2021-DSE
BIO
PAPER 1A

Queen's College
Mock Examination 2020 – 2021

Biology Paper 1

Secondary 6
Blocks 1 & 2

Date: 2 – 2 – 2021
Time: 8:30 am – 11:00 am

This paper must be answered in English.

GENERAL INSTRUCTIONS

(1) There are **TWO** sections, A and B, in this Paper. You are advised to finish Section A in about 35 minutes.

(2) Section A consists of multiple-choice questions in this question paper. Section B contains conventional questions printed separately in Question-Answer Book **B**.

(3) Answers to Section A should be marked on the Multiple-choice Answer Sheet while answers to Section B should be written in the spaces provided in Question-Answer Book **B**. **The Answer Sheet for Section A and the Question-Answer Book for Section B must be handed in separately at the end of the examination.**

INSTRUCTIONS FOR SECTION A (MULTIPLE CHOICE QUESTIONS)

(1) Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should fill in the information required in the spaces provided.

(2) When told to open this book, you should check that all the questions are there. Look for the words '**END OF SECTION A**' after the last question.

(3) All questions carry equal marks.

(4) **ANSWER ALL QUESTIONS.** You are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured.

(5) You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.

(6) No marks will be deducted for wrong answers.

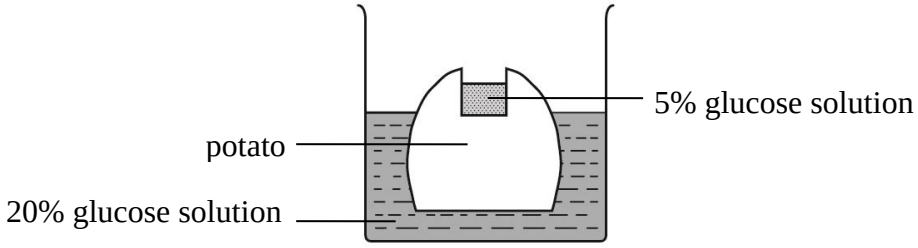
Not to be taken away before the end of the examination session

There are 36 questions in this section.
The diagrams in this section are NOT necessarily drawn to scale.

1. Which of the following sub-cellular structures can be found in an *Amoeba*?
   A. vacuole, ribosome, cell membrane
   B. ribosome, endoplasmic reticulum, chloroplast
   C. cell wall, cell membrane, mitochondria
   D. cell membrane, chloroplast, mitochondria

2. Which of the following roles is played by the glycoproteins on human cell membranes?
   A. serving as the respiratory enzymes
   B. acting as the receptors for hormones
   C. increasing the membrane integrity
   D. uptake of the ions by active transport

3. The diagram below shows a set-up designed to investigate osmosis using a potato. The cavity made in the potato is partly filled with 5% glucose solution. The whole potato was peeled then immersed partly in a beaker containing 20% glucose solution.



   The level of glucose solution inside the cavity remains the same after 20 hours. Which of the following explanations is the most possible?
   A. Water moves into the potato cells and out at the same rate by osmosis.
   B. The potato cells are only impermeable to sucrose.
   C. Glucose diffuses from the 20% glucose solution into the cavity together with water.
   D. The cell membrane of the potato cells are fully permeable.

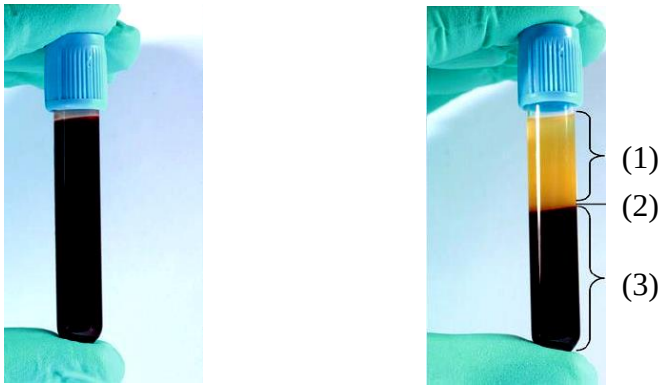
4. A student accidentally mixed up five tubes of different carbohydrates solutions. The table below shows the results of several food tests carried out previously on the five carbohydrates:

