

Second Semester

BIOLOGY
البيولوجيا

(Answers)



مركز القياس والتقويم التربوي
The Center for Educational Assessment
and Measurement (CEAM)

نموذج إجابة امتحان دبلوم التعليم العام- المدارس الخاصة

للعام الدراسي: ١٤٤٤هـ - ٢٠٢٢/٢٠٢٣م

الدور: الأول - الفصل الدراسي: الثاني

المادة: الأحياء



سَلْطَنَةُ عُمَانَ
وَمِنَارُهَا الْبَرِّيَّةُ وَالْبَحْرِيَّةُ


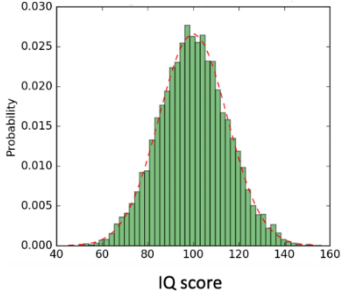
Note: Answer guide in (5) sheets.

Total marks: 70

Part 1: Multiple Choice

Each Question: 1 mark

Total: 14 marks

Q	Ch	Answer	Page		Outcome	Level of learning			
			Cambr	Hodd					
1	٥	Each DNA molecule formed would have one new strand and one original strand.	150	126-127	5.1.3	Knowledge			
2		<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="padding: 5px;">purine</td> <td style="padding: 5px;">two hydrogen bonds</td> <td style="padding: 5px;">ribose</td> </tr> </table>	purine	two hydrogen bonds	ribose	144-148	121, 123	5.1.1	Application
purine		two hydrogen bonds	ribose						
3		N and R	148-149	123-125	5.1.2	Application			
4	CGT ACG TTT TAT TTG	151-152	136-137	5.2.1	Reasoning				
5	٦	alleles	433-436	352	6.2.1	Knowledge			
6			431	438	6.1.3	Application			
7		insertion	452	371	6.2.5	Application			
8		DFE	434	345, 347	6.1.5	Reasoning			
9	٧	discontinuous variation	465-466	380	7.1.1	Knowledge			
10			466	381	7.1.2	Application			
11	٨	microarrays.	560	470	8.1.1 2	Knowledge			
12		<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="padding: 5px;">Restriction endonucleases</td> <td style="padding: 5px;">Ligase</td> </tr> </table>	Restriction endonucleases	Ligase	548	462-465	8.1.3	Application	
Restriction endonucleases		Ligase							
13		1, 2 and 4 only.	570	482	8.1.1 5	Application			
14	(1 – 2) and (5 – 6)	556	461	8.1.2	Reasoning				

Part 2: Extended Response (56 marks)

Chapter 5 (15 marks)

Q	Answer	Mark	Page		outcome	Level of learning	
			Cambr	Hodd			
15 (4m)	a.	By Hydrogen bonds between bases.	1	148	123	5.1.3	Knowledge
	b.	(i) 30 %	1	148	123	5.1.1 5.1.2	Application
		(ii) the ratio of <u>A</u> to <u>T</u> , (1 mark) and the ratio of <u>C</u> to <u>G</u> , is not equal. (1 mark)	2	148	123	5.1.1 5.1.2	Reasoning
16 (6m)	a.	Translation.	1	154	136	5.2.2	Knowledge
	b.	X: tRNA. (1 mark)	3	154	136	5.2.2	Knowledge
		Y: start codon. (1 mark)					
		Z: ribosome. (1 mark)					
c.	A peptide bond forms between two amino acids.	1	154	136	5.2.3	Application	
d.	CTA	1	154	136	5.2.3	Reasoning	
17 (5m)	a.	More harmful. (1 mark)	2	155	138	5.2.4	Application
		Because it may be transferred to offspring. (1 mark)					
	b.	(i) Substitution.	1	155	138	5.2.4	Application
(ii) - Mutation 1: The two codons (original and mutated) code for the same amino acid (alanine). (1 mark) - Mutation 2: Change in sequence of the amino acids, valine is replaced by alanine. (1 mark)	2						

Chapter 5 (15 marks): 5Knowledge 7Application 3Reasoning

C. Part 2: Extended Response.

Chapter 6 (18 marks)

Q	Answer	Mark	Page		outcome	Level of learning
			Cambr	Hodd		
18 (8m)	a. (i) has the same effect on phenotype, whether or not another allele is present. (ii) - Hh (1 mark) - <u>H and h</u> (1 mark for both) - <u>hairy and wooly.</u> (1 mark for both)	1	437	352	6.2.1	Knowledge
		3	437	352	6.2.2	Application
			438	353	6.2.2	Application
			437-438	352-353	6.2.2	Application
b.	(i) The position of a gene on a chromosome.	1	433	344	6.2.1	Knowledge
	(ii) Dominant.	1	437	352	6.2.1	Application
	(iii) Because of the <u>independent assortment</u> .	1	434	348	6.1.5	Application
	(iv) aaDd OR aaDD.	1	441-442	360-361	6.2.2	Reasoning
19 (5m)	a. Sex linked.	1	440-441	358-359	6.2.2	Knowledge
	b. - Father's genotype: $X^H y$ (1 mark) - Mother's genotype: $X^H X^h$ (1 mark)	2	441	359	6.2.2	Application
	c. - 100% (1 mark) - 0 % (Zero) (1 mark)	2	441	359	6.2.2	Reasoning
20 (5m)	a. (i) codominance. (1 mark) (ii) genes that are located on different chromosomes. (1 mark)	2	437, 445	355, 363	6.2.1	Knowledge
	b. - Ff $N^D N^D$ (1 mark) - ff $N^D N^L$ (1 mark)	2	445	363	6.2.2	Application
	c. <u>Stripes of deep pink and royal blue.</u>	1	445	363	6.2.2	Reasoning

