SMJK PEREMPUAN CHINA PULAU PINANG
TRIAL EXAMINATION 2014
UPPER SIX BIOLOGY 964/3 TERM 3
TIME: 1 HOUR 30 MINUTES

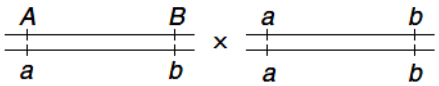
Name: …….. U6S….

Part A: Objective Section (15%)
Instructions: This section contains fifteen compulsory multiple choice questions. Answer **all**.

1. A length of double-stranded DNA contains 120 nucleotides and codes for polypeptide X. What is the maximum length of polypeptide X?
   A. 20 amino acids
   B. 40 amino acids
   C. 60 amino acids
   D. 120 amino acids

2. What is the ecological definition of the term community?
   A. All the food webs in an ecosystem
   B. All the individuals of one species in an area
   C. All the populations of different species in a habitat
   D. The living organisms and their non-living environment

3. A test cross between individuals of genotypes below is carried out as follows:



The genotype and number of progeny obtained are as shown below.

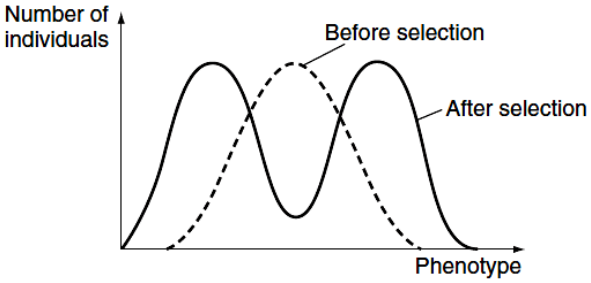
Genotype	*Number*
A B / a b	**40**
a B / A b	**11**
A b / a B	**9**
a b / a b	**40**

What is the map distance, in map units, between the two genes?
   A. 9
   B. 11
   C. 20
   D. 40

4. In a population of 100 000 people, 10 of them are albinos. The frequency of the albinism carriers is
   A. 0.01 B. 0.02 C. 0.20 D. 0.99

5. Which statement is true of allopatric speciation?
   A. Speciation produces hybrid species.
   B. Individuals occupy an overlapping area.
   C. Speciation is not caused by geographical factor.
   D. Geographical barrier prevents gene flow between populations.

6. The graph below shows the result of a type of selection for a population.



What conclusions can be made about the graph?

I Disruptive selection
II Directional selection
III Selection against extreme groups
IV Selection against intermediate groups
V Result in polymorphism

A. I, III and IV
B. I, IV and V
C. II, IV and V
D. II, III and V

7. Which has a palindromic sequence?
   A. AAGCGA
      TTCGCT
   B. AAAGTTCG
      TTTCAAGC
   C. CGAATTCG
      GCTTAAGC
   D. CACAGGTGAT
      GTGTCCACTA

8. What are the correct steps of *ex vivo* gene therapy?

I Recombinant DNA is injected into host cell.
II Harmful genes from the virus are removed.
III Cultured rat cells are inoculated with retrovirus.
IV Stem cells are tested for the presence of ADA enzyme.
V Adenosine deaminase (ADA) gene is inserted into DNA.

A. I, III, V, II, IV
B. V, I, III, II, IV
C. II, IV, V, I, III
D. III, II, V, I, IV

9. A radioactive short sequence of single stranded DNA used to locate a gene is called
   A. plasmid
   B. phage
   C. probe
   D. PCR primer

10. Which of the following is a correct match between the type of biotechnology and the field involved?

Type	Field
P Green Technology	I Aquatic
Q White Technology	II Agriculture
R Red Technology	III Industry
S Blue Technology	IV Medical

