9E
11 N.E

37. Below is the list of some amino acids:

(i) alanine (iv) histidine
(ii) arginine (v) leucine, isoleucine
(iii) glycine (vi) lysine valine

Which of the following consists of essential amino acids?

A. (i), (ii), (iii) B. (ii), (iv), (v) C. (i), (iii), (iv) D. (ii), (v), (vi) NONE

38. The following are trisonic conditions except:

A. Klinefelter's syndrome B. Down's syndrome C. Turner's syndrome
D. XXX female

39. Among the allopatric species of anopheles mosquitoes, some live in brackish water, some in running water and others in stagnant water. What type of reproductive barrier is most obviously separating these different species?

A. Mechanical barrier B. Post zygotic barrier
C. Ecological isolation D. Behavioural isolation

40. Given that two genes are linked and no crossing-over occurs between them. What would be the proportions of the F1 generation if a double recessive parent is crossed with a double heterozygous one?

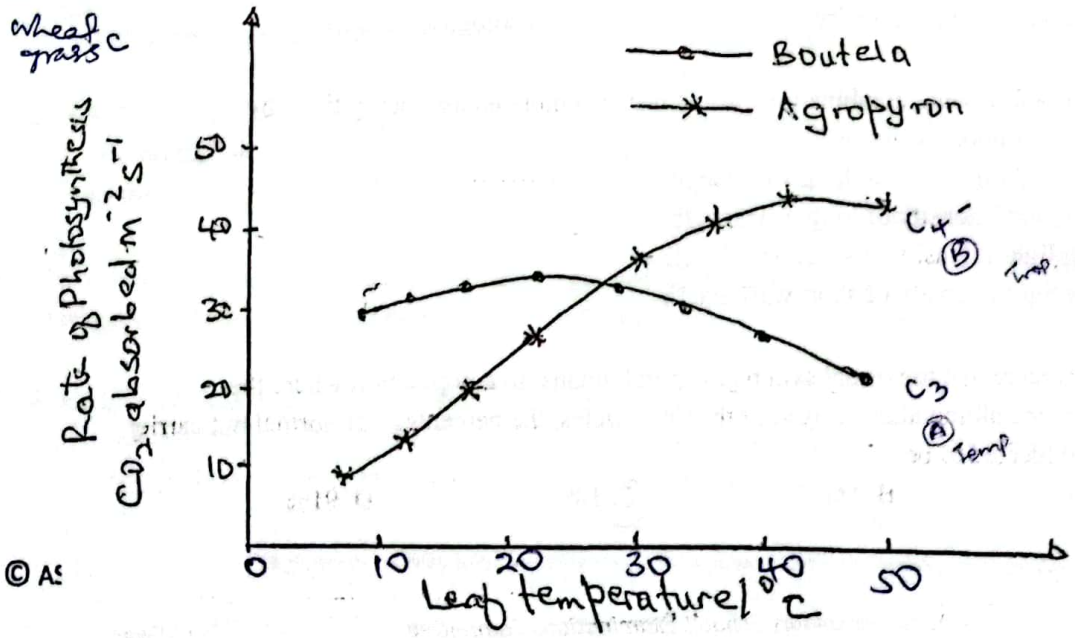
A. 3 : 1 B. 9 : 3 : 3 : 1 C. 1 : 1 D. 1 : 1 : 1 : 1

SECTION B

Answers to this section should be written in the spaces provided and NOT anywhere else.

Question 41:

The figure below shows the effect of temperature on the rate of photosynthesis of two grasses in Agropyron and Boutela.



Over

(a) State how different the effect of leaf temperature on the rate of photosynthesis in both grasses. (03 marks)

	Rate of Photosynthesis of Boutela	Rate of Photosynthesis of Agropyron.
i)	Increases gradually to a peak	Increases rapidly to a peak
ii)	Lower peak attained	Higher peak attained
iii)	Peak attained at lower tempt.	Peak attained at higher tempt
iv)	Higher at lower tempt	Lower at lower tempt.
v)	Lower at higher tempt	Higher at high tempt.

