



امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

للعام الدراسي ١٤٣٩/١٤٤٠ هـ - ٢٠١٨ / ٢٠١٩ م

الدور الأول - الفصل الدراسي الثاني

- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

- تنبيه: المادة: الأحياء.
- الأسئلة في (١٧) صفحة.

تعليمات مهمة:

- يجب على الممتحن التأكد من استلام دفتر امتحانه، مغلفاً بغلاف بلاستيكي شفاف وغير ممزق، وهو مسؤول عنه حتى يسلمه لمراقبي اللجنة بعد الانتهاء من الإجابة.
- يجب الالتزام بضوابط إدارة امتحانات دبلوم التعليم العام وما في مستواه وأية مخالفة لهذه الضوابط تعرضك للتدابير والإجراءات والعقوبات المنصوص عليها بالقرار الوزاري رقم ٥٨٨ / ٢٠١٥.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل () وفق النموذج الآتي:
س - عاصمة سلطنة عمان هي:
القاهرة ☐ الدوحة ☐
مسقط ☒ أبوظبي ☐
- ملاحظة: يتم تظليل الشكل () باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.
- يجب الحضور إلى قاعة الامتحان قبل عشر دقائق على الأقل من بدء زمن الامتحان.
- يجب إحضار أصل ما يثبت الهوية وإبرازها للعاملين بالامتحانات.
- يجب الالتزام بالزي (الدشداشة البيضاء والمصر أو الكمة للذكور) والزي المدرسي للطالبات، ويستثنى من ذلك الدارسون من غير العمانيين بشرط الالتزام بالذوق العام، ويمنع على جميع المتقدمين ارتداء النقاب داخل المركز وقاعات الامتحان.
- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الذاكرة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أيّاً كان نوعها وأي شيء له علاقة بالامتحان.
- يجب على الممتحن الامتثال لإجراءات التفتيش داخل المركز طوال أيام الامتحان.

صحيح ☒ غير صحيح ☐ ☒ ☐ ☐ ☐ ☐

مُسَوَّدَة، لا يتم تصحيحها

Do not write in this space

Do not write in this space

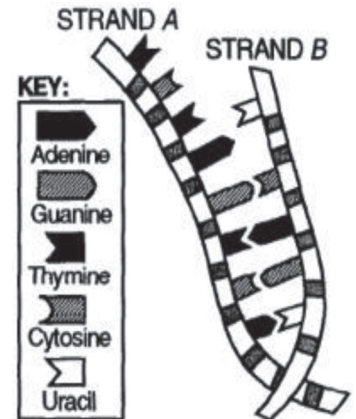
Question 1: Multiple Choice Items**(14 marks)**

There are 14 multiple-choice items worth one mark each.

Shade in the bubble (○) next to the **correct** answer for each of the following items.

- 1) The diagram below shows one stage of protein synthesis, what are the strands labeled **A** and **B**?

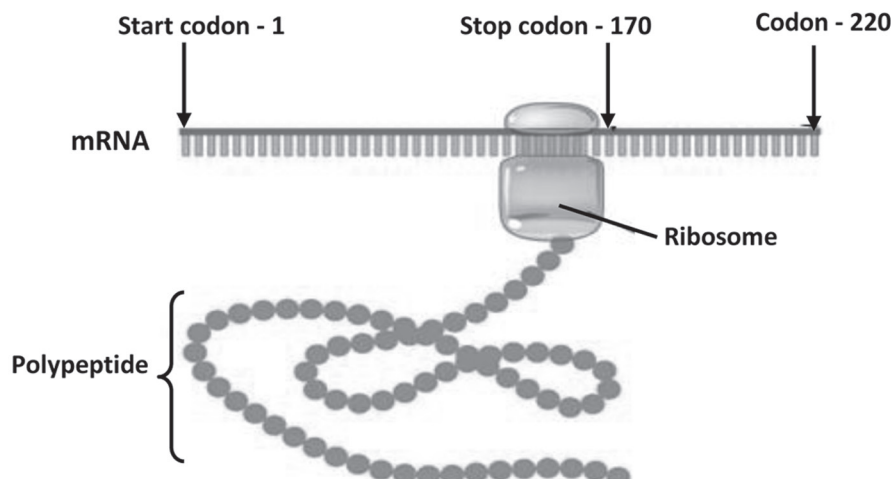
	Strand A	Strand B
<input type="radio"/>	DNA	RNA
<input type="radio"/>	DNA	DNA
<input type="radio"/>	RNA	RNA
<input type="radio"/>	RNA	DNA



- 2) What is the function of transfer RNA (tRNA) molecules in protein synthesis?

