IB · DP · Biology

40 mins 40 questions

Practice Paper 1

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Total Marks **/40**

1 The use of pesticides is a cause of controversy due to its impact on pollinators such as bees.

What effect do these pesticides have on the nervous system of insects?

A. They prevent acetylcholinesterase from breaking down acetylcholine.

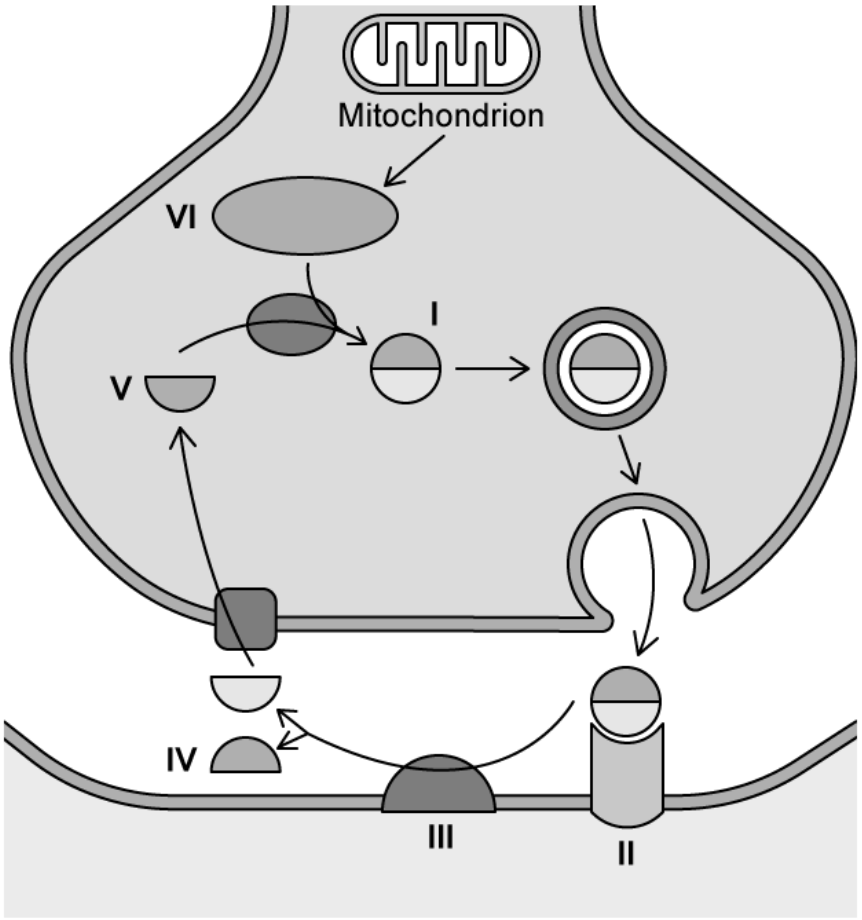
B. They inhibit depolarisation in the presynaptic neurone which increases the level of acetylcholine.

C. They block synaptic transmission by binding with postsynaptic acetylcholine receptors.

D. They produce an inhibitor that promotes the binding of acetylcholine.

(1 mark)

2 Study the diagram below.



Which of the following table rows correctly identifies **I - VI**?

	I	II	III	IV	V	VI
A.	Acetylcholine	Acetyl-cholinesterase	Cholinergic receptor	Choline	Acetyl group	Acetyl-CoA
B.	Acetyl-cholinesterase	Acetyl-CoA	Acetylcholine	Cholinergic receptor	Choline	Acetyl group
C.	Acetylcholine	Cholinergic receptor	Acetyl-cholinesterase	Acetyl group	Choline	Acetyl-CoA
D.	Acetylcholine	Cholinergic receptor	Acetyl-CoA	Choline	Acetyl group	Acetyl-cholinesterase

(1 mark)

3 Which of the following correctly identifies the process that allows prokaryotic cells to reproduce?

A. Mitosis

B. Binary fission

C. Fertilisation

D. Meiosis

(1 mark)

4 Each of the following events takes place during mitosis.

1 Chromosomes uncoil.
2 Chromatids move to opposite poles of the cell.
3 Centromeres divide.
4 Chromosomes line up along the equator of the spindle.
5 Two chromatids are joined by a centromere.

In which order do the events take place?

