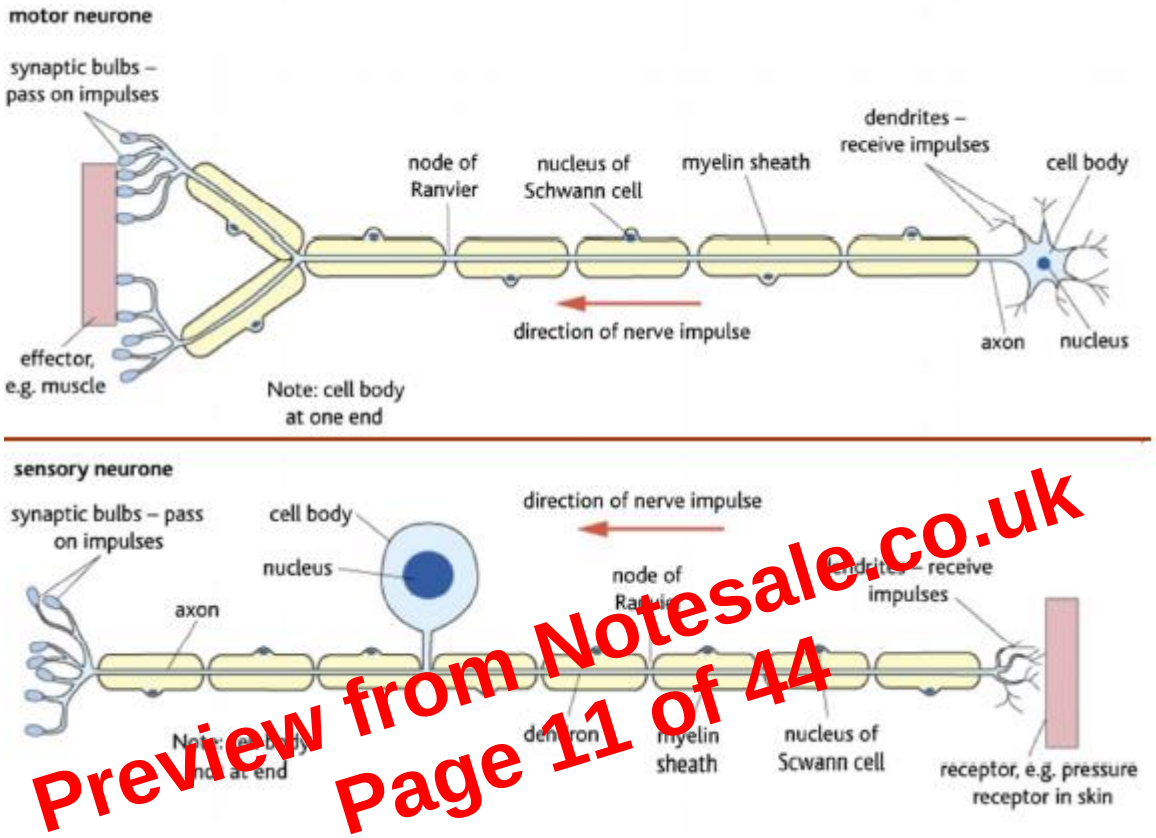
Paragraph: 4

37. Diagram with neurones (Learn to distinguish between the two and learn how to label them).



38. What is lamellae?
    - A thin layer, membrane or plate of tissue

39. What are Schwann cells? What is their function and structure?
    - Wrap around the axon of the long nerves,
    - Creating a thick layer of membrane,
    - Which insulates the nerve
    - Allows for much faster conduction speed.
    - The thick layer of membrane has gaps in it between adjacent Schwann cells, these are called Nodes of Ranvier.

