SL Paper 1

What is the purpose of pulmonary surfactant?

A. Promotes capillary growth
B. Decreases surface tension
C. Adheres alveoli and capillaries
D. Stretches the inside surface of the alveoli

Markscheme

B

Examiners report

[N/A]

Which feature increases the absorption of glucose in the small intestine?

A. Villi
B. Lacteal
C. Cilia
D. Goblet cells

Markscheme

A

Examiners report

This was a very easy question, where most candidates chose the villi as the structures in the small intestines increasing surface area for absorption.

Celiac disease causes the destruction of the villi cells. Which of the following is most likely to happen to people with celiac disease?

A. Incomplete digestion of fats
B. Poor absorption of calcium
C. Increased levels of glucose in blood
D. Damage in the esophagus caused by increase in acid content of the stomach

Markscheme

B

Examiners report

N/A

What changes take place in the thorax during inhalation?

	External Intercostal Muscles	Pressure
A.	contract	increases
B.	contract	decreases
C.	relax	increases
D.	relax	decreases

Markscheme

B

Examiners report

This was also poorly answered, with only slightly more than 30% of candidates selecting the correct answer. Knowledge of the mechanism of ventilation is often patchy, with candidates either muddled or lacking in knowledge of the details of muscle contraction.

What are two effects of HIV on the immune system?

A. Reduction in antibody production and increase in active lymphocytes
B. Increase in antibody production and decrease in red blood cells
C. Reduction in antibody production and decrease in active lymphocytes
D. Increase in antibody production and increase in red blood cells

Markscheme

C

Examiners report

This turned out to be a quite easy question, the third easiest question of this paper. Most candidates had this question right.

Colonic irrigation involves regularly flushing the large intestine with water. Why should this practice be avoided?

A. The large intestine absorbs water.

B. Vitamin-producing bacteria are eliminated.

C. It will stimulate the production of toxins.

D. Undigested remains of food are removed.

Markscheme

B

Examiners report

This happened to be a very difficult question for candidates and a bad discriminator. This means that good candidates believed that colonic irrigation should be avoided because the large intestine absorbs water. Only a few candidates realised that the problem of this practice is that it eliminates vitamin-producing bacteria. The topic 6.1.5 expects the functions of the large intestine and the production of Vitamin K is one of them.

Which words from the table below complete the sentence correctly?

In the pancreas, ____I__ *secrete glucagon*, *which* ____II____ *blood glucose levels*.

	I	II
A.	α cells	raises
B.	β cells	raises
C.	α cells	lowers
D.	β cells	lowers

Markscheme

A

Examiners report

G2 comments suggested that this question was too specific. However, it was deemed to be a fair question, reflecting the assessment statement

6.5.11.

Which statement describes the movements of the rib cage during inhalation of air?

A. External intercostal muscles contract moving the ribs up and outwards.
B. Internal intercostal muscles contract moving the ribs down and inwards.
C. External intercostal muscles relax moving ribs down and inwards.
D. Internal intercostal muscles relax moving ribs up and outwards.

Markscheme

A

Examiners report

N/A

What are functions of the stomach, small intestine and large intestine?

	Stomach	Small intestine	Large intestine
A.	digest proteins	absorb glucose	absorb water
B.	digest starch	digest proteins	digest lipids
C.	digest proteins	assimilate glucose	excrete cellulose
D.	assimilate alcohol	digest starch	absorb water

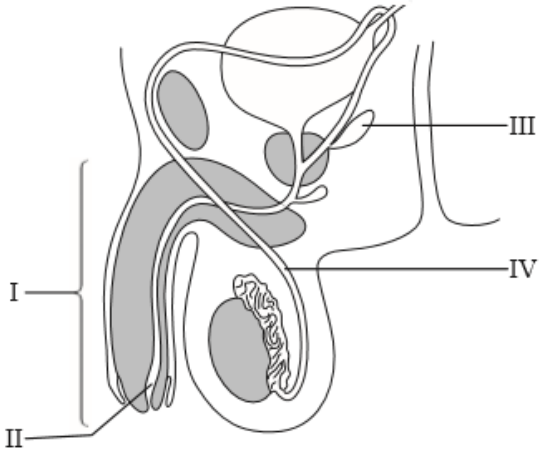
Markscheme

A

Examiners report

This question was too easy.

What structures are indicated on the diagram?



	I	II	III	IV
A.	penis	urethra	seminal vesicles	sperm duct
B.	erectile tissue	ureter	prostate	sperm duct
C.	penis	sperm duct	prostate	seminal vesicles
D.	penis	urethra	sperm duct	seminal vesicles

Markscheme

A

Examiners report

N/A

Which of the following statements about antibodies is correct?

A. Antibodies are polypeptides.
B. Antibodies are produced by the bone marrow.
C. Antibodies are pathogenic foreign substances.
D. Antibodies kill bacteria but not viruses.

Markscheme

A

Examiners report

There were some comments about this question on the G2 forms. It was suggested that protein could be confused with polypeptides, but students should know the relationship between the two. It was felt that perhaps the wording of D was not good (as viruses are nonliving) and many students picked this option. However, candidates should have been able to eliminate options C and D when making their decisions.

What is the position of heart valves when blood pressure is highest in the aorta?

	Atrioventricular valves	Semilunar valves
A.	open	closed
B.	closed	open
C.	closed	closed
D.	open	open

Markscheme

B

Examiners report

[N/A]

Which term describes a molecule capable of triggering an immune response?

A. Antibody
B. Antigen
C. Pathogen
D. Antibiotic

Markscheme

B

Examiners report

N/A

What is placed into the uterus after the process of *in vitro* fertilization (IVF)?

A. Eggs
B. Sperm
C. Embryos
D. Fetuses

Markscheme

C

Examiners report

This question seemed to be easy for many candidates. There was some concern with the term embryo, but this is present in the subject guide.

Which of the following are controlled by homeostasis?

I. Blood pH
II. Water balance
III. Blood glucose concentration

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

Markscheme

D

Examiners report

N/A

What is dissolved in blood plasma?

A. carbon dioxide, erythrocytes and platelets

B. amino acids, glucose and urea

C. carbon dioxide, oxygen and heat

D. glycogen, antibodies and urea

Markscheme

B

Examiners report

This proved to be a poor discriminator since all answers were seen in fairly high percentages. Many candidates found this confusing, perhaps from not fully understanding that the question was asking for substances dissolved in plasma, not transported in plasma. Erythrocytes are cellular so not dissolved in solution and heat is not dissolved either.

Which element or ion is required for transmission of a nerve impulse?

A. Phosphorous
B. Sodium
C. Sulfur
D. Iron

Markscheme

B

Examiners report

N/A

Which vessel carries deoxygenated blood from the heart to the lungs?

A. Vena cava

B. Coronary vein

C. Pulmonary artery

D. Pulmonary vein

Markscheme

C

Examiners report

[N/A]

Which hormone triggers ovulation?

A. FSH
B. Testosterone
C. Progesterone
D. LH

Markscheme

D

Examiners report

There was some concern about the terminology used in the question. This question proved to be a very good discriminator, so it probably did not distract candidates, as the most able candidates were getting this question right.

What is a function of LH (luteinizing hormone)?

A. It stimulates the release of an egg from the follicle.
B. It stimulates the development of corpus luteum into a follicle.
C. It causes an increase in the production of estrogen by the follicle.
D. It causes a decrease in the production of progesterone by the follicle.

Markscheme

A

Examiners report

N/A

What route does blood follow to supply oxygen to heart muscle?

A. pulmonary vein → left atrium → left ventricle → aorta → coronary artery

B. pulmonary vein → right atrium → right ventricle → aorta → coronary artery

C. pulmonary artery → left atrium → left ventricle → aorta → coronary artery

D. pulmonary artery → right atrium → right ventricle → aorta → coronary artery

Markscheme

A

Examiners report

[N/A]

What is a consequence of AIDS?

A. Excess production of lymphocytes to help fight disease
B. Excess erythrocytes in capillaries
C. Loss of ability to produce antibodies
D. Loss of ability to produce antigens

Markscheme

C

Examiners report

G2 feedback commented that the wording of this question should have been about the consequences of the presence of HIV. The question was designed to be about AIDS rather than the state of being HIV positive. It was in fact a poor discriminator, with most students giving the right response, which was C. Very few candidates were distracted by the other alternatives.