	P	Q	R	S
A.	II	III	IV	I
B.	I	II	IV	III
C.	IV	III	I	II
D.	III	IV	II	I

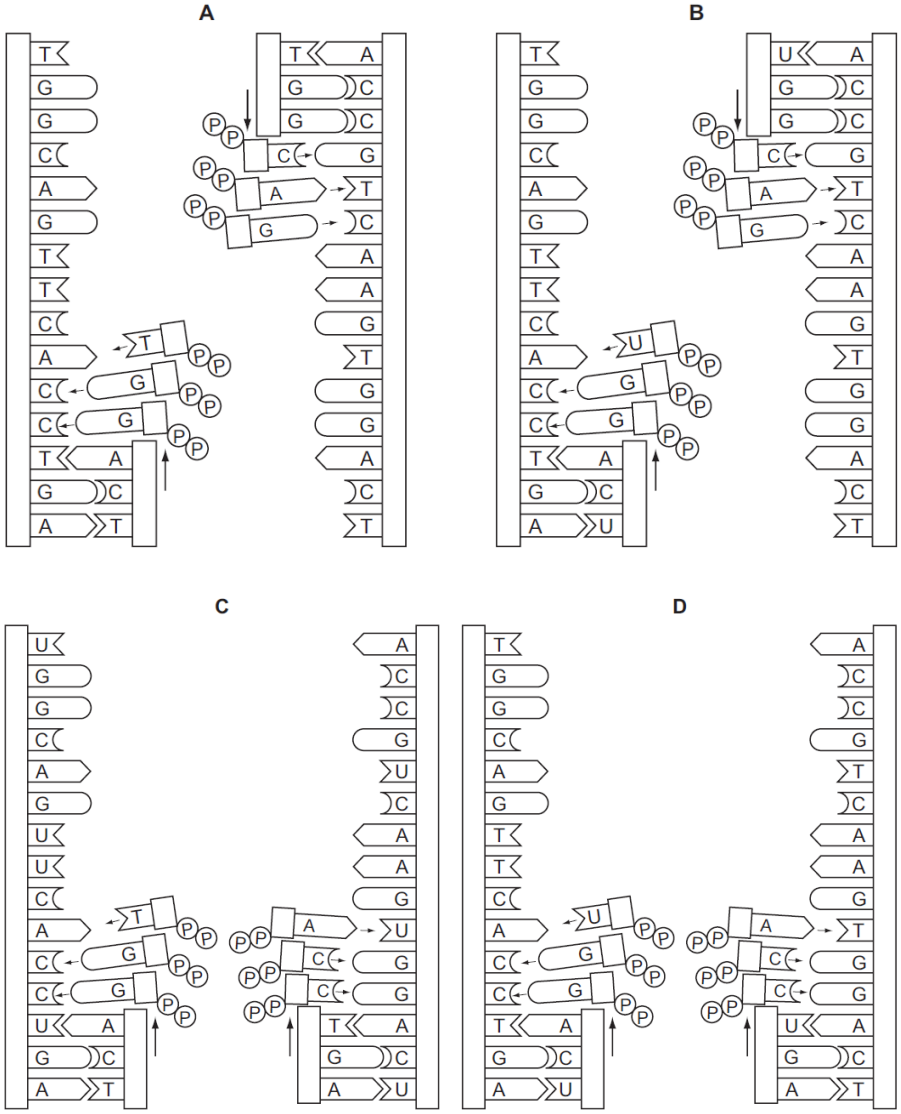
11. Why is the number of trophic levels in a food chain limited to only four or five levels?
A. There are different modes of nutrition among organisms.
B. There are different organisms that occupy different trophic levels.
C. The food chain reaches the carrying capacity.
D. High amount of energy is lost at every trophic level.

12. Which of the following causes frameshift mutation?
A. Addition of three nucleotides.
B. Addition of one nucleotide.
C. Deletion of three nucleotides.
D. Substitution of a nucleotide.

13. Which phylum does the plant below belong to?

A. Angiospermophyta
B. Coniferophyta
C. Filicinophyta
D. Bryophyta

14. Which diagram shows the semi-conservative replication of a section of a molecule of DNA?



15. What is removed during the formation of mature RNA in eukaryotes?

A. Exons
B. Introns
C. Promoter
D. RNA primer

Blank Page

Part B: Structure Section (15%)
Instruction: Answer two compulsory short structured questions below.