Chapter 6 (18 marks): 5Knowledge 9Application 4Reasoning

C. Part 2: Extended Response.

Chapter 7 (7 marks)

Q	Answer	Mark	Page		outcome	Level of learning										
			Cambr	Hodd												
21 (7m)	a.	a feature of the environment of an organism that affects its survival or its phenotype.	1	467	381	7.1.4	Knowledge									
	b.	continuous.	1	466	381	7.1.1	Knowledge									
		Because it is controlled by two genes.	1													
	c.	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Parent 1 Parent 2</td> <td style="text-align: center;">AB</td> <td style="text-align: center;">Ab</td> <td style="text-align: center;">aB</td> <td style="text-align: center;">ab</td> </tr> <tr> <td style="text-align: center;">AB</td> <td style="text-align: center;">20 cm</td> <td style="text-align: center;"></td> <td style="text-align: center;">18 cm</td> <td style="text-align: center;">16 cm</td> </tr> </table> <p><i>(1 mark for each phenotype)</i></p>	Parent 1 Parent 2	AB	Ab	aB	ab	AB	20 cm		18 cm	16 cm	3	466-467	381-382, 386	7.1.2
Parent 1 Parent 2	AB	Ab	aB	ab												
AB	20 cm		18 cm	16 cm												
d.	19 cm.	1	467	382	7.1.4	Reasoning										

Chapter 7 (7marks): 2Knowledge 4Application 1Reasoning

C. Part 2: Extended Response.

Chapter 8 (16 marks)

Q	Answer	Mark	Page		outcome	Level of learning
			Cambr	Hodd		
22 (7m)	a. X: TPA gene. (1 mark) Y: Plasmid. (1 mark)	2	548	465	8.1.3	Application
	b. Restriction enzyme.	1	548	462	8.1.3	Knowledge
	c. - Cutting the plasmid with the same (restriction) enzyme to form sticky ends. (1 mark) - treatment with ligase enzyme. (1 mark)	2	548	462	8.1.2 8.1.11	Knowledge
	d. - reliable supply available. - produce large quantities quickly. - supplies are not dependent factors. - acceptable to patients. - an immediate response is generated. (Only two, 1 mark for each)	2	549	472	8.1.4	Application
23 (6m)	a. Y: nucleotides. (1 mark) Z: DNA polymerase. (1 mark)	2	555	461	8.1.2	Application
	b. DNA can be amplified/copied.	1	545	461	8.1.2	Application
	c.	2	555-556	461	8.1.2	Reasoning
	d. bind to DNA strands, so DNA polymerase can start synthesizing DNA.	1	555	461	8.1.2	Reasoning
24 (3m)	a. - recombinant <u>human insulin</u> . - <u>factor VIII</u> – a blood-clotting protein. - <u>adenosine deaminase</u> . (Only one)	1	564	472-473	8.1.11	Knowledge
	- <u>Bt toxin</u> gene transferred to crop plants to make them resistant to insect pests.	1	571	484	8.1.15	Knowledge
	b. Genetic screening.	1	564	474-475	8.1.13	Application

Chapter 8 (16 marks): 5Knowledge 8Application 3Reasoning

END OF THE MARKING GUIDE

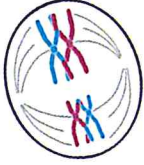
Note: Answer guide in (5) sheets.

Total marks: 70

Part 1: Multiple Choice

Each Question: 1 mark

Total: 14 marks

Q	Ch	Answer	Page		Outcome	Level of learning				
			Cambr	Hodd						
1	5	thymine and uracil.	144	121	5.1.1	Knowledge				
2		280	149	123	5.1.2	Application				
3		a substitution mutation.	155	137	5.2.4	Application				
4		CAT	151	119	5.2.1	Reasoning				
5	6		430-431	345-346	6.1.3	Knowledge				
6		recessive.	437-439	352-353	6.2.1	Application				
7		deletion.	452	370	6.2.4	Application				
8		<table border="1" style="width: 100%; text-align: center;"> <tr> <td>independent assortment</td> <td>new combination</td> <td>haploid</td> </tr> </table>	independent assortment	new combination	haploid	434	344, 348	6.1.5	Reasoning	
independent assortment	new combination	haploid								
9	7	environmental and genetic.	472-473	383	7.1.4	Knowledge				
10		multiple genes.	466-467	381-383	7.1.2	Application				
11	8	recombinant DNA.	544	458	8.1.1	Knowledge				
12		<table border="1" style="width: 100%; text-align: center;"> <tr> <td>X</td> <td>Y</td> </tr> <tr> <td>Insulin gene</td> <td>vector</td> </tr> </table>	X	Y	Insulin gene	vector	550	465	8.1.3	Application
X		Y								
Insulin gene		vector								
13	1, 2, and 3.	572	482	8.1.15	Application					
14	D	558	468-469	8.1.8 8.1.9	Reasoning					

Part 2: Extended Response (56 marks)

Chapter 5 (15 marks)

Q	Answer	Mark	Page		outcome	Level of learning
			Cambr	Hodd		
15 (4m)	a. (i) transcription. (1 mark)	2	151	131-132	5.2.3	Knowledge
	(ii) in the nucleus. (1 mark)					
b.	X: RNA polymerase. (1 mark)	2	151	132	5.2.3	Application
	Y: mRNA (1 mark)					
16 (6m)	(i) leading strand.	1	149	125-126	5.1.3	Knowledge
	a. (ii) <u>DNA polymerase can only copy in the 5 to 3 direction</u> (1 mark) along each strand, so <u>it follows the unwinding process</u> , (1 mark) copying the DNA as it is unwound.	2	149	125-126	5.1.3	Reasoning
	b. (i) Okazaky fragment OR lagging strand.	1	149	126	5.1.3	Application
	(ii) DNA ligase.	1				
17 (6m)	a. X: polypeptide chain. (1 mark)	2	154	136	5.2.2 5.2.3	Knowledge
	Z: Peptide bond. (1 mark)					
	b. Leu	1	154	136-137	5.2.2 5.2.3	Application
	c. GAC	1	154	120	5.2.1	Reasoning
d.	Translation is the process by which a <u>sequence of bases in mRNA is converted</u> (1 mark) into a <u>sequence of amino acids in polypeptide</u> . (1 mark)	2	152	135	5.2.3	Application

Chapter 5 (15 marks): 5Knowledge 7Application 3Reasoning

Part 2: Extended Response.