Why are antibiotics effective against pathogenic bacteria?

A. Bacteria have a high rate of mutation

B. Bacterial cell processes are blocked

C. Bacteria have a slow metabolism

D. Bacteria assimilate antibiotics

Markscheme

B

Examiners report

[N/A]

What causes heart ventricles to fill with blood?

I. Atrial contraction

II. Closing of atrioventricular valves

III. Opening of semilunar valves

A. I only

B. I and II only

C. II and III only

D. III only

Markscheme

A

Examiners report

[N/A]

In which blood vessel connected to the heart does blood have the lowest carbon dioxide concentration?

A. Pulmonary vein

B. Vena cava

C. Pulmonary artery

D. Coronary vein

Markscheme

A

Examiners report

[N/A]

Between which structures do sensory neurons carry nerve impulses?

A. From effectors to the central nervous system (CNS)
B. From effectors to receptors
C. From receptors to effectors
D. From receptors to the central nervous system (CNS)

Markscheme

D

Examiners report

N/A

Which event directly leads to an action potential?

A. Fusion of vesicles with the pre-synaptic membrane
B. Diffusion of neurotransmitter across the synaptic cleft
C. Membrane potential reaches the threshold potential
D. Breakdown of the neurotransmitter

Markscheme

C

Examiners report

The question clearly states which event directly leads to the action potential, so the only possible answer is C.

What helps to keep blood flowing onwards away from the heart in an artery?

A. Valves

B. Elastic fibres

C. Contraction of skeletal muscles

D. Having a wide lumen

Markscheme

B

Examiners report

[N/A]

What can protect the body from blood loss?

A. Antibodies

B. Fibrin

C. Histamines

D. Hemophilia

Markscheme

B

Examiners report

[N/A]

Which conditions are correct for inspiration?

	Muscles contracted	Pressure in thorax
A.	external intercostal	decreases
B.	internal intercostal	increases
C.	diaphragm	increases
D.	abdominal	decreases

Markscheme

A

Examiners report

[N/A]

Which hormone inhibits appetite?

A. Epinephrine

B. Leptin

C. Thyroxin

D. Glucagon

Markscheme

B

Examiners report

[N/A]

Which vessel directly supplies the heart muscle with blood?

A. The aorta
B. The pulmonary artery
C. The coronary artery
D. The pulmonary vein

Markscheme

C

Examiners report

This question asked the name of the vessel that directly supplies the heart with blood. Thanks to all the G2 comments received, it was realized that the correct answer could be C (the coronary artery) or D (the pulmonary artery) so both of these answers were accepted as correct. Most candidates indicated D as correct and a large number chose C. A surprisingly large number of candidates chose A (the aorta).

What is the main method of transport of monosaccharides such as fructose across the intestinal epithelium?

A. Osmosis
B. Facilitated diffusion
C. Endocytosis
D. Active transport

Markscheme

B

Examiners report

[N/A]

What is a feature of the left atrium?

A. Epinephrine decreases its rate of contraction.

B. It contracts as the left ventricle contracts.

C. It receives blood from the left pulmonary artery.

D. Its pressure decreases as the left ventricle fills up.

Markscheme

D

Examiners report

[N/A]

Which of the following is/are a role of testosterone in males?

I. Pre-natal development of male genitalia
II. Maintenance of sex drive
III. Increase in mental development

A. II only
B. I and II only
C. II and III only
D. I, II and III

Markscheme

B

Examiners report

Most candidates answered this question correctly, thus turning out into an easy question. Many candidates did not realize that testosterone is involved in pre natal development of male genitalia, although this is a function specifically mentioned in the guide.

How does the hypothalamus respond to a very high body temperature?

A. Increases muscle contraction

B. Stops receiving sensory input

C. Causes dilation of skin arterioles

D. Slows the heart rate

Markscheme

C

Examiners report

Most candidates answer this question well, although the question stated body temperature instead of blood temperature.

Where does gas exchange occur in the lungs?

A. In type I pneumocytes

B. In the bronchioles

C. In the veins surrounding the alveoli

D. In the surfactants

Markscheme

A

Examiners report

[N/A]

What is a correct pathway for blood flowing through the heart?

A. right atrium, tricuspid valve, right ventricle, aorta
B. left atrium, tricuspid valve, left ventricle, pulmonary artery
C. right atrium, tricuspid valve, right ventricle, pulmonary artery
D. left atrium, left ventricle, bicuspid valve, aorta

Markscheme

C

Examiners report

Thanks to all the G2 comments received, it was realized that tricuspid and bicuspid valves were not always taught as such, but often, simply as the atrioventricular valves. This would mean that candidates who knew the structure of the heart and the pathway through it would not be able to answer the question. In order to solve this problem, although answer D was not correct, it was also accepted (as well as C) as a correct answer, giving these candidates the benefit of the doubt. Most of the good candidates still went for C as the correct answer.

How does the body respond to an increase in body temperature?

I. Vasoconstriction of skin arterioles

II. Shivering

III. Vasodilation of skin arterioles

A. I only
B. I and II only
C. II and III only
D. III only

Markscheme

D

Examiners report

N/A

Between which structures do sensory neurons carry nerve impulses?

A. From receptors to muscles
B. From effectors to the central nervous system (CNS)
C. From the central nervous system (CNS) to receptors
D. From receptors to the central nervous system (CNS)

Markscheme

D

Examiners report

N/A

How is epinephrine (adrenaline) carried to the pacemaker of the heart and what effect does it have on heartbeat rate?

	Epinephrine carried to the pacemaker	Effect of epinephrine on heartbeat rate
A.	in the bloodstream	increases it
B.	in the bloodstream	decreases it
C.	by nerves	increases it
D.	by nerves	decreases it

Markscheme

A

Examiners report

N/A

What is an important function of the lacteal in the villus?

A. Secretion of mucus
B. Secretion of enzymes
C. Transport of glucose
D. Transport of fats

Markscheme

D

Examiners report

Feedback from the G2 forms implied that it is unclear whether the function of the lacteal is a required part of the knowledge of the digestive system. Assessment statement 6.1.7 of the core syllabus requires students to explain how the structure of the villus is related to its role in absorption. It was therefore felt that the lacteal was a necessary part of the understanding of the villus, and that the question was fair. Many candidates gave options A, B and C as the answer, but the question did discriminate well, with the majority choosing D, the correct response.

LH causes the rupture of a follicle and release of an egg cell. What is this process called?

A. Conception
B. Fertilization
C. Menstruation
D. Ovulation

Markscheme

D

Examiners report

N/A

What normally prevents the membranes of the alveoli from sticking together during expiration?

A. The thickness of the single-cell layer of alveoli membranes
B. The secretion of fluids in the inner surface of the alveoli
C. The pressure within the thoracic cavity
D. The dense net of capillaries covering the alveoli

Markscheme

B

Examiners report

Some comments on the G2 forms implied that this was an unfair question. Most candidates did pick the right answer of B, although many were distracted by D, which is not an appropriate response. It was accepted that the stem of the question was not in alignment with the assessment statement, and so perhaps a little too much was asked of the candidates, but at the same time, it was felt that the question was not unfair.

Why are antibiotics effective against bacteria?

A. They can produce specific antibodies.
B. They can engulf foreign matter.
C. They can block specific metabolic pathways.
D. They can act as a vaccine.

Markscheme

C

Examiners report

N/A

What role does the medulla of the brain have in controlling heart rate?

A. To secrete adrenaline to speed up the heart.

B. To stimulate myogenic heart muscle contraction.

C. To block pacemaker activity.

D. To adjust heart rate to changing blood pressure.

Markscheme

D

Examiners report

[N/A]

Which hormone controls circadian rhythms?

A. Thyroxin
B. Melatonin
C. Leptin
D. Glucagon

Markscheme

B

Examiners report

[N/A]

If schizophrenia is caused by an overabundance of the neurotransmitters dopamine and serotonin in the synapses of some areas of the brain, which drug action could work in treating the symptoms?