Q16.

Figure 1 summarises the large-scale production of three proteins of medical importance: insulin, human growth hormone (HGH) and human factor VIII. P, Q and R and enzymes.

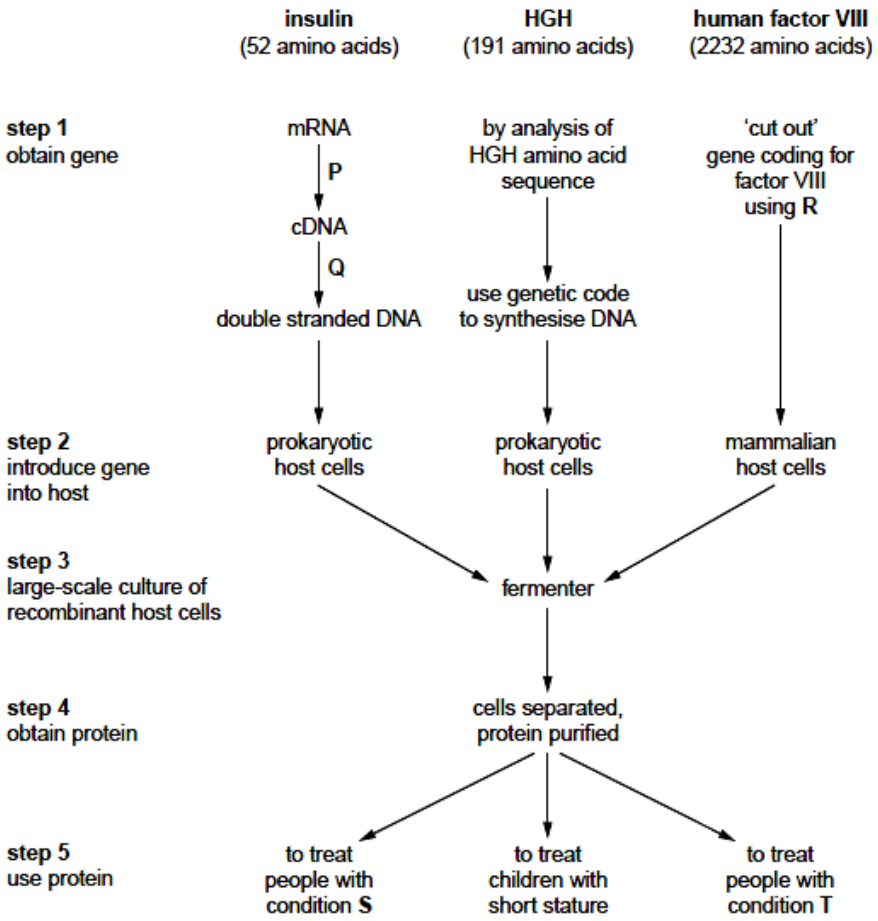


Figure 1

(a) Name the enzymes **P**, **Q** and **R** in step 1 of Fig 1. [3 marks]

P ……

Q ……

R ……

(b) Describe the role of **R** in gene engineering. [2 marks]

.....

.....

(c) Suggest why the method used to synthesise the gene coding for HGH is **not** used to obtain the gene coding for human factor VIII. [1 mark]

.....

.....