	First →→→→→→→→→→→→→→→→→				Last
A	1	2	4	5	3
B	3	1	2	4	5
C	4	5	3	1	2
D	5	4	3	2	1

(1 mark)

5 Which of the structures in **Diagram 2** correctly shows the structure of β-glucose and of α-glucose?

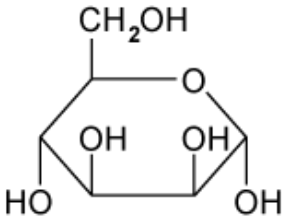
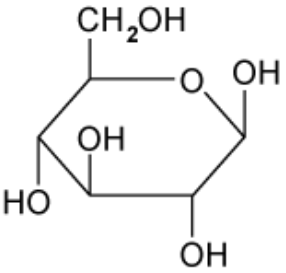
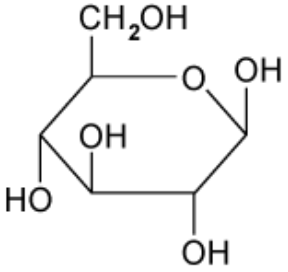
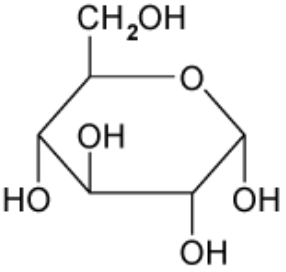
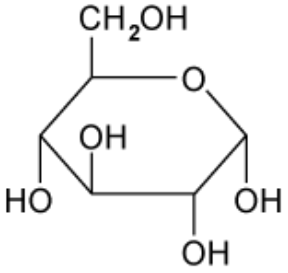
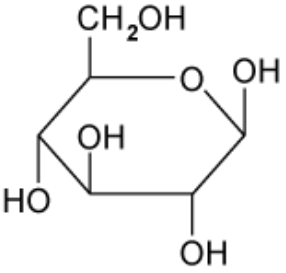
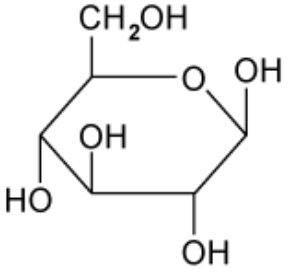
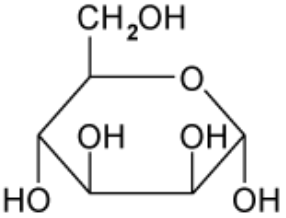
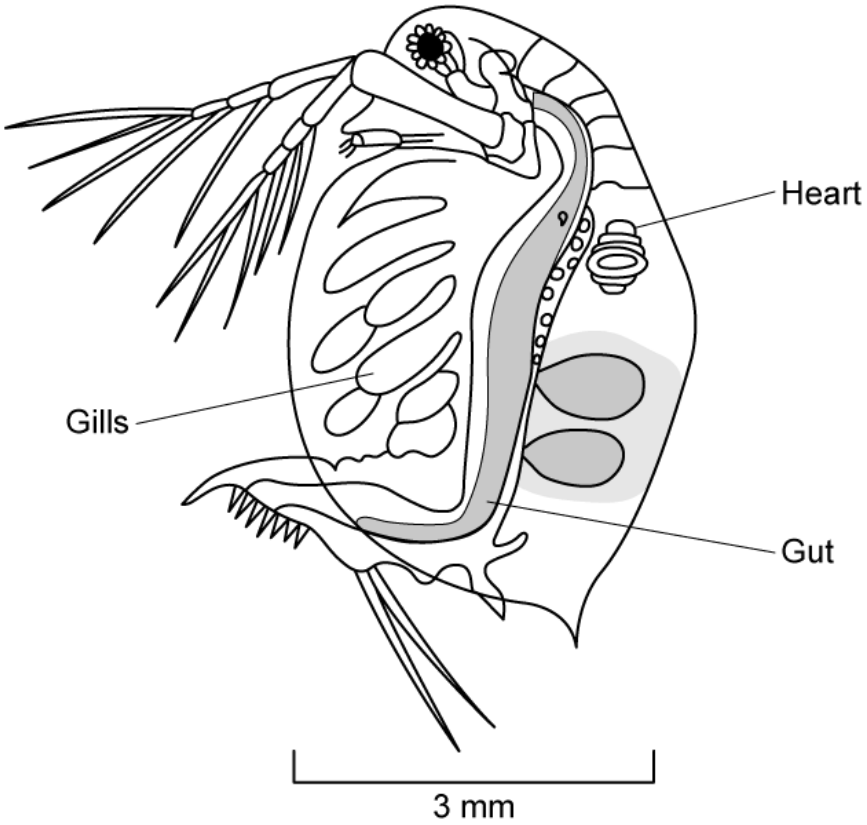
	β-glucose	α-glucose
A		
B		
C		
D		

Diagram 2

(1 mark)

6 The aquatic crustacean the water flea (*Daphnia magna*, pictured below) has a heart that pumps blood-like liquid called hemolymph around its body cavity.



Which statement about *Daphnia magna*'s circulatory system is correct?

A. single closed

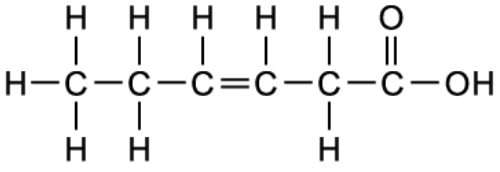
B. single open

C. double closed

D. double open

(1 mark)

7 The diagram below shows a component of a triglyceride.



Which of the following correctly identifies this component?