A. Release of cholinesterase into the synaptic cleft

B. Increased re-uptake of dopamine and serotonin by presynaptic neurons

C. Increased permeability of the presynaptic neuron to sodium

D. Blockage of dopamine and serotonin receptors on presynaptic neurons

Markscheme

B

Examiners report

[N/A]

What is a similarity between arteries and capillaries?

A. They both have elastic tissue.
B. They both have smooth muscle cells.
C. Neither has collagen fibres in their walls.
D. Neither has valves.

Markscheme

D

Examiners report

This question presented a different way of comparing blood vessels, since students often compare arteries and veins, rather than capillaries, so it was an indirect assessment of the structure of the three types of blood vessel. Many candidates picked options A or B, but overall the question discriminated well.

Why is penicillin **not** used in the treatment of human immunodeficiency virus (HIV)?

A. HIV patients may be allergic to penicillin.
B. Penicillin does not affect viruses.
C. Penicillin affects helper T-cell metabolism.
D. Penicillin causes antibiotic resistance.

Markscheme

B

Examiners report

[N/A]

What is the state of the atrio-ventricular and semilunar valves when the left ventricle contracts?

	Atrio-ventricular valves	Semilunar valves
A.	open	closed
B.	open	open
C.	closed	closed
D.	closed	open

Markscheme

D

Examiners report

N/A

What is a role of the hypothalamus in homeostasis?

A. Monitoring body temperature

B. Monitoring blood glucose concentration

C. Secretion of glucagon

D. Secretion of sweat

Markscheme

A

Examiners report

[N/A]

What is a role of the coronary arteries?

A. To supply information about blood temperature to the hypothalamus

B. To supply the heart muscle with oxygen and nutrients

C. To carry blood away from the heart

D. To monitor blood pH

Markscheme

B

Examiners report

Most candidates correctly recognised that the function of the coronary arteries is to supply the heart muscle with oxygen and nutrients. Some candidates wrongly believed that they carry blood away from the heart.

What are features of the enzyme amylase?

	Substrate	Source	Optimum pH
A.	starch	salivary glands	7
B.	lignin	pancreas	1.5
C.	cellulose	liver	4
D.	glycogen	kidney	9

Markscheme

A

Examiners report

This question on amylase was very easy with almost all candidates choosing the correct response.

What feature of alveoli adapts them to efficient gas exchange?

A. They have muscles which pump air in and out regularly.
B. Their membranes are more permeable to gases than water.
C. A constant blood supply flows through them.
D. A dense network of capillaries surrounds them.

Markscheme

D

Examiners report

N/A

What is a characteristic of antigens?

A. They recognize foreign substances

B. They are produced in bone marrow

C. They cause disease in humans

D. They stimulate the production of antibodies

Markscheme

D

Examiners report

[N/A]

What is a characteristic of type II diabetes?

A. Insufficient insulin

B. Insulin insensitivity

C. Excess glucagon

D. Low white blood cell count

Markscheme

B

Examiners report

[N/A]

What changes occur in the thorax of a mammal when the external intercostal muscles and diaphragm muscles contract?

A. Pressure increases and volume decreases.
B. Pressure and volume both increase.
C. Pressure and volume both decrease.
D. Pressure decreases and volume increases.

Markscheme

D

Examiners report

Question 28 was another one in which there was criticism of the vocabulary used. In this case it was felt that the word chest should have been used instead of thorax. It is true that only one third of candidates chose the correct answer to this question, but the discrimination index was excellent showing that many of the stronger candidates had been successful. It was possible to deduce that the thorax must be equivalent to the chest if it was known that contraction of external intercostal muscles and the diaphragm cause inspiration. The answer to the question could then be deduced, that the pressure decreases and the volume increases. Many candidates thought that contraction of these muscles caused the opposite; an increase in pressure and decrease in volume.

Which of the following is a characteristic of type I but **not** type II diabetes?

A. β cells in the pancreas are destroyed.
B. Insulin injections are required.
C. α cells in the pancreas are destroyed.
D. Sugar intake control is required.

Markscheme

A

Examiners report

This question was tricky and did not discriminate well for the more able candidates. Many candidates chose option B instead of A. Although usually type II diabetic patients do not require insulin injections, they may do. The more correct answer is A.

Which hormone promotes the thickening of the endometrium and also inhibits the hormone that promotes the development of the follicle wall into the corpus luteum?

A. LH
B. Progesterone
C. FSH
D. Estrogen

Markscheme

B

Examiners report

[N/A]

During expiration, how does air pressure in the lungs compare with atmospheric pressure?

A. Lung air pressure is greater than atmospheric pressure.

B. Lung air pressure is less than atmospheric pressure.

C. Lung air pressure starts below atmospheric pressure and rises above it.

D. Lung air pressure starts above atmospheric pressure and falls below it.

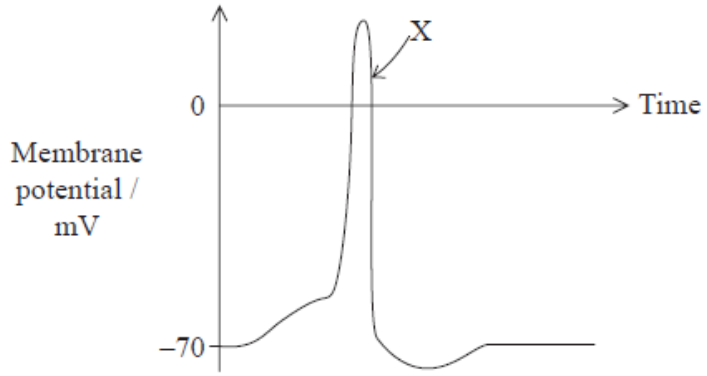
Markscheme

A

Examiners report

Most candidates believed that the lung air pressure falls below atmospheric pressure after expiration. This is incorrect, as it reaches the atmospheric pressure.

The graph below shows changes in membrane potential in an axon during the passage of an action potential. What is causing the decrease in membrane potential at point X?



A. Sodium ions entering the axon
B. Potassium ions entering the axon
C. Sodium ions leaving the axon
D. Potassium ions leaving the axon

Markscheme

D

Examiners report

This turned out to be a very difficult question, where many candidates believed C was correct instead of D.

Which is a negative feedback mechanism in the menstrual cycle?

A. Follicle stimulating hormone inhibits estrogen
B. Estrogen inhibits luteinizing hormone
C. Estrogen inhibits follicle stimulating hormone
D. Progesterone inhibits estrogen

Markscheme

C

Examiners report

[N/A]

When the left ventricle is relaxed, what is the state of the valves?

	Atrioventricular valve	Semilunar valve
A.	closed	closed
B.	closed	open
C.	open	closed
D.	open	open

Markscheme

C

Examiners report

[N/A]

What change occurs to the pressure and volume of the lungs when the external intercostal muscles contract?

A. Both pressure and volume increase.

B. Pressure increases and volume decreases.

C. Pressure decreases and volume increases.

D. Both pressure and volume decrease.

Markscheme

C

Examiners report

[N/A]

What stimulates the production of antibodies?

A. AIDS

B. Antibiotics

C. Anticodons

D. Antigens

Markscheme

D

Examiners report

[N/A]

Which is a long-term effect of the human immunodeficiency virus (HIV) on the immune system?

A. Fewer bacterial infections

B. Fewer active lymphocytes

C. More antibody production

D. More antigen recognition

Markscheme

B

Examiners report

[N/A]

What happens when human body temperature rises during exercise?

A. The arterioles move closer to the skin.

B. The hypothalamus decreases cell respiration.

C. The skin capillaries close up.

D. The water from sweat evaporates to cool the body.

Markscheme

D

Examiners report

Many candidates wrongly believed that arterioles move in the body instead of suffering vasodilation. Nevertheless, most candidates had the right answer, proving this question to be too easy.

What is an effect of the HIV virus on the immune system?

A. Reduction of the number of phagocytes
B. Reduction of the number of lymphocytes
C. Increase in the ability to form antibodies
D. Decrease in the ability to produce antigens

Markscheme

B

Examiners report

Most candidates mentioned the reduction in the number of lymphocytes as a cause of HIV, but many believed that it was the reduction in the production of antigens. Probably the confusion was with the words antibodies and antigens.

How can knowledge about the pineal gland function be applied?