51. Paragraph 4 states that "Both these receptors are commonly found in mammalian skin", describe how the DNA and protein (receptors) of this mole and other mammals could be compared to show that they have a common ancestor.
    - Idea of using proteomics to study protein
    - Idea of using DNA profiling/fingerprinting to study DNA
    - Idea of obtaining tissue/cell sample from one set of bacteria
    - Multiple copies of DNA made
    - Using PCR (polymerase chain reaction)
    - Ref to restriction enzymes/endonucleases to produce DNA fragments
    - Reference to gel electrophoresis
    - Idea of loading the DNA onto the gel, agarose gel
    - Idea that an electric current/change is applied (potential difference)
    - Reference to use of dye/fluorescent staining/UV light/southern blotting/gene probes/radioactive labelling

52. To carry out DNA comparison between different mammals enough DNA must be obtained for analysis. Describe how small samples of DNA can be amplified.
    - Reference to polymerase chain reaction/PCR
    - Polymerase enzyme added
    - Idea of need for primers and nucleotides
    - 90-98°C, then 50-65 °C, then 70-75 °C
    - Idea that cycle needs to be repeated several times/to make several copies of DNA

53. Suggest how the DNA profiles produced for different mammals for these receptors are going to be compared.
    - Idea of comparing total number of bands
    - Idea of comparing position of bands
    - Idea of comparing size/width of bands

54. What is the difference between a nerve cell and a nerve fibre?
    - A nerve cell is the fundamental unit of signal processing;
    - An electrically excitable cell that processes and transmits information through electrical and chemical signals
    - Nerve fibre refers to axon and myelin sheath

55. What is a nerve formed from?
    - A nerve is formed of a bundle of many nerve fibres *the axon of the neuron), with their myelin sheaths

75. Suggest why functional magnetic resonance imaging (fMRI) is considered better than CT for studying brain function.
    - View brain activity directly
    - Idea of see brain activity over a period of time
    - Safer as does not use X-rays
    - No need to use special dyes

76. Explain the advantages of using MRI scanning to identify specific regions compared to using CT scanning.
    - MRI gives better resolution
    - Therefore, more detail can be seen
    - No use of X-rays
    - Therefore, safer/less risk of mutation
    - Therefore, can be used more often

Paragraph: 6

Formidable = Inspiring fear.

Prowls = A person or animal move about restlessly and stealthily, especially in search of prey.

Haunts = A place frequented.

77. The CNS consists of?
    - The brain
    - And the spinal cord

78. What is the neoxortex?
    - A part of the cerebral cortex
    - Concerned with sight and hearing in mammals,
    - Regarded as the most recently evolved part of the cortex (so named neo which means new).

79. The mammalian processing centre is part of the cerebral hemispheres of the brain. The cerebral hemispheres have a number of functions. State two functions associated with the cerebral hemispheres.
    - Think, learn, feel emotions, personality, ability to see, memory, initiate motor activity, speech, decision making, problem solving, intelligence, controls voluntary behavior, forming associations, ability to carry out different movement.

80. The mammalian processing centre is part of the cerebral hemispheres of the brain. What does this mean?
    - The part of the brain that is responsible for thinking, learning, ability to see, memory, initiate motor activity, decision making, problem solving, intelligence, controls voluntary behavior, ability to carry out different movement etc.

81. Suggest how natural selection could have resulted in the development of these receptors making fast sensory discriminations.
    - Any population with a large gene pool has higher chances of survival, due to higher chances of having an advantageous allele.
    - Genetic Variation within a population (due to random mutations)
    - An environmental change occurs (need to have more sensation of the environment)
    - Selection pressure (changing environment, need for food and exploration)
    - A portion of this population will have an allele, that makes them more adapted to the new conditions (an advantageous allele) e.g. the array of receptors making fast sensory discriminations.
    - These individuals will survive, as they were better at exploring their environment and finding prey. Thus, more food, higher survival rate.
    - Thus, reproduce more
    - Pass their advantageous allele to the next generation
    - And over time (over several generations, the allele frequency within the population will change (the frequency of the advantageous allele will increase)

Paragraph: 7

82. How many touches can the star accomplish in one minute?
    - 12 touches per second
    - So, in 1 minute there are 60 seconds
    - Thus, 12*60 = 720 touches in one minute

83. If each Eimer's organ has a surface area of 1 cm^2 what is the total area covered/explored in one second and then calculate the total area for one minute?
    - 12 cm^2 covered in one second
    - 720 cm^2 covered in one minute

104. What is the topographic organization?
    - The ordered projection
    - Of a sensory surface e.g. retina
    - To one or more structures of the central nervous system

105. Why is the topographic organization important?
    - Provides information about brain function
    - And structure

106. Explain what this paragraph says.
    - Different parts of the brain
    - Represent information from different sensory receptors
    - One region represents the stimuli received from the retina
    - Another region represents the stimuli received from the ears