A. Saturated fatty acid

B. Monounsaturated fatty acid

C. Polyunsaturated fatty acid

D. Phospholipid

(1 mark)

8 Which row of the table best classifies common proteins with differing numbers of polypeptide chains?

	One polypeptide chain	Two polypeptide chains	Three polypeptide chains
A	Collagen	Insulin	Haemoglobin
B	Lysozyme	Insulin	Collagen
C	Lysozyme	Haemoglobin	Insulin
D	Haemoglobin	Lysozyme	Collagen

(1 mark)

9 During the process of semi-conservative replication of DNA, which activity, relating to bonding, does **not** take place?.

A. Breaking of hydrogen bonds.

B. DNA polymerase forms an enzyme-substrate complex with free nucleotides.

C. Formation of new covalent bonds between nucleotides.

D. Formation of new glycosidic bonds between deoxyribose molecules.

(1 mark)

10 Which statements best explain why the ABO blood system in humans is an example of co-dominance?

I. Allele I^A and the allele I^B are both expressed in the heterozygote/AB type blood.
II. Neither allele I^A or the allele I^B can mask the expression of the other allele.
III. There are three alleles of the gene that controls the blood group.
IV. There are more than two blood groups.

A. All of them.

B. I. II. and III.

C. I. and II.

D. II. and III.

(1 mark)

11 Which of the following statements correctly describes meiosis?

A. It is a mechanism of nuclear division that occurs in all cells.

B. It produces haploid cells during the first nuclear division.

C. It involves interphase, prophase, metaphase, anaphase and telophase.

D. It is the only process that generates genetic variation.

(1 mark)

12 Which of the following statements correctly describes co-dominance?

A. The alleles are both expressed to an equal extent in the phenotype.

B. Two alleles are 'blended together'.

C. One allele is dominant over the other.

D. Neither allele is expressed in the phenotype.

(1 mark)

13 If one molecule of DNA goes through 5 PCR cycles in the thermocycler, how many copies of that molecule of DNA will be produced?

A. 16

B. 5

C. 32

D. 64

(1 mark)

14 Which of the following statements about quadrat sampling are true?

I. Sampling must be random to avoid bias.
II. Random samples can be achieved by closing your eyes and throwing a quadrat.
III. Quadrat sampling is only useful for small organisms.

A. I only

B. I and II only

C. I and III only

D. I, II, and III

(1 mark)

15 A water quality investigation was carried out after some cases of heavy metal poisoning were detected in a countryside village with a river running through it. The investigators were trying to establish if poisoning was worse on the north or the south of the river.

	North of the river	**South of the river**
Number of cases of heavy metal poisoning	26	12

The results from a chi-squared test were:

Chi-squared value:	5.2
Degrees of freedom:	1

Critical values table:

Degrees of Freedom	**P = 0.05**	**P = 0.01**	**P = 0.001**
1	3.83	6.64	10.83
2	5.99	9.21	13.82
3	7.82	11.35	16.27

What conclusions can be drawn from the information above?

A. The χ^2 value is greater than the critical value so there is an association between heavy metal poisoning and location

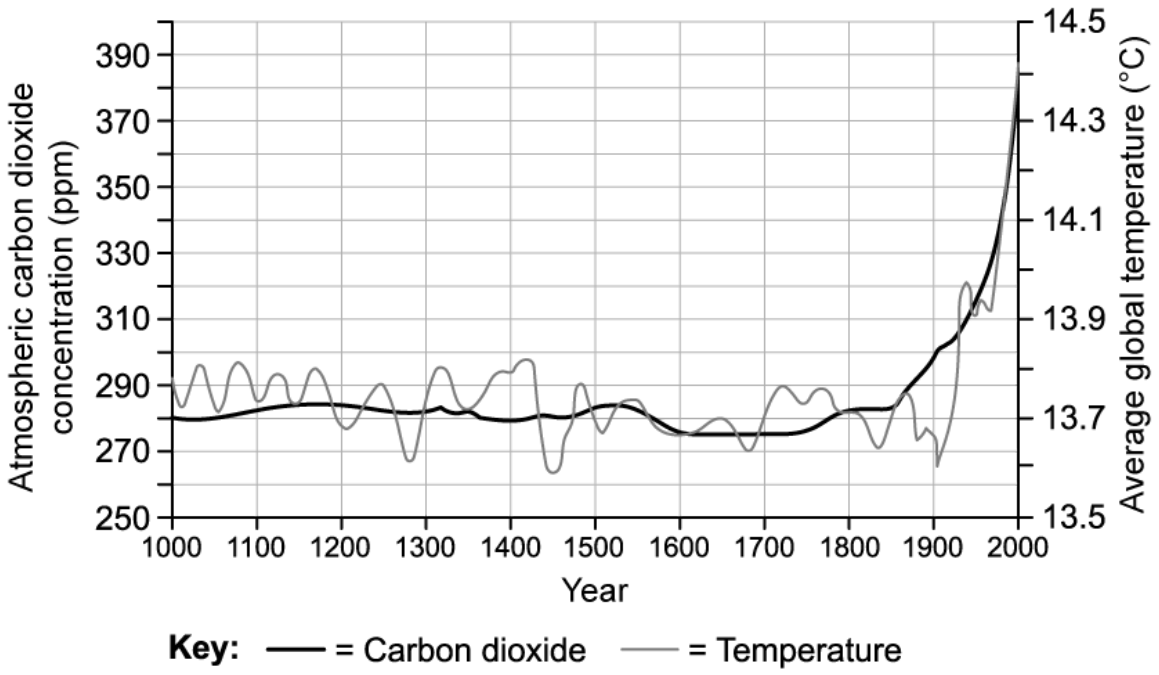
B. The χ^2 value is lower than the critical value so there is no association between heavy metal poisoning and location

