PEARSON EDEXCEL A-LEVEL BIOLOGY B · 9BI0

BIOLOGY



MARK SCHEME

TOPIC 9: CONTROL SYSTEMS

STRUCTURE AND FUNCTION OF THE MAMMALIAN NERVOUS SYSTEM

SCORE	PERCENTAGE
/63	%

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Mark Scheme

Q1.

Question Number	Answer	Additional guidance	Mark
(a)	1. idea of comparative image clarity ; 2. CT therefore can only identify {larger / main} structures / MRI can identify smaller structures / eq ; 3. Reference to tissue identified / eq ; 4. MRI uses {radio waves / magnetic field}, CT uses X-rays / eq ; 5. Idea of both give {2D / 3D} images ; 6. limitation of MRI or CT ; 7. idea of images for both are at one point in time ; 8. ref to comparative cost of use ;	ACCEPT 1 - image resolution {higher in MRI / lower in CT} / MRI offers more detail ACCEPT 6 – MRI-noisy, need to keep still, not so good for people with metal implants, pacemakers CT ref to safety aspects of X-rays ACCEPT 8 - MRI more expensive than CT	**(3)**

Question Number	Answer	Additional guidance	Mark
(b)	1. view brain activity directly / eq ; 2. idea of see brain activity over a period of time ; 3. safer as does not use X rays ; 4. no need to use special dyes ;	ACCEPT 1 – MRI identifies active areas by greater blood flow, greater oxygen uptake, presence of more oxyhaemoglobin in these areas ACCEPT 2 – see in real time, quotes figures such as fMRI takes up to 4 images a second or moving image, CT is still image	**(2)**

Question Number	Answer	Additional guidance	Mark
(c)(i)	1. idea that tumour tissue differs from brain tissue ; 2. detail of effect on scan e.g. {energy source / magnetic field / radio waves / eq} {absorbed / blocked / eq}} ; 3. Ref to difference in blood supply ;	ACCEPT 1 - ref to relative densities, tumour growing / dividing / mutated cells	**(2)**

Question Number	Answer	Additional guidance	Mark
(c)(ii)	1. Idea that (treatment) has been partially successful ; 2. tumour reduced / eq ; 3. reduction qualified e.g. in contact with less brain tissue or size reduction quoted ;	ACCEPT 3 - affecting less brain tissue Halved in size	**(2)**

Question Number	Answer	Additional guidance	Mark
(c)(iii)	1&2. two appropriate functions given e.g. think, learn, show emotions, memory, personality, reasoning, eq ; ; 3. Because tumour is situated in the frontal lobe / cerebral hemispheres / cerebrum ;	ACCEPT 1&2 – decision making, problem solving, planning, intelligence, controls voluntary behaviour, forming associations (combining information from rest of cortex) ACCEPT 3 – frontal cortex	**(3)**

Q2.

Question Number	Answer	Additional Comments	Mark
(a)	1. identification of location / eq ; 2. size of tumour / eq ; 3. type of tumour / eq ; 4. reference to {blood vessels / eq} ; 5. idea of monitoring treatment or growth of tumour ;	**NB question asks about the use of the scan not MRI** **4. Accept** oxygen supply	**(2)**

Question Number	Answer	Additional Comments	Mark
(b) (i)	Two from gender, age, physiological state, {BMI/eq}, not dieting, previous chocolate intake ;		**(1)**

Question Number	Answer	Additional Comments	Mark
(b) (ii)	1. idea that fMRI can allow brain activity to be seen in real time ; 2. idea that fMRI uses {radio waves / magnetic field} ; 3. increase supply of oxygenated blood in active areas / eq ; 4. that {reflects/does not absorb} fMRI signals / eq ; 5. idea of seen as a white area ; 6. idea of comparison with and without chocolate ;	**1. Accept** observe whilst eating chocolate **3. Accept** active areas {use more oxygen /more de-oxygenated blood produced} **4. Accept** less signal absorbed **Accept** if de-oxygenated then more signal absorbed, less reflected **5. Accept** area lights up or is a different colour	**(3)**

Question Number	Answer	Additional Comments	Mark
(b)(iii)	Two from Think, learn, feel emotions, personality, ability to see, memory, initiate motor activity ;;	**Accept** Speech, decision making, problem solving intelligence, controls voluntary behaviour, forming associations, ability to carry out different movement, **Ignore** control / co-ordinates movement	**(2)**

Q3.

Question Number	Answer	Mark
(a)	**Region of the brain** / **One role while she is on the beam** Cerebellum / maintaining balance / coordination of movement / muscle control / eq ; Medulla oblongata / regulation of {breathing / heart beat} / eq ;	**(2)**

Question Number	Answer	Mark
(b)	1. idea more blood flows near the skin surface / eq ; 2. due to {vasodilation / dilation of arterioles / eq} ; 3. {vasoconstriction / eq} of shunt vessels / eq ; 4. more blood to capillaries / eq ; 5. idea of more heat lost ; 6. via radiation ;	**(4)**

Question Number	Answer	Mark
(c)(i)	1. {in the knee / behind the knee cap} /{cross- shaped / two ligaments} ; 2. (connective tissue that) connects bone to bone / eq ;	**(2)**

Question Number	Answer	Mark
(c)(ii)	1. idea of smaller incision reduces chance of infection / eq ; 2. idea of smaller incision reduces recovery time ; 3. idea of smaller incision reduces likelihood of osteoarthritis / knee joint replacement later / eq ; 4. idea of smaller incision so less scar tissue / eq ; 5. idea of smaller incision so less blood loss / eq ; 6. idea of smaller incision so less pain / eq ; 7. use of local anaesthetic means less (associated) risk / eq ; 8. idea of cheaper related to fewer staff needed ;	**(2)**

Q4.