- ☐ Provide a template for the synthesis of messenger RNA.
- ☐ Transport amino acids to DNA in the nucleus.
- ☐ Transport amino acids to the ribosome.
- ☐ Synthesize more transfer RNA.

- 3) The diagram below shows the process of translation.



The number of possible amino acids that will be in the formed polypeptide is:

- ☐ 169 ☐ 170
- ☐ 219 ☐ 220

Do not write in this space

Question 1 continued

- 4) The table below shows the percentage of each nitrogenous base in the DNA of two different organisms.

Organism	Percentage of each base in DNA			
	Adenine	Guanine	Thymine	Cytosine
Human	30.9	X	Y	Z
Grasshopper	29.4	20.5	29.4	20.7

What are the percentages labeled X, Y and Z?

	X	Y	Z
<input type="radio"/>	30.9	19.1	19.1
<input type="radio"/>	20.5	29.4	20.7
<input type="radio"/>	19.1	30.9	19.1
<input type="radio"/>	20.7	19.1	29.4

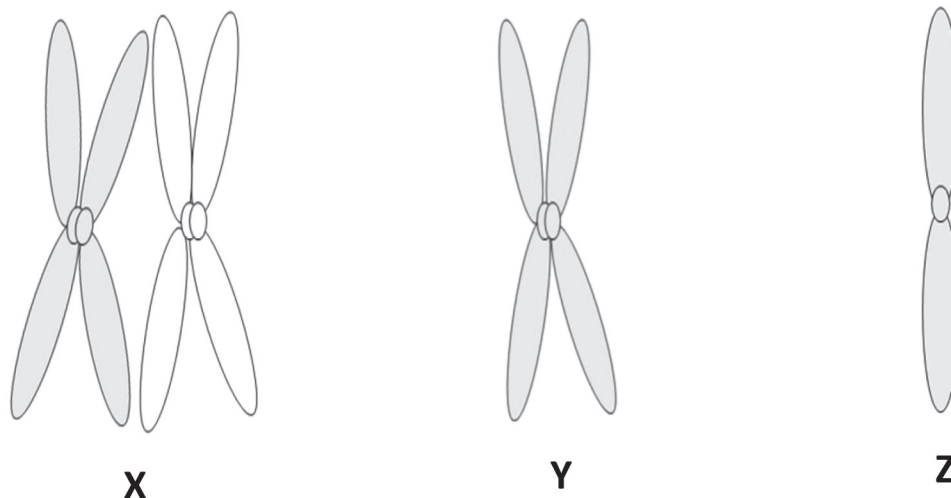
- 5) A cross is made between two pea plants and yields 50% dominant and 50% recessive plants for a specific trait.

This result suggests that the parents are:

- ☐ Both homozygous.
- ☐ Both heterozygous.
- ☐ One is homozygous recessive and the other is heterozygous.
- ☐ One is homozygous dominant and the other is heterozygous.

Question 1 continued

- 6) The diagram below shows three statuses of chromosomes during different subphases of meiosis that take place in a diploid paternal cell.



Which of the following correctly describes the phases in which the three statuses of chromosomes labeled **X**, **Y** and **Z** can be found?

	X	Y	Z
<input type="radio"/>	Prophase I	Telophase I	Telophase II
<input type="radio"/>	Prophase I	Metaphase I	Telophase II
<input type="radio"/>	Metaphase I	Anaphase I	Telophase I
<input type="radio"/>	Prophase I	Anaphase I	Telophase I

- 7) What is the percentage of giving birth to a **child with blood group (O)**, if his father's blood group is (A) heterozygous and his mother's blood group is (B) heterozygous?

- ☐ 0%

☐ 25%

☐ 50%

☐ 75%

- 8) The coat color in rabbits has 4 different phenotypes, one of them is normal which has 4 genotypes ($CC - CC^H - CC^A - CC^{CH}$). This type of inheritance is called:

- ☐ dominance.

☐ co-dominance.

☐ multi alleles.

☐ sex-linkage.

Do not write in this space

Question 1 continued

- 9) Skin color in humans is a type of continuous variation. Which of the following correctly describes the distribution of the alleles in the genotype and its corresponding phenotype?

	White man	Light man	Dark man
<input type="radio"/>	aabb	aaBb	AaBb
<input type="radio"/>	AABB	AABb	aabb
<input type="radio"/>	aabb	Aabb	AaBB
<input type="radio"/>	AABB	aaBB	aabb

- 10) A man with blood group (A) and his wife with blood group (B) have four children, each with a different blood group (A, B, AB and O). Which type of variation does this demonstrate?

