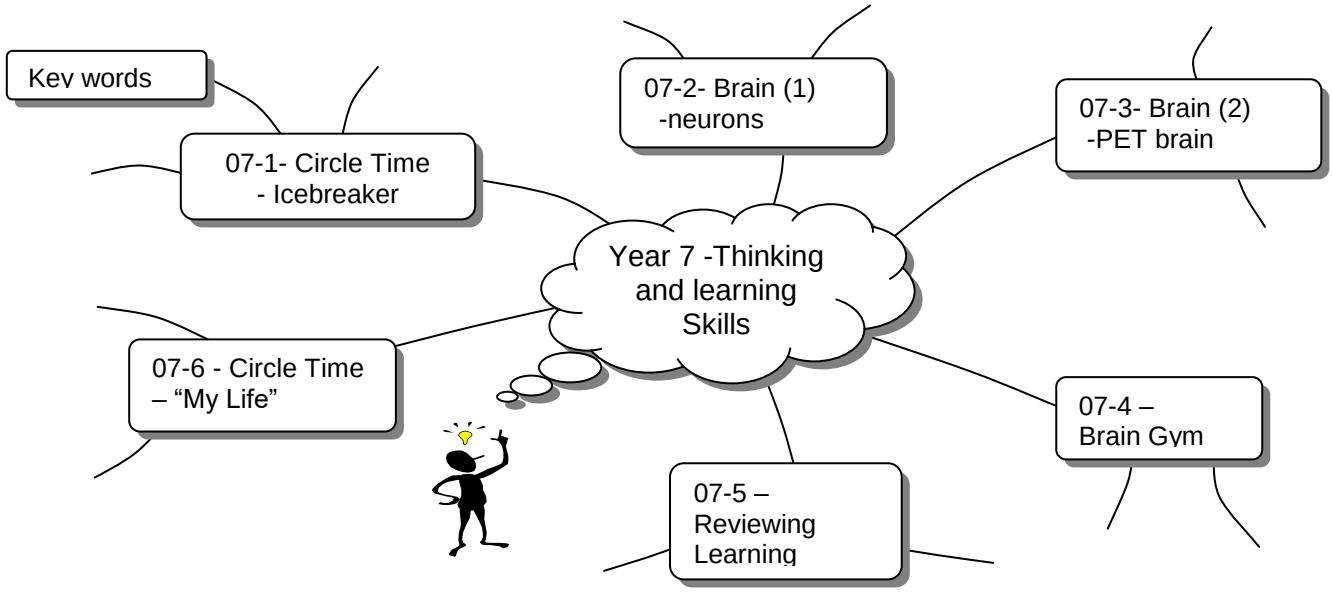
Resources... • Laptop + projector + screen • Human elec. circuit – optional • Thinking Skills Record + glue	**Key Words...** neuron, synapse, electrical signal,	**Thinking Skills** BL1 LT2

Learning outcomes : **I will be able to**…. (IWILBAT) **Homework**….	• the name the parts of a neuron, and how it works • say how practising my learning improves my neurons and synapses Task 2 and 8 (extension)
Setting up the lesson... **1.Starter** (5 mins) **2.Main part a.** (10 min) **b.** (20 min) **c.** (5 min) **Homework – reminder** (5 min) **3. Plenary** (5 min)	• **copy**.... lesson title.....aims.....key words.....Homework • **Homework**...from last lesson... ready to hand in • **3 things** from last lesson...noted in Ex. book • stick **Skills Record** in Ex. book Brain Booster **Option A**.....A simple Human electric circuit….1 cell, sensitive meter, and students holding hands…..we are electrical conductors! **Option B**....True or False ? - an average brain has 1 million million brain cells - if you don't use your brain cells they die - your brain needs oxygen and water to work properly - all your brain cells stretched end to end would reach to the Moon .....**all TRUE!** **PowerPoint** presentation introducing the basics of brain learning and homing in on Neurons. **Brain Break exercise** **Worksheet** to summarise key learning, and give students practice. Add to the **"Big Picture"** in students' Ex. books...on A3 You may want to explain the Homework task, and the optional extension work. • what **do we do know now** that we didn't before? • **1 thing** from the lesson • who has **done well** in the lesson? --> merits
And next lesson…	My PET Brain

The Big Picture.....



