

MARKING INSTRUCTIONS FOR HIGHER UNIT 1 QUESTION BOOKLET

Topic 1.1 - The Structure and Organisation of DNA

Question	Expected Answer(s)	Max Mark	Additional Guidance
1.	A	1	
2.	C	1	
3.	C	1	
4.	B	1	
5.	C	1	

Question	Expected Answer(s)	Max Mark	Additional Guidance
6. a i	Prokaryotic has circular (chromosome) AND eukaryotic has linear (chromosomes)	1	NOT – eukaryote has linear chromosome and prokaryote has not NOT – prokaryotic has plasmid alone.
a ii	Proteins/ Histone	1	
b	Mitochondrion OR Chloroplast OR plasmid in yeast	1	

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Question		Expected Answer(s)	Max Mark	Additional Guidance
6	a	0.24	1	
	b	32	1	
	c	Inclusive scale and axes labels copied exactly from table headings =1 Points plotted and joined with a ruler =1	2	
	d	Only donor 2 is suitable OR donor 2 is most suitable	1	
	e i	TACTGTTTAGC	1	
	e ii	Separates strands/splits up DNA strands/breaks H bonds between strands/denatures DNA/unzips DNA =1 Any temperature from 50 - 65 =1	2	NOT - splits DNA alone

Question		Expected Answer(s)	Max Mark	Additional Guidance
7.	a	Stage 1 separates strands or breaks H bonds Stage 2 allows primer to bond/anneal to strand/target sequence	2	
	b	7	1	
	c	identical set up but without primers	2	
	d	Forensic use/ paternity testing	1	

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1.3 DNA and the production of proteins

Question	Expected Answer(s)	Max Mark	Additional Guidance
1.	A	1	
2.	B	1	
3.	B	1	
4.	C	1	

Question	Expected Answer(s)	Max Mark	Additional Guidance
5	a	1	Introns NOT - non-coding regions.
	b	1	1,3,4 / 2,3,4 Must be in correct order and inversions not acceptable.

Question	Expected Answer(s)	Max Mark	Additional Guidance
6.	a	1	Amino acid
	b	1	Protein OR Enzymes
	c	1	Cut/cleave AND combine polypeptide chains OR add phosphate/ carbohydrate NOT – post translational modification NOT – cleave/cut alone
	d	2	Name: Alternative (RNA) splicing =1 Description: Different (combinations of / variety of) exons are included/ spliced together (in the mature transcript/ RNA) =1 NOT – a description suggesting the order of exons is changed NOT – depends what sections are treated as exons and introns

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Question		Expected Answer(s)	Max Mark	Additional Guidance
7.	a i	Intron/Intron1/Intron 2	1	
	a ii	(Alternative) RNA splicing	1	
	a iii	Depending on which RNA segments are treated as exons and introns =1 different segments can be spliced together to produce different mRNA transcripts or appropriate example from diagram =1	2	
	b	Cutting and combining different protein chains or adding phosphate to the protein or adding carbohydrate to the protein	1	

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1.4 Cellular Differentiation

Question	Expected Answer(s)	Max Mark	Additional Guidance
1.	D	1	

Question	Expected Answer(s)	Max Mark	Additional Guidance
2. a i	Can only differentiate/specialise/change into- a few types of cell/myoblasts/muscle cells/limited variety of cells/cells of the tissue that it came from (or converse)	1	NOT- can only differentiate into a limited number of cells without reference to type. NOT- multipotent alone.
a ii	Growth/repair/renewal of muscle (tissue). OR Increase number of muscle cells for growth/repair (of muscles). OR Become muscle cells for growth/repair (of muscles).	1	NOT- repair of muscle cells. NOT- growth of muscle cells. NOT- increase number of muscle cells alone
a iii	Does not involve destruction/killing of a (potential) life/embryo.	1	
b	Testing/ development of drugs/ medicines. OR Study how diseases develop (or description of development of a named disease). OR Study cell growth/cell division/ cell differentiation/ gene regulation.	1	NOT- descriptions of therapeutic uses. NOT- researching diseases. NOT- study cell processes