C. Poisoning from heavy metals is worse in villages

D. Heavy metals are found in both locations, north and south of the river

(1 mark)

16 What can be concluded from the graph shown?



A. Increasing atmospheric carbon dioxide concentration causes an increase in average global temperatures

B. Increasing average global temperatures cause an increase in atmospheric carbon dioxide

C. There is a correlation between atmospheric carbon dioxide concentration and average global temperature

D. The industrial revolution that began in the mid 1700s has caused an increase in average global temperatures

(1 mark)

17 Which of the following is **not** a reason for the evolution of melanism in peppered moths?

A. Predators such as birds act as a selection pressure, leading to differences in survival rates of moths with and without melanism.

B. Pollution from industry causes the death of lichens, leading to darkening of tree bark.

C. There is variation in the gene coding for melanin production in the moth population.

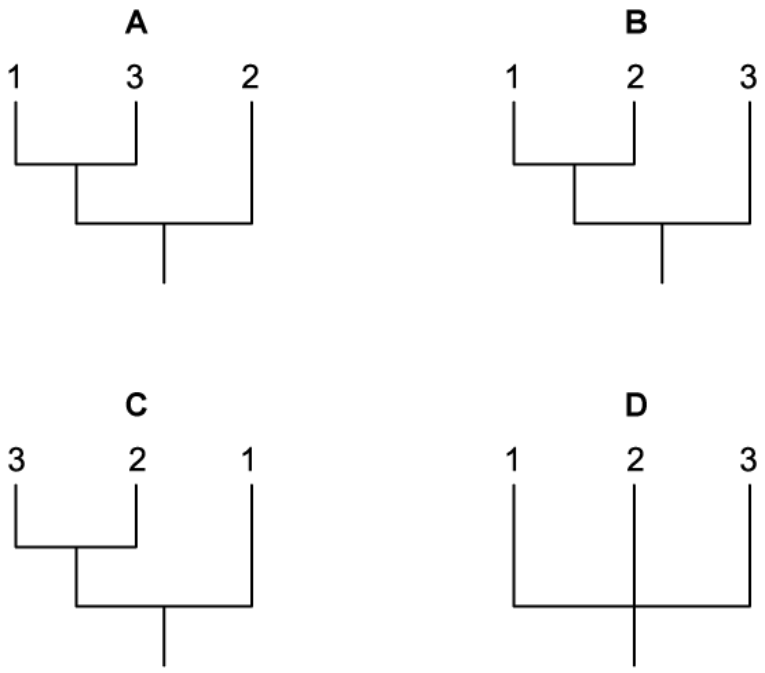
D. Some moths acquire darkened wings as a result of soot particles in the air, providing them with camouflage.

(1 mark)

18 The table shows a short section of the DNA base sequence of three different species.

Species	Base sequence
1	ATCTGC
2	CCTGGT
3	ACCTAC

Which cladogram best represents the relationships between species 1, 2, and 3?



(1 mark)

19 Which of the following animals can be classified in the phylum annelida?

A. *Arenicola marina*, a worm with a cylindrical body that has bristles along its sides.

B. *Bipalium kewense*, an unsegmented worm with a distinctive hammer-shaped 'head' and mouth/anus located in the middle of its body.

C. *Boettgerilla pallens*, also known as the worm slug, has a long, narrow body, and a yellow-grey coloured muscular foot. It can dig burrows to a depth of up to 60cm.

D. *Schistosoma haematobium*, a parasitic fluke. The body of males is leaf-like in shape, and can roll up to gain a cylindrical appearance. Humans are the primary host.

(1 mark)

20 Which is the correct reason that cellulose passes through the gut undigested?

A. There are no enzymes present in the human digestive system capable of cellulose digestion.

B. Cellulose is not a required nutrient of the human body.

C. Cellulose provides bulk for effective peristalsis which forces the food through the alimentary canal.

D. It takes too long for the glucose monomers in cellulose to be hydrolysed, so cellulose is egested before it can be digested.