	Food test		
Carbohydrate	**Glucose test paper**	**Benedict's test**	**Iodine test**
glucose	positive	forms brick-red precipitate	remains brown
fructose	negative	forms brick-red precipitate	remains brown
sucrose	negative	remains blue	remains brown
lactose	negative	forms brick-red precipitate	remains brown
starch	negative	remains blue	turns blue-black

   What is the minimum number of food test(s) that the student needs to carry out in order to identify sucrose from the four other carbohydrates?
   A. one
   B. two
   C. three
   D. cannot be determined

5. The milk of mammals contains lactose which is a disaccharide. What is the advantage of supplying a baby with lactose instead of glucose in breast milk?
   A. Each disaccharide molecule contains higher energy value than a glucose molecule.
   B. Disaccharides can be easily converted to amino acids in the body of the growing baby.
   C. Disaccharides are more easily condensed to glycogen for storage in the body of the baby.
   D. Digestion of disaccharides gives a more gradual release of monosaccharides.

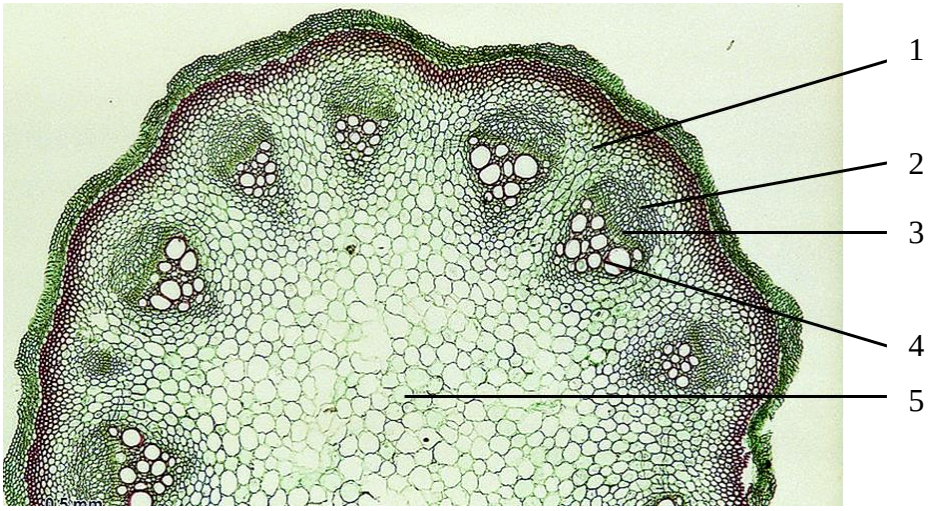
6. The photograph below shows a sample of blood before and separated into three layers after centrifugation:



Before centrifugation ***After centrifugation***

Referring to the photograph, which of the following layer(s) of blood is/are involved in body defence?
   A. (1) only
   B. (1) and (2) only
   C. (2) and (3) only
   D. (1), (2) and (3)

7. The photomicrograph below shows a transverse section of a part of a young dicotyledonous stem:



If an aphid is going to insert its mouthparts into the stem, which part of the stem should the mouthparts reach?
   A. 1
   B. 3
   C. 4
   D. 5

Go on to the next page

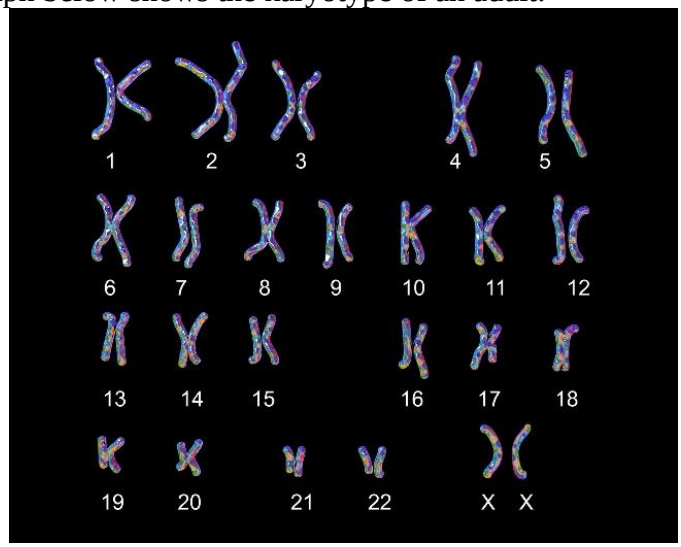
8. The photograph below shows the collection of the saps from a maple tree for the production of maple syrup. The sap collected is then boiled, evaporated and filtered for the final syrup product:

Which of the following food components is/are the major nutrient constituent(s) of maple syrup?

