

JABATAN PENDIDIKAN NEGERI TERENGGANU

STPM 2020

**PEPERIKSAAN PERCUBAAN
SEMESTER 3**

**BIOLOGY
964/3**

Nama :.....

Kelas :.....

DISEDIAKAN OLEH PANEL AKRAM NEGERI TERENGGANU

Tidak dibenarkan menyunting atau mencetak mana-mana bahagian dalam modul ini
tanpa kebenaran Pengarah Pendidikan Negeri Terengganu

Section A [15 marks]

Answer **all** questions in this section.

- 1 In the preparation of a key to separate four orders, Q, R and T of class Insecta, the following observations were made :

Characteristics	Q	R	S	T
I Three pairs of legs	√	√	√	√
II Two pairs of wings	√	√	√	-
III One pair of antennae	√	√	√	√
IV Legs adapted for running	-	-	√	-
V Incomplete metamorphosis	-	√	√	√
VI Piercing-sucking mouthparts	-	-	√	√

√ Indicates the presence of the character

- Indicates the absence of the character

Which of the following combinations would give sufficient information for the **Four** orders to be separated ?

- A III, II, VI
 B II, I, IV
 C III, II, V
 D II, IV, V

- 2 *In Malaysia, poaching of tigers has reduced their population significantly. This causes negative impacts on the interactions between populations of different species such as mouse deer and wild boar.*

Based on the statements above, which level of biodiversity is affected ?

- A Species diversity
 B Genetic diversity
 C Population diversity
 D Ecosystem diversity
- 3 The rate of absorption of light energy measured in an ecosystem is $12\,000\text{ kJ m}^{-2}\text{ y}^{-1}$. Only 1% of this energy is converted into net plant production. 10% of the net production is transferred from one trophic level to the next.

What is the amount of energy obtained by secondary consumers ?

- A $120\text{ kJ m}^{-2}\text{ y}^{-1}$
 B $12.0\text{ kJ m}^{-2}\text{ y}^{-1}$
 C $1.20\text{ kJ m}^{-2}\text{ y}^{-1}$
 D $0.120\text{ kJ m}^{-2}\text{ y}^{-1}$

- 4

A researcher collected 150 specimens of a species of moth, marked them and released them in a 5000 m ² area. Two days later, he collected 420 specimens of the species of moth, of which 14 were marked.

Assuming that there was no mortality between the time of marking and recapturing, what is the population of the moth species per 100 m² ?

- A 42
B 90
C 210
D 450
- 5 A study shows that the average mortality rate among infants who are less heavy and very heavy is high.
Which is true of the above type of selection ?
- A Disruptive
B Stabilizing
C Directional
D Elimination
- 6 X is a species of fish in a river. After a dam is constructed, individuals of species X upstream are separated from the individuals downstream. Gradually, the individuals in the upstream become a new species.
What this type of speciation?
- A Intraspecific and allopatric
B Intraspecific and sympatric
C Interspecific and allopatric
D Interspecific and sympatric
- 7 Which factors are involved as prezygotic reproductive barriers ?
- I Gametic isolation
II Hybrid breakdown
III Temporal isolation
IV Reduced hybrid viability
- A I and III
B I and IV
C II and III
D II and IV

- 8 After a test-cross is performed, two genes were mapped to be 17.2 cM apart. The result suggested that
- I 82.8% of the offspring are showing the parental phenotypes
 - II A single crossing-over has occurred between the two genes
 - III 172 of the offspring are showing the recombinant phenotypes
 - IV The COV can be calculated by dividing total number of recombinant phenotypes with total number of parental phenotypes
- A I and II
 - B I and IV
 - C II and III
 - D III and IV
- 9 In sheep, the normal fur is controlled by dominant allele R, while the non-uniform fur is controlled by recessive allele r. In a population of 1000 sheep that mate randomly, it is found that 250 sheep have non-uniform fur. What is the frequency of the recessive allele in the population ?
- A 0.25
 - B 0.50
 - C 0.75
 - D 0.87
- 10 The codons used in translation process are given below.
- I UAG
 - II UGA
 - III UUA
 - IV AUG
- Which codons are used as stop codons ?
- A I and II
 - B I and IV
 - C II and III
 - D II and IV