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Question		Expected Answer(s)	Max Mark	Additional Guidance
3.	a	<p>It differentiates into/specialises into/ becomes...</p> <p>many/lots of/all/wide range of cell types/tissue types</p> <p>OR</p> <p>It is pluripotent/totipotent</p>	1	NOT – multipotent
	b	<p>Different proteins will be produced/ synthesised/made (resulting in different cell types)</p> <p>OR</p> <p>Only proteins characteristic of that cell type are produced/ synthesised/ made</p>	1	NB : Protein coded for \neq synthesised
	c	<p>Repair of damaged/diseased... organs/cells/tissues</p> <p>OR</p> <p>Production of tissues for grafting / transplant</p> <p>OR</p> <p>Correct examples eg bone marrow transplants/(make) skin grafts/ to treat a named disease/treat burns</p>	1	<p>NOT – cure/treat diseases alone</p> <p>NOT – research diseases</p>
	d	<p>Embryo/it/baby/foetus/a potential life... is... destroyed/killed/not allowed to develop</p> <p>OR</p> <p>Embryos which would have been destroyed are being put to good use</p> <p>OR</p> <p>Use of stem cells for drug testing rather than animals</p> <p>OR</p> <p>Diseases could be cured</p>	1	NOT – religious reasons alone

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Question		Expected Answer(s)	Max Mark	Additional Guidance
4.	a i	<p>From.... start/0 – 5 weeks/over first 5 weeks it increased from 0 – 9·2 =1</p> <p>From 5 (- 7) weeks it remained constant/levelled off =1</p> <p>Correct values for 2 statements but no units (weeks) = 1</p>	2	
	a ii	200	1	
	a iii	B	1	
	b	<p>B It/ number of shoots is highest/greatest (at 7 weeks) =1</p> <p><u>and</u></p> <p>this is (still) increasing =1</p> <p>OR</p> <p>C It/ number of shoots... is increasing more/ most rapidly =1</p> <p><u>and</u></p> <p>B is slowing down/levelling off =1</p>	2	
	c	<p>Greatest (average) root length/ Longer roots =1</p> <p>More water absorbed for photolysis/photosynthesis</p> <p>OR</p> <p>More nutrients absorbed for named process eg protein synthesis/ATP production etc. =1</p>	2	

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Question		Expected Answer(s)	Max Mark	Additional Guidance
5.	a	Increase in stroke volume/volume of blood pumped out of heart per heartbeat (in patients given the treatment) =1 No effect on heart rate (of patients given the treatment) =1	2	
	b	1190	1	
	c i	Embryonic stem cells differentiate/develop into all/many types of cell AND adult/tissue stem cells differentiate/develop into less/narrower range of/limited cell types OR Adult stem cells are more differentiated/specialised than embryonic stem cells	1	
	c ii	They express/switch on the genes characteristic of that type of cell OR Certain genes/some genes are expressed/switched on (and other genes are switched off)	1	NOT - genes are switched on and off
	d	Provide information on gene regulation/cell growth/cell differentiation/cell division/cell ageing/disease development OR Use as model cells to study how diseases develop OR For drug testing	1	

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1.5 The Structure of the Genome

Question	Expected Answer(s)	Max Mark	Additional Guidance
1.	D	1	

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Topic 1.6 - Mutations

Question	Expected Answer(s)	Max Mark	Additional Guidance
1.	B	1	
2.	A	1	
3.	A	1	

Question	Expected Answer(s)	Max Mark	Additional Guidance
4. a i	Shorter protein/fewer amino acids. =1 Stop codon is produced earlier (in the sequence) =1	2	NOT- non-functional protein. NOT- protein is short. NOT- stop codon is produced alone
a ii	Every amino acid after the mutation is changed/affected.	1	NOT- frame shift mutation alone.