107. How can scientist map/create this topographic organization?
    - Stimulated the sensory receptors
    - And monitor the brain using fMRI
    - In order to detect the region that is activated
    - Repeat the procedure for all receptors
    - Till the topographic organization is completed

Paragraph: 12

108. Paragraph 12 states "In all mammals, the left half of the body is represented predominantly in the right side of the cortex, and vice versa", why?
    - There is criss-crossing of the neurones (wiring) in the spinal cord
    - Due to anatomical (and physiological) constrains

109. If a mammal is to develop these capacities and these maps it must be exposed to particular stimuli. What evidence are there that a critical 'window' exists.
    - The cortex is split into column of cells
    - When born, the columns overlap and are tangled
    - As the mammal learns to process stimuli
    - The cells organise themselves into discrete columns, which no longer overlap
    - There is a "critical window" for this to happen
    - If It is missed the brains will become "fixed" with tangled columns and won't be able to process stimuli properly

110. Is it nature or nurture responsible for the creation of this topographic organization?
    - NURTURE has overriding influence
    - on patterns laid down by nature.

- Idea of impulse moves in one direction only
- Myelin sheath speeds up conduction
- Current jumps between nodes of Ranvier (saltatory effect)

116. How does an inhibitory neurotransmitter work?
    - Inhibitory neurotransmitter is released at the synapses
    - It opens channels of chloride ions and potassium ions in the postsynaptic membrane
    - These ions will then move through the channels down their diffusion gradients
    - Chloride ions will move into the cell carrying a negative charge
    - And positive ions will move out carrying a positive charge
    - The results will be a greater potential difference across the membrane as the inside becomes more negative than usual
    - Called hyperpolarisation
    - This makes subsequent depolarisation less likely

117. Describe how propagation of a nerve impulse occurs along an axon.
    - Propagated along an axon automatically
    - Local reversal of the membrane potential is detected by the sodium voltage-gated ion channels, which opens when the potential changed above the threshold
    - This causes more sodium ion influx
    - Causes a change in the electric charge
    - Thus, more sodium channels open along the axon

118. Explain how myelination increases the speed of nerve impulses in a neurone.
    - Schwann cells wrapped around axons make a neurone myelinated
    - Act as an electrical insulator
    - Allowing quick conduction of the impulse
    - Salutatory conduction.
    - Impulse jumps from node to node (node of Ranvier)

119. How does the structure of the synapse and axon membrane ensure that nerve impulses are only able to travel in one direction?
    - Refractory period
    - During which sodium in channels cannot reopen which prevents another action potential being triggered
    - Synapses only have receptors on the postsynaptic membrane, thus, neurotransmitters can only bind to the post synaptic membrane and move forward

See questions given in other sections on Cortex, nerve signalling, neurotransmitters etc.

183. How to write a proper reference?
   - Authors (Last name. Initial of the first name), The Date in brackets, Article title, Journal title, Volume, the issue number in brackets, Pages.
   - e.g. Catania K., (2017), "The nose takes a starring role", Scientific American, 26 (2), 82-87

184. How can you improve the bibliography?
   - More references
   - Articles from scientific journals
   - Websites
   - Scientific books

185. If a reference from a website was used, what information would be needed?
   - The URL
   - The date when you retrieved the information.
   - The author of the page,
   - The name of the website,
   - The title of the article,
   - The publication date,
   - Example: e.g. "Last name, first name (or name of the website, if no author available). Title of article.", Title of webpage/associated publication or college, Year published. Date of access (day month year).

186. Suggest how the scientists who conducted the study had their results accepted by other scientists.
   - Idea of work appearing in a scientific journal or being presented at a conference
   - Idea that validity or reliability is considered
   - By other scientists/reference to peer review

187. Do you consider that the information in this article has been obtained from reliable sources?
   - Overall no specific sources are given
   - Many paragraphs are not even linked to references
   - Thus, less reliable
   - No bibliography acknowledgment at the end of the article
   - Even the references that are given are incomplete
   - No names of Scientists were given for each of the studies mentioned
   - No inclusion of titles of manuscripts, journal names and issue number, the year of publication, and relevant pages