Chapter 6 (18 marks)

	Answer	Mark	Page		outcome	Level of learning												
			Cambr	Hodd														
18 (8m)	(i) dihybrid inheritance.	1	441	360	6.2.1 6.2.2	Knowledge												
	a. (ii) - Bbrr (1 mark) - grey coat with red eyes. (1 mark)	2	441-443	360-361	6.2.2	Application												
	(iii) BbRr	1	441-443	360-361	6.2.2	Reasoning												
	b. (i) codominance (ii) <table border="1" style="margin-left: 20px;"> <tr> <td></td> <td>I^A</td> <td>I^B</td> </tr> <tr> <td>I^A</td> <td>I^A I^A</td> <td>I^A I^B</td> </tr> <tr> <td>I^B</td> <td>I^A I^B</td> <td>I^B I^B</td> </tr> </table> <p>1 mark for one correct parental genotype 1 mark for the child's genotype of A blood group 1 mark for the child's genotype of B blood group</p>		I ^A	I ^B	I ^A	I ^A I ^A	I ^A I ^B	I ^B	I ^A I ^B	I ^B I ^B	3	437	356	6.2.2	Application			
	I ^A	I ^B																
I ^A	I ^A I ^A	I ^A I ^B																
I ^B	I ^A I ^B	I ^B I ^B																
19 (5m)	a. multiple alleles.	1	437	356	6.2.2	Knowledge												
	b. - white (1 mark) - dots of carmine and purple colors. (1 mark)	2	442-445	361-363	6.2.2	Application												
	c. - I ^R I ^R ee (1 mark) - I ^C I ^C ee (1 mark)	2	442-445	361-363	6.2.2	Reasoning												
20 (5m)	a. - sex linked trait. (1 mark) - carrier. (1 mark)	2	440-441	358-359	6.2.2	Knowledge												
	b. <table border="1" style="margin-left: 20px;"> <tr> <td>Female</td> <td>X^F</td> <td>X^f</td> </tr> <tr> <td>Male</td> <td>X^F</td> <td>X^f</td> </tr> <tr> <td></td> <td>healthy</td> <td>healthy</td> </tr> <tr> <td></td> <td>healthy</td> <td>affected</td> </tr> </table> <p>- All females are healthy (1 mark). - Half of the males are healthy and the other half is affected (1 mark).</p>	Female	X ^F	X ^f	Male	X ^F	X ^f		healthy	healthy		healthy	affected	2	440-441	358-359	6.2.2	Application
	Female	X ^F	X ^f															
Male	X ^F	X ^f																
	healthy	healthy																
	healthy	affected																
c. X ^f Y	1	440	358	6.2.2	Reasoning													

Chapter 2 (18 marks): 5Knowledge 9Application 4Reasoning

C. Part 2: Extended Response.

Chapter 7 (7 marks)

	Answer	Mark	Page		outcome	Level of learning
			Cambr	Hodd		
21 (7m)	a. continuous. (1 mark) it is controlled by two genes. (1 mark)	2	465-466	381	7.1.1	Application
	b. (i) the level of nutrients in soil (1 mark) and the spacing between the plants (1 mark).	2	465-466	381	7.1.4	Knowledge
	(ii) the <u>genotype</u> of the seeds allows them to <u>grow large</u> (1 mark). So, when they were transferred to <u>medium C</u> which is <u>high in nutrients level</u> and has <u>large spacing</u> these <u>factors</u> allowed them to reach a large size (1 mark).	2	465-466	381	7.1.4	Application
	c. 6 kg.	1	468	382	7.1.4	Reasoning

Chapter 3 (7marks): 2Knowledge 4Application 1Reasoning

C. Part 2: Extended Response.

Chapter 8 (16 marks)

	Answer	Mark	Page		outcome	Level of learning
			Cambr	Hodd		
22 (7m)	a. The DNA is denatured (1 mark) by heating it to about 95°C. (1 mark)	2	555 557	461- 465	8.1.2	Application
	(i) DNA polymerase.	1				
	b. (ii) It will not be destroyed by the denaturation stage(1 mark), so it does not have to be replaced during each cycle (1 mark).	2	555 557	460- 465	8.1.3	Application
	c. - DNA is amplified using PCR. (1 mark) - DNA is separated by gel electrophoresis. (1 mark)	2	555 557	460- 465	8.1.10 8.1.2	Application
23 (4m)	a. fragments of DNA formed by a restriction enzyme(1 mark) which have exposed nucleotides that are complementary to each other. (1 mark)	2	545	462	8.1.3	Knowledge
	b. a particular restriction enzyme will cut any type of DNA in exactly the same position. (1 mark) sticky ends will be complementary so DNA from any organism can be joined to DNA from any other organism. (1 mark)	2	544	459	8.1.3	Knowledge
24 (5m)	a. Treatment of a genetic disorder by inserting genetically corrected cells into the body.	1	564	477	8.1.13	Knowledge
	b. Lungs become blocked by mucus and are prone to infection.	1	565	475	8.1.13	Application
	c. - reduce the number of children born with genetic disorders. (1 mark) - economic benefit. (1 mark)	2	566 568	480	8.1.14	Reasoning
	d. CF is caused by a recessive allele of the gene.	1	564	474	8.1.14	Reasoning