(1 mark)

21 A condition known as congenital adrenal hyperplasia (CAH) may affect the development of the genitals in female fetuses. These children lack an enzyme necessary to produce the hormones cortisol and aldosterone. Without these hormones the fetus will produce more male sex hormones, such as testosterone, during their development.

What effect would this have on the development of a female fetus?

A. Sperm production would take place in the fetal gonads.

B. Delayed development of fetal genitalia.

C. Development of an abnormally large uterus.

D. Difficulty in identifying the fetus as female.

(1 mark)

22 Which of the following describes the apoplast route along which sucrose is loaded into phloem sieve tubes?

I. H^+ ions are actively pumped out of the companion cell
II. Sucrose travels along plasmodesmata to the companion cell
III. H^+ ions flow down their concentration gradient through a co-transporter protein
IV. Sucrose is carried across a sieve tube membrane

A. I only

B. I and II only

C. I, II and IV

D. I, III and IV

(1 mark)

23 The following steps describe the role of gibberellin in seed germination.

I. Maltose is converted into sucrose and glucose for transport in the germinating seed.
II. Several genes are expressed that code for a series of enzymes.
III. Gibberellin is produced, influencing growth and enzyme production in the embryo.
IV. These products are used to produce ATP and to build up the tissues of the growing plant.
V. Amylase breaks down insoluble starch within the food stores of the germinating seed.

Which of the following represents the correct sequence of these steps?

A. III → II → V → I → IV

B. II → III → V → I → IV

C. II → V → I → IV→ III

D. V → I → IV → II → III

(1 mark)

24 Which row of the table puts these DNA-containing structures into the correct order of size?

	Largest ←	**Mid-sized**	**→ Smallest**	
A	bivalent & tetrad the same size		chromosome	chromatid
B	bivalent	tetrad	chromatid	chromosome
C	tetrad	chromosome	bivalent	chromatid
D	chromosome	bivalent & tetrad the same size		chromatid

(1 mark)

25 In a breeding experiment, a tall, round seeded (homozygous dominant) pea plant was crossed with a short, wrinkled seeded (homozygous recessive) pea plant. The F_1 dihybrid plants were then used in a test cross.

If the genes are always linked and no crossing over occurs, what would be the predicted ratio in the F_2 generation?

A. 9 : 3 : 3 : 1

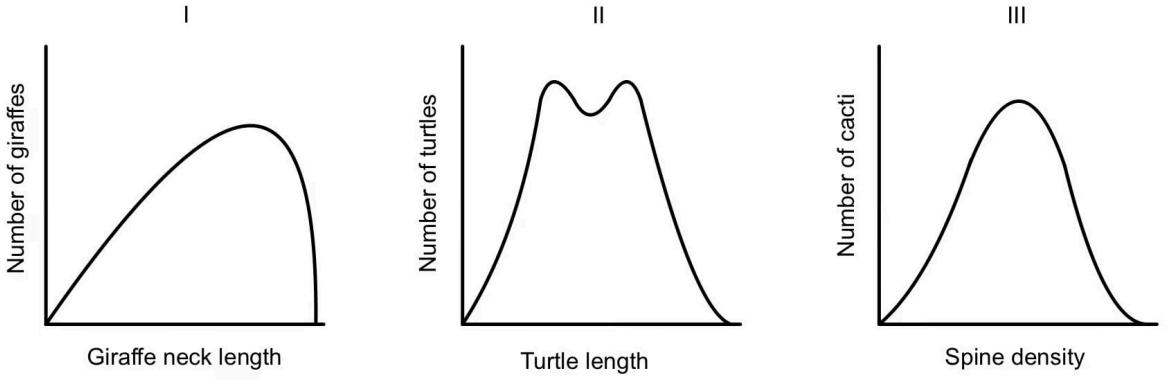
B. 1 : 1 : 1 : 1

C. 3 : 1

D. 1 : 1

(1 mark)

26 What would be the most accurate description of the following graphs?



	I	II	III
A	Stabilising selection as giraffes with longer necks are selected for	Directional selection as larger and smaller turtles are selected for	Disruptive selection as cacti with a medium spine density are selected for
B	Directional selection as giraffes with longer necks are selected for	Disruptive selection as larger and smaller turtles are selected for	Stabilising selection as cacti with a medium spine density are selected for
C	Stabilising selection as giraffes with medium neck lengths are selected for	Disruptive selection as larger and smaller turtles are selected against	Directional selection as cacti with medium spine density are selected for
D	Directional selection as giraffes with medium neck lengths are selected for	Stabilising selection as larger and smaller turtles are selected against	Disruptive selection as cacti with medium spine density are selected for

(1 mark)

27 Which of the following meristems is correctly matched with the tissue that it can form?

	Meristem	Tissue
A	Ground tissue	Parenchyma forming the pith
B	Protoderm	Collenchyma forming supportive tissue
C	Procambium	Epidermis
D	Protoderm	Xylem and Phloem

(1 mark)

28 The statements below refer to the functions of antibodies:

I. Antibodies can combine with viruses inside cells to prevent them from damaging cells.
II. Antibodies can attach to flagella to make the bacteria less mobile.
III. Antibodies with single binding sites can cause agglutination of bacteria.
IV. Antibodies can, with other molecules, make holes in the cell walls of bacteria.
V. Antibodies can coat bacteria to mark them for phagocytosis.
VI. Antibodies can neutralise toxins.