Question	Expected Answer(s)	Max Mark	Additional Guidance
5. a i	(At least one) extra set of chromosomes OR More than 2 (complete) sets of chromosomes. OR 2n becomes 3n/4n etc. OR genome duplication/multiple sets of genome	1	NOT – more than 1 set of chromosomes NOT – 3n/4n/5n alone NOT – sets of DNA/genes/genetic material in place of chromosomes

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Question		Expected Answer(s)	Max Mark	Additional Guidance
	a ii	<p>Provides additional material upon which natural selection can work on</p> <p>OR</p> <p>Additional sets of chromosomes can mask harmful mutations</p> <p>OR</p> <p>Allows (advantageous) mutations to occur in extra chromosomes</p> <p>OR</p> <p>Can produce fertile/stable hybrids</p> <p>OR</p> <p>They are more vigorous/disease resistant/grow faster</p>	1	<p>NOT – increased yield/size/seedless varieties</p> <p>NOT – Polyploidy provides/creates new variation for natural selection</p> <p>NOT – hybrid vigour</p>

Question		Expected Answer(s)	Max Mark	Additional Guidance
6.	a	translocation	1	
	b i	competitive	1	
	b ii	95	1	
	b iii	<p>Drug was effective as white blood count reduced to normal =1</p> <p>Drug works by inhibiting the enzyme produced by Philadelphia chromosome =1</p>	2	

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Topic 1.7 - Evolution

Question	Expected Answer(s)	Max Mark	Additional Guidance
1.	B	1	
2.	D	1	

Question	Expected Answer(s)	Max Mark	Additional Guidance
3. a	<p>From 2009/from the start it increases from 10% to 66% in 2015. OR</p> <p>Over the first 6 years it increases from 10% to 66%. =1</p> <p>Then stays constant (until 2016). =1</p>	2	<p>Cannot access any marks if 66 and 2015 not mentioned.</p> <p>Must state % unit at least once to gain full marks. All correct values but no % unit = 1.</p> <p>If additional points are correctly described do not negate.</p>
b	<p>Resistant plants survive</p> <p>OR</p> <p>Non-resistant die. =1</p> <p>Pass resistance-</p> <ul style="list-style-type: none"> • genes/alleles/sequences • to next generation/to offspring/vertically. <p>OR</p> <p>Reproduce/breed</p> <ul style="list-style-type: none"> • and pass on resistance • genes/alleles/sequences. =1 	2	<p>NOT- pass on characteristic/ traits/resistance.</p>

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Question		Expected Answer(s)	Max Mark	Additional Guidance
	c	<p>Bacteria can exchange-</p> <ul style="list-style-type: none"> • genetic material/plasmids • horizontally/ in same generation • and charlock cannot/charlock transfers vertically. <p>OR</p> <p>Horizontal gene transfer is faster (or converse).</p>	1	NOT- horizontal gene transfer is fast.

Question		Expected Answer(s)	Max Mark	Additional Guidance
4.	a i	Sympatric	1	
	a ii	<p>Prevents/interrupts/stops/blocks... gene flow/gene exchange/breeding/ mating... between populations</p> <p>OR</p> <p>Prevents interbreeding</p>	1	NOT – stops populations from mating/ breeding alone
	a iii	<p>(DNA) sequence data/genome analysis would be similar</p> <p>OR</p> <p>They/the two populations... can interbreed/breed together... to produce fertile offspring (or converse statement)</p>	1	<p>NOT – they can breed to produce fertile offspring</p> <p>NOT – answers referring to 2 species instead of 2 populations</p>

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Topic 1.8 - Genomic Sequencing

Question	Expected Answer(s)	Max Mark	Additional Guidance
1.	C	1	
2.	B	1	
3.	A	1	
4.	D	1	

Question	Expected Answer(s)	Max Mark	Additional Guidance
5. a i	550	2	
a ii	260	1	
a iii	<p>Last common ancestor (of rats and humans) was more recent (than rats and frogs).</p> <p>OR</p> <p>Last/most recent common ancestor of rats and humans was 90 million years ago while rats and frogs was 420 million years ago.</p> <p>OR</p> <p>Rats diverged more recently from humans than from frogs.</p>	1	
b i	28	1	
b ii	Any value from 27 to 28	1	
c	21	1	

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Question		Expected Answer(s)	Max Mark	Additional Guidance
6.	a	sequence data	1	
	b	horizontal / lateral	1	
	c i	25	1	
	c ii	<p>Last common ancestor of humans and chimpanzees was more recent than humans and orangutans =1</p> <p>Chimpanzees and humans 5 million years ago, orangutans and humans 19 million years ago =1</p>	2	