting library of information? It might seem as though lots of the so-called long-term memories have actually turned to dust because there are plenty of things you've forgotten: old addresses and passwords for example.

The problem here is not that it has disappeared, but rather that you can't recall it. It's a bit like losing a glove – you still own a glove, it's in your home somewhere, but you can't use it.

Recall is a very impressive but slightly mysterious process. When we want to access a memory from the dark recesses of our brain, signals from our frontal cortex link to that memory via uncertain means, and the memory is reconstructed from the information available. The more often you use the memory, the easier it is to find.

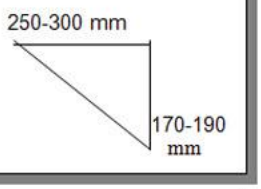
Revising and remembering is a crucial part of the learning process. And there are things you can do to make it easier – some stranger than others. Being in the presence of some of the elements from the original memory helps retrieval. For example, if you learned something while in a swimming pool, you'll remember it better while in a swimming pool at a later date (this is proven by Science). So working in a different place, or wearing something different, or using a different pen when revising each subject may help you to more easily recall information.



Flash cards

Effective flashcards:

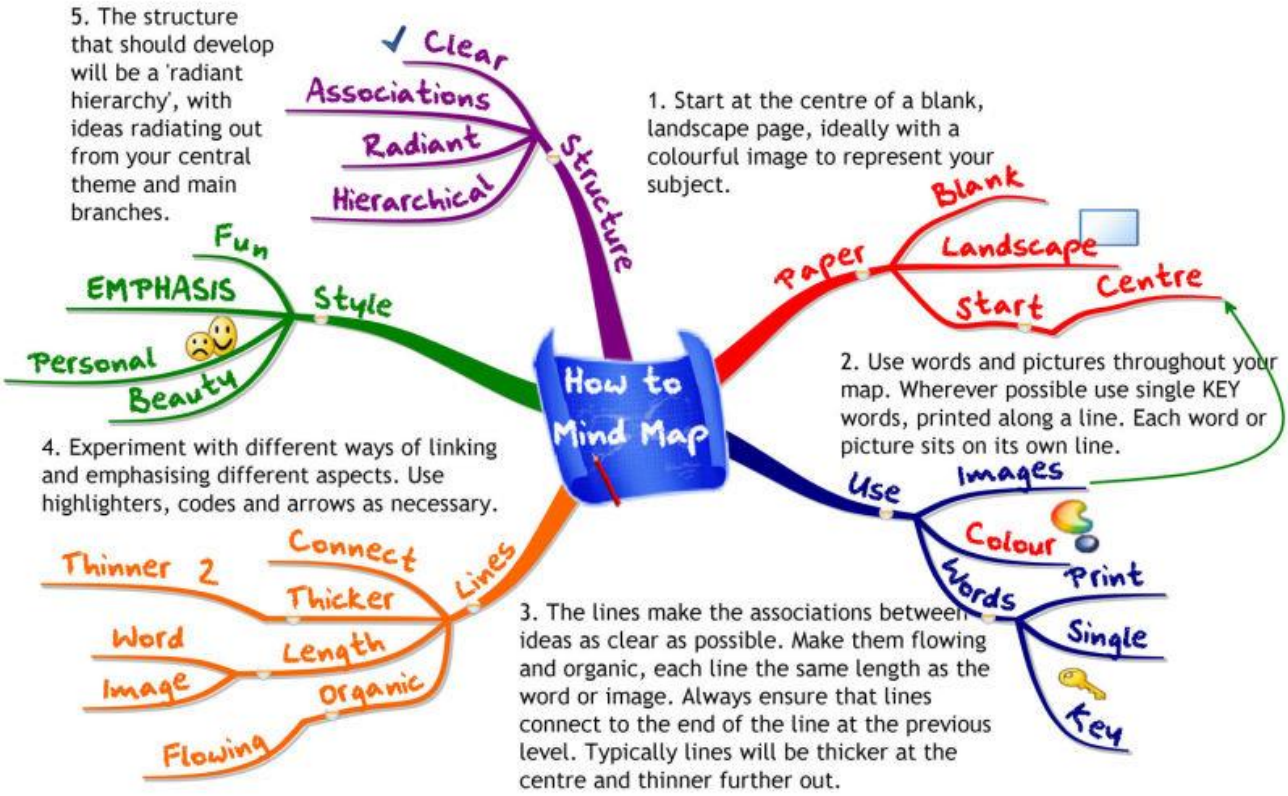
1. Make the flashcards yourself – the process is as important as the finished product
2. Each card should only have 1 question and 1 answer (even if that answer has several parts)
3. Use images as well as words to help you remember
4. Your deck of flashcards should *not* just be "dictionary definitions." It needs to be your own interpretation.