Which of these statements are **not** correct?

A. I, II and VI

B. I and VI

C. II, III and V

D. I and III

(1 mark)

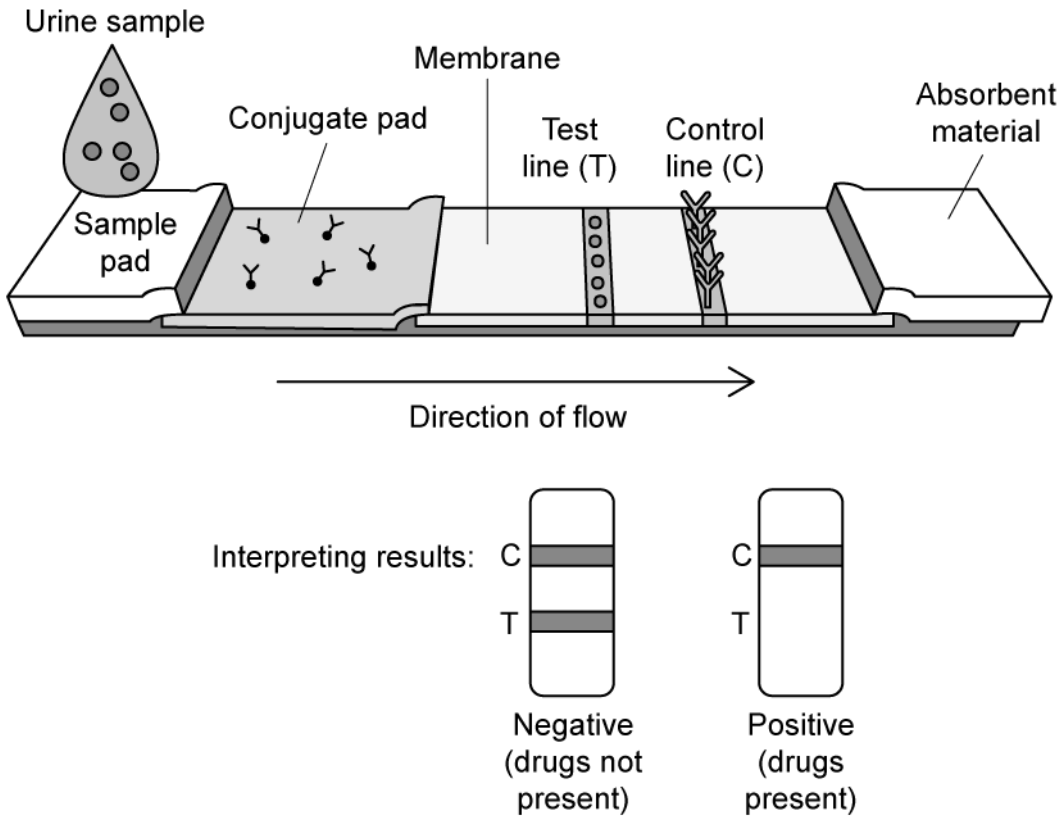
29 The image below shows a test strip used for drugs testing. Unlike the hormone in a pregnancy test, the substances tested for in this kind of drugs test are too small to bind to more than one antibody at the same time. This type of test is known as a competitive binding assay.

The components of the test contain the following:

Conjugate pad - antibodies complementary to the drug being tested for. The antibodies are attached to a coloured bead.

Test line - bound molecules of the drug being tested for.

Control line - bound antibodies complementary to the antibody from the conjugate pad.



Which of the following correctly explains the appearance of a **positive** result?

A. The drug binds to antibodies on the conjugate pad, preventing them from binding to the test line.

B. The antibodies from the conjugate pad bind to the test line, causing the beads to form a visible band.

C. Unbound antibodies from the conjugate pad bind to antibodies on the control line, forming a visible band.

D. The drug binds to antibodies on the conjugate pad and to antibodies on the test line.

(1 mark)

30 The majority of the eukaryotic genome contains non-coding regions of DNA.

Which of the following are functions of non-coding DNA?