(1) glucose
(2) amino acids
(3) sucrose
(4) minerals

A. (1) only
B. (3) only
C. (2) and (3) only
D. (1), (2), (3) and (4)

9. The photomicrograph below shows the karyotype of an adult:

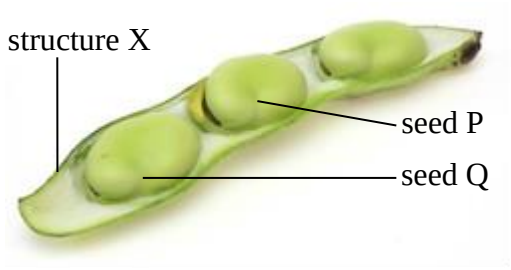


From the karyotype, which of the following deductions are correct?

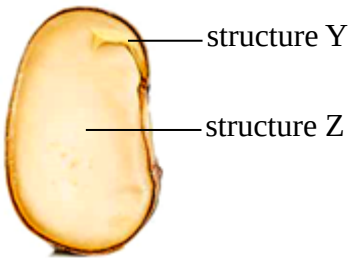
(1) The cell used for karyotyping is a somatic cell.
(2) The person is a female.
(3) The person does not have any genetic diseases.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

Directions: Questions 10 and 11 refer to Photographs I and II below. Photograph I shows an opened broad bean pod and Photograph II shows the vertical section of a broad bean.



Photograph I

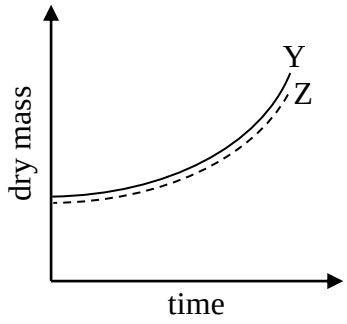


Photograph II

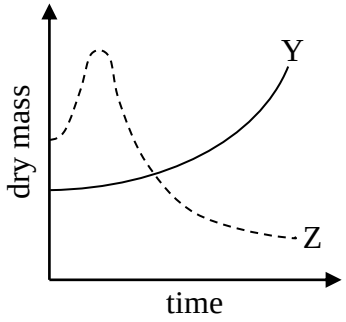
10. Which of the following statements about the labelled structures in Photograph I is correct?
    A. Structure X is developed from the whole carpel of the flower.
    B. Structure X is diploid while seeds P and Q are haploid.
    C. Structure X helps disperse seeds P and Q.
    D. Seeds P and Q have the same genetic make-up.

11. Which of the following graphs correctly shows the changes in dry mass of structures Y and Z shown in Photograph II during germination?

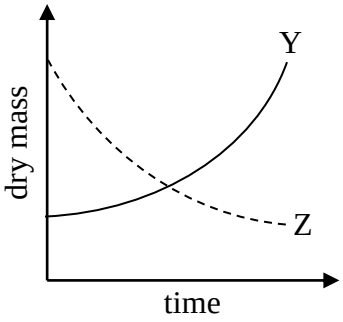
A.



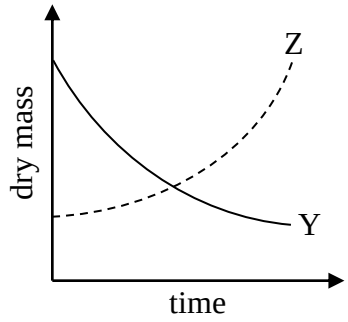
B.



C.



D.