Question Number	Acceptable Answer	Additional Guidance	Mark
	• correct numerical calculation (1) • correct units (1)	Example of Calculation: 22 ÷ 120 =0.183 beats per minute per minute / beats minutes^{-2}	**(2)**

Q5.

Question Number	Acceptable Answer	Additional Guidance	Mark
	An explanation that makes reference to the following: • { stress / fear } causes the adrenal glands to release adrenaline into the bloodstream (1) • because of impulses along sympathetic nerve (1) • from the { cardiac control centre / medulla (oblongata) } in the brain (1) • increase in heart rate caused by increased rate of depolarisation of SAN (1) • due to release of noradrenaline at SAN (1) ATP than other cells		**(5)**

Q6.

Question Number	Correct Answer	Additional guidance	Mark
	An explanation that makes reference to one of the following pairs: • less cerebral cortex (1) • so individual has inability to do everyday tasks (1) **or** • smaller hippocampus (1) • so loss of memory / incapacity or inability to perform everyday tasks (1)	control movement	**(2)**

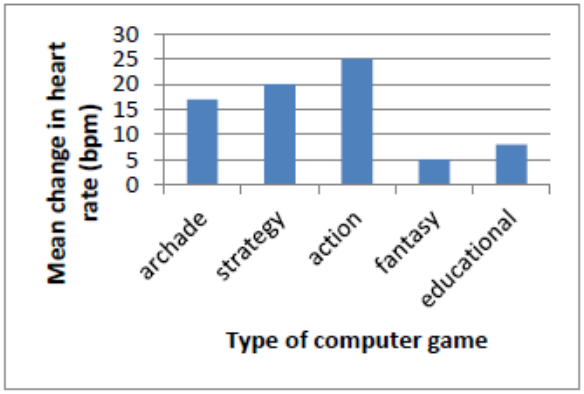
Q7.

Question Number	Answer	Additional Guidance	Mark
(i)	1. fMRI ; and any two from: 2. (fMRI) operates in real time / eq ; 3. as experience will be short lived / eq ; 4. Active areas will {light up / be coloured / eq} (on the image) / eq ; 5. high resolution (as areas involved may be small) / eq ; 6. Safer / eq ;	**2 ACCEPT** live images, 4 images per second **4. ACCEPT** idea of active areas require more oxygen/ oxygenated blood 5 **ACCEPT** more pixels, image is more detailed **6. ACCEPT** ref. to not using X rays, etc	**(3)**

Question Number	Answer	Mark
(ii)	D ;	**(1)**

Q8.

Question Number	Acceptable Answer	Additional Guidance	Mark
(i)	An explanation that makes reference to four of the following: • all games must be played for the same length of time to make a valid comparison (1) • a recovery period is needed for the heart rate to return to normal before each subsequent game (1) • repeats should be { at the same time of day / under the same conditions } to avoid effect of other variables (1) • games should be tested in a different sequence each time, to account for effects of fatigue (1) • more individuals should be tested, other than the student himself, to obtain valid results (1)		**(4)**

Question Number	Acceptable Answer	Additional Guidance	Mark
(ii)	• bar chart (1) • x-axis: type of computer game and y-axis: mean change in heart rate (1)		**(2)**

Q9.

Question Number	Answer	Additional Guidance	Mark
	• E		**(1)**

Q10.

Question Number	Answer	Additional Guidance	Mark
	The only correct answer is **D** (Z,Y,X) **A** is not correct because X regulates temperature and Z controls breathing rate **B** is not correct because Y controls balance and Z controls breathing rate **C** is not correct because X regulates temperature and Y controls balance		**(1)**

Q11.

Question Number	Answer	Mark
(i)	A ; cerebrum	**(1)**

Question Number	Answer	Mark
(ii)	C ; hypothalamus	**(1)**

Q12.

Question Number	Correct Answer	Additional guidance	Mark
	cerebrum (1)		**(1)**

Q13.

Question Number	Answer	Additional Guidance	Mark
	An answer that makes reference to at least one similarity and one difference: **Similarities** • both contain {nerve cells / neurones} (1) • both contain synapses (1) **Differences** • PNS is divided into somatic and autonomic systems, butCNS is not (1) • only the PNS has sensory input and motor output (1) • only the CNS carries out processing of information (1)	Allow both carry nerve impulses Allow both use neurotransmitters Allow PNS contains sympathetic and parasympathetic systems, butCNS does not	**(3)**

Q14.

Question Number	Answer	Additional Guidance	Mark
(i)	An answer that makes reference to the following: • (the cerebellum is for) {balance / coordination (ofmuscles) / posture} (1)	Allow {motor memory / learning complexmotor skills}	**(1)**
(ii)	An answer that makes reference to the following: • cerebrum (1)	Allow {cerebral cortex / motor cortex /cerebral hemisphere}	**(1)**
(iii)	An explanation that makes reference to two of thefollowing: • the damage is to the left side of the cerebellum (1) • so movement of the right arm is no longer automatic /co-ordinated (1) • therefore the soldier compensates by having to think about it (1)	Allow no impulses from cerebellumto (right) arm Allow impulses pass from cerebrum to right arm (to movearm)	**(2)**

Q15.

Question Number	Answer	Additional Guidance	Mark
(i)	The only correct answer is: **D** *A is incorrect because W is the hypothalamus* *B is incorrect because X is the cerebrum* *C is incorrect because Y is the cerebellum*		**1 comp**

Question Number	Answer	Additional Guidance	Mark
(ii)	The only correct answer is: **C** release of noradrenaline by the sympathetic nervous system *A is incorrect because acetylcholine decreases the rate* *B is incorrect because acetylcholine decreases the rate* *D is incorrect because noradrenaline is released by the sympathetic nervous system*		**1 comp**