Chapter 8 (16 marks): 5Knowledge 8Application 3Reasoning

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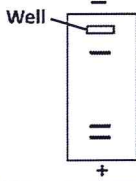
MARKING GUIDE



Part 1: Multiple Choice

Each Question: 1 mark

Total: 14 marks

Q	Ch	Answer	Outcome	Page Number		Level of learning			
				Cambr	Hodd				
1	1 33%	bases	5.2.4	118	124	Knowing			
2		nucleotides	5.1.2	118	120	Knowing			
3		301	5.2.2	119	118	Applying			
4		TAACTG	5.1.1	112	111	Applying			
5		20%	5.2.1	119	119	Reasoning			
6	2 33%		6.1.1	365	343	Knowing			
7		<table border="1" style="width: 100%;"> <tr> <td style="width: 33%;">1. Condensation of chromosomes.</td> <td style="width: 33%;">2. Pairing of homologous chromosomes.</td> <td style="width: 33%;">3. Crossing over between homologous chromosomes.</td> </tr> </table>	1. Condensation of chromosomes.	2. Pairing of homologous chromosomes.	3. Crossing over between homologous chromosomes.	6.1.3	369	346	Knowing
1. Condensation of chromosomes.		2. Pairing of homologous chromosomes.	3. Crossing over between homologous chromosomes.						
8		(B) heterozygous × (A) heterozygous	6.2.2	378	356	Applying			
9		Nn X nn	6.2.2	377	362,363	Applying			
10	Sex linkage, multiple alleles and co-dominance.	6.2.2	376 - 379	356 358	Reasoning				
11	3 5%	Blood groups.	7.1.1	399	377 378	Applying			
12	4 29%		8.1.8	470	464-465	Applying			
13		1	8.1.10	484	487	Applying			
14		Suspect D.	6.1.6	469-471	464-465	Reasoning			

Part 2: Extended Response (Total 56 marks) (Q15-Q17) Chapter 1 33% (18 marks)

Q	Answer	Mark	Page		Outcome	Level of learning
			Cambr	Hodd		
15	Strand 2.					
	a The transcription starts from 5' to 3' direction and it has starting codes.	2	119	120	5.2.3	Applying
	b Met-Asn-Thr-Ile-Glu	1	120	123	5.2.3	Applying
	c Peptide bonds.	1	121	123	5.2.2	Knowing
d	- In A change: sickle cell anemia. - In C change: no effect.	2	118	125	5.2.2	Reasoning
16	a (i) One strand of each new double helix comes from the parent chromosome and one is a newly synthesized strand.	2	117	116	5.1.3	Knowing
	(ii) Because both DNA strands has nitrogen 15 isotope.	1	117	116		Applying
16	b (i) X: Covalent bond OR phosphodiester bonds. Y: Hydrogen bonds.	2	114	113	5.1.2	Applying
	(ii) It has thymine bases.	1	112	111	5.1.2	Reasoning
17	a X: polypeptide or amino acids. Z: ribosome.	2	120	123	5.2.3	Knowing
	b Y	1	120	121		Applying
	c Y: GCG K: GGA	2	119	119		Applying
	d CGC AAG CCT	1	119	119		Reasoning

Chapter 1 (18 marks): 5Knowing 9Applying 4Reasoning

Part II: Extended Response (Q18-20)

Chapter 2 33% (18 marks)

Q	Answer	Mark	Page		Outcome	Level of learning										
			Cambr	Hodd												
18	a	A form of gene.	1	367	342	6.2.1	Knowing									
	b	(i)	2	375 376 378	353 355	6.2.2	Applying									
		<table border="1"> <tr> <td>Gametes</td> <td>W</td> <td>R</td> </tr> <tr> <td>W</td> <td>WW</td> <td>WR</td> </tr> <tr> <td>R</td> <td>WR</td> <td>RR</td> </tr> </table>						Gametes	W	R	W	WW	WR	R	WR	RR
		Gametes						W	R							
W	WW	WR														
R	WR	RR														
(ii) White : Spotted : Red 1 : 2 : 1																
c	Parent 1 genotype: WW Parent 2 genotype: RR	2	375	353	6.2.2	Reasoning										
19	a	- Meiosis. - Gametogenesis.	2	368- 369 371- 372	344- 346		Knowing									
	b	- 40 chromosomes. -20 Chromosomes.	2	369	346	6.1.3	Applying									
	c	To avoid duplication of chromosomes after fertilization.	1					6.1.2								
	d	The cell (X) will be diploid OR 2n.	1	371	344	6.1.2	Applying									
20	a	(i) Albinism.	1	388- 389	369- 370	6.2.5 6.2.6	Knowing									
		(ii) A mutation in the gene for tyrosinase results in either the absence of tyrosinase OR the inactivation of this enzyme.	1													
	b	(i) Males: 50% Normal vision and 50% colour blindness vision. Females: 50% Normal vision and 50% colour blindness vision.	2	379	359	6.2.1 6.2.2	Applying									
(ii) Mother genotype: $X^B X^b$ Father genotype: $X^b Y$		2	375, 379	349, 359		Reasoning										

Chapter 2 (18 marks): 5Knowing 9Applying 4Reasoning

Part 2: Extended Response.(Q21)

Chapter 3.5% (3 marks)

Q	Answer	Mark	Page		outcome	Level of learning	
			Cambr	Hodd			
21	a	Discontinuous variation.	1				
	b	Body height OR Body weight OR Skin colour OR any trait that shows intermediates OR continuity in the phenotypes.	1	399-400	378-379	7.1.1	Knowing
	c	This trait is controlled by one gene.	1	399-400	379	7.1.2	Applying