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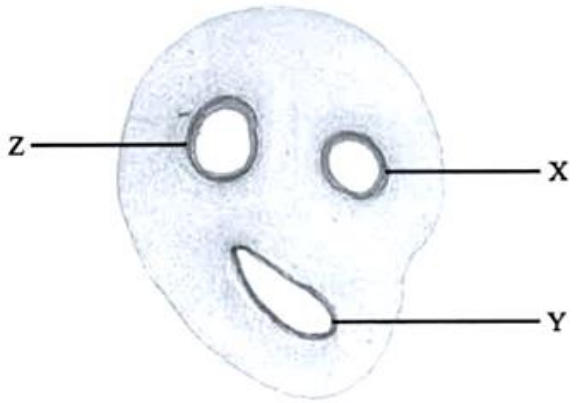
12. Which of the following cells reproduce by mitotic cell division?
    (1) *Paramecium*
    (2) blue-green algae
    (3) *E. coli*
    A. (1) only
    B. (2) only
    C. (1) and (3) only
    D. (2) and (3) only

13. The photomicrograph below shows a section of a human umbilical cord with three blood vessels:



    Which of the following comparisons of content of the blood vessels is correct?
    A. The blood in vessel X has a higher oxygen content than that in vessel Y.
    B. The blood in vessel Z has a higher glucose content than that in vessel X.
    C. The blood in vessel Y has a higher amino acid content than that in vessel X.
    D. The blood in vessel Y has a higher urea content than that in vessel Z.

14. If a red blood cell has to move from the small intestine to the liver, and then from the liver to the small intestine, it has to pass through the heart for at least how many times in each of these two journeys?

	Small intestine to liver	***Liver to small intestine***
A.	1	1
B.	2	2
C.	0	1
D.	0	2

15. Which of the following phenomena is/are the secondary sexual characteristics in males?
    (1) deepening of voice
    (2) occurrence of wet dream
    (3) growth of extra facial and body hair
    (4) increase in muscle mass and strength
    A. (1) and (2) only
    B. (2) and (3) only
    C. (1), (3) and (4) only
    D. (1), (2), (3) and (4)

16. Which of the following descriptions is the advantage of binocular vision (with both eyes in the orbits for vision)?
    A. The visual field of view can be wider than monocular vision.
    B. Objects under dim light can be seen more clearly.
    C. Distant objects can be detected more readily.
    D. The position of an object can be estimated more accurately.

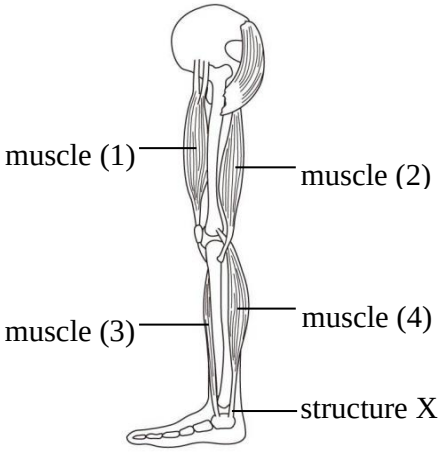
17. Which of the following structures in an ear connects to the oval window?
    A. ear bones
    B. semicircular canals
    C. cochlea
    D. Eustachian tube

18. John sits upright when he enters the classroom for his lessons. Which of the following body structures is involved in this response?
    A. skeletal muscles
    B. cerebrum
    C. cerebellum
    D. medulla oblongata

Directions: Questions 19 and 20 refer to Diagrams I and II below. Diagram I shows an athlete practising high diving, and Diagram II shows some structures in a human leg:

Diagram I

Diagram II



19. In maintaining the posture shown in Diagram I, which of the labelled muscles in Diagram II are contracting?
    A. muscles (1) and (3)
    B. muscles (1) and (4)
    C. muscles (2) and (3)
    D. muscles (2) and (4)

20. Which of the following statements about structure X shown in Diagram II is correct?
    A. It consists of living cells.
    B. It becomes shorter when muscle (4) contracts.
    C. It prevents dislocation of the ankle joint during movement.
    D. It absorbs shock during movement.

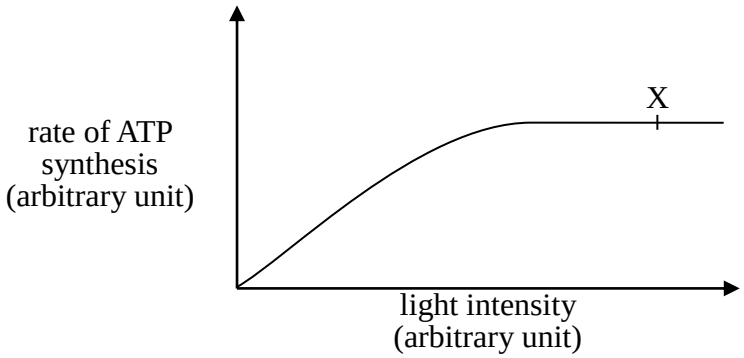
21. Which of the following events would occur if a healthy person has received an injection of insulin?
(1) The glucagon secretion from the pancreas would increase.
(2) The glucose concentration in the body cells would increase.
(3) The liver cells would increase the rate of oxidation of glucose.
A. (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