- ☐ Discontinuous, environmental and genetic.
- ☐ Continuous, environmental and genetic.
- ☐ Discontinuous and genetic only.
- ☐ Continuous and genetic only.

- 11) Which of the following statements is **FALSE** about recombinant DNA?

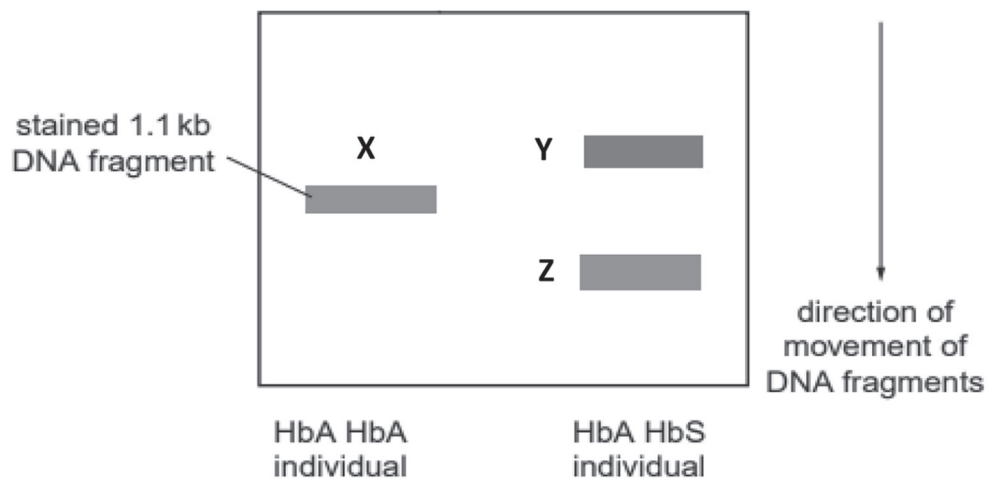
- ☐ Presents in transgenic organisms.
- ☐ Presents in genetically modified organisms.
- ☐ Formed by laboratory techniques, bringing together DNA from two different sources.
- ☐ Formed naturally in bacterial cells, when plasmids and bacterial DNA join together.

Question 1 continued

12) Identifying transformed bacteria prior to cloning is done by:

- ☐ expression factors.
- ☐ endonucleases.
- ☐ R-plasmids.
- ☐ ligases.

13) The diagram below shows the results of electrophoresis done for a normal person and another person with sickle cell trait.

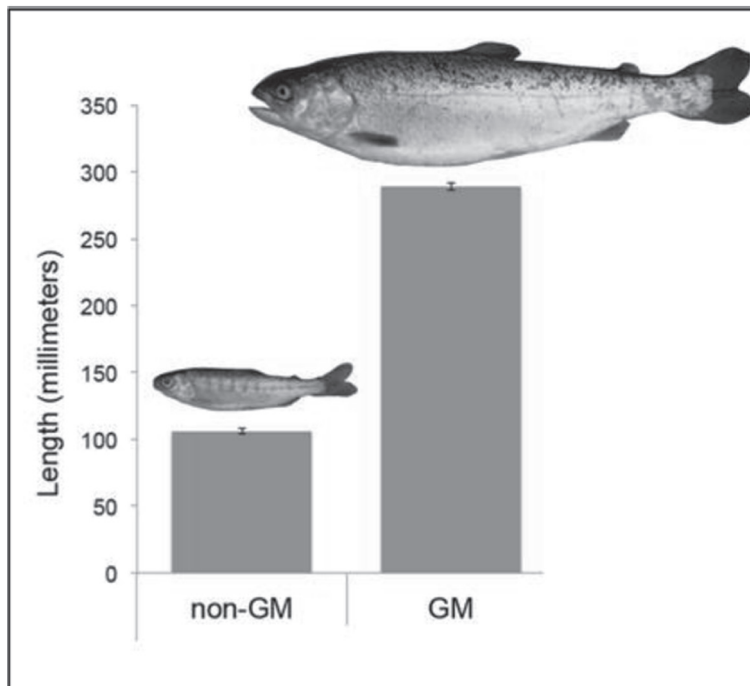


Which statement best describes the result of the person with sickle cell trait?

- ☐ Only the band labeled X will present.
- ☐ Only the band labeled Y will present.
- ☐ Only the band labeled Z will present.
- ☐ Both bands labeled Y and Z will present.

Question 1 continued

- 14) The graph below shows a difference between genetically modified salmon (GM) and non genetically modified (non-GM) salmon.



The genes that are genetically engineered into the salmon are:

- ☐ vitamins enhancement genes.
- ☐ herbicide resistance genes.
- ☐ disease resistance genes.
- ☐ growth hormone genes.