Front	Back
Common rise and run of a concrete stair?	
Carbohydrates?	• Classified as plants • Starches, sugars, & fiber • Simple (sugar) or complex (starches, fiber) • Supply energy
Canine Parvo Virus?	• Water hose diarrhea with mucus and blood • Sunken eyes • Anorexia • Rapid, weak pulse • Destroyed intestinal villi
What is an expression?	Combining two or more values using some operation: add, multiply, greater than etc. Value Value Value } +, x, >…

Tips for using your flashcards effectively:

1. Set a goal to review each flashcard in your pack 3 times per day.
2. The best way to use flashcards is as a quick impromptu study session. 15 minutes at the bus stop and 30 minutes between classes is better than hours and hours of continuous study at the end of the day
3. You should think about each card. Use the word in a sentence, remember some places you've heard it, say it aloud to yourself, etc. Engage with the content, don't just say "yes, I know it" or "no, I don't."
4. Set aside the cards you know ONLY after you can answer them correctly after a night of sleep.

What makes an effective mind-map?



Tips for using a mind-map effectively:

- Spend time creating it and making clear links between ideas
- Look at your mind-map once a week
- Actively recall the information for each branch; what does each word mean and how does it link to the other words around it?
- Map from memory – do the same one and continue to fill in the gaps

Mnemonics

What is a mnemonic?

- a system such as a pattern of letters, ideas, or associations which assists in remembering something.

Two different types of mnemonic

1. An acronym is a word formed from the first letters or groups of letters in a name or phrase. For example, to remember the colours in the rainbow, you could use the acronym Richard of York Gave Battle In Vain (Red, orange, yellow, green, blue, indigo, violet)

2. Rhyming - for example:

In fourteen hundred and ninety-two Columbus sailed the Ocean Blue.

OR

Thirty days hath September,
April, June, and November;
All the rest have thirty-one,
Save February, with twenty-eight days clear,
And twenty-nine each leap year.

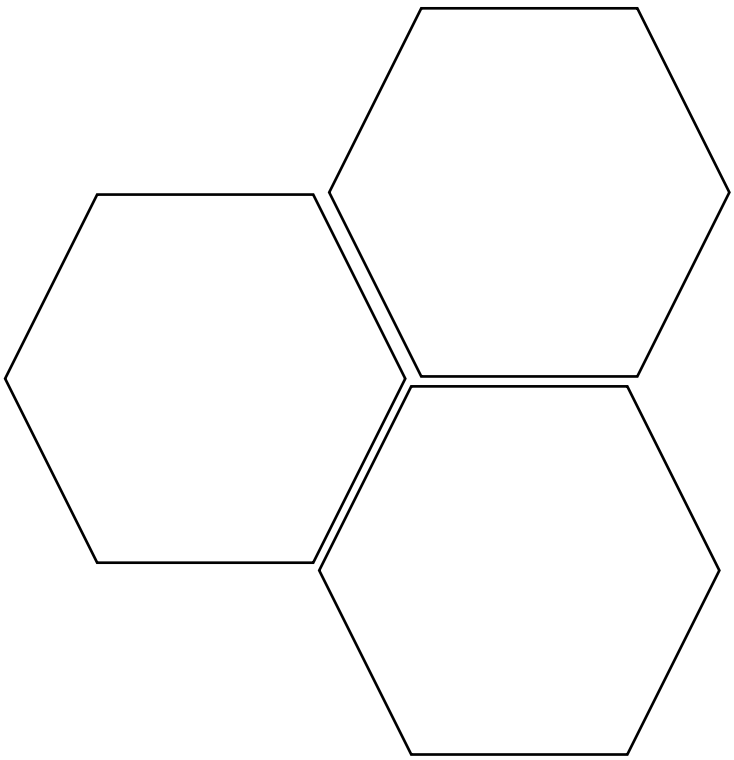
Remember, each time you recall your mnemonic, make sure that you recall what everything stands for and how that relates to your studies; it is not enough to just know the acronym or rhyme.