A. To restore sleep time by the use of melatonin
B. To trigger ovulation during an IVF treatment
C. To reduce sperm production in male contraception

D. To regulate blood sugar in type I diabetes

Markscheme

A

Examiners report

Some teachers complained this topic is not in the guide, but it is specifically mentioned in section 6.6.

What happens to the external and internal intercostal muscles and diaphragm when inhaling?

	External intercostal muscles	Internal intercostal muscles	Diaphragm
A.	relax	relax	relaxes
B.	contract	relax	relaxes
C.	relax	contract	contracts
D.	contract	relax	contracts

Markscheme

D

Examiners report

N/A

A structure has a thin epithelium of one cell layer and contains a lacteal and blood capillaries. It has protein channels and mitochondria to aid absorption. What is this structure?

A. Alveolus
B. Gastric gland
C. Pancreas
D. Villus

Markscheme

D

Examiners report

This question was quite easy for most candidates, probably due to the fact that the lacteal is only present in the villus therefore very easy to spot the right answer.

What characterizes type I diabetes?

A. It can be controlled by diet alone.

B. Risk factors such as obesity increase its frequency.

C. The alpha cells of the pancreas are destroyed, usually during adulthood.

D. The beta cells of the pancreas are destroyed, usually during childhood.

Markscheme

D

Examiners report

An easy question.

What is the body's response to low blood glucose levels?

A. Alpha cells in the pancreas secrete glucagon

B. Beta cells in the pancreas secrete insulin

C. Alpha cells in the pancreas secrete insulin

D. Beta cells in the pancreas secrete glucagon

Markscheme

A

Examiners report

This question proved to be a very good discriminator with stronger candidates correctly choosing A and the weaker candidates split fairly evenly between the three other distracters.

Pancreatic gland cells produce and secrete large amounts of digestive enzymes. Which organelles would you expect to be present in higher than normal amounts in such cells?

A. Free ribosomes and Golgi apparatus

B. Rough endoplasmic reticulum and lysosomes

C. Rough endoplasmic reticulum and Golgi apparatus

D. Free ribosomes and lysosomes

Markscheme

C

Examiners report

[N/A]

Neurotransmitters are released into the synaptic cleft from the presynaptic neuron and travel to a receptor on the postsynaptic neuron membrane.

Which processes are required for this to happen?

	Release into synaptic cleft	Travel to postsynaptic neuron membrane
A.	exocytosis	diffusion
B.	active transport	diffusion
C.	exocytosis	active transport
D.	active transport	active transport

Markscheme

A

Examiners report

[N/A]

Is the blood in the aorta, left ventricle and pulmonary artery oxygenated or deoxygenated?

	Aorta	Left ventricle	Pulmonary artery
A.	oxygenated	deoxygenated	deoxygenated
B.	deoxygenated	oxygenated	oxygenated
C.	oxygenated	oxygenated	deoxygenated
D.	oxygenated	oxygenated	oxygenated

Markscheme

C

Examiners report

N/A

Which of the following is correct for lipase?

	Substrate	Source	pH optimum
A.	triglycerides	pancreas	pH = 7
B.	fatty acids	small intestine	pH = 7
C.	triglycerides	small intestine	pH = 9
D.	fatty acids	pancreas	pH = 9

Markscheme

A

Examiners report

In most sources, the optimum pH for lipase is shown as weakly alkaline, not neutral. Nevertheless, this question could be answered without the pH column. Many candidates went for option B; showing candidates did not know the function of lipase.

What is the sequence of operations during IVF treatment?

A. egg collection → FSH injections → fertilization

B. egg collection → fertilization → FSH injections

C. FSH injections → egg collection → fertilization

D. FSH injections → fertilization → egg collection

Markscheme

C

Examiners report

[N/A]

Which is the correct statement concerning HIV and AIDS?

A. All HIV patients have AIDS.

B. HIV and AIDS are transmitted on the sex chromosomes.

C. All AIDS patients have HIV.

D. HIV and AIDS neutralize antibodies.

Markscheme

C

Examiners report

[N/A]

What structures in the small intestine transport most fats?

A. Collecting ducts

B. Capillaries

C. Veins

D. Lacteals

Markscheme

D

Examiners report

There have been complaints about the translation into German and Spanish of this question, but these did not affect the answer to the question.

Where do motor neurons conduct impulses from and to?

A. From effectors to the central nervous system.

B. From receptors to the central nervous system.

C. From neurons to other neurons.

D. From the central nervous system to effectors.

Markscheme

D

Examiners report

[N/A]

Oral contraceptives taken by women contain the hormone progesterone. How does this prevent pregnancy?

A. It stops menstruation.
B. It inhibits the secretion of FSH.
C. It blocks the fallopian tubes (oviducts).
D. It stimulates the production of estrogen.

Markscheme

B

Examiners report

Question 30 was also part of the HL Paper 1. It attracted the similar comments from SL as HL teachers, who contested the answer. Some teachers thought that LH both stimulates follicle development of follicles and ovulation. This view is not supported by the evidence, which shows that LH promotes secretion of estrogen by cells in the developing follicle but that follicle development is stimulated by FSH. The two pituitary hormones FSH and LH have distinctly different roles and it is not correct to lump them together in an explanation of the menstrual cycle. The LH surge is such a good predictor of ovulation for couples wanting to conceive because LH stimulates ovulation.

What are increasing levels of progesterone responsible for during the female menstrual cycle?

A. Stimulating ovulation

B. Development of the follicle

C. Thickening of the endometrium

D. Menstruation

Markscheme

C

Examiners report

[N/A]

Which two hormones promote thickening of the endometrium?

A. FSH and LH

B. Estrogen and FSH

C. LH and estrogen

D. Progesterone and estrogen

Markscheme

D

Examiners report

[N/A]

Which of the following features of the alveoli adapt them to gaseous exchange?

I. Single layer of cells
II. Film of moisture
III. Dense network of capillaries

A. I and II only
B. II only
C. II and III only
D. I, II and III

Markscheme

D

Examiners report

It has been suggested that the question should have mentioned that the alveoli have a wall of single layer of cells, it was felt that this would have only complicated the question.

Which is a process occurring in the small intestine?

	Substrate	Digesting enzyme	Final product absorbed
A.	fatty acids	lipase from the liver	glycerol
B.	nucleic acids	endopeptidase from the pancreas	nucleotides
C.	maltose	glucagon from α cells of the pancreas	glucose
D.	starch	amylase from the pancreas	glucose

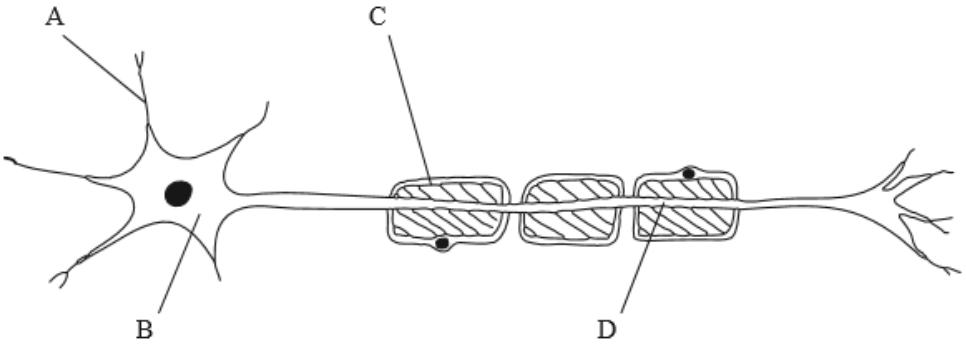
Markscheme

D

Examiners report

[N/A]

On the diagram of the motor neurone shown below, which label identifies a dendrite?



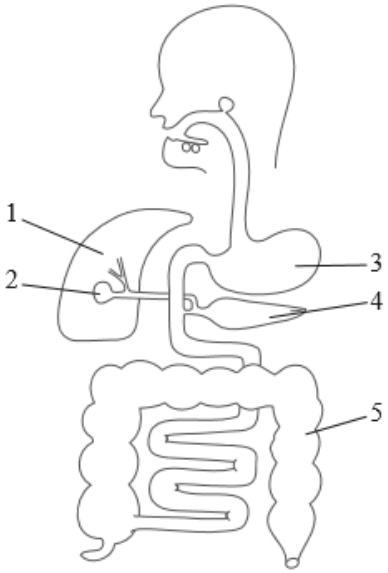
Markscheme

A

Examiners report

N/A

Questions 9 and 10 refer to the following diagram of the human digestive system.