Extended Questions**(56 marks)**

Write your answer for each of the following questions in the space provided.
Be sure to show all your work, including the correct units where applicable.

15) The strand below is for mRNA.

(5 marks)

AUG UUA AUA GAC GAG UAG CGA CGA UGU

--	--	--	--	--	--	--	--	--

Answer the following questions using the below table of mRNA codons.

mRNA Codons			
UUU } Phe UUC } UUA } Leu UUG }	UCU } Ser UCC } UCA } UCG }	UAU } Tyr UAC } UAA } Stop UAG }	UGU } Cys UGC } UGA } Stop UGG } Trp
CUU } Leu CUC } CUA } CUG }	CCU } Pro CCC } CCA } CCG }	CAU } His CAC } CAA } Gln CAG }	CGU } Arg CGC } CGA } CGG }
AUU } Ile AUC } AUA } AUG } Met	ACU } Thr ACC } ACA } ACG }	AAU } Asn AAC } AAA } Lys AAG }	AGU } Ser AGC } AGA } Arg AGG }
GUU } Val GUC } GUA } GUG }	GCU } Ala GCC } GCA } GCG }	GAU } Asp GAC } GAA } Glu GAG }	GGU } Gly GGC } GGA } GGG }

a. How many amino acids can be formed after the translation?

b. Which codon in the molecule acts as a stop codon?

c. Write the sequence of amino acids in the formed polypeptide.

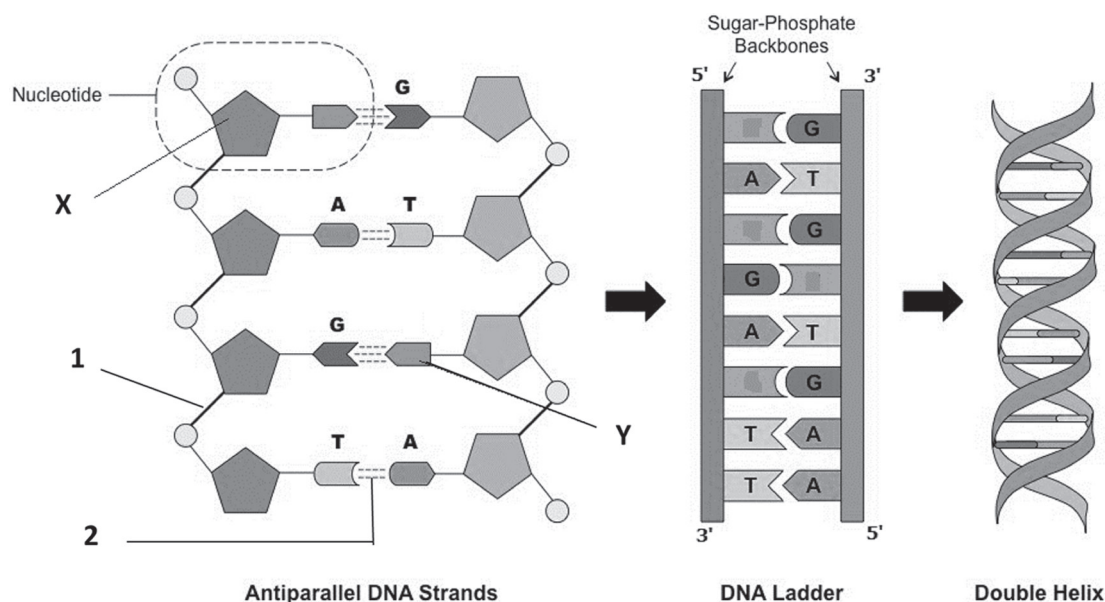
Do not write in this space

Question 2 continued

- d. Write the anti-codon of t-RNA that carries the third amino acid in the polypeptide.

- 16) The diagram below shows a part of DNA structure.

(4 marks)



- a. Name the parts labeled (X and Y).

(i) (X): _____

(ii) (Y): _____

- b. Determine the type of bonds labeled (1 and 2).

(1) _____

(2) _____

- c. Name the process that occurs in the strands of DNA ladder to form two molecules of double Helix.

Do not write in this space

Question 2 continued

- 17) Complete the table below to show the differences between RNA and DNA. (2 marks)

	RNA	DNA
Number of strands		
Different Nitrogenous base		

- 18) The diagram below shows gene mutation in DNA strand that will be transcribed into mRNA. (4 marks)

Original strand	TAC	CGC	TGA	GCC	CAC	GTC	ATT
Mutant	TAC	CGC	TGA	GCC	CAC	GTC	ATC

- a. Write the triplet code before and after mutation:

Normal triplet code: _____

Mutant triplet code: _____

- b. Is this mutation harmful or harmless? Explain your answer.