Chapter 3 (3 marks): 2Knowing 1Applying

Part 2: Extended Response. (Q22-Q24)

Chapter 4 29% (17 marks)

Q	Answer	Mark	Page		Outcome	Level of learning	
			Cambr	Hodd			
22	a	(X): separating DNA chains. OR denaturing DNA. (Y): allowing the primer to stick to each strand. OR annealing of primers.	2	472	457	8.1.8	Applying
	b	4000	1	472	457	8.1.7	Reasoning
	c	To produce a large number of copies of a particular fragment of DNA.	1	471	457	8.1.6	Knowing
	d	Building up complete new DNA strands.	1	472	456-457	8.1.6	Knowing
23	a	(X): Restriction enzyme OR restriction endonuclease. (Y): Ligase.	2	464	455	8.1.3	Applying
	b	Enzyme X. OR the restriction enzyme/ endonuclease.	1	467	458	8.1.3	Reasoning
	c	Plasmid OR virus OR liposomes.	1	466	458	8.1.3	Knowing
	d	The useful gene and plasmid DNA are mixed together with a ligase enzyme. The sticky end bases form hydrogen bonds. The ligase joins the DNA backbone and a recombinant plasmid is produced.	1	467	461	8.1.2	Applying
	e	- Plasmid replicates. - The gene is cloned by the growing bacterium and protein is produced.	2	467	461	8.1.2	Knowing
24	a	<u>(i) Insects eat the plant and ingest the pesticide, which acts as a toxin and kills the caterpillars.</u>	2	482	485	8.1.10	Applying
	a	<u>(ii) One of the following:</u> -the evolution of resistance by the insect pests. -a damaging effect on other species of insects. -the transfer of the added gene to other species of plant. -genetically engineered genes may be transferred to a human gut bacteria via food eaten. -"superweeds" may develop.	1	481	489	8.1.10	Reasoning
	b	<u>Wheat plants with the gene produce a protein that degrades and detoxifies the glyphosate.</u>	2	481-484	485-489	8.1.10	Applying

Chapter 4 (17 marks): 5Knowing 9Applying 3Reasoning


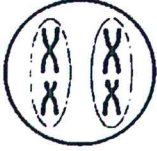
END OF THE MARKING GUIDE

MARKING GUIDE

Part 1: Multiple Choice

Each Question: 1 mark

Total: 14 marks

Q	Ch	Answer	Outcome	Page Number		Level of learning		
				Cambr	Hodd			
1	1 33%	Affects the gene β -hemoglobin of red blood cells.	5.2.4	119	125	Knowing		
2		Each purine and pyrimidine is paired with a complementary base.	5.1.1	113	112	Knowing		
3			5.1.3	118	117	Applying		
4		3'AUG UCG GUA 5'	5.2.2	119	120	Applying		
5		50%	5.1.1	112	111	Reasoning		
6	2 33%		6.1.4	369	346	Knowing		
7		the growth of embryonic tissues.	6.1.3	371	344	Knowing		
8		50%	6.2.2	374-375	355	Applying		
9		Tt X tt	6.2.3	377	354	Applying		
10		Multiple genes.	6.2.2	382	360-361	Reasoning		
11	3 5%	Eye color	7.1.1	399	377 378	Applying		
12	4 29%	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 100px; text-align: center;">2</td> <td style="width: 100px; text-align: center;">1</td> </tr> </table>	2	1	8.1.3	465	461	Applying
2		1						
13		<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 100px; text-align: center;">2</td> <td style="width: 100px; text-align: center;">3</td> </tr> </table>	2	3	8.1.3	464-466	455-461	Applying
2	3							
14	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 100px; text-align: center;">A</td> <td style="width: 100px; text-align: center;">4</td> </tr> </table>	A	4	8.1.10	484	487	Reasoning	
A	4							

Part II: Extended Response (56 marks) (Q15-Q17)

Chapter 1 33% (18 marks)

Q	Answer	Mark	Page		Outcome	Level of learning
			Cambr	Hodd		
15 (6m)	(a) - In m-RNA - In t-RNA	2	120	123	5.2.2	Knowing
	(b) (X) ATT (Y) UAC (Z) GCU	3	119	120	5.2.2	Applying
	(c) AUG CGU UAA	1	121	123	5.2.3	Reasoning
16 (5m)	(a) Cytoplasm or ribosome	1	119	121	5.2.3	Knowing
	(b) Stage1: transcription Stage 2: translation	2	119	121	5.2.3	Applying
	(c) Pick up free amino acids and bring them to m-RNA on the ribosome	1	119	121	5.2.3	Knowing
	(d) Met-Phe -Gly	1	121	123	5.2.1	Reasoning
17 (7m)	(a) X: nucleotide Y: deoxyribose sugar	2	112	113	5.1.2	Applying
	(b) Z: holds two strand of DNA together or maintains the double helix structure. K: forms the backbone of the DNA structure or links the nucleotides within the strand	2	113	112	5.1.2	Applying
	(c) Is made up of many similar molecules joined in long chain or is made by linking together similar building blocks.	1	111	110	5.1.2	Knowing
	(d) - CGCATG - CGCUAG	2	120	120	5.2.3	Reasoning

Chapter 1 (18 marks): 5Knowing 9Applying 4Reasoning

Part II: Extended Response (Q18-20)

Chapter 2 33% (18 marks)