Which organs are associated with the transformation of glucose into glycogen?

A. 1 and 4
B. 2 and 3
C. 2 and 4
D. 1 and 3

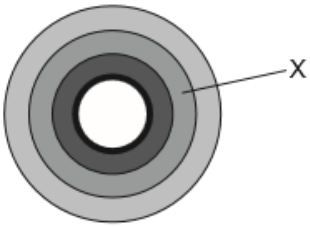
Markscheme

A

Examiners report

A number of teachers felt that the diagram used for question 9 (and 10) was difficult for candidates to interpret. It is important that candidates are made aware that schematic diagrams are used to identify many structures in Biology. The question proved difficult for candidates with many choosing C for the answer rather than the correct response, A.

The diagram shows the layers of the tissues in a transverse section of the human small intestine.



Which is the layer labelled with the letter X?

A. Mucosa
B. Circular muscle
C. Epithelium
D. Longitudinal muscle

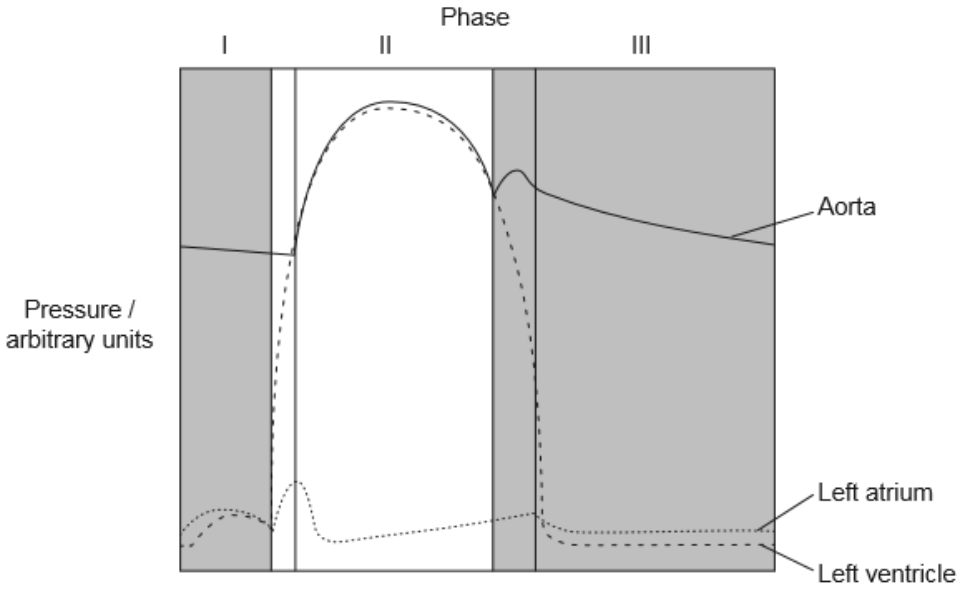
Markscheme

B

Examiners report

An image from an electronmicrograph would have been better. A layer seems to be missing, as the serosa is very small. The majority of candidates however gave the correct answer.

The diagram shows changes of pressure during the cardiac cycle.



[Source: adapted from G J Tortora, J Parent, S Reynolds, (1994), *Principes d'anatomie et de physiologie*, Centre Éducatif et Culturel, Montréal, page 640]

Which is an explanation of the processes happening?

A. During phase I, pressure in the left ventricle decreases while it increases in the aorta during contraction of the left atrium.
B. In phase II, pressure rises in the aorta because the left ventricle is contracting.
C. In phase III, pressure decreases in the aorta because the left atrium is relaxing.
D. In phase III, there is a constant increase of pressure in the aorta as both left atrium and ventricle are at rest.

Markscheme

B

Examiners report

This question discriminated very well.

What is the name and source of the hormone that regulates basal metabolic rate?

	Name	Source
A.	ADH	kidneys
B.	melatonin	pineal gland
C.	thyroxin	thyroid gland
D.	glucagon	pancreas

Markscheme

C

Examiners report

[N/A]

What is the correct sequence of events used in IVF?

A. collection of oocytes and sperms → stimulation of ovarian follicles → incubation of oocytes and sperms → implantation

B. stimulation of ovarian follicles → collection of oocytes and sperms → incubation of oocytes and sperms → implantation

C. stimulation of ovarian follicles → incubation of oocytes and sperms → collection of oocytes and sperms → implantation

D. collection of oocytes and sperms → incubation of oocytes and sperms → stimulation of ovarian follicles → implantation

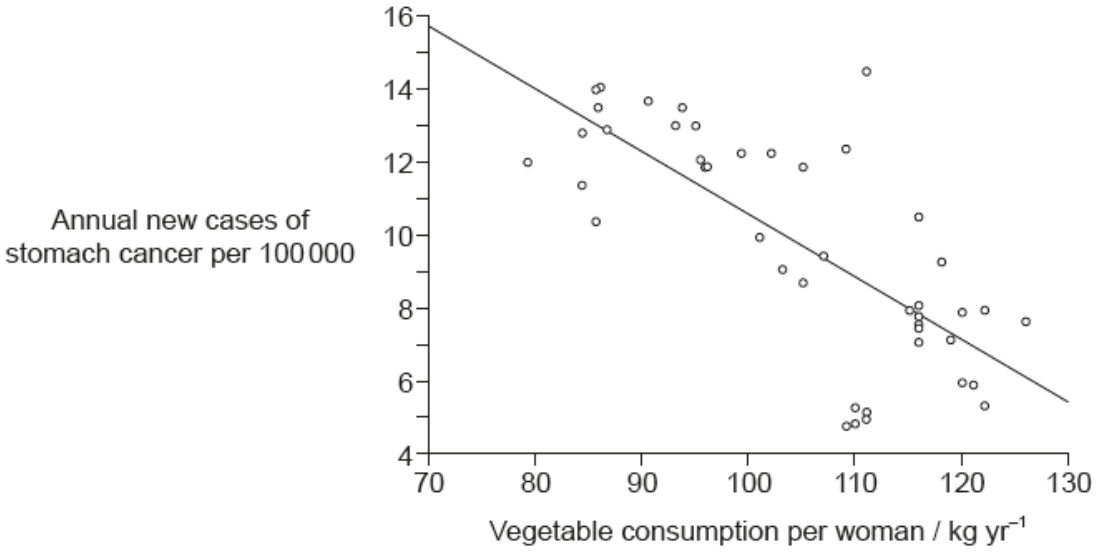
Markscheme

B

Examiners report

N/A

The graph shows a correlation between the number of new cases of stomach cancer and vegetable consumption for women in Poland.



[Source: "Impact of diet on long-term decline in gastric cancer incidence in Poland", Miroslaw Jarosz, Wlodzimierz Sekula, Ewa Rychlik and Katarzyna Figurska. *World J Gastroenterol*, **17**(1): 89–97. Figure 4. Published online 2011 January 07. doi:10.3748/wjg.v17.i1.89.]

What can be stated from the graph?
A. Vegetable consumption causes stomach cancer
B. 68 % of the data are gathered around the trend line
C. Causality cannot be stated from the graph alone
D. Only that the correlation is positive

Markscheme

C

Examiners report

There was a complaint on the G2s about the placing of this question. Considering it was based on statistics of stomach cancer, placing it in the digestion system topic seems reasonable.

What are causes of type I and type II diabetes?