- 11 If $(n + 1)$ gamete is fertilized by a normal gamete, the condition of the resulting zygote is known as
- I trisomy
 - II euploidy
 - III aneuploidy
 - IV monosomy
- A I and III
 - B I and IV
 - C II and III
 - D II and IV
- 12 Which DNA sequence would be part of a double strand that could be recognized by a restriction enzyme ?
- A AAAGGGGAGCCT
 - B CCTCAGCAGGAG
 - C GAGGAATTCCT
 - D CCCTAAAGGGCT
- 13 What are the advantages of transgenic plants?
- I Create superweeds
 - II Resistant to insecticides
 - III Delay the ripening of fruits
 - IV Reduce weed species on farmlands
- A I and II
 - B I and IV
 - C II and III
 - D III and IV
- 14 Which biotechnology application have been used to benefit human being ?
- I Production of cotton trees which are herbicide resistant
 - II Production of α -1-antitrypsin by sheep to treat emphysema
 - III Introduction of cancer resistance genes into human gamete
 - IV Production of growth hormone by salmon fish to treat dwarfism
- A I and III
 - B I and IV
 - C II and III
 - D II and IV

- 15 Which genetically engineered microorganism is successfully used in bioremediation of oil spills ?
- A Bacillus sp.
 - B Trichoderma sp.
 - C Agrobacterium sp
 - D Pseudomonas sp.

Section B [15 marks]
Answer all questions in this section

- 16 In tomato, smooth fruit (S) is dominant over wrinkled fruit (s) and red flowers (R) are dominant over white flower (m) . A cross was done between a homozygous smooth fruit white flower line and a homozygous wrinkled fruit red flower line. The F1 generation was then crossed with a homozygous wrinkled fruit white flower line, and the following progeny were produced.

Smooth fruit, red flower	480
Wrinkled fruit, white flower	480
Wrinkled fruit, red flower	130
Smooth fruit, white flower	120

- (a) State the type of cross between the F1 generation and the homozygous wrinkled fruit white flower line above. [1 mark]

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- (b) Does the above cross conform to the mendelian ratio? Give reasons for your answer. [2 marks]

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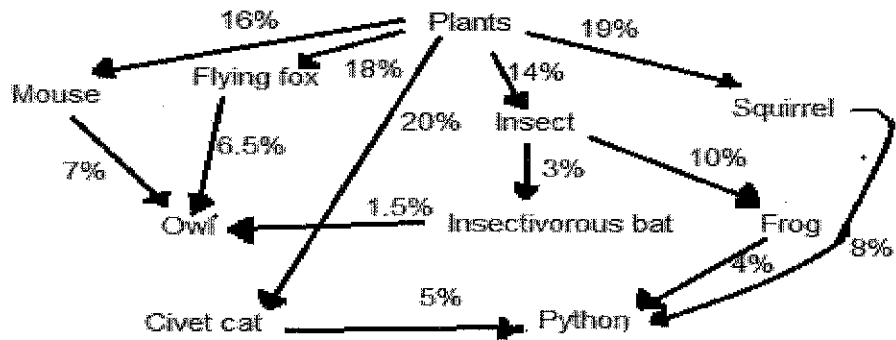
- (c) State the genotypes of the progeny. [1 mark]

.....

(d) Calculate the distance (in maps units) between genes S and R on the chromosome. [2 marks]

(e) Draw a labeled diagram to show the relative positions of the above genes. [1 mark]

17 The percentage of energy transferred among the organisms in a forest is shown in the food web below



(a) Draw and label an ecological pyramid for insect, plants, frog and python. [2 marks]

(b) Assuming that the plants contain 90 KJ of energy, calculate the net energy obtained by Owl in the following food chains.



[1 mark]



[1 mark]

(iii) Why do the Owl in (b) (i) receive less energy compared to the Owl in (b) (ii)?

[2 marks]

.....
.....
.....

(c) What is the effect on the population of the owl if the number of the following organisms decreases?

(i) Plants

[1 mark]

.....

(ii) Insects

[1 mark]

.....

SECTION C [30 marks]

Answer any two questions in this section.