Hexagons

The main usage of hexagons is to make clear links between different pieces of information. This will support your ability to remember by creating more neural pathways which makes retrieval easier.

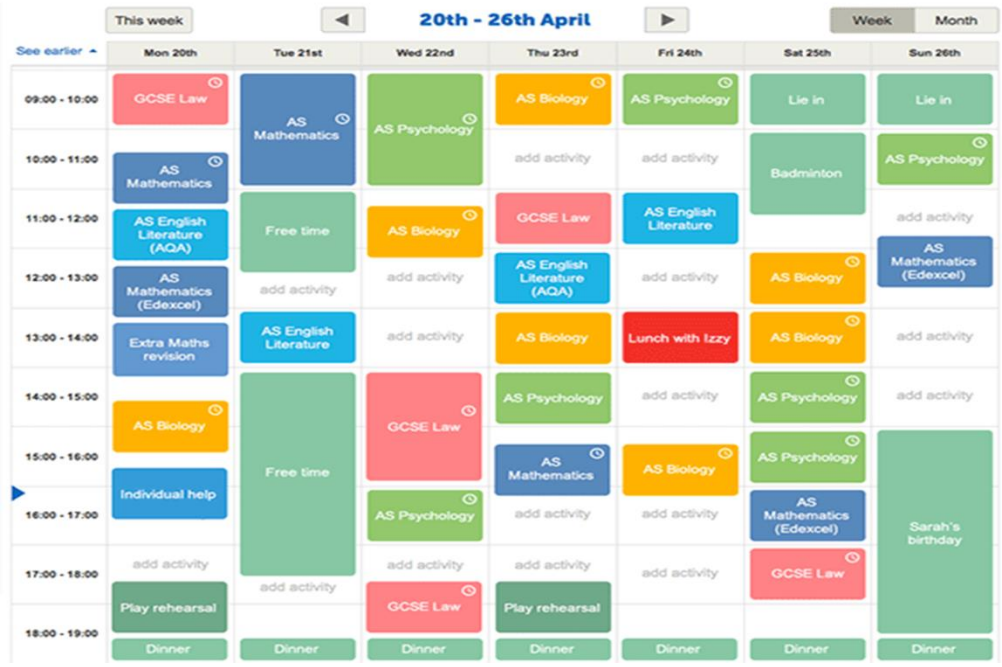
Every two sides that meet must have a clear link and every time you revise in this way, you need to remember the links and why you have made them.

You can either just write key words in the hexagons or you can annotate the links between them with reasons that they are linked.



Key tips for creating an effective revision timetable:

- ✓ Keep it simple and be realistic
- ✓ Add boxes for exactly what you want to achieve in each session
- ✓ Prioritise and be clever (Maths for Physics later)
- ✓ Fit in time to continually revise what you have learned; don't schedule everything just once – build in testing time too
- ✓ Approach subjects in different ways
- ✓ Use colour coding
- ✓ Consider where you are going to revise; can it be in different places for different subjects?
- ✓ Print it off, ideally in a bigger size so that you can add notes to it
- ✓ Be flexible; it should be a working document



Key points:

- The earlier revision is started, the better. The summer holidays are the ideal time to get a head start.
- Use spaced learning techniques to ensure that the information goes into long term memory
- Consider changing simple things like using different coloured pens or different spaces to work
- Create effective resources now that can be used again

Tips to support your child's revision

- Plan with them and share their revision timetable for home commitments; make it a working document
- Ask them about the revision strategies they use and why; check how effective and varied they are
- Provide a quiet space in which to work
- Stationery and revision guides – check the spec!
- Access to exam board materials
- Test them - flashcards, revision questions
- Ask them to explain tricky concepts to you
- Eating and sleeping well
- Rest breaks and other activities for stress management