

Topic 8 Biology

Booklet 3 of 3

Revision Questions

**Brain Scans, Learning,
HGP & GM Plants**

MARK SCHEME

Question Number	Correct Answer	Mark
1(a)	<ol style="list-style-type: none"> 1. nature of abnormality e.g. bleeding, ref. to density ; 2. {location / eq} of abnormality ; 3. {extent / size/ eq} of abnormality ; 4. likely problems e.g. accessibility for surgery ; 	max (2)

Question Number	Correct Answer	Mark
1(b)	<ol style="list-style-type: none"> 1. (found in) different {regions / eq} of brain / eq ; 2. the right hand brain has {more / two/ eq} abnormalities ; 3. different areas of brain have different functions / eq ; 4. {symptoms / eq} depend on region of brain affected / eq ; 5. idea of different types of abnormality can cause different symptoms ; 	max (2)

Question Number	Correct Answer	Mark
1(c)	<ol style="list-style-type: none"> 1. detects level of oxygenation of the blood /measures changes in blood flow within brain / eq ; 2. {increased flow / more oxygen / eq} suggests increased activity / eq ; 3. study brain activity related to {stimuli / tasks / eq} ; 	max (2)

June 2010

Question Number	Correct Answer	Mark																														
1(d)	<table><tr><td></td><td>W</td><td>X</td><td>Y</td><td>Z</td><td></td></tr><tr><td>Regulating core temperature</td><td></td><td><input checked="" type="checkbox"/></td><td></td><td></td><td>;</td></tr><tr><td>Climbing stairs</td><td></td><td></td><td></td><td><input checked="" type="checkbox"/></td><td>;</td></tr><tr><td>Regulating carbon dioxide in the blood</td><td></td><td></td><td><input checked="" type="checkbox"/></td><td></td><td>;</td></tr><tr><td>Choosing a gift</td><td><input checked="" type="checkbox"/></td><td></td><td></td><td></td><td>;</td></tr></table>		W	X	Y	Z		Regulating core temperature		<input checked="" type="checkbox"/>			;	Climbing stairs				<input checked="" type="checkbox"/>	;	Regulating carbon dioxide in the blood			<input checked="" type="checkbox"/>		;	Choosing a gift	<input checked="" type="checkbox"/>				;	(4)
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June 2010

Question Number	Answer	Mark
3(a)	<ol style="list-style-type: none"> 1. (L-Dopa) can reach brain / unlike dopamine treatment / eq; 2. converted to dopamine (in brain) / eq ; 3. increases dopamine levels in the brain / eq ; 4. Parkinson's disease has low dopamine levels / reduces symptoms of Parkinson's disease / eq ; 	max (2)

Question Number	Answer	Mark
3(b)	<ol style="list-style-type: none"> 1. reference to {higher levels of / more} serotonin / eq ; 2. reference to synapse / eq ; 3. {inhibits / eq} reabsorption (into neurone) / eq ; 4. may reverse pumps to release more serotonin / eq ; 	max (3)

Question Number	Answer	Mark
3(c)(i)	to mimic Parkinson's disease / Parkinson's disease has low dopamine levels / eq ;	(1)

Question Number	Answer	Mark
3(c)(ii)	<ol style="list-style-type: none"> 1. (rationalist view) overall good should outweigh harm (to animals) ; 2. (absolutist view) all use (of animals) unacceptable ; 3. idea of as few animals as possible used in the trial ; 4. welfare of animals should be important / eq ; 	max (3)

Jan 2011

Question Number	Answer	Mark
3(d)	<ol style="list-style-type: none"> 1. test {small sample / eq} {for safety / of healthy individuals} / eq ; 2. large sample of {patients / tested for effectiveness} / eq ; 3. reference to clinical trials on {1000s / larger sample} ; 4. reference to double blind {trials / tests} ; 5. reference to placebo ; 6. idea of representative sample e.g. take into account sex, age ; 	<p>max (3)</p>

Question Number	Answer	Mark
4(a)	C ; A ; D ;	(3)

Question Number	Answer	Mark
4(b)(i)	<ol style="list-style-type: none"> 1. high frequency of impulses / eq ; 2. {depletes /eq} neurotransmitter / eq ; 3. calcium ion channels do not open / are less responsive / eq ; 4. reference to synapse / synaptic {membrane / knob / eq } ; 5. (post synaptic) membrane not depolarised / eq ; 6. impulses do not reach gill / eq ; 	(3)