(b) Giving a reason in each case, suggest which of the two grasses is likely to grow faster in (a):

(i) Temperate climate (02 marks)

Boutelova; because its rate of photosynthesis peaks at lower temperature; owing to lower optimum tempt. for the photosynthetic enzymes.

(ii) Tropical climate (02 marks)

Agropyron; because its rate of photosynthesis peaks at higher temperatures; owing to higher optimum tempt for the photosynthetic enzymes; this aids it continue rapidly fixing CO_2 at higher tempt.

(c) Explain the effect of temperature on the rate of photosynthesis in Agrophyron. (03 marks)

Increase in tempt rapidly increases the rate of photosynthesis to a peak because the K.E of CO_2 molecules and enzymes increased; moving faster; increasing the number of collisions between enzymes and CO_2 molecules per unit time. Also increase in tempt increases the rate of diffusion of CO_2; more CO_2 enters the leaves

Question 42:
In sweet potato flower, colour is determined by two alleles of R for red and W for white which are incompletely dominant. A population has the following individuals distributed as follows:

Flower colour	Number of individuals
Red	450
Pink	500
White	50

(a) Using the information provided, determine the:
(i) total number of R and W alleles in the population. Show your working. (03 marks)

RR RW WW

450/1,000 500/1,000 50/1000

0.45 0.5 0.05

½ ½

0.45+0.25 0.05+0.25

0.7 0.3

Total R alleles
= 0.7×1,000
= 700

Total W alleles
= 0.3×1,000
= 300

(ii) genotype frequency of each genotype (03 marks)

RR RW WW

450/1,000 500/1,000 50/1,000

0.45 0.5 0.05

(iii) allele frequencies of each allele. (02 marks)

$\Rightarrow R = 0.45 + 0.25 = 0.7$

$\Rightarrow W = 0.05 + 0.25 = 0.3$

(b) State four causes of change in the allele frequencies and genotype frequencies in a population. (02 marks)

i) Mutation v) Natural selection

ii) Genetic drift

iii) Non-random mating

iv) Gene flow

Question 43:

(a) Explain the changes in the metabolic rate of a mammal when the environmental temperature :

(i) lowers below the lower critical temperature. (02 marks)

As environmental temperature lowers below the L.C.T, metabolic rate increases; so as to generate heat and maintain a stable internal body temperature.

(ii) rises above the upper critical temperature (02 marks)

As environmental temperature rises above the U.C.T, metabolic rate increases; because the body is no longer protected by the body's cooling process; chemical reactions in the cells become subject to the temperature rule.

(b) Explain the role of the following in temperature regulation:

(i) Hypothalamus (03 marks)

Yes ~~As~~ thermoreceptors to monitor temperature of the blood

It establishes a set-point

It triggers appropriate responses to adjust the body's

temperature:

(ii) Circulatory system (03 marks)

In heat distribution, it carries warm blood to peripheral tissues
In vasodilation and vasconstriction, blood vessels can change their diameter in response to temperature changes.
In cooling of the body through sweating

Question 44:
The table below shows control of digestion along the alimentary canal of a human being.

Parts of Canal	Mechanism controlling digestive juice secretion
Mouth	Pure nervous control
Stomach	Both nervous and hormonal
Duodenum	Purely hormonal

(a) State the significance of the observed trend of control of secretion of digestive juice along the alimentary canal. (06 marks)

i) Efficient digestion and nutrient absorption. The progressive shift from nervous to hormonal control as food moves along the canal, allows for precise control over digestive processes.
ii) Hormal control ensures the right enzymes at the right time are produced; optimising nutrient digestion and absorption
iii) Adaptability; it enables the body to adjust its digestive responses.

(v) Prevention of overstimulation e.g hormonal control ensures that gastric lyises are not overly secreted thus preventing damage.