22. Which of the following organisms below belong to the domain Eukarya?
(1) Yeast
(2) *Amoeba*
(3) *Paramecium*
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

23. Which of the following examples is correctly matched to the type of interaction between the organisms?

	Type of interaction	***Example***
A.	mutualism	a tree and the mushrooms growing on its bark
B.	competition	oysters and barnacles living on a rock surface
C.	commensalism	a suckerfish attaches itself to the body surface of a shark
D.	parasitism	a whale and the barnacles living on its body surface

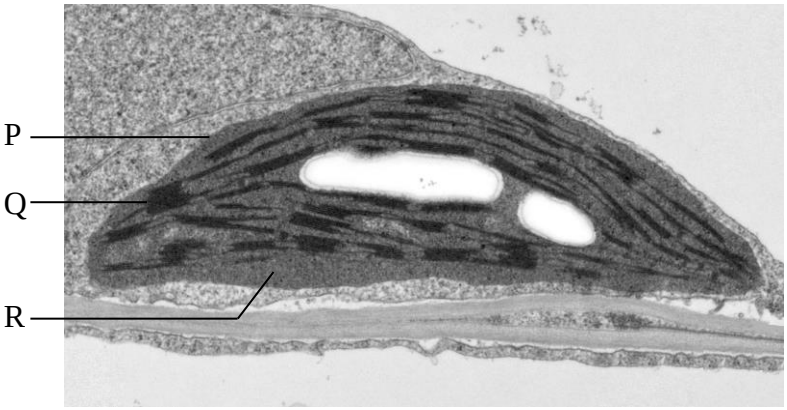
24. A scientist investigated the effect of light intensity on photochemical reactions. He extracted some grana from chloroplasts and mixed them with excess ADP, phosphate and NADP. Then, he measured the rates of ATP synthesis of the mixture at different light intensities. The graph below shows the results:



Which of the following factors is/are possible to limit the rate of ATP synthesis at point X?
(1) carbon dioxide concentration
(2) amount of chlorophyll
(3) light intensity
A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only

25. For the muscles contracts with quick energy supply, the respiratory pathway in the muscle cells
    A. involves the oxidation of glucose.
    B. produces lactic acid and carbon dioxide.
    C. takes place in the cristae of the mitochondria.
    D. takes place in the matrix of the mitochondria.

26. The electron micrographs below show two sub-cellular structures in cells:



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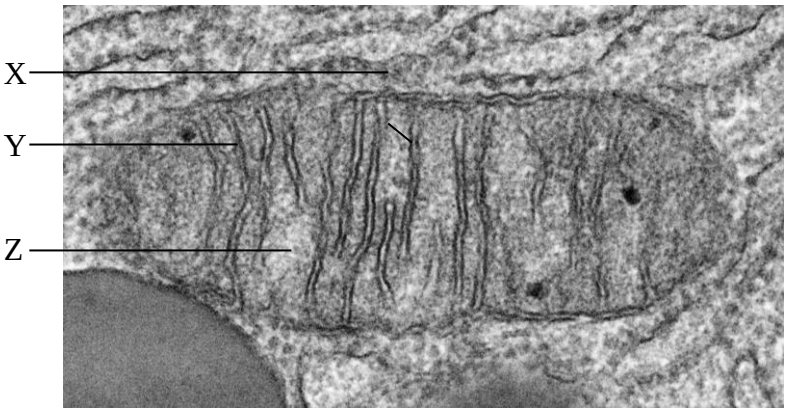

(×35 000)

Which of the following statements about the two sub-cellular structures is/are correct?
(1) Electron carriers are located at P and X.
(2) ATP is synthesized at Q and Y.
(3) Enzymes are found at R and Z.
A. (2) only
B. (3) only
C. (2) and (3) only
D. (1), (2) and (3)

27. Antibiotics are ineffective against viruses because
    A. viruses are much smaller than antibiotic molecules.
    B. viruses can release enzymes that inactivate the antibiotics.
    C. the protein coat of viruses can fuse with the antibiotics.
    D. viruses do not have cellular activities.