- c. What is the effect of this mutation on the formed polypeptide?

Do not write in this space

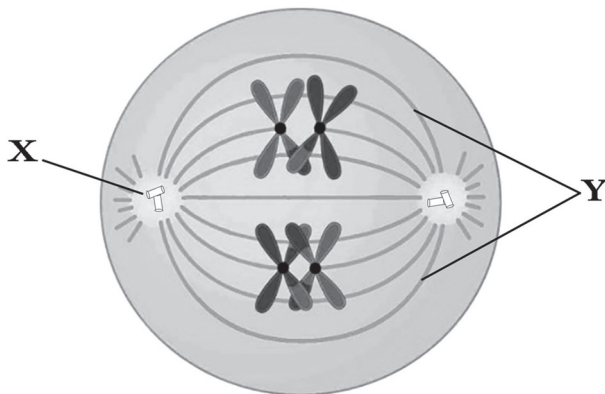
Question 2 continued

- 19) A DNA molecule contains 21000 nucleotides. One strand is used to form one mRNA molecule. (3 marks)

a. What is the number of nitrogenous bases in the formed mRNA?

b. Calculate the number of codons that will be in the formed mRNA?

- 20) The diagram below shows one phase of meiosis. (5 marks)



a. Name this phase.

b. Name the parts Labeled (X and Y):

(i) (X): _____

(ii) (Y): _____

c. What is the process that occurs in the previous phase and important for genetic variation in offspring?

d. Name the phase that follows this phase.

Do not write in this space

Question 2 continued

- 21) A pea plant that is heterozygous for purple flowers and homozygous for yellow seeds was crossed with a plant that is heterozygous for purple flowers with green seeds. (5 marks)

Use the genetic diagram to show the genotypes of the parents and progeny

Purple flowers: dominant = P
 White flowers: recessive = p
 Yellow seeds: dominant = Y
 Green seeds: recessive = y

Phenotypes of parents: Heterozygous purple flower and homozygous yellow seeds x Heterozygous purple flower with green seeds

Genotypes of parents: _____ x _____

gametes		

- 22) A haemophiliac man is married to a woman who is a haemophilia carrier. (4 marks)

- a. Use the genetic diagram to show the genotypes of the progeny.

Phenotypes of parents: Haemophiliac man (♂) x Carrier female (♀)

♂ \ ♀		

- b. What is the percentage of chance of having haemophiliac daughter?

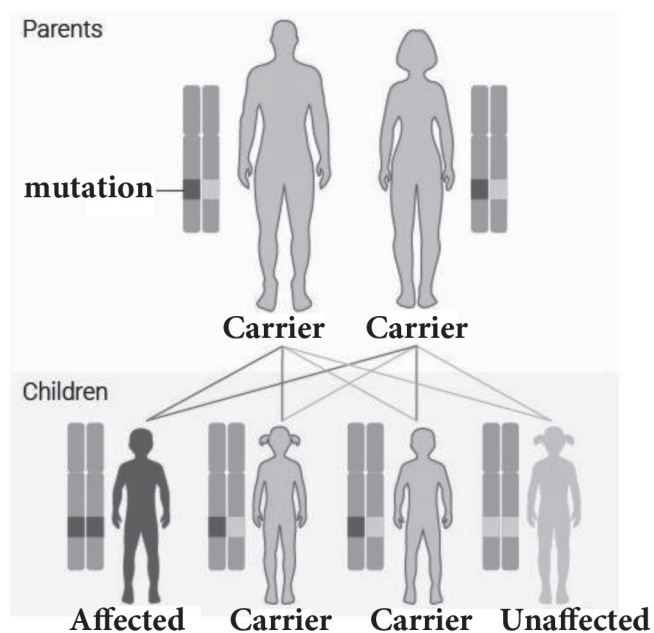
Do not write in this space

Question 2 continued

- c. Explain why it is impossible to be a carrier male?

- 23) The diagram below shows the inheritance pattern of albinism.

(3 marks)



- a. Explain how mutation in the gene of parental chromosome has impact on the phenotype.

- b. Is the mutated allele recessive or dominant? Show one evidence from the diagram.

Do not write in this space

Question 2 continued

- 24) The table below gives some information about two species of palm tree that live in two different environments. (2 marks)

	Howea forsteriana	Howea belmoreana
Optimum pH of the soil for growth of the palm tree	pH 8	pH 6
Height above sea level of most common habitat	30 to 60 metres	Above 120 metres
Month when most palm trees flower	October	December
Method of pollination	Wind	Wind

Suggest two of the environmental differences that may affect the phenotypes of these two species.