Q	Answer	Mark	Page		Outcome	Level of learning
			Cambr	Hodd		
18 (6m)	(a) The genotype is consisting of two different alleles	1	374	350	6.2.1	Knowing
	(b) - Codominance. - Green: Variegated: White. - 1: 2: 1	3	376	355	6.2.2	Applying
	(c) - Phenotypes: Green : White - Ratios: 3:1	2	376	352	6.2.1	Reasoning
19 (6m)	(a) - Anaphase I - Spindle fibers Or spindle.	2	369	346	6.1.4	Knowing
	(b) Crossing over.	1				
	(c) Nuclear envelope reforms or Nucleolus reform or Cytokinesis takes place Or spindle breaks.	1	368-370	345-349	6.1.4 6.1.6	Applying
	(d) 4 chromosomes	1				
	(e) Chromosomes will not move towards the opposite end of the cell. or Homologous chromosomes will not separate.	1	369	346	6.1.4	Applying
20 (6m)	(a) (i) Dominance (ii) The mutation occurs due to the incidence of many extra CAG repeats, leading to the production of a protein called huntingtin.	1 1	389	370	6.2.5	Knowing
	(b) -Father: $X^H Y$ -Mother: $X^H X^h$	2	379	371	6.2.2	Applying
	(c) -Males: 50% -Females: 100%	2	375,379	349,371	6.2.2	Reasoning

Chapter 2 (18 marks): 5Knowing 9Applying 4Reasoning

C. Part 2: Extended Response.(Q21)

Chapter 3 5% (3 marks)

Q	Answer	Mark	Page		Outcome	Level of learning	
			Cambr	Hodd			
21 (3m)	(a)	Continuous.					
	(b)	Body height OR body weight OR arm span OR skin color.	1	399-400	378-379	7.1.1	Knowing
	(C)	This trait is controlled by multiple genes.	1	399,400	378	7.1.2	Applying

Chapter 3 (3 marks): 2Knowing 1Applying

C. Part 2: Extended Response. (Q22-Q24)

Chapter 4 29% (17 marks)

Q	Answer	Mark	Page		Outcome	Level of learning	
			Cambr	Hodd			
22 (6m)	(a)	- uses free nucleotides to synthesis complementary strands. - is used to begin the process.	2	472	457	8.1.7	Knowing
	(b)	Because there are two strands.	1	472	457	8.1.7	Applying
	(c)	- Denaturing the double-stranded DNA molecules to make single-stranded. or Separate DNA chains. - To allow the primer to stick to each strand.	2	472	457	8.1.7	Applying
	(d)	16	1	472	457	8.1.7	Reasoning
23 (6m)	(a)	(i) Remove a gene from one organism and transfer it into another so that the gene is expressed in its new host. or Change the genetic constitution of an organism.	2	465	458	8.1.3	Knowing
		(ii) To join DNA with plasmid.	1	467	459	8.1.2	Applying
		(iii) Because the sticky ends are complementary.	1	463	454	8.1.1	Knowing
		(iv) To clone the gene by growing the bacteria.	1	465-466	458	8.1.3	Applying
	(b)	D	1	471	464	8.1.6	Reasoning
24 (5m)	(a)	(X): human insulin gene. (Y): transformed bacteria. (Z): fermenter.	3	467	459-461	8.1.2	Applying
	(b)	Pancreatic β cell.	1	466-467	456	8.1.2	Applying
	(c)	A reliable supply available of insulin.	1	466	455	8.1.4	Reasoning

Chapter 4 (17 marks): 5Knowing 9Applying 3Reasoning

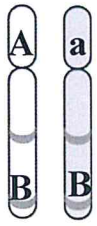
END OF THE MARKING GUIDE

MARKING GUIDE

Part I: Multiple Choice

Each Question: 1 mark

Total: 12 marks

Q	Answer	Outcome	Page Number		Level of learning						
			Cambridge	Hodder							
1	X	1.2.6	274	248	Applying						
2	Involved in ADP phosphorylation.	1.2.1	272,275	243,251	Reasoning						
3	B	2.2.1 2.2.2	291	275	Knowing						
4	1	3.1.13	305	299	Knowing						
5	Selective reabsorption.	3.1.14	308	301	Applying						
6	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>A</td> <td>B</td> </tr> <tr> <td>Non-myelinated</td> <td>Myelinated</td> </tr> </table>	A	B	Non-myelinated	Myelinated	4.1.13	332	319	Reasoning		
A	B										
Non-myelinated	Myelinated										
7	W	4.1.6	335	314	Applying						
8	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Resting p.</td> <td>Threshold p.</td> </tr> <tr> <td>-70</td> <td>-50</td> </tr> </table>	Resting p.	Threshold p.	-70	-50	4.1.13	332	318	Knowing		
Resting p.	Threshold p.										
-70	-50										
9	Hydrogen bonds	5.1.2	114	113	Knowing						
10	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>(1)</td> <td>(2)</td> <td>(3)</td> </tr> <tr> <td>Nucleus</td> <td>Nucleus</td> <td>Cytoplasm</td> </tr> </table>	(1)	(2)	(3)	Nucleus	Nucleus	Cytoplasm	5.2.3	113-118	115-123	Applying
(1)	(2)	(3)									
Nucleus	Nucleus	Cytoplasm									
11		6.2.1	285	360	Applying						
12	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>DNA samples are loaded into the wells.</td> <td>Power is turned on and the DNA fragments migrate through gel.</td> <td>The fragments are separated by size.</td> </tr> </table>	DNA samples are loaded into the wells.	Power is turned on and the DNA fragments migrate through gel.	The fragments are separated by size.	8.1.3	468	463	Applying			
DNA samples are loaded into the wells.	Power is turned on and the DNA fragments migrate through gel.	The fragments are separated by size.									