Question Number	Answer	Mark
4(b)(ii)	<ol style="list-style-type: none"> 1. avoids wasted {effort / time / resources / eq} / eq ; 2. to {non-threatening / unimportant / eq} stimulus / eq ; 3. reference to natural frequent stimuli e.g. wave action ; 	(2)

Question number	Answer	Mark
4(a)(i)	<ol style="list-style-type: none"> 1. idea that people are more likely to have obsessive compulsive disorder if they have a close relative with the condition ; 2. credit manipulation of figures i.e. 100 times more likely ; 3. therefore they may also have the {genes / alleles / genotype / eq} for this condition / eq ; 	(2)

Question number	Answer	Mark
4(a)(ii)	<ol style="list-style-type: none"> 1. idea that if they have a close relative with this illness, the risk {ought to be higher than / is only} 10% ; 2. therefore other factors must be involved as well / eq ; 3. named example of environmental influence e.g. learnt behaviour ; 	(2)

Question number	Answer	Mark
4(a)(iii)	<ol style="list-style-type: none"> 1. neurotic depression ; 2. {little / eq} difference between {population as a whole / females} and close relative data / eq ; 	(2)

Question Number	Answer	Mark
1(a)(i)	B ;	(1)

Question Number	Answer	Mark
1(a)(ii)	C ;	(1)

Question Number	Answer	Mark
1(b)	D ;	(1)

Question Number	Answer	Mark
1(c)	A ;	(1)

Question Number	Answer	Mark
1(d)	C ;	(1)

Question Number	Answer	Mark
1(e)	D ;	(1)

Question Number	Answer	Mark
2 (a)(i)	all the {DNA / genes / eq} of (the human species) ;	(1)

Question Number	Answer	Mark
2 (a)(ii)	Any one from: 1. idea of discrimination e.g. insurers might have access to a person's DNA / 2. idea of who decides whether a person is tested / 3. idea of need for confidentiality / 4. expensive medical treatments might be restricted / eq ;	(1)

Question Number	Answer	Mark
2 (b)(i)	1. idea that (Human Genome Project) identifies allele related to melanoma e.g. mutant allele, aberrant allele ; 2. idea that drug targets this allele ; 3. (mutant) allele can no longer express itself / eq ; 4. idea of drug preventing translation ; 5. idea that such a drug is more effective ;	(3)

Question Number	Answer	Mark
2 (b)(ii)	<ol style="list-style-type: none"> 1. idea that drug affects expression of the allele ; 2. idea that protein not produced ; 3. idea that (melanoma) cells killed ; 4. idea that (melanoma) cells do not divide ; 5. idea that they are replaced with normal body cells ; 6. through mitosis / eq ; 7. description of specific part of mitosis affected e.g. no spindle fibres ; 	(4)

Question Number	Answer	Mark
2 (b)(iii)	<ol style="list-style-type: none"> 1. randomised trial / eq ; 2. {large number / eq} of patients ; 3. double blind / eq ; 4. idea of {use of placebo / use of current treatment} ; 5. testing how effective the drug is on patients / eq ; 	(2)

Question Number	Answer	Mark
2 (c)	<ol style="list-style-type: none"> 1. yeast cells have human collagen {gene / allele / DNA / eq} ; 2. idea that new collagen is recognised as 'self' e.g. has no non-self antigens ; 3. does not trigger immune response / eq ; 	(2)

Question Number	Answer	Mark
3 (a)(i)	1. cage with no enrichment / eq ; 2. idea of same regime e.g. starvation time, feeding time, time in cage ;	(2)

Question Number	Answer	Mark
3 (a)(ii)	idea of motivation e.g. to encourage them to look for food ;	(1)

Question Number	Answer	Mark
3 (b)	1. overall trend increases / eq ; 2. idea of rapid increase in visiting over first {2 / 3 / 5} days / eq ; 3. after this the increase in visiting slows down / eq ; 4. comment on lower percentage on day 4 ; 5. comment on levels off from day {5 / 9} ; 6. idea that the rats did not visit all the floors (on each day) e.g. 100% of the floors never achieved ; 7. manipulation of figures / eq ;	(3)

Question Number	Answer	Mark
3 (c)	1. idea that exploration encouraged in group P ; 2. due to {enrichment / hidden food / eq} ; 3. idea that they are more intrepid e.g. they visit more of the maze ; 4. {better / more adept / eq} at looking for food / learnt to look for food ;	(2)