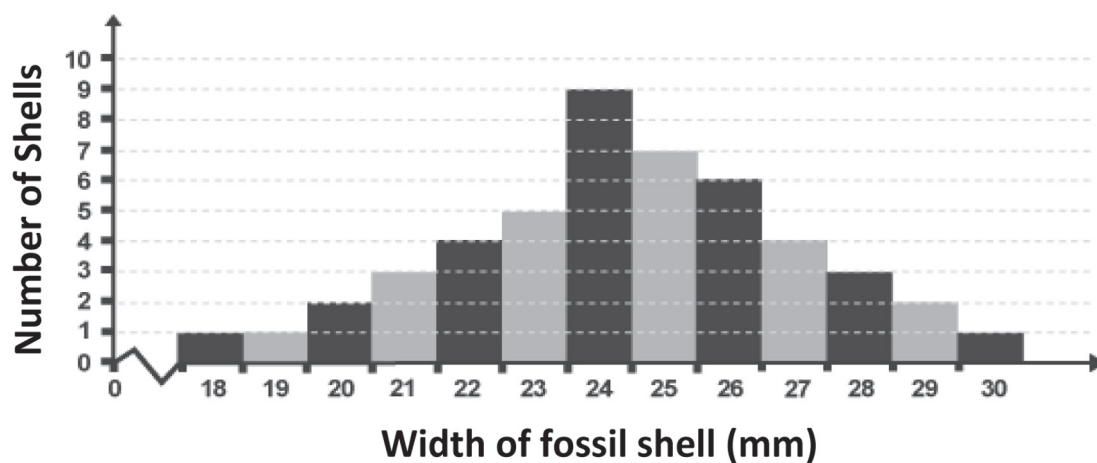
- 25) Write in the table below, the type of the variation of the provided human characteristics. (3 marks)

Characteristic	Variation type
Body weight	
Height	
Ability to roll tongue (able OR not able)	

Do not write in this space

Question 2 continued

- 26) A species of snail lived 400 million years ago. Scientists measured the width of 49 fossil shells of this snail. The bar chart shows the scientists' results. (4 marks)



- a. What is the range of the values for the width of the fossil shells for this species?

- b. What sort of variation is shown in the bar chart?

- c. Explain the genetic base for this kind of variation?

Question 2 continued

27) In some people, the lack of a particular enzyme causes a disease. Scientists are attempting to use bacteria to produce this enzyme for the treatment of people with the disease. (3 marks)

- a. Which row in the table below best describes the sequence of steps the scientists would most likely follow?

	Step A	Step B	Step C	Step D
(1)	Identify the gene	Insert the gene into a bacterium	Remove the gene	Extract the enzyme
(2)	Insert the gene into a bacterium	Identify the gene	Remove the gene	Extract the enzyme
(3)	Identify the gene	Remove the gene	Insert the gene into a bacterium	Extract the enzyme
(4)	Remove the gene	Extract the enzyme	Identify the gene	Insert the gene into a bacterium

- b. Name this technology.

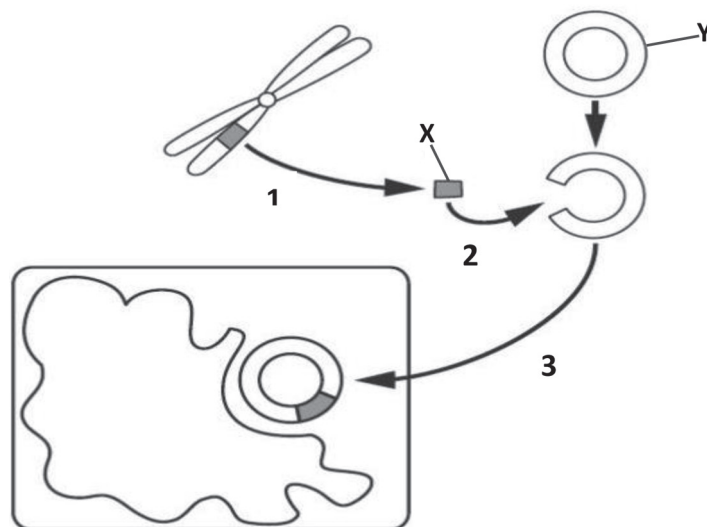
- c. Write one advantage of using this technology?

Do not write in this space

Question 2 continued

28) The diagram below shows part of insulin production technology.

(6 marks)



a. Name the parts labeled (X and Y):

X: _____

Y: _____

b. Name the enzyme that is needed in the step labeled (1).

c. Predict what will happen in the following cases:

(1) Absence of DNA ligase in the step labeled (2).