Lesson notes….

Do one of the **Brain Booster** exercises at the start of this lesson, and at some suitable point mid-way, to refresh and re-focus. Teach students the rhyme that goes with the exercise.

Lazy 8s	**Double Doodle**	**Arm Activation**	**Hook Ups**	**Balance Buttons**
"To read and write, and do well in a test, Lazy 8s is the very best."	"Links hand and eye, helps writing too, Double Doodle is the one for you."	"At any time, to relax and feel great, all you do is Arm Activate."	"It's easily done, there's no hocus pocus, Hook Ups help me to listen and focus."	"To think and remember, and do well in PE, Balance Buttons is the one for me."

About the Brain.....A useful **Starter** is to make a human circuit, with one 1.5 Volt cell, a sensitive meter, and a few students. With them all connected, holding hands, you get a minute (safe) but measurable current. The point is that we are electrical conductors, and the brain cells work electrically.

I have selected key slides and diagrams for the OHP version. The PowerPoint pres. should "run itself". It is a fuller treatment, in colour and there are things that move.

The key progression of ideas is….

- The immense, unlimited power of the basic human Brain
- The individual neuron….main parts….how it conducts electricity….how to improve the synaptic connections…..basics of brain maintenance
- The brain "thinks" by millions of neurons all working together – the "Cooperative Brain"
- how practising learning keeps neurons alive and in good condition

This leads into Brain (2), which goes into overall brain organisation and function.

There are a lot of new words; I've tried to help with some learning aids.

Year 7 Thinking and learning Skills (v2) - 7 - 2 – Brain (1)

The students have a **worksheet** to do, on neurons. I've made them cut'n'stick, with some key missing words to fill in. You could get them to try in pencil, check each other's ideas, and finally put the OHT/slide up for the correct answers.

As extension work, I've asked students to "RTS" their work, and use partners to practise and test each other. I'm not sure how the time will go on this.

I'm anticipating that the Brain, like Space, will interest students. We each have the most amazing means of thinking and feeling in the 11/2 Kg of squishy grey matter between our ears. Here are some observations (not just facts)…

- A standard brain holds about 1 million million (1×10^{12}) neurons…that's about 100 times more than a 10 gigabyte hard drive
- But then the neurons connect….each can connect with 1000 or more others…so the information you can remember is virtually limitless.
- The brain not only holds more data, but is hugely faster in processing speed. A modern PC running at 2 gigaHertz, does 2 thousand million little calculation steps per second – adding 2 + 2 might take half a dozen steps. The human brain doesn't work this fast, but it works by **millions** of neurons all firing and connecting together. Susan Greenfield, the eminent neuroscientist, estimated that you'd need a power station to run enough PCs in parallel to match a human brain – that would be 500 MW for a power station ÷ 500 W for a single PC, which makes about 1 million PCs.
- All this is for an average brain. Some authorities talk about us using only 2-4% of our potential. Others take issue with this, but you get the general idea.
- The brain doesn't just compute logically. It handles body movements, emotions, inputs from all the senses as well. Our thinking and learning become vastly more effective if we link them to emotions and movements.
- a bee apparently has about 900 brain cells, and a brain about the size of a grain of salt. Yet think of all the things a bee does...fly...find nectar...bring it back to the hive and store it...AND do the well known bee dance to tell the other bees where to find the flowers. Think what we can do with a billion times more neurons.

Starter

Option A...You can borrow the cell (battery) lead and sensitive meter from science...or you can do Option B.

Main part

(a) You'll need to set up your room for the laptop, with projector and screen/wall. Students very much liked the PowerPoint presentation – a major problem was the number and depth of questions and comments it generated!

I've selected some of the slides for a WORD format, in case you can't get a laptop/projector.

(b) I've tried to summarise the learning in a worksheet format...you can use the cut'n'stick labels, or get students to write their own labels in. The former approach takes time and resources, but allows students to shape their ideas.