Part 2: Extended Response

(48 marks)

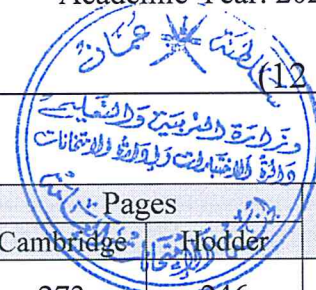
Question number	Answer	Mark	Page		outcome	Level of learning
			Cambridge	Hodder		
13	(a) X: NAD Y: Reduced NAD	1 1	272	244	1.2.2	Knowing
	(b) 1. Link reaction 2. Kreb's cycle 3. Lactate formation ✓	1 1 1	272	244	1.2.1	Applying
	(c) 1. Acetyl Co-A 3- Lactic Acid	1 1	272	244- 254	1.2.3 1.2.8	Reasoning
14	(a) Light independent reaction <u>or</u> Calvin cycle.	1	290-292	270- 272	2.1.7	Knowing
	(b) W: carries hydrogen ions from light dependent to Calvin cycle to reduce GP to TP. X: carries energy from light dependent to Calvin cycle. Z: fixation of CO ₂ OR acceptor molecule of CO ₂ .	1 1 1	290-292	270- 272	2.1.7	Applying
	(c) Increases.	1	292	275	2.2.2	Reasoning
15	(a) X : glucagon. Z : insulin.	1 1	315	292- 294	3.1.7	Knowing
	(b) i. Diabetes ii. constant thirst, un-diminished hunger, excessive urination. <i>(anyone of them is correct)</i>	1 1	315 318	295	3.1.7 3.1.8	Applying
	(c) The concentration of substance Y (glucose) will increase in the blood. Therefore substance Z (insulin) is secreted to increase the absorption of substance Y (glucose) to reduce its level in the blood.	1	318	292- 294	3.1.7	Reasoning
	(d) The muscles need more energy, that means more glucose will be used so its concentration in the blood will decrease, therefore, hormone glucagon (X) is secreted to convert glycogen into glucose so its concentration returns to normal.	1	315-317	292- 293	3.1.7	Applying

16	(a)	W: Presynaptic neurone. X: Synaptic cleft. Y: Postsynaptic neurone.	1 1 1	342-343	320-321	4.1.14	Knowing									
	(b)	It breaks or is inactivated and the products reenter the presynaptic neurone to be resynthesized.	1.													
	(c)	In Relay neurone.	1.			4.1.16	Applying									
	(d)	It opens to allow Na^+ ions to diffuse passively to the postsynaptic neurone and triggers action potential.	1.													
17	(a)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td>1</td> <td></td> <td>open</td> </tr> <tr> <td>2</td> <td>exciting</td> <td></td> </tr> <tr> <td>3</td> <td></td> <td>close</td> </tr> </tbody> </table>	1		open	2	exciting		3		close	1. 1. 1.	336	316-317	4.1.10	reasoning Applying
	1		open													
	2	exciting														
	3		close													
(b)	i- <u>Potassium channels open (1 mark)</u> , so K^+ moves to the outside of the axon(1 mark) causing the axon potential to decrease from +40 mV to -70 and the axon to repolarize.	2														
	ii. 2	1	336	316-317												
	iii. refractory period.	1	336	318												
18	(a)	X: mRNA Y: ribosome	1. 1.	120-121	123	5.2.3	Knowing									
	(b)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td>Cys</td> <td></td> </tr> <tr> <td></td> <td>TAC</td> </tr> <tr> <td></td> <td>AUG</td> </tr> </tbody> </table>	Cys			TAC		AUG	3	120- 121	123-124	5.2.2	Applying			
	Cys															
	TAC															
	AUG															
(c)	Cysteine	1	120-121	123	5.2.4	Reasoning										
19	(a)	Sex linkage.	1	379	358	6.2.2	Knowing									
	(b)	Heterozygous.	1	379	358	6.2.2	Knowing									
	(c)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td></td> <td>X^{B}</td> <td>Y</td> </tr> <tr> <td>X^{B}</td> <td>$\text{X}^{\text{B}} \text{X}^{\text{B}}$</td> <td>$\text{X}^{\text{B}} \text{Y}$</td> </tr> <tr> <td>$\text{X}^{\text{b}}$</td> <td>$\text{X}^{\text{B}} \text{X}^{\text{b}}$</td> <td>$\text{X}^{\text{b}} \text{Y}$</td> </tr> </tbody> </table>		X^{B}	Y	X^{B}	$\text{X}^{\text{B}} \text{X}^{\text{B}}$	$\text{X}^{\text{B}} \text{Y}$	X^{b}	$\text{X}^{\text{B}} \text{X}^{\text{b}}$	$\text{X}^{\text{b}} \text{Y}$	2	379	359	6.2.2	Applying
		X^{B}	Y													
X^{B}	$\text{X}^{\text{B}} \text{X}^{\text{B}}$	$\text{X}^{\text{B}} \text{Y}$														
X^{b}	$\text{X}^{\text{B}} \text{X}^{\text{b}}$	$\text{X}^{\text{b}} \text{Y}$														
(d)	0.25 or 1/4 or 25%	1	379	359	6.2.2	Reasoning										

20	(a)	1- Endonuclease or restriction enzyme.	1	464-466	455-458	8.1.3	Knowing
	(b)	2- DNA ligase or ligase.	1	464-469	455-460		Applying
		1. No hydrogen bonds will be made between the nitrogenous bases. or base pairing will not take place.	1				
		ii. The sugar-phosphate backbone will not be linked.	1				
		iii. The inserted gene will not be transcribed. or No mRNA will be produced. or No protein or gene product will be produced.	1				
	(c)	Ribosome.	1	468	463		Reasoning

48

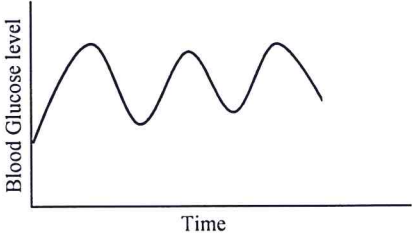

END OF MARKING GUIDE



Question 1: Multiple Choice Items.