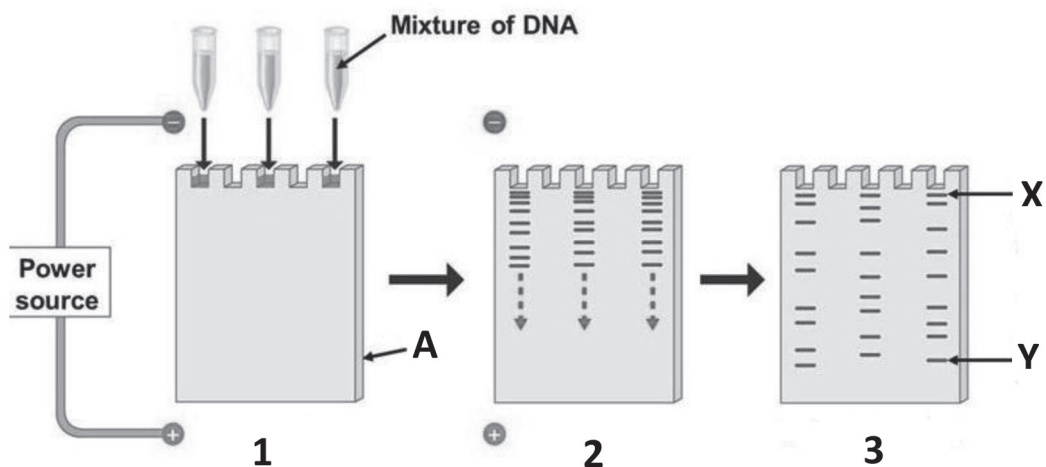
(2) A scientist didn't do any identifying to the transformed bacteria resulted from the step labeled (3).

Do not write in this space

Question 2 continued

29) The figure bellow shows the steps of DNA electrophoresis.

(3 marks)



a. Name the part labeled (A).

(A): _____

b. Explain the principle of electrophoresis separation shown in the step labeled (2).

c. Determine the fragments (X OR Y) in the step labeled (3) as:

(i) Small (shortest) fragments: _____

(ii) Large (longest) fragments: _____

[End of Examination]

Do not write in this space

مُسَوِّدَة

Do not write in this space

MARKING GUIDE

[This guide consists of 4 pages]

2018 / 2019

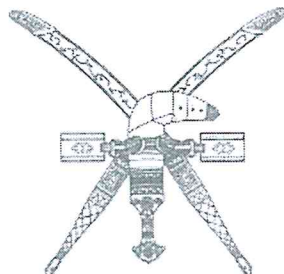
First Session - Second Semester

BIOLOGY

GENERAL EDUCATION DIPLOMA EXAMINATION
FOR BILINGUAL PRIVATE SCHOOLS



SULTANATE OF OMAN
MINISTRY OF EDUCATION
DIRECTORATE GENERAL OF EDUCATIONAL EVALUATION



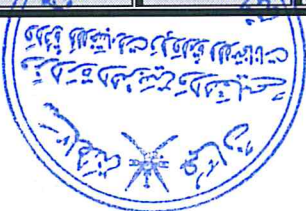
QUESTION 1 (14 marks)

Each answer 1 mark

Question number	Answer			Outcomes	Level of learning
1	Strand A	DNA	Strand B	5.1.2	Applying
2	Transport amino acids to the ribosome			5.2.3	Knowing
3	169			5.2.2	Reasoning
4	X	Y	Z	5.1.2	Applying
5	One is homozygous recessive and the other is heterozygous.			6.2.1	Applying
6	X	Y	Z	6.1.4	Reasoning
7	25%			6.2.2	Applying
8	multi-alleles			6.2.1	Reasoning
9	White man	Light man	Dark man	7.1.2	Knowing
10	Discontinuous and genetic only			7.1.1	Applying
11	Formed naturally in bacterial cells, when plasmids and bacterial DNA join together			8.1.1	Knowing
12	R-plasmid			8.1.3	Knowing
13	Both bands labeled Y and Z will present			8.1.5	Reasoning
14	Growth hormone genes			8.1.9	Applying



Extended Response (56 marks)