I. Code for functional RNA molecules

II. Regulate gene expression

III. Allow alternative proteins to be expressed from a gene

IV. Act as telomeres

A. I and II

B. II and III

C. I, II and III

D. I, II, III and IV

(1 mark)

31 Which of the following is **not** a function of tRNA?

A. Helps translate anticodons into amino acids

B. Peptide bond formation linking amino acid to a polypeptide chain

C. Carrying a specific amino acid to the ribosome

D. Recognising codons on mRNA

(1 mark)

32 Which of the following correctly identifies the location of the light-dependent reactions?

A. In the stroma of the chloroplast

B. In the thylakoid intermembrane space

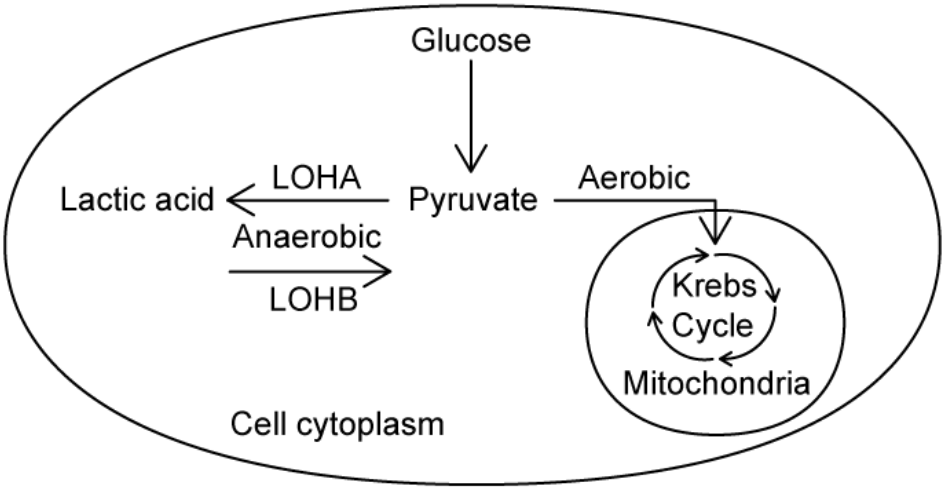
C. On the outer membrane of the mitochondria

D. On the outer membrane of the chloroplast

(1 mark)

33 In an investigation into the impact of enzyme inhibition on respiration, scientists used a molecule to inhibit transcription of the gene that codes for the enzyme LDHA.

Using the diagram, identify the likely effect this would have on the process of respiration.



I. Increased production of lactic acid
II. A build up of pyruvate in anaerobic conditions
III. Increased activity of the Krebs cycle in aerobic conditions

A. I, II and III

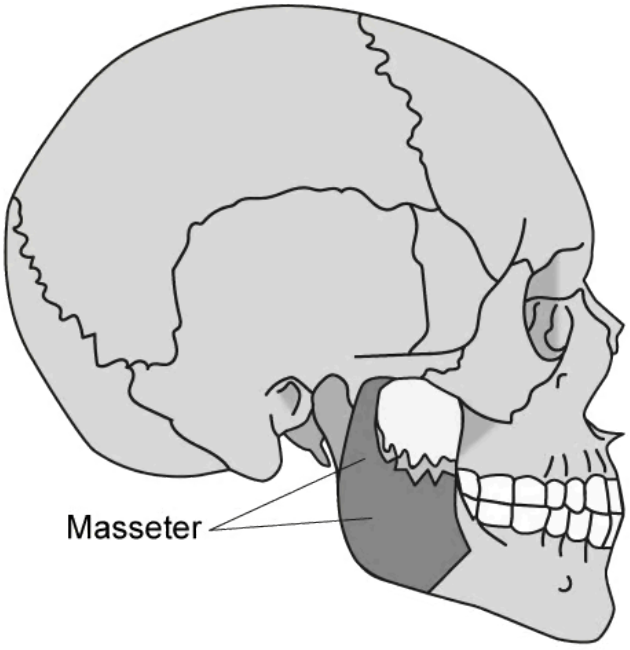
B. I only

C. II and III

D. II only

(1 mark)

34 The masseter is the strongest muscle in the human body and is responsible for lifting the lower jaw to close the mouth. The location of the masseter can be seen in the diagram.



Which of the following is **not** an event which would occur in the masseter as the jaw is moved towards its closed position?

A. Myosin heads perform a power stroke which is driven by energy released in the hydrolysis of ATP

B. The sarcomeres shorten as the Z lines are pulled together but the A band remains the same length.

C. Calcium ions are actively pumped back into the sarcoplasmic reticulum and tropomyosin covers binding sites

D. Troponin complexes change shape leading to the exposure of binding sites on actin molecules

(1 mark)

35 Which of the following statements correctly describes a process that takes place in the excretory systems of land insects?