	Type I	Type II
A.	autoimmune disease leading to reduced insulin secretion	decreased responsiveness of the body to insulin
B.	decreased responsiveness of the body to insulin	autoimmune disease leading to reduced insulin secretion
C.	increased responsiveness of the body to insulin	autoimmune disease leading to increased insulin secretion
D.	autoimmune disease leading to increased insulin secretion	increased responsiveness of the body to insulin

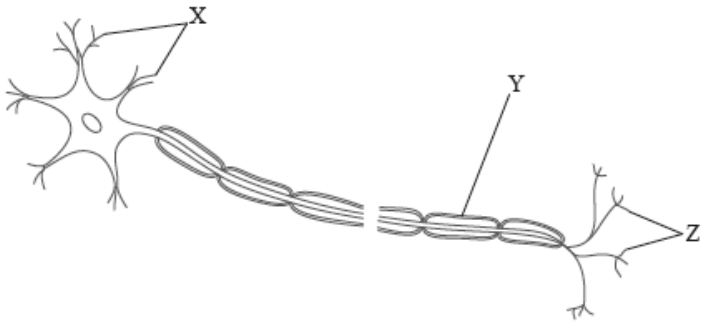
Markscheme

A

Examiners report

N/A

The diagram below shows a motor neuron.



[Source: International Baccalaureate Organization 2014]

What are the structures indicated by X, Y and Z?

	X	Y	Z
A.	motor end plates	myelin sheath	dendrites
B.	dendrites	cell body	motor end plates
C.	dendrites	myelin sheath	motor end plates
D.	motor end plates	cell body	dendrites

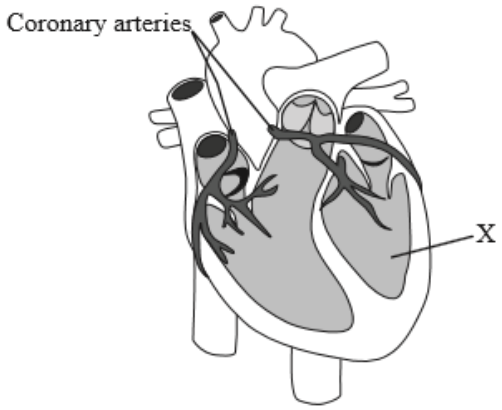
Markscheme

C

Examiners report

[N/A]

This question refers to the following diagram of the heart.



Reprinted by permission from Macmillan Publishers Ltd.: L. Bu *et al.*, "Human ISL1 heart progenitors generate diverse multipotent cardiovascular cell lineages", *Nature*, 460, pp. 113–117. © 2009.

What is the structure labelled X?

A. Right ventricle
B. Right atrium
C. Left atrium
D. Left ventricle

Markscheme

D

Examiners report

N/A

What processes occur during assimilation and absorption of lipids?

	Assimilation	Absorption
A.	lipids are broken down by enzymes	lipids are egested
B.	lipids are incorporated into new membranes	lipids pass into the lacteal
C.	lipids pass into the lacteal	lipids are incorporated into new membranes
D.	lipids are egested	lipids are broken down by enzymes

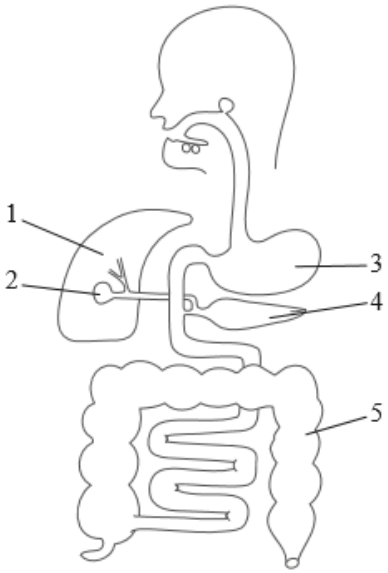
Markscheme

B

Examiners report

Some teachers complained that this question was very difficult. Although quite difficult, this question turned out to be a very good discriminator.

Questions 9 and 10 refer to the following diagram of the human digestive system.



Which structure produces lipase?

A. 1
B. 2
C. 4
D. 5

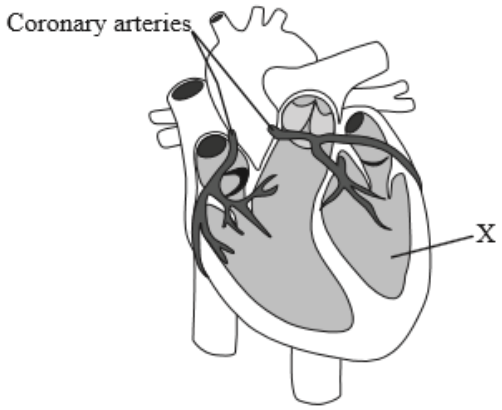
Markscheme

C

Examiners report

A number of teachers felt that the diagram used for question 9 (and 10) was difficult for candidates to interpret. It is important that candidates are made aware that schematic diagrams are used to identify many structures in Biology. The question proved difficult for candidates with many choosing C for the answer rather than the correct response, A.

This question refers to the following diagram of the heart.



What is a role of the coronary arteries?

A. To transport oxygen from the lungs directly to the heart muscle
B. To remove deoxygenated blood from the heart muscle
C. To supply the heart muscle with nutrients
D. To remove cholesterol from the heart muscle

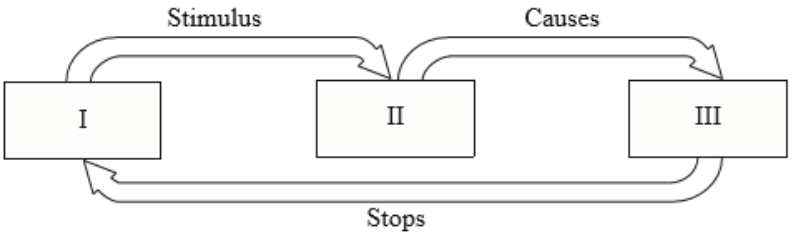
Markscheme

C

Examiners report

Many candidates did not answer this question, it is possible that they did not have time to finish the exam.

The diagram shows a feedback pathway.



Which sequence is an example of the pathway?

	I	II	III
A.	high blood sugar	alpha cells	secretion of insulin
B.	low blood sugar	alpha cells	secretion of glucagon
C.	high blood sugar	beta cells	secretion of glucagon
D.	low blood sugar	beta cells	secretion of insulin

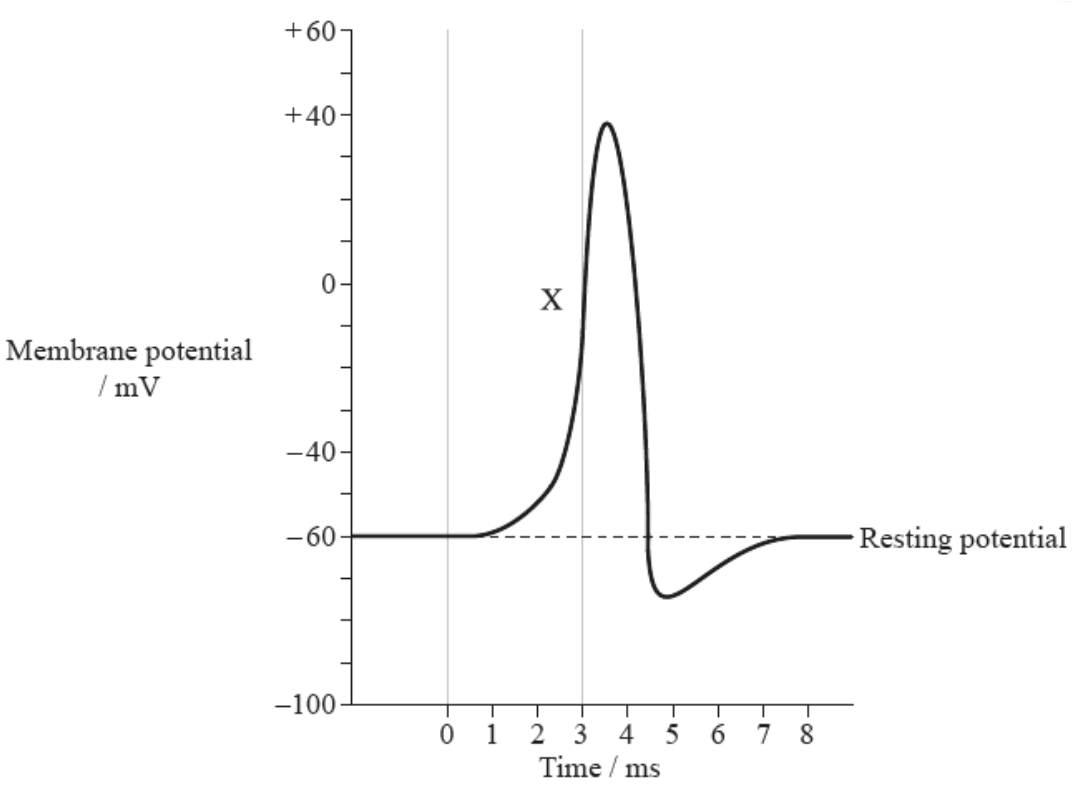
Markscheme

B

Examiners report

N/A

The diagram below shows the changes in membrane potential during an action potential.