(d) Table 1 shows the genetic code (mRNA codons) that can be used to synthesise the gene coding for HGH in step 1.

first position	second position				third position
	U	C	A	G	
U	phe	ser	tyr	cys	U
	phe	ser	tyr	cys	C
	leu	ser	STOP	STOP	A
	leu	ser	STOP	trp	G
C	leu	pro	his	arg	U
	leu	pro	his	arg	C
	leu	pro	gln	arg	A
	leu	pro	gln	arg	G
A	ile	thr	asn	ser	U
	ile	thr	asn	ser	C
	ile	thr	lys	arg	A
	met	thr	lys	arg	G
G	val	ala	asp	gly	U
	val	ala	asp	gly	C
	val	ala	glu	gly	A
	val	ala	glu	gly	G

Table 1

The sequence of the first five (N-terminal) amino acids in human HGH is **met – phe – pro – thr – ile**. Using the genetic code in Table 1, work out a

sequence of bases in the synthetic DNA strand that would correspond to the first five amino acids. [2 marks]

Amino acid sequence:

met – phe – pro – thr – ile

DNA base sequence:

Q17.
The fruit fly, *Drosophila melanogaster*, has many phenotypic variations and has been used in experiments to demonstrate the principles of inheritance. The majority of fruit flies have red eyes but there is a variant with white eyes.

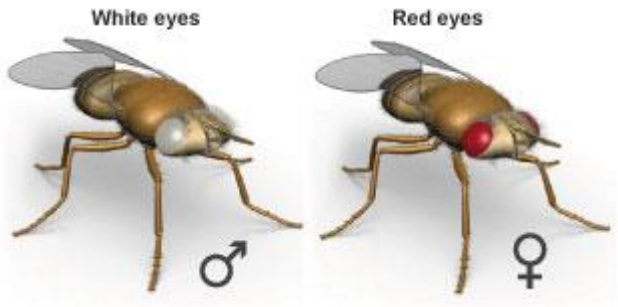


Figure 2

(a) Figure 2 shows the red-eyed and white-eyed variants of the fruit fly. The gene for eye colour is located on the X chromosome.

Using suitable symbols, draw a genetic schematic diagram to show the possible offspring of a cross between a heterozygous red-eyed female fruit fly with a white-eyed male fruit fly. [5 marks]

Key to symbols:

……

……

parental phenotypes	red-eyed female	white-eyed male
parental genotypes		

(b) A dihybrid female *Drosophila melanogaster* with red-eyed and normal long wings is test-crossed with male white-eyed and vestigial wings. The progeny produced are as follows:

Phenotype	**Number**
red-eyed and normal long wings	201
red-eyed and vestigial wings	38
white-eyed and vestigial wings	199
white-eyed and normal long wings	42

Table 2

(i) What is meant by a sex-linked gene? [1 mark]

.....

.....

(ii) How do we know the two genes above are linked? [1 mark]

.....

.....

.....

Part C: Essay Section (30%)
Instruction: Choose two out of three essay questions to be answered.

Q18.
(a) Based on growth characteristics, populations can be categorized into either r-strategists or K-strategists. Compare the characteristics of r-strategists and K-strategists. [6 marks]

(b) Explain the components in the phosphorus cycle with illustration. [6 marks]

(c) Compare for the advantages and disadvantages of quadrat, line transect and capture-recapture method. [3 marks]

Q19.
(a) Describe the key characteristics of the following phyla: [12 marks]
Chordata Cnidaria

(b) Explain three joint efforts taken by Malaysia government and regional ASEAN countries to address the threats to biodiversity in Malaysia. [3 marks]

Q20.
Explain how it is possible that a new species can be formed without physical isolation.

Discuss various isolating mechanisms available, where no physical isolation is concerned, and the importances of speciation for driving the evolution. [15 marks]

Blank Page

Name: …….. U6S….

Student's Answers Sheet
Instruction: Write down your answer in the following table:

1.	2.	3.	4.	5.
6.	7.	8.	9.	10.
11.	12.	13.	14.	15.

15

For Examiner's Use

Section	Full Score		Student's Score
A *(Answer all)*	**15**		
B *(Answer all)*	**15**		
	Q16	8	
	Q17	7	
C *(Answer any two)*	**30**		
	Q18	15	
	Q19	15	
	Q20	15	
Total Score	**60**		
Score scaled to 100%			

Prepared by Yeap Chee Beng

Checked by Confirmed by