Put a brief summary of the lesson in the "Big Picture"

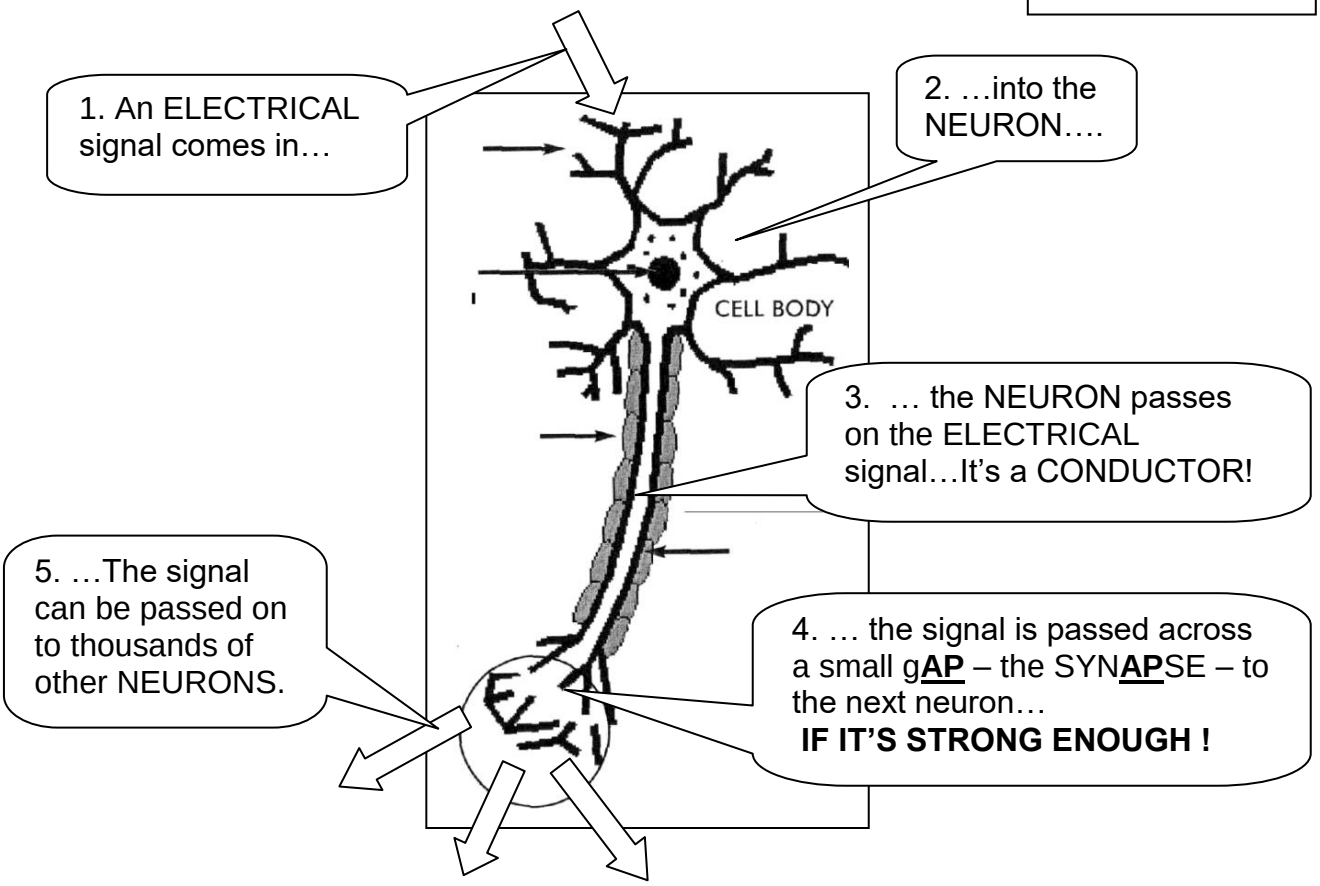
Homework

This is the first of the "Thinking Diary" homeworks. You will need to introduce and explain this carefully....use the Guidance sheet...ensure students stick this in their Ex. books.

Plenary...check the learning...who's done well ?