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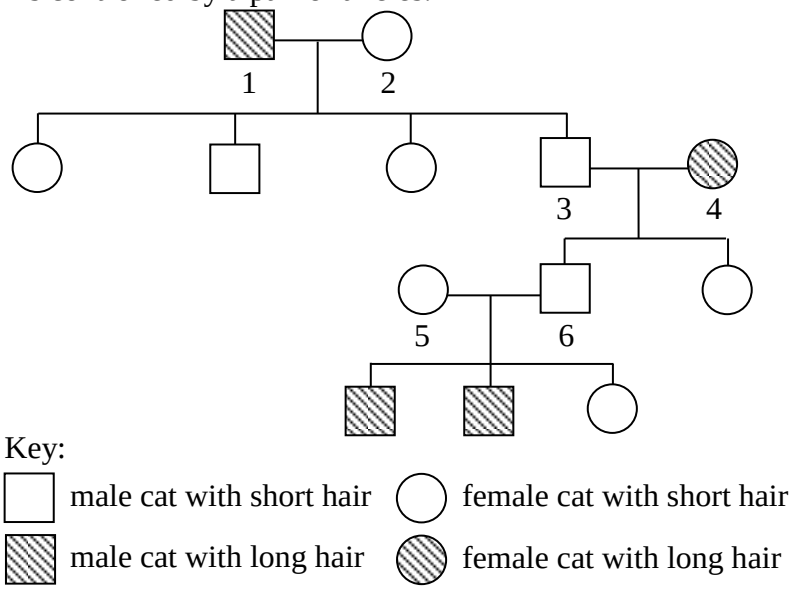
28. When a person has a fever during a bacterial infection, his body temperature is raised. Which of the following explanations is a possible advantage of this higher temperature?
    A. A higher temperature is unfavourable to the bacterial growth in the body.
    B. The human body can counteract the bacterial infection at a higher rate.
    C. More food can be broken down by the body to counteract the bacterial infection.
    D. More sweating under higher body temperature can excrete more toxic wastes from the bacterial infection.

29. COVID-19 caused by a virus. After a person has contracted COVID-19 and recovered, it is unlikely that he would contract COVID-19 within months. This is because
    A. the antibodies in the body can recognise the virus readily.
    B. the antibodies against the virus exist in the blood for months.
    C. the B cells against the virus exist in the blood for months.
    D. the memory cells for COVID-19 have developed.

30. The pedigree below shows the inheritance of hair length in a group of cats. Whether a cat has long or short hair is controlled by a pair of alleles.



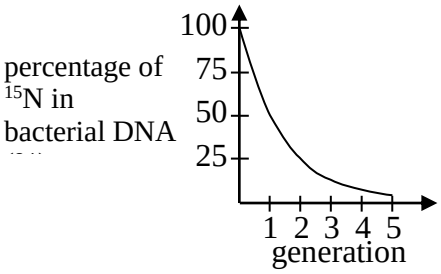
In cats, sex is determined by a pair of sex chromosomes. Male cats have one X chromosome and one Y chromosome in their cells, while female cats have two X chromosomes. Which of the following cross(es) can be used to determine whether hair length in cats is sex-linked?
(1) cross between individuals 1 and 2
(2) cross between individuals 3 and 4
(3) cross between individuals 5 and 6
A. (2) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only

31. Red-green colour blindness and cystic fibrosis are both genetic diseases. Red-green colour blindness is caused by a recessive allele on the X chromosome while cystic fibrosis is caused by a recessive allele on an autosome.
Which of the following descriptions is/are correct for the inheritance of both diseases?
(1) A male having the disease can pass the disease allele on to his son.
(2) A normal female can be homozygous or heterozygous.
(3) If a heterozygous normal female and a male having the disease give birth to a child, the chance of the child having the disease is 50%.
A. (1) only
B. (2) only
C. (1) and (2) only
D. (2) and (3) only

32. The tRNA anticodon for the sequence TGA on the coding strand of DNA is
A. UGA.
B. ACU.
C. ACT.
D. UCU.

33. A scientist grew some bacteria in a medium containing ^{15}N for a period of time until all the DNA in the bacteria had incorporated with ^{15}N. He then transferred the bacteria to a medium containing ^{14}N. Which of the following graphs best represents the change in the amount of ^{15}N in the DNA of bacteria over 5 generations?