Question Number	Answer	Mark
3 (d)	<ol style="list-style-type: none">1. more synapses /eq ;2. idea that more {connections between neurones / neurones connected together} ;3. idea of better learning capacity ;	(2)

Question Number	Answer	Mark
6(a)	<ol style="list-style-type: none"> 1. reference to {restriction enzyme / endonuclease} ; 2. to cut gene out of animal DNA ; 3. idea of amplification using DNA polymerase (in PCR) ; 4. (enzymes) open plasmid ; 5. (same endonuclease) to produce 'sticky ends' /description / at selected base sequence ; 6. H bonds formed between bases at 'sticky ends' ; 7. ligase ; 8. to join gene to plasmid / eq ; 9. reference to {phosphodiester / eq} bond ; 	(5)

Question Number	Answer	Mark
6(b)	<ol style="list-style-type: none"> 1. (small) {circle /eq} of DNA ; 2. containing bacterial (survival) genes and {protein / animal} gene ; 3. marker gene / description given ; 	(2)

Question Number	Answer	Mark
6(c)	<ol style="list-style-type: none"> 1. idea of easier to manage growth e.g. do not need sterile conditions ; 2. idea that it is safer (than bacteria) ; 3. idea of more protein can be made /eq ; 4. bacteria may not have correct amino acids to make protein / eq ; 5. idea that it could produce edible drugs ; 6. idea that plants have introns/bacteria do not so gene does not need modifying ; 7. idea that it is cheaper ; 	(2)

Question Number	Answer	Mark
6(d)	<ol style="list-style-type: none"> 1. idea of gene transfer to other {species / eq} ; 2. idea of consequence of transfer e.g. resistance to pesticide / antibiotics, superweeds ; 3. idea of possible harmful effects from genes e.g. biochemical changes to substances that could act as allergens, long term effects of consuming ; 4. idea that benefit focused on developed countries / converse ; 5. idea of risk related to use of viral vectors ; 6. idea of effect on organic farmers ; 	(2)

Question Number	Answer	Additional guidance	Mark
2(a)	<ol style="list-style-type: none"> 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 ; 	<p>ACCEPT 1 - image resolution {higher in MRI / lower in CT} / MRI offers more detail</p> <p>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</p> <p>ACCEPT 8 - MRI more expensive than CT</p>	(3)

Question Number	Answer	Additional guidance	Mark
2(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
2(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
2(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
2(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)

Question Number	Answer			Additional Guidance	Mark
6(a)	Labelled structure	Name of structure	One function		
	A	Medulla (oblongata) ;	Controls {breathing / heart / eq} ;	For A ACCEPT involuntary muscles or named e.g. swallowing, vomiting, sneezing IGNORE brain stem	
	C ;	Cerebral hemisphere/ cerebrum / frontal cortex ;	Feel emotions	For cerebrum, reject cerebellum For cerebrum, accept frontal lobe/prefrontal / cerebral cortex	(4)

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	1. idea that cuts at a specific sequence of bases ; 2. idea of (generates) sticky ends ; 3. so easier to join together / eq ;	1. ACCEPT DNA sequence 3. ACCEPT to produce {same / complementary / eq} sticky ends (in plasmid and (human) gene)	(2)

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	<ol style="list-style-type: none"> 1. the chemical could be a {transcription factor / hormone} ; 2. idea of interaction at (bacterial) cell (surface) membrane ; 3. idea of transcription factor being activated ; (e.g. transcription initiation complex formed, binds to transcription factor) or counters inhibitor ; 4. ref to promoter region ; 5. idea of transcription occurs e.g. RNA polymerase binds, mRNA produced ; 	<ol style="list-style-type: none"> 2. ACCEPT binds to cell surface membrane/passes through 3. ACCEPT triggers secondary messenger to be released {into cytoplasm/from (inner side of) membrane} 5. NOT DNA polymerase 	(3)

Question Number	Answer	Additional Guidance	Mark
6(b)(iii)	(ribosome has) larger and smaller subunit / (ribosomal) protein and rRNA ;	ACCEPT ref to 2 subunits ACCEPT 30S and 50S subunits	(1)

Question Number	Answer	Additional Guidance	Mark
6(b)(iv)	1. larger lumen so easier to put into blood / eq ; 2. (less muscle / thinner wall) so easier to penetrate / eq ; 3. (blood) pressure less so less damage to vein / eq ; 4. idea that vein is easier to find;	ACCEPT converse when appropriate IGNORE ref to 'going to the heart' 3. ACCEPT (blood) pressure less so less blood loss 4. ACCEPT nearer the skin surface/easier to access	(2)