The basics of Brain learning – Neurons and Synapses

OHT 1 Brain (1)



Your brain has about
1 000 000 000 000 neurons
That's 1 million million

…and the number of synapses is unlimited.
You might need about 10 million PCs all working together to match 1 Human brain.

Practising your learning….

1. keeps the NEURONS alive and working
2. strengthens the connections at the SYNAPSES
3. makes the NEURONS better conductors

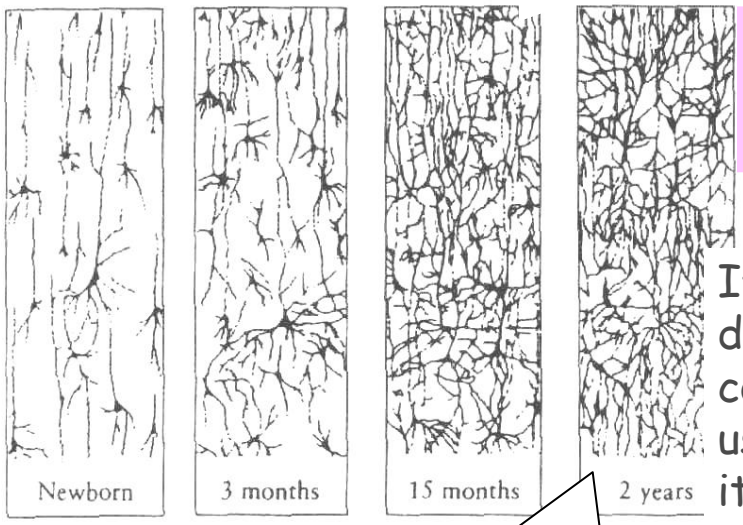
Learning Tips….
synAPse = a gAP
NEUron = NEW learning

Growing new Connections….

OHT 2 Brain (1)

Neurons grow and connect…..or not.

Neurons grow and connect in the first years of life



After that…. it's "Use it or Lose it" !

If a new neuron does not make contact …**or** is not used enough, then it **dies**.

Everything you know and can do is held in the pattern of neurons and synapses

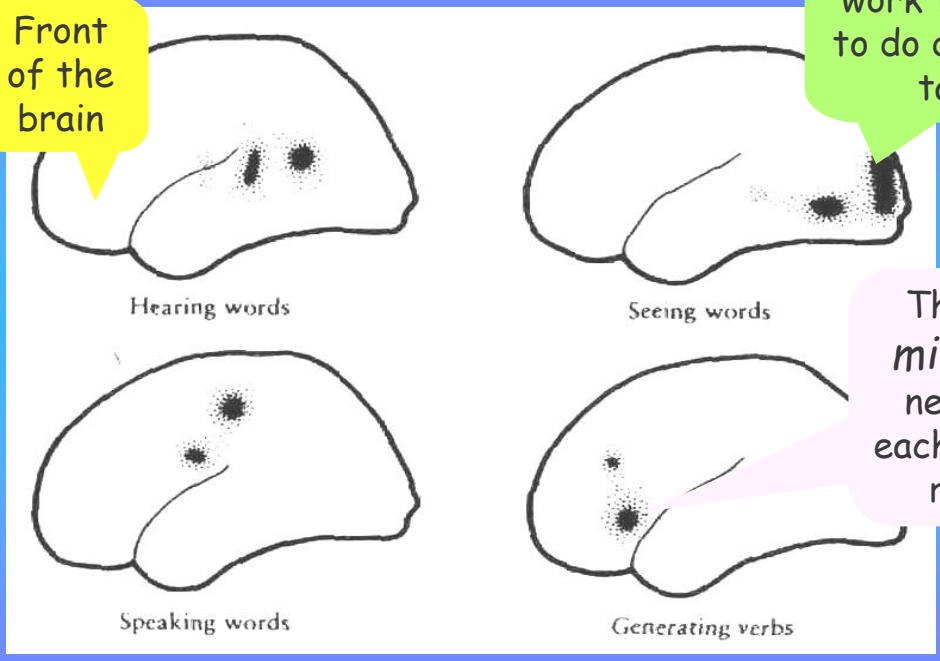
But it's not just 1 neuron at a time...