(12 marks)

Each answer 1 mark

Q	Answer	Outcome	Pages		Level of learning						
			Cambridge	Hodder							
1	C.	1.2.6	273	246	Applying						
2	Y.	1.2.1	273	243,251	Reasoning						
3	Has no effect on the rate of photosynthesis.	2.2.2	292	275	Knowing						
4		3.1.7	318	292-294	Applying						
5	W.	3.1.13	306	299	Knowing						
6	K^+ ions diffuse out.	4.1.10	335	317-318	Knowing						
7	<table border="1" data-bbox="183 1064 861 1142"> <thead> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>Become closer</td> <td>Become narrower</td> <td>Doesn't change</td> </tr> </tbody> </table>	A	B	C	Become closer	Become narrower	Doesn't change	4.1.20	347	326	Applying
A	B	C									
Become closer	Become narrower	Doesn't change									
8	2.	4.1.10	339	317	Reasoning						
9	Sugar-phosphate bond.	5.1.2	113	112- 113	Knowing						
10	1& 3 only.	5.1.3	116, 120 & 121	115-123	Applying						
11		6.2.1	374	354	Applying						
12	3.	8.1.7	469-470	464-465	Applying						

Part1: 12 Total - 4 Knowing - 6 Applying - 2 Reasoning

PART 2: Extended Response

(48 marks)

Q	Answer	Marks	Pages			Level of learning		
			Cambri dge	Hodder	outcomes			
13	(a) X: CO ₂ . Y: Oxaloacetate.	1 1	273	245	1.2.4	Knowing		
	(b) i. Decarboxylation. ii. Dehydrogenation. iii. The electron transport chain. or Oxidative phosphorylation.	1 1 1	273	245	1.2.4	Applying		
	(c) V: 5C. Y: 4C.	1 1	273	245	1.2.4	Reasoning		
14	(a) O ₂	1	288-289	268-269	2.1.6	Knowing		
	(b) PS I	1			2.1.6	Applying		
	(c) Carries hydrogen ions (H ⁺) to the light independent stage.	1						
	(d) In the thylakoid membrane.	1						
	(e) The reactions will be stopped. or inhibited. or decreases.	1					2.1.6	Reasoning
15	(a) X: Loop of Henle. Y: Proximal convoluted tubule.	1 1	306	299	3.1.13	Knowing		
	(b) i: Z . ii: Diabetes.	1 1	309 318	305	3.1.14 3.1.15	Applying		
		(c) i: Antidiuretic Hormone (ADH). ii: High.	1 1	312 - 313	305		3.1.15	Reasoning
16	(a) 1: presynaptic neurone. 2: neurotransmitter vesicle. 6: postsynaptic neurone.	1 1 1	342	320	4.1.14	Knowing		
	(b) <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>5</td></tr> <tr><td>3</td></tr> <tr><td>4</td></tr> </table>	5	3	4	1 1 1	342	321	4.1.15
5								
3								
4								

17	(a)	X: Action Potential. Z: Resting Potential.	1 1	338	316-317	4.1.10	Reasoning									
	(b)	Creation of action potential.	1													
	(c)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>X</th> <th>Y</th> </tr> </thead> <tbody> <tr> <td>open.</td> <td>close.</td> </tr> <tr> <td>close.</td> <td>Open.</td> </tr> </tbody> </table>	X	Y	open.	close.	close.	Open.	4	332	316-317	4.1.10	Applying			
X	Y															
open.	close.															
close.	Open.															
18	(a)	i: Nucleus. ii: Cytoplasm. <u>or</u> Ribosome.	1 1	119	120-123	5.2.3	Knowing									
	(b)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td></td> <td>UGG</td> <td></td> </tr> <tr> <td>CTT</td> <td></td> <td>CUU</td> </tr> </tbody> </table>		UGG		CTT		CUU	3	120	120-123	5.2.2	Applying			
		UGG														
CTT		CUU														
(c)	No change in the protein because the amino acid doesn't change.	1	119	124-125	5.2.4	Reasoning										
19	(a)	3 alleles.	1	378	356	6.2.1	Knowing									
	(b)	$I^B I^O$	1													
	(c)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td></td> <td>I^A</td> <td>I^O</td> </tr> <tr> <td>I^B</td> <td>$I^A I^B$</td> <td>$I^B I^O$</td> </tr> <tr> <td>I^O</td> <td>$I^A I^O$</td> <td>$I^O I^O$</td> </tr> </tbody> </table>		I^A	I^O	I^B	$I^A I^B$	$I^B I^O$	I^O	$I^A I^O$	$I^O I^O$	2	378	356	6.2.2	Applying
		I^A	I^O													
I^B	$I^A I^B$	$I^B I^O$														
I^O	$I^A I^O$	$I^O I^O$														
(d)	12.5% <u>or</u> 1/8 <u>or</u> 0.125	1	378	356	6.2.2	Reasoning										
20	(a)	i. Initiation of the transcription process. ii. Joins the sugar phosphate backbone of the paired sticky ends.	1 1	458-460	458	8.1.2	Knowing									
	(b)	GFP gene <u>or</u> antibiotic resistance gene.	1				Applying									
	(c)	Y.	1	Applying												
	(d)	By insertion of a blood clotting protein gene.	1	469	460	8.1.3	Applying									
	(e)	Gel electrophoresis.	1	469	464	8.1.6	Reasoning									

END OF THE ANSWER GUIDE.

Part 2: 48 Total - 14 Knowing - 24 Applying - 10 Reasoning