Question number	Answer	Marks	Outcomes	Level of learning
15	(a) 5 amino acids	[1]	(5.2.2)	Applying
	(b) UAG	[1]		Knowing
	(c) Met – Leu – Ile – Asp – Glu Note: All amino acids have to be written in the same order	[2.5]	(5.2.3)	Applying
	(d) UAU	[0.5]	(5.2.1)	Applying
16	(a) X: Deoxyribose or Pentose sugar Y: Cytosine or (C)	[0.5]		Knowing
	(b) (1) Phosphodiester bond (2) hydrogen bonds	[1]	(5.2.1)	Knowing
	(c) DNA Replication	[1]	(5.1.3)	Knowing
17	Number of strands	One		
	Different Nitrogenous base	U		
		Two (Double)		
		T		
18	(a) Normal triplet code: ATT Mutant triplet code: ATC	[0.5]	(5.2.4)	Applying
	(b) Harmless Because both triplet codes will be transcribed into stop codons	[1]		
	(c) No effect will be in the formed polypeptide	[1]	(5.2.3)	
19	(a) Two strands of DNA = 21000, one strand = 10500 mRNA=10500	[1]	(5.2.3)	Reasoning
	(b) mRNA codons = 10500 / 3 = 3500 codons	[1]		
20	a Metaphase I	[1]	(6.1.4)	Knowing
	b X: Centrosome OR centrioles Y: Spindle OR microtubules	[1]		
	c Crossing over	[1]		
	d Anaphase I	[1]		

26	(a)	Range 18 -30 mm	[1]	(7.1.1)	Applying											
	(b)	Continuous variation	[1]													
	(c)	Continuous variation results from the combined (collective) effect of many genes (known as polygenes: group of genes that together determine a characteristic) which produces infinite variety among the offspring.	[2]													
25		Characteristic	Variation type	[3]	(7.1.1)	Applying										
		Body weight	Continuous													
		Height	Continuous													
Ability to roll tongue		discontinuous														
24		Any two answers		[1]	(7.1.3)	Applying										
		• Different pH conditions of soil where the two palm trees are located	[1]													
		• Different heights above sea level.	[1]													
23		The defective gene fails to code for tyrosinase protein. As a result, active tyrosinase and the pigment melanin are absent from pigment forming cells in the body.	[1]	(6.2.1)	Knowing											
		The mutated allele is recessive. Albino individuals are homozygous for the mutant allele.	[1]													
			[1]													
22	(a)	<table><tr><td rowspan="2">♂</td><td>X^h</td><td>X^HX^h (½)</td><td>X^hY (½)</td></tr><tr><td>Y</td><td>X^HY (½)</td><td>X^hY (½)</td></tr><tr><td>♀</td><td>X^H</td><td>X^H</td><td>X^h</td></tr></table>	♂	X ^h	X ^H X ^h (½)	X ^h Y (½)	Y	X ^H Y (½)	X ^h Y (½)	♀	X ^H	X ^H	X ^h	[2]	(6.2.2)	Applying
	♂	X ^h		X ^H X ^h (½)	X ^h Y (½)											
		Y	X ^H Y (½)	X ^h Y (½)												
♀	X ^H	X ^H	X ^h													
(b)	25%	[1]														
(c)	Because male has only one (X) chromosome, so it cannot be heterozygous to be a carrier.	[1]														
21		Genotypes of parents : PpYy x PpYy (½ + ½)	[5]	(6.2.2)	Applying											
		<table><tr><td>Gametes</td><td>PY (½)</td><td>PpYy (½)</td><td>pY (½)</td></tr><tr><td></td><td>PY (½)</td><td>PpYy (½)</td><td>pY (½)</td></tr><tr><td></td><td>pY (½)</td><td>PpYy (½)</td><td>pYy (½)</td></tr></table>				Gametes	PY (½)	PpYy (½)	pY (½)		PY (½)	PpYy (½)	pY (½)		pY (½)	PpYy (½)
Gametes	PY (½)	PpYy (½)	pY (½)													
	PY (½)	PpYy (½)	pY (½)													
	pY (½)	PpYy (½)	pYy (½)													

27	(a)	(3)		[1]	(8.1.2)	Applying	Knowing	28	(a)	(X) Gene to be engineered	[0.5]	(8.1.2)	Applying	29	(a)	Gel	[1]	(8.1.5)	Reasoning	c	i. Small (shortest) fragments: Y	ii. Large (longest) fragments: X
	(b)	Gene technology OR Genetic engineering	[1]	(8.1.1)	(b)				Restriction enzymes OR restriction endonucleases	[1]	(b)				Separation occurs by size and charge carried	[1]						
	(c)	Production of enzymes when the gene is not working in the body.	[1]	(8.1.4)	(c)				1. DNA molecules will not join together and will not form the recombinant DNA. 2. He would not be able to identify the bacteria that successfully taken up recombinant plasmids and thus be able to synthesise insulin (because only less than 1 percent of bacteria is transformed and can be cloned). Thus he may not get significant amount of insulin.	[2]						[1]						

END OF MARKING GUIDE