OHT 3 Brain (1)

The cooperative brain

Front of the brain

These areas work together to do different tasks

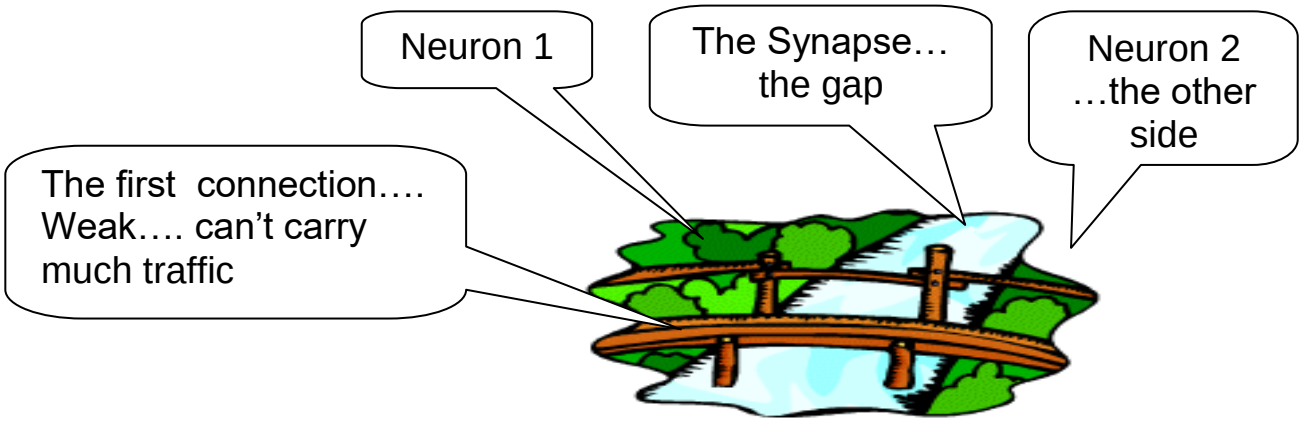


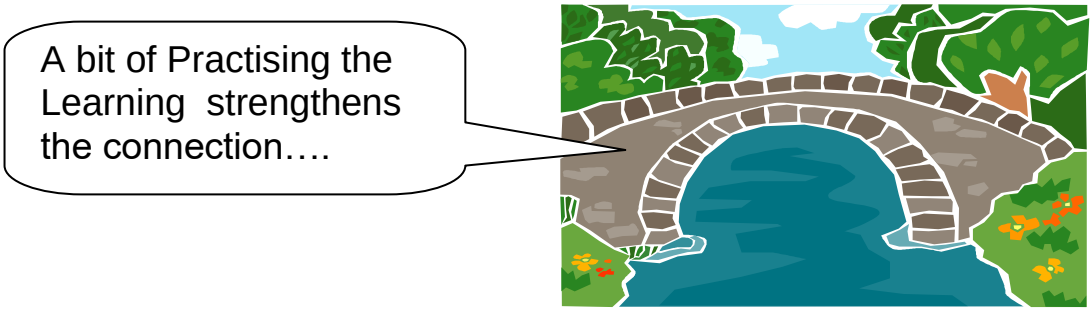
There are *millions* of neurons in each of these regions

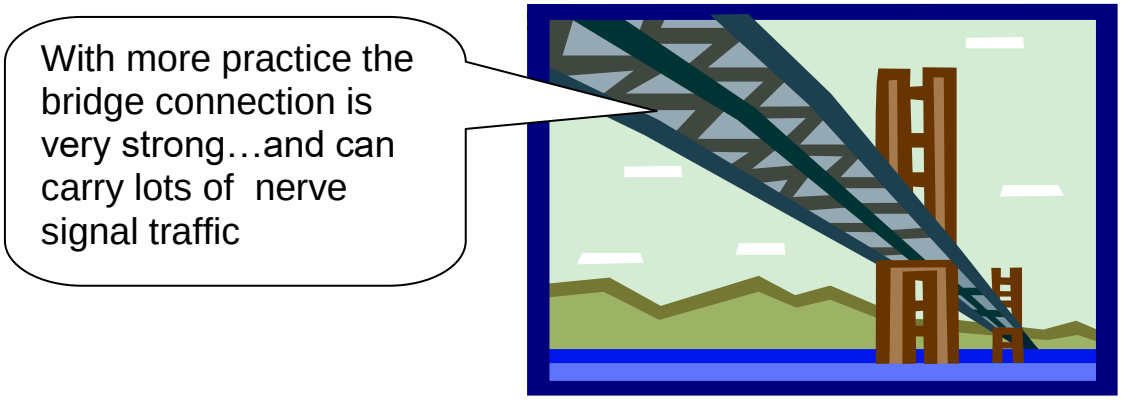
So it's ***millions*** of neurons all working together