What best describes events indicated by the label X?

A.	sodium ions diffuse out of the neuron	the inside of the neuron becomes more negative
B.	potassium ions diffuse out of the neuron	the inside of the neuron becomes more negative
C.	potassium ions diffuse into the neuron	the inside of the neuron becomes more positive
D.	sodium ions diffuse into the neuron	the inside of the neuron becomes more positive

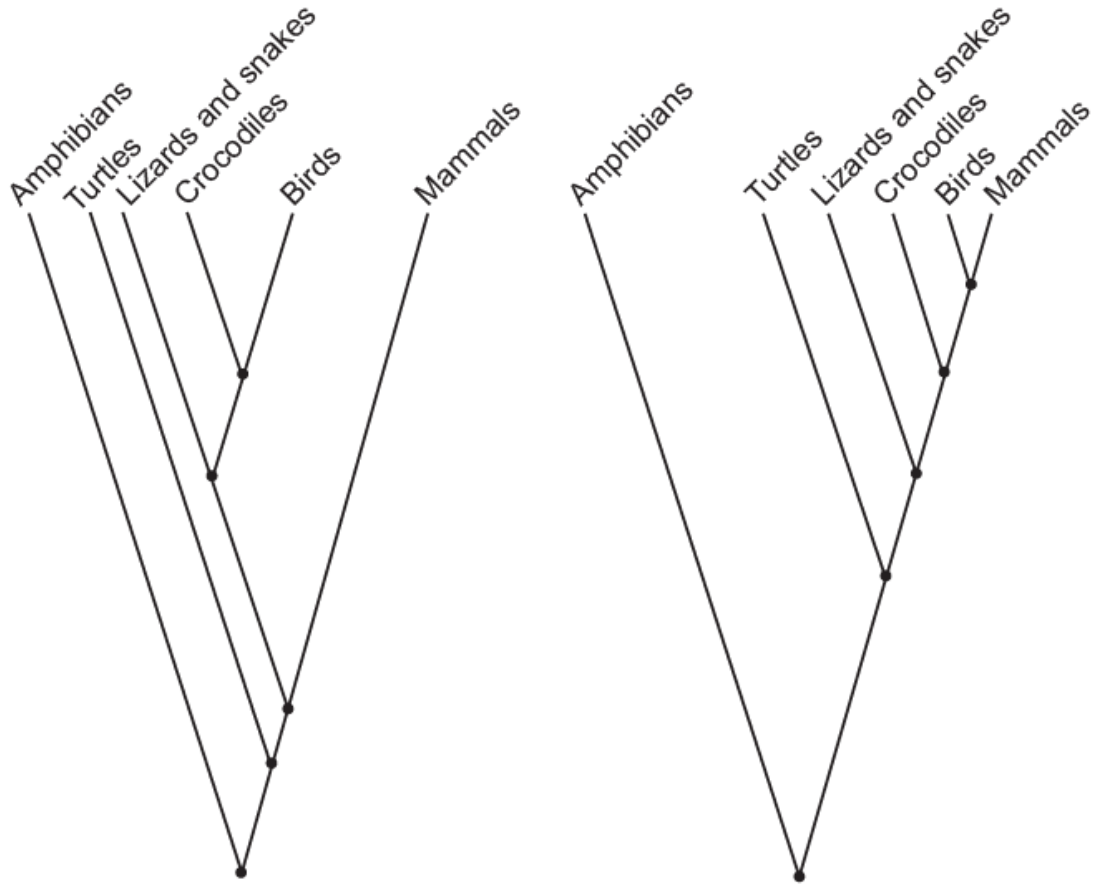
Markscheme

D

Examiners report

This question was a good discriminator. Many of those getting this incorrect chose C, showing confusion as to which ion was diffusing into the neuron.

Cladograms can be created by comparing DNA or protein sequences. The cladogram on the left is based on DNA sequences and the cladogram on the right is based on comparing protein sequences.



What is the reason that cladograms based on DNA sequences are more reliable predictors of the phylogenetic relationship of species than cladograms based on protein sequences?

A. Amino acids are not as chemically stable as DNA nucleotides.

B. DNA mutates but amino acids do not.

C. Several different triplets of bases can code for the same amino acid.

D. There are 20 different amino acids but only 4 nucleotides.

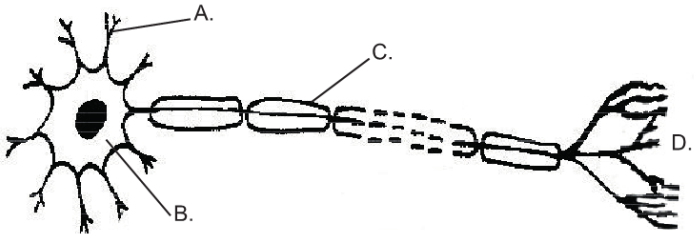
Markscheme

C

Examiners report

[N/A]

Which structure in the motor neuron is required for saltatory conduction?



[Source: https://commons.wikimedia.org/wiki/File:Anatomy_and_physiology_of_animals_Motor_neuron.jpg] (https://commons.wikimedia.org/wiki/File:Anatomy_and_physiology_of_animals_Motor_neuron.jpg])

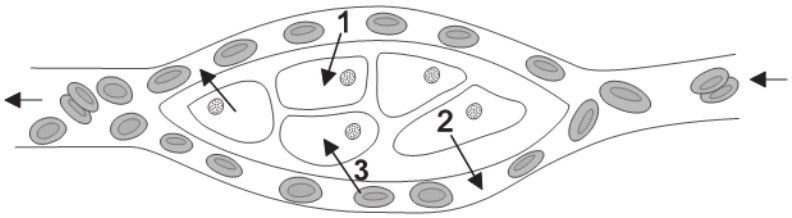
Markscheme

C

Examiners report

[N/A]

The diagram shows red blood cells and undifferentiated tissue cells.



[Source: © International Baccalaureate Organization 2017]

Diffusion of oxygen from blood cells to tissue cells is represented by arrow 3 in the diagram.
What molecules are shown diffusing by arrow 1 and arrow 2?

	Arrow 1	Arrow 2
A.	carbon dioxide	urea
B.	water	glucose
C.	glucose	carbon dioxide
D.	fatty acids	amino acids

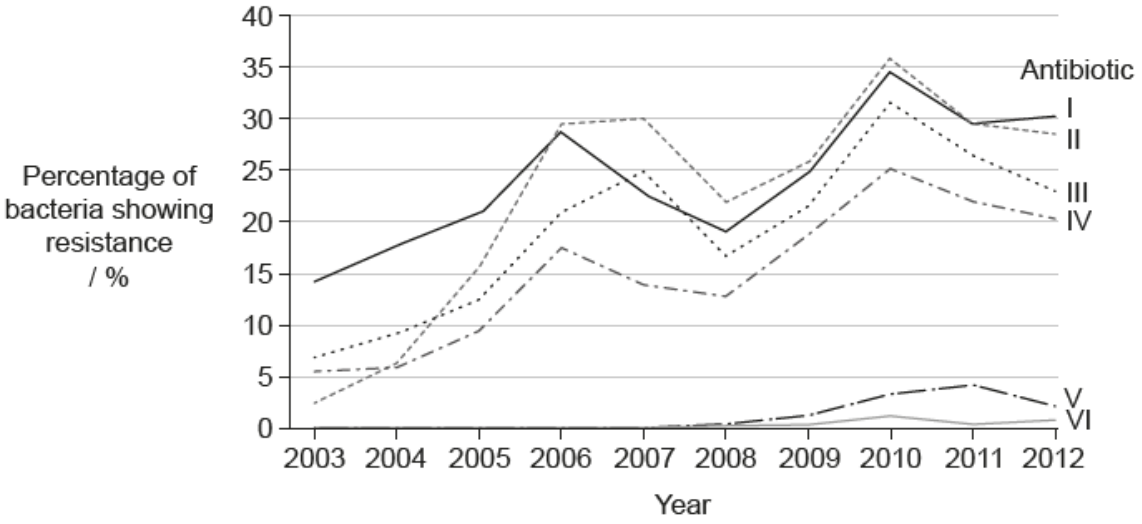
Markscheme

C

Examiners report

[N/A]

The bacterium *Neisseria gonorrhoeae* causes infections related to the human reproductive system. The graph shows the percentage of samples in which this bacterium showed resistance to six antibiotics over a period of ten years.