A.



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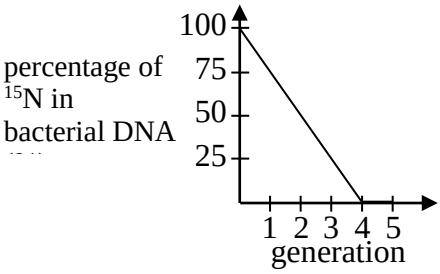

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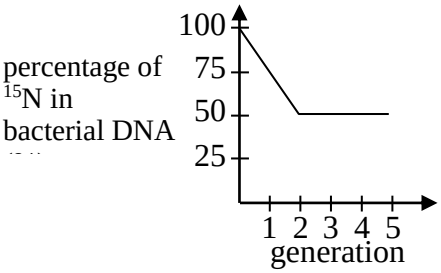
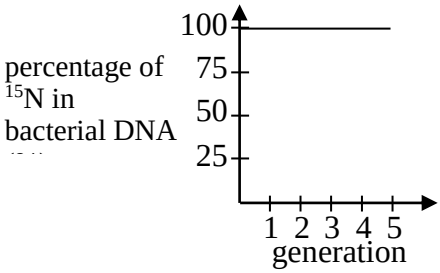


D.



34. Which of the following is ***not*** an application of DNA fingerprinting?
A. forensic science
B. screening for genetic diseases
C. identification of Chinese medicines
D. sequencing of the human genome

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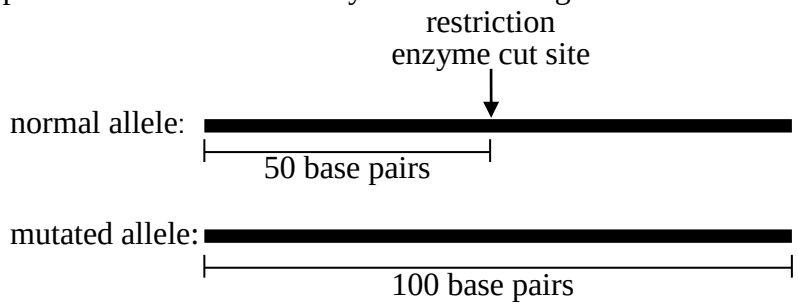
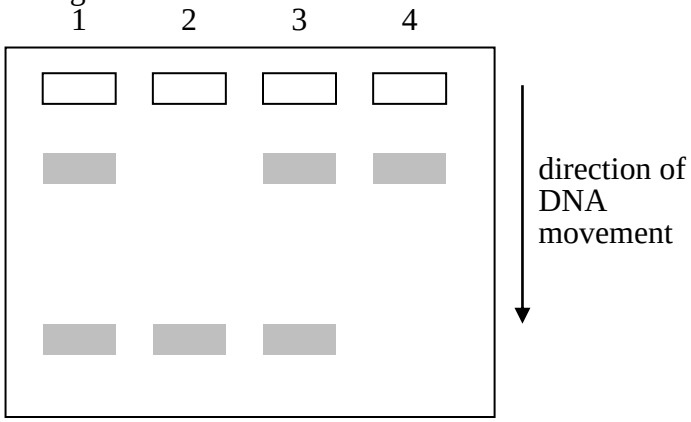
35. Evolution of species is likely to be faster in a changing environment than in a stable environment because
    A. more individuals are produced in the changing environment.
    B. there are more variations among individuals in the changing environment.
    C. the changing environment keeps selecting individuals with different characters.
    D. mutations in the changing environment are more frequent.

36. The diagram below shows two alleles of a gene located on X chromosome. The normal allele contains a restriction enzyme cut site. In the mutated allele, a mutation occurs at the restriction cut site. This prevents the restriction enzyme from cutting the mutated allele.



DNA samples containing the gene were obtained from four individuals. The samples were treated with the restriction enzyme. The DNA fragments obtained were then separated using gel electrophoresis. The diagram below shows the results.



Which of the following descriptions are the deductions from the above results?
(1) Individual 2 is homozygous for the normal allele.
(2) Individuals 1 and 3 are females.
(3) The normal allele is dominant over the mutated allele.
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

END OF SECTION A

Go on to Question-Answer Book B for questions on Section B