- 18 (a) Describe three level of biodiversity in Malaysia. [6 marks]
- (b) By giving specific examples of in-situ, explain the importance of these areas in sustaining biodiversity in Malaysia. [9 marks]
- 19 (a) Explain the mechanisms of prezygotic isolation. [8 marks]
- (b) Explain the process of hybridization which give rise to the formation of modern wheat. [7 marks]
- 20 (a) Describe the missense and nonsense mutation that occur in gene by using example. [8 marks]
- (b) Explain what happened to lactose operon if mutation occurs in a gene of protein repressor? [7 marks]

STPM 2020

**PEPERIKSAAN PERCUBAAN
SEMESTER 3**

SKEMA

BIOLOGY

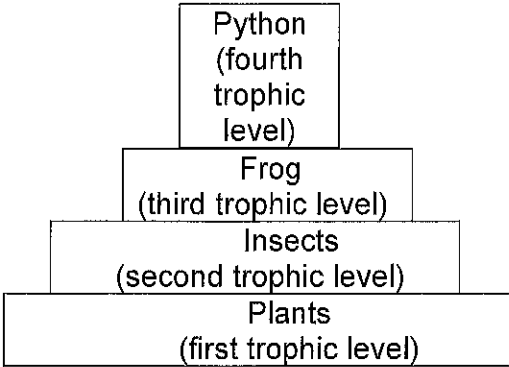
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MARKING SCHEME TRIAL YEAR BIOLOGY PAPER 3 STPM 2020

SECTION : A		
No	ANSWER	EXPLANATION
1	D	
2	A	
3	C	
4	B	
5	B	
6	A	
7	A	
8	A	
9	B	
10	A	
11	A	
12	C	
13	C	
14	D	
15	D	

SECTION : B (15 Marks)

16	(a)	Test cross	1
	(b)	No because the ratio of phenotype shown above is 4:4:1:1 which is different from the mendelian ratio which is 1:1:1:1	1
	(c)	$\begin{array}{c c} R & S \\ \hline r & s \end{array}, \begin{array}{c c} R & s \\ \hline r & s \end{array}, \begin{array}{c c} r & S \\ \hline r & s \end{array}, \begin{array}{c c} r & S \\ \hline r & s \end{array}$	2
	(d)	$COV = \frac{250}{960} \times 100$ $= 26\%$ (Map distance = 26 units)	1 1
	(e)	$\begin{array}{ccc} S & \text{26 units} & R \\ & \text{-----} & \end{array}$	1
TOTAL			07 Marks

17	(a)	<div style="text-align: center;">  <p>Python (fourth trophic level)</p> <p>Frog (third trophic level)</p> <p>Insects (second trophic level)</p> <p>Plants (first trophic level)</p> </div>	2
	(b) (i)	<p>The net primary production of energy in plants = 90 KJ. From plants to insect, $90 \text{ KJ} \times 14\% = 12.6 \text{ KJ}$. From insect to insectivorous, $12.6 \text{ KJ} \times 3\% = 0.378 \text{ KJ}$. From insectivorous to Owl, $0.378 \text{ KJ} \times 1.5\% = 5.67 \times 10^{-3} \text{ KJ}$</p>	1
	(b) (ii)	<p>From plants to mouse, $90 \text{ KJ} \times 16\% = 14.4\%$. From mouse to Owl, $14.4 \text{ KJ} \times 7\% = 1.008 \text{ KJ}$.</p>	1
	(b) (iii)	<p>the first food chain, the phyton are in the fifth tropic and more energy is lost with more tropic level whereas In the second food chain, the phyton are in third tropic level and less energy is lost because there is less tropic level.</p>	1
	(c) (i)	Plants decrease, owl decrease.	1
	(c) (ii)	Insect decrease, owl remains the same.	1
TOTAL			08 Marks

SECTION : C (30 Marks)