OHT 4 Brain (1)

Neurons and Bridges
Practising your learning and strengthening the connections

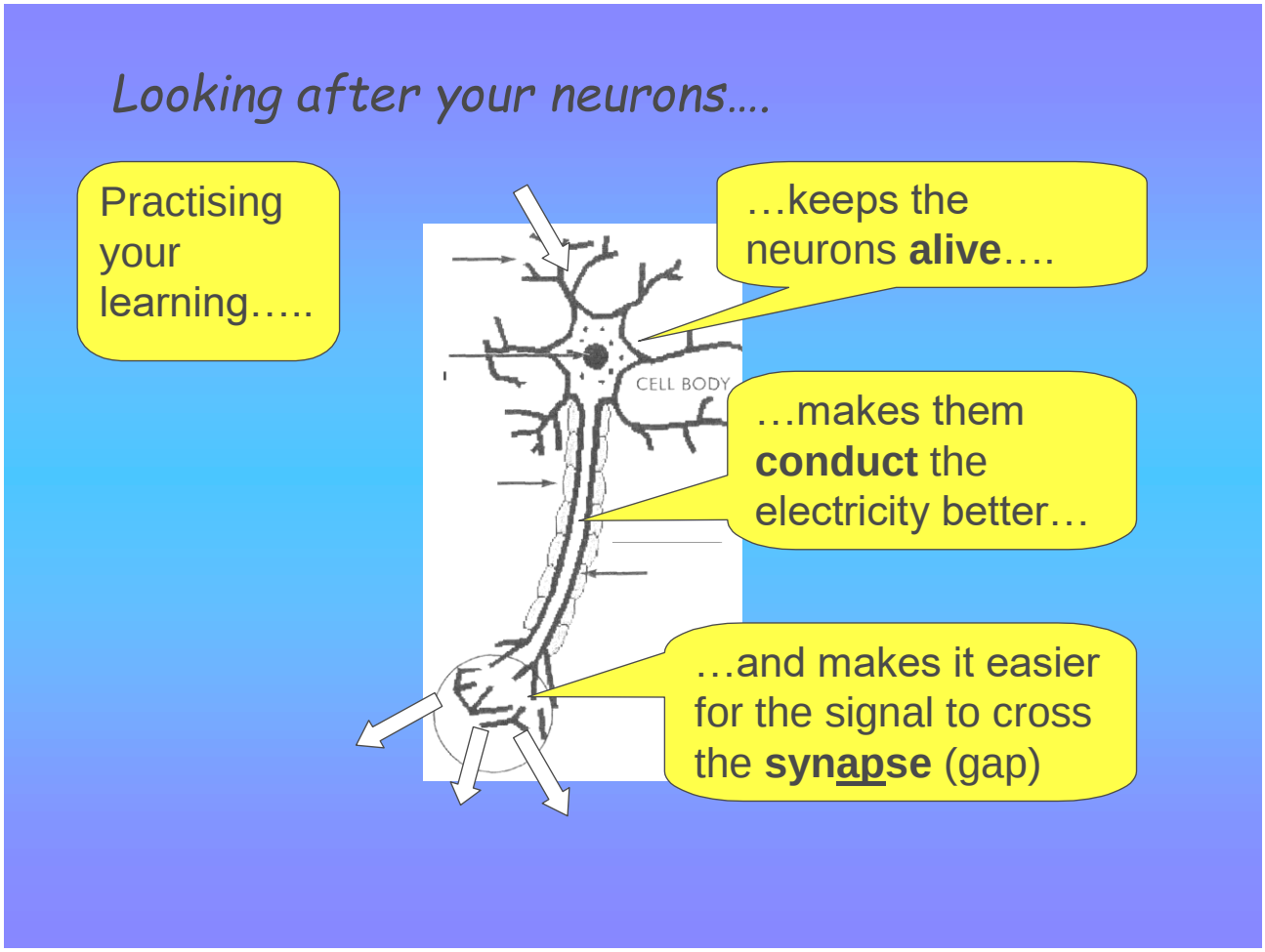






Looking after your neurons.....

OHT 5 Brain (1)

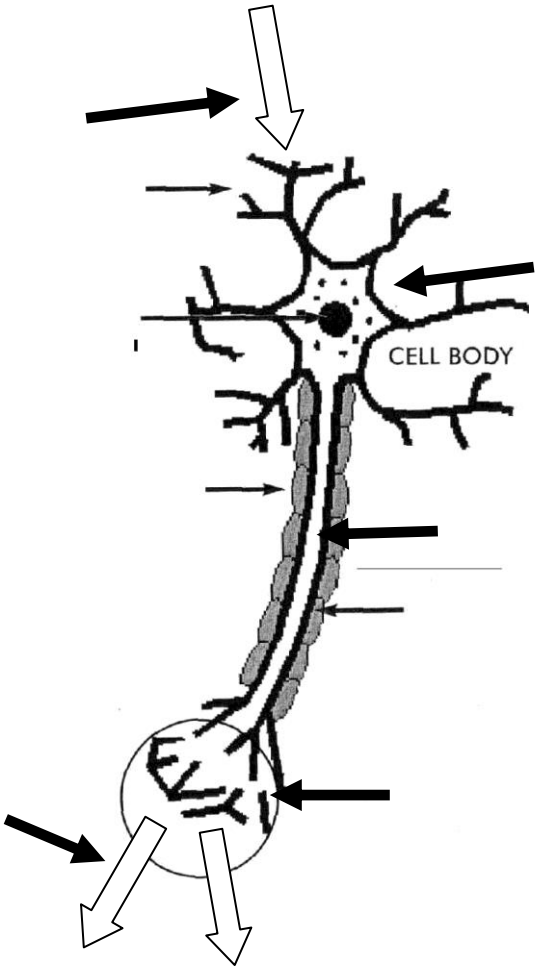


The Electrical Neuron

Worksheet 1
Brain (1)

Name _____ Form ___ Teacher __

Remember!
synAPse = a gAP
NEUron = NEW learning



Tasks

1. Fill in the **missing words** in the boxes…. Cut them out and match them to the diagram…Don't stick them in until you've checked with your teacher!
2. **Read** your completed diagram….quietly read aloud what each part does….cover the labels….can you repeat what they say?
3. **Test** the other students in your group on the diagram…get them to test you.

4. Can you complete this **summary** by filling in the missing words?

Our n_____s work by passing on signals to t_____s of other neurons. Each signal is a tiny e_____ c_____. To get to the next neuron, the signal has to cross a small gap called a s_____.
If we practise our learning, we keep the _____s alive, and make it easier for the s_____s to cross the s_____ to the next _____.

The Electrical Neuron

Labels for Worksheet 1 Brain (1)

A. The _____ is passed on to lots more neurons	A. The _____ is passed on to lots more neurons	A. The _____ is passed on to lots more neurons
B. A new E_____ signal arrives	B. A new E_____ signal arrives	B. A new E_____ signal arrives
C. The main part of the Neuron (a B_____ cell)	C. The main part of the Neuron (a B_____ cell)	C. The main part of the Neuron (a B_____ cell)
D. The _____ – the gap the signal must cross to get to the next _____.	D. The _____ – the gap the signal must cross to get to the next _____.	D. The _____ – the gap the signal must cross to get to the next _____.
E. The signal is passed on as a tiny electric _____.	E. The signal is passed on as a tiny electric _____.	E. The signal is passed on as a tiny electric _____.