A. Uric acid is actively transported from the haemolymph into the malpighian tubules.

B. Salts and nitrogenous waste are actively transported from the haemolymph into the malpighian tubules.

C. The malpighian tubules drain into the haemolymph.

D. Nitrogenous waste is converted into urea.

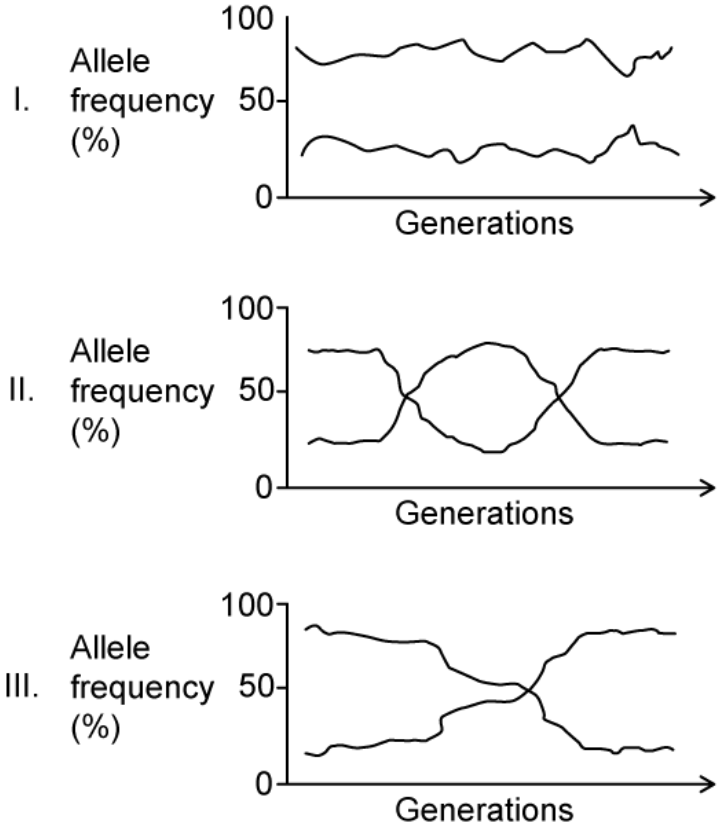
(1 mark)

36 Which of the hormone functions shown below are correct?

	hCG	Progesterone	Oestrogen	Oxytocin
A	Stimulates release of hormones by the corpus luteum	Inhibits oxytocin production	Inhibits progesterone production	Stimulates relaxation of the cervix
B	Stimulates release of hormones by the corpus luteum	Stimulates oxytocin production	Inhibits progesterone production	Stimulates contractions in the muscles of the uterus wall
C	Causes loss of the uterus lining	Inhibits oxytocin production	Decreases sensitivity of uterus wall to oxytocin	Stimulates relaxation of the cervix
D	Inhibits loss of the uterus lining	Inhibits oxytocin production	Increases sensitivity of uterus wall to oxytocin	Stimulates contractions in the muscles of the uterus wall

(1 mark)

37 The three graphs below show how the allele frequencies of two alleles in three different populations changed over several generations.



Which of the graphs show changes in allele frequency that suggest that evolution is taking place?

A. II. only

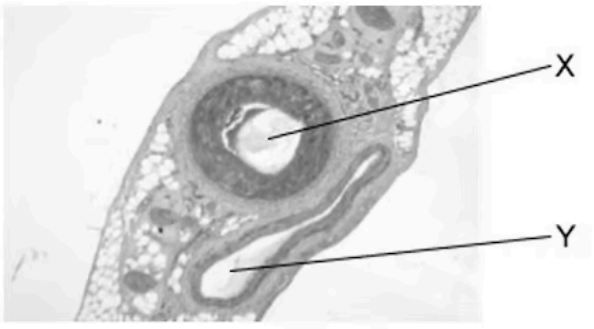
B. II. and III. only

C. III. only

D. I., II. and III.

(1 mark)

38 The image below shows two structures commonly found in mammals. A light microscope was used to view the sample.



Identify the structures labelled **X** and **Y** along with one correct feature of these structures.

	X	Y	Feature
A	Vein	Artery	**Y** contains deoxygenated blood
B	Trachea	Artery	the lumen of **X** allows air to pass through
C	Artery	Vein	**Y** contains many cells filled with oxyhaemoglobin
D	Artery	Vein	**X** contains many cells filled with oxyhaemoglobin

(1 mark)

39 Why is it difficult to show a causal link between a risk factor and a particular disease?

A. Confounding factors influence the results making the results unreliable.

B. Epidemiological studies rely on large numbers of volunteers who suffer from the exact disease being studied to provide valid data.

C. Statistical analysis cannot be carried out on results of epidemiological studies.

D. There are ethical issues with publishing data from epidemiological studies.

(1 mark)

40 It is estimated that the human genome contains between 20 000 and 25 000 genes. However, the proteome is estimated to contain up to 400 000 proteins. This large difference in numbers is due to alternative splicing.

Which of the following best describes alternative splicing in eukaryotes?

A. Different combinations of introns can be incorporated into the mature mRNA.

B. Some exons are duplicated.

C. Different combinations of exons can be incorporated into the mature mRNA.

D. Different genes can be fused together.

(1 mark)