

Answers to exam-style questions

Option A

- 1 a the visual cortex processes and interprets impulses it receives from both eyes to produce the images we 'see';
Broca's area is involved in our understanding of language / is responsible for our abilities in speaking and writing [4]
- b A – cortex, B – cerebellum, C – pituitary gland [3]
- 2 shine light in eye to see if pupil constricts; controlled by the medulla (oblongata);
absence of pupil reflex means medulla unlikely to be functioning;
medulla controls breathing and heart activity / cannot maintain life-sustaining activity;
person is most likely brain dead; [4 max]
- 3 *Diagram should show:*
receptor, sensory neuron, relay neuron, motor neuron and effector
Outline of withdrawal reflex pathway:
pain receptor detects stimulus;
sensory neuron relays impulse to CNS / spinal cord;
relay neuron connects impulse to motor neuron;
motor neuron relays impulse to effector / muscle;
effector / muscle responds by contracting to move away from pain [3 max]
Credit annotated diagrams.
- 4 information from the left and right visual fields crosses over in the brain at the optic chiasma;
the right brain / visual cortex processes information from the left visual field / or converse [2]
- 5 hair cells send messages to the brain;
cilia on hair cells vary in length;
each resonates to a different frequency of sound;
different regions of the cochlea respond to different frequencies of sound / high frequencies (short wavelengths) are detected nearest to the oval window and the lowest frequencies (longest wavelengths) are picked up further away;
complex sounds are resolved into their components [3 max]

- 6 *Innate behaviour:*
develops independently of the environmental context;
cannot be altered [1 max]
Learned behaviour:
develops as a result of experience;
can be modified [1 max]
Must have at least one from each for full marks.
[total 2 marks]
- 7 learning allows an animal to remember location of food sources;
recognise predators / toxic food;
find a mate / breed successfully;
gain a competitive advantage;
learning also allows social organisation, improving individuals' chances of survival;
leads to more efficient energy use [3 max]
- 8 Pavlov fed dogs and at same time rang bell / made sound;
unconditioned stimulus is food / sight or smell of food caused salivation;
unconditioned response is salivation;
sound / ringing of bell given on own caused salivation;
conditioned stimulus caused conditioned response;
repeated association of two stimuli (food and sound) lead to a type of learning (conditioning) [3 max]
- 9 pre-synaptic neuron releases neurotransmitter;
neurotransmitter binds to the post-synaptic membrane;
causes hyperpolarisation (of post-synaptic membrane) / negatively charged chloride (Cl^-) ions move in / potassium (K^+) ions move out;
making it more difficult to cause depolarisation (of post-synaptic neuron) / nerve impulse transmission / action potential [2 max]
- 10 *Innate behaviour:*
is genetically determined;
must arise as a result of natural selection;
arises over many generations;
Learned behaviour:
is not genetically determined;
can pass from one individual to another in a population in less than a generation / can be passed from parent to offspring in just one generation [4 max]

- 11 a i after 30 minutes the level of serotonin had risen sharply; reached a maximum 1 hour after the dose was given; rose to six times normal level in the rats pre-treated with saline and eight times the normal level in rats pre-treated with vitamin C [2]
- ii the rats that had been pre-treated with vitamin C; levels of serotonin rose higher than the other groups and after three hours remained higher than other groups [1]
- iii approximately 5 hours \pm 0.5 [1]
- iv higher serotonin levels occurred in the group that had received vitamin C + saline than in the group that had received vitamin C + MDMA / serotonin levels rose more quickly in the group that had received vitamin C + saline than in the group that had received vitamin C + MDMA
Comparison must be made. [1]
- v so that investigators could investigate whether vitamin C had an effect on the reaction to MDMA in the rats which had not been pre-treated with the drug [1]
- b i 39.75 ± 0.25 °C [2]
- ii the tail temperature of the rats that received MDMA was lower than that of the control animals;
rats lose heat through their hairless tails, which suggested that MDMA was interfering with the temperature regulation process, leading to hyperthermia [1]