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	1. identical twins (agreement) is greater / eq ; 2. credit correct manipulation of the data e. g. {41% more / 2.4x as much / 141% higher / eq} agreement than non-identical twins ; 3. idea that alleles are involved ; 4. idea that non-identical have genetic differences ; 5. idea that because less than 100% then some other factor is involved ;	ACCEPT converse where appropriate 2. ACCEPT 41% difference 3. ACCEPT gene alternatives 3 and 4 IGNORE genes / DNA unqualified 4. ACCEPT identical twins are genetically the same	(4)

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	idea that there is less of a gap between the results ;	ACCEPT expressed as numbers, results similar (to each other), identical twin result is lower, non-identical higher	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)	<ol style="list-style-type: none"> 1. idea that active areas have more {oxygen / oxygenated blood} ; 2. active areas involved in face recognition will be identified / eq ; 3. idea of level of brain activity between identical twins and non identical twins is compared ; 4. to offer supportive evidence / improve validity of study ; 5. idea that fMRI shows brain activity in real time ; 6. idea of high resolution ; 7. comment on safety / eq ; 	<ol style="list-style-type: none"> 3. areas more active / more oxygenated blood flowing to areas in identical twins compared with non-identical twins 3. idea of {more / eq} areas showing activity in common in identical twins than non-identical 5. IGNORE 3D image 6. ACCEPT more detail 7. fMRI does not use X rays 	(4)

Question Number	Answer	Additional Guidance	Mark
3(c)(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
3(c)(ii)	D ;	(1)

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	<p>correct answer with units gains full marks</p> <p>1. $5 \div 90$;</p> <p>2. $= \{ 0.056 / 0.06 \} \text{ au min}^{-1}$;</p> <p>OR</p> <p>3 $[(0.3 \div 30) + (3.7 \div 30) + (1 \div 30) \div 3]$;</p> <p>4 $= \{0.054 / 0.05\} \text{ au min}^{-1}$;</p>	<p>ACCEPT answer expressed as e.g. 3.6 au per hour</p> <p>2 ACCEPT au/min, au per min</p>	(2)

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	<p>1. idea that rate of use is greater than uptake from gut ;</p> <p>2. idea that L-Dopa leaves the blood into tissues ;</p> <p>3. L-Dopa crosses the blood-brain barrier / eq ;</p> <p>4. converted to dopamine / eq ;</p> <p>5. L-Dopa is broken down / eq ;</p>	<p>1 IGNORE: less being absorbed, running low in gut unqualified</p> <p>4 ACCEPT L-Dopa is a precursor to dopamine</p> <p>5 ACCEPT metabolised for broken down</p>	(4)

Question	Answer	Additional Guidance	Mark
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Number			
6(b)(i)	when{ touched / eq } the tentacles { not pulled into body / remain outside body / eq } ;	ACCEPT: no response when touched / no reaction to stimulus	(1)

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	1. use habituated sea anemone / eq ; 2. idea of stimulate after leaving for different lengths of time ; 3. idea of repetition at each different time ; 4. note time when anemone responds to being touched / eq ;	2 ACCEPT examples given 4 ACCEPT note time when withdraws tentacles into body	(3)

Question Number	Answer	Additional Guidance	Mark
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Number			
4(a)	<ol style="list-style-type: none"> 1. { identical / monozygotic twins } are genetically identical / eq ; 2. derived from one egg and one sperm / one { zygote / embryo / eq } / eq ; 3. (so any phenotypic) difference is due to { nurture / environmental } / eq ; 4. { non-identical twins / dizygotic twins } are genetically different ; 5. (any phenotype) that is different when the environment is the same is likely to be { nature / genetic / eq } / eq ; 	<p>ACCEPT comments on monozygotic twins (MZ) raised apart as a context</p> <p>1 ACCEPT same alleles IGNORE: same DNA / genes</p> <p>2 ACCEPT one fertilised egg, ball of cells, blastula</p>	(4)

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	<ol style="list-style-type: none"> 1. study groups from different cultures / eq ; 2. (If) outcome is the same then (likely to be) nature ; 3. (If) outcome is different in the groups then (likely to be) nurture ; 	<p>1 IGNORE different countries / environments</p>	(2)

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	1. idea of large sample size ; 2. idea of standardised sampling technique e.g. age, gender ; 3. same (range of) emotions used / eq OR standard methodology e.g. same photos ;		(2)