(vi) Protection of digestive organs

(vi) It allows the body to efficiently process a wide range of foods.

(b) Give the roles of two named hormones in stimulating the secretion of digestive juices in the duodenum. (04 marks)

i) Secretin

— Stimulates the pancreas to produce alkaline bicarbonate solution to neutralise the acidic chyme.

— Stimulates the liver to secrete bile into gall bladder

ii) Cholecystokinin

— Stimulates pancreas to produce pancreatic enzymes

— Stimulates contraction of gall bladder to release bile into duodenum.

Question 45:

(a) State four ideas put forward in Mendel~~ers~~ work on genetics. (03 marks)

i) During meiosis, each pair of alleles separates and each gamete receives one of each pair of allele

ii) During gamete formation in each sex, either one of a pair of alleles may enter the same gamete cell (combine randomly) with either one of another pair

iii) Each trait of an organism is controlled by a pair of allele.

(b) Examine the data for crosses in cats as shown in the table below;

iv) Each organism inherits one allele from each parent

v) Dominance and recessiveness.

Parents	Off-springs
Black male x yellow female	½ yellow males ½ tortoise shell females
Yellow male x black female	½ black males ½ tortoise shell females
Yellow male x tortoise shell female	¼ black males ¼ yellow males ¼ yellow females ¼ tortoise females

From the data given, suggest the type of inheritance exhibited. (01 mark)

Sex-linked inheritance

(c) Using a Punnet Square, predict the results of a cross involving a black male and a tortoise shell female. (04 marks)

Let: B represent ~~yellow~~ black coat colour
C represent yellow coat colour
XX represent female cat
XY represent male cat.

♂ \ ♀	X^B	X^C
X^B	$X^B X^B$	$X^B X^C$
Y	$X^B Y$	$X^C Y$

⇒ ¼ black males
¼ yellow males
¼ black females
¼ tortoise shell females.

(d) Explain why tortoise shell cats are normally females. (02 marks)

For tortoise shell to express itself, both the alleles for black and yellow coat colour must combine together which can only happen in the female (X X) since Y chromosome in male is always empty.

Question 46:

(a) Distinguish between magnification and resolving power of a microscope. (02 marks)

Magnification is the number of times an image is larger than the specimen where as resolving power is the minimum distance by which two points must be separated in order for them to be perceived as two distinct points rather than as a single fused image.

(b) In an investigation under medium power of a microscope, the number of epidermal cells of an onion leaf observed across a diameter of field of view was 100. The diameter of the field of view as 3mm:

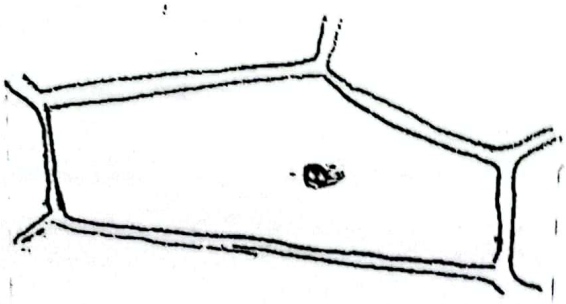
(i) Work out the average length of each cell in micrometres. (03 marks)

Average length of one cell = Diameter of field of view / Number of cells that cross the diameter

$= \frac{(3 \times 1000)}{100}$

$= 30\mu m$

(ii) The figure below shows a candidate's drawing of one of the cell observed under this microscope.



Work out the magnification of the drawing. (02 marks)

Magnification = $\frac{(7.5\text{cm} \times 10{,}000)\text{cm}}{30\text{cm}}$

$= X2{,}500$

(c) What are the advantages of a light microscope over an electron microscope? (03 marks)

i) Easy to use

ii) Cheaper than electron microscope

iii) Used for studying living cells unlike electron that can't be used to see living cells

iv) Provides colour information and uses a wide range of staining techniques to enhance constrast

v) Can handle larger sample sizes. END