Question	Suggested Answer	Marks
18	<p>(a) Describe three level of biodiversity in Malaysia.</p> <ul style="list-style-type: none"> - Ecosystem diversity A variety of habitats that support species which involves the interaction between biotic and abiotic components. - Species diversity The number of different species present in a community. - Genetic diversity The heritable variation among members of a population that arises by gene and chromosome mutation or by sexual reproduction. <p style="text-align: right;">Max: 6 marks</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>6 marks</p>
	<p>(b) By giving specific examples of in-situ, explain the importance of these areas in sustaining biodiversity in Malaysia.</p> <p>Example: Taman Negara/ National Park in Pahang/ Royal Belum in Perak, Sarawak Biodiversity Centre, Marine Parks, Virgin Jungle Reserves.</p> <p style="text-align: right;">Any 2 example =</p> <ul style="list-style-type: none"> To study genetic diversity of wild species. To protect the habitats of flora and fauna in the ecosystem. To facilitate scientific research of the area and the biodiversity found there. To protect the soil and its fertility To conserve nutrient storage and recycling of elements through biogeochemical cycles. To preserve and conserve biodiversity at low cost and convenient way. To maintain climatic conditions/ to protect against natural disasters. To protect endangered species To preserve the source of natural resources such as medical, timber and food. To maintain aesthetic values. <p style="text-align: right;">Max : 7 marks</p>	<p>2 marks</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>7 marks</p>
TOTAL		15 Marks

Question	Suggested Answer	Marks
19	<p>(a) Explain the mechanisms of prezygotic isolation.</p> <p>1. Seasonal isolation Different sub-populations have different mating seasons which prevent them from interbreeding</p> <p>2. Ecological isolation Sub-populations of a species living in different geographical region and become adapted to different ecological condition that eventually cause them cannot interbreed</p> <p>3. Behaviour isolation Different sub-population of a species show different sexual behavior in mating // The mating behavior of one sub-population of a species is not acceptable to the other sub-population</p> <p>4. Mechanical isolation Mating cannot occur between sub-populations because of incompatible sexual structure</p> <p style="text-align: right;">Max: 8 marks</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
	<p>(b) Explain the process of hybridization which give rise to the formation of modern wheat.</p> <p>1 Hybridisation is the process of interbreeding individuals from different varieties to form a new species</p> <p>2 The offspring produced from hybridization is called hybrid</p> <p>3 Modern wheat is produced from the interbreeding of wild acorn and wild grass</p> <p>4 Wild acorn ($2n = 14$) was cultivated and crossed with wild grass ($2n=14$)</p> <p>5 Producing hybrid wheat which is <u>tetraploid</u> / $4n = 28$</p> <p>6 The hybrid wheat is crossed with another type of wild grass which chromosome number is also 14 / ($2n = 14$)</p> <p>7 This produces modern wheat which is a <u>polyploid</u> plant / $6n = 42$</p> <p>8 The modern wheat is the new species arise from hybridisation</p> <p style="text-align: right;">Any 7 = 7 marks</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p style="text-align: right;">7 marks</p>
TOTAL		15 Marks

Question	Suggested Answer	Marks	
20	(a) Describe the missense and nonsense mutation that occur in gene by using example.		
	F1	Substitution mutation resulted from the substitution of a base in a gene	1
	P1	Missense mutation occurs when the altered codon codes for different amino acid	1
	P2	Example , sickle cell anemia	1
	P3	Adenine (A) is substituted by thymine (T) in DNA triplet codon // CTC to CAC	1
	P4	Codon for glutamic acid is changed to valine	1
	P5	So the mutant Beta -globin has valine// normal red blood cell become sickle	1
	P6	Nonsense mutation occurs when the altered codon codes for a stop codon	1
	P7	UAG/UAA/UGA	1
	P8	Translation will terminate prematurely and resulting a non functional protein	1
TOTAL		8 Marks	
(b)	Explain what happened to lactose operon if mutation occurs in a gene of protein repressor?		
P1	Repressor protein is not produced // not functional	1	
P2	Repressor protein unable to bind to the operator	1	
P3	RNA polymerase can bind to the promoter	1	
P4	Operon system is switch on at all time / in the presence or absence of lactose	1	
P5	Transcription occurs as RNA polymerase moves along the structural genes	1	
P6	The produced mRNA will be translated	1	
P7	β -galactosidase, permease and transacetylase will be produced continuously	1	
TOTAL		7 marks	
TOTAL		15 Marks	