[Source: © All rights reserved. National Surveillance of Antimicrobial Susceptibilities of *Neisseria gonorrhoeae* Annual Summary 2012. Public Health Agency of Canada, 2012. Translated, adapted and reproduced with permission from the Minister of Health, 2017.]

What is a possible explanation for the total percentage resistance being larger than 100% in 2010?

A. People do not take the antibiotics as prescribed.

B. More people have been sampled in that year.

C. There was an epidemic of *Neisseria gonorrhoeae* in that year.

D. Some bacteria are resistant to more than one antibiotic.

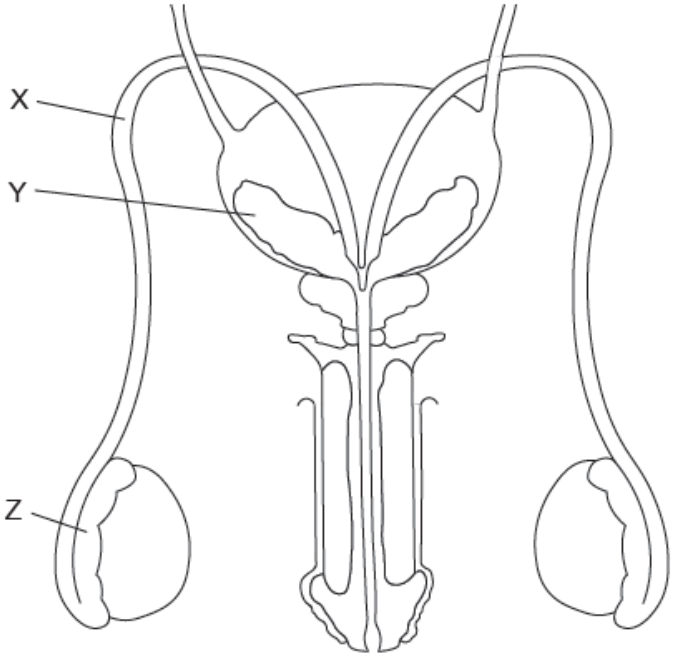
Markscheme

D

Examiners report

[N/A]

The diagram shows the male reproductive organs in front view.



[Source: Generic diagram]

Which structures are indicated by the letters X, Y and Z?

	X	Y	Z
A.	Sperm duct	Seminal vesicle	Epididymis
B.	Urethra	Prostate gland	Sperm duct
C.	Sperm duct	Prostate gland	Epididymis
D.	Urethra	Seminal vesicle	Sperm duct

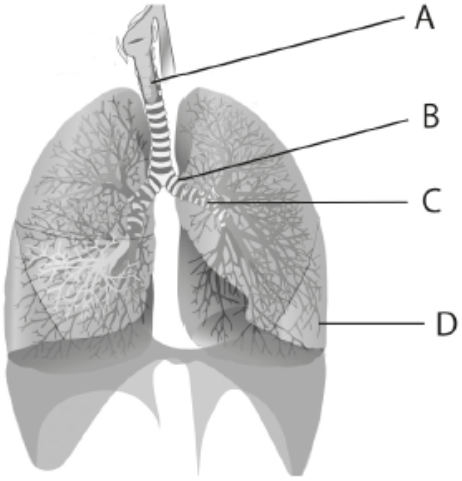
Markscheme

A

Examiners report

[N/A]

The image shows a section of the human respiratory system. Which letter identifies a bronchiole?



[Source: "Respiratory system complete no labels" by Bibi Saint-Pol – en.wikipedia.org/wiki/File:Respiratory_system_complete_en.svg. Licensed under CC BY-SA 3.0 via Wikimedia Commons – https://commons.wikimedia.org/wiki/File:Respiratory_system_complete_no_labels.svg#/media/File:Respiratory_system_complete_no_labels.svg]

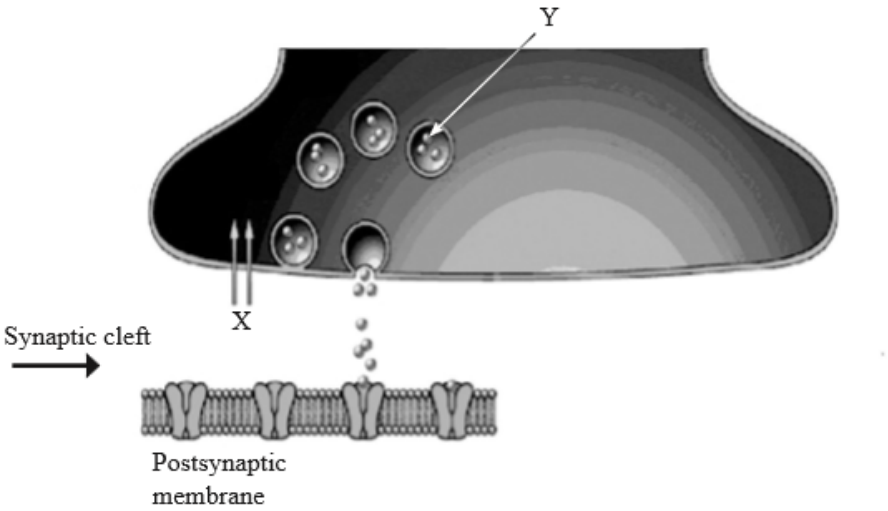
Markscheme

D

Examiners report

Due to the fact that the diagram was not clear enough to distinguish a bronchiole from an alveolus, the answers C and D were taken to be correct.

In the diagram of synaptic transmission below, what is indicated by the letters X and Y?



[Source: adapted from http://aids.hallym.ac.kr/d/kns/tutor/medical/01premed2/chapter45/nt092.gif]

	X	Y
A.	neurotransmitter enters synaptic knob	Ca^{2+} ions
B.	Ca^{2+} ions diffuse into the synaptic knob	neurotransmitter
C.	K^{+} ions diffuse into the synaptic knob	neurotransmitter
D.	Na^{+} ions diffuse into the synaptic knob	Ca^{2+} ions

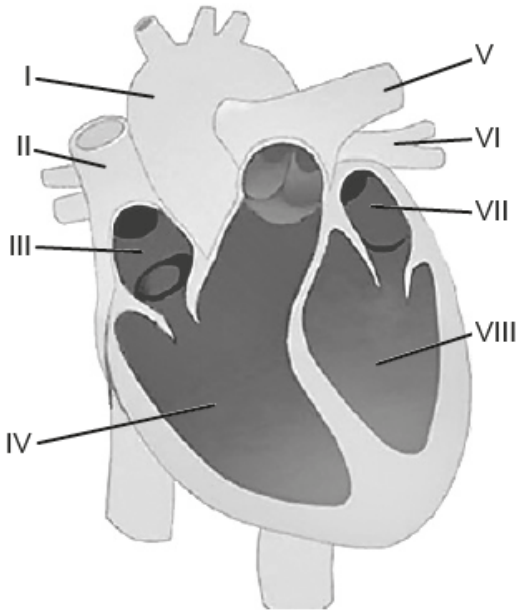
Markscheme

B

Examiners report

N/A

The diagram shows the human heart.



[Source: Reprinted by permission from Macmillan Publishers Ltd: *Nature*, 406, Bu *et al*., page 116, copyright (2009).]

Which shows the sequence of blood flow in the heart?

A. III IV I

B. IV III II

C. VII VIII I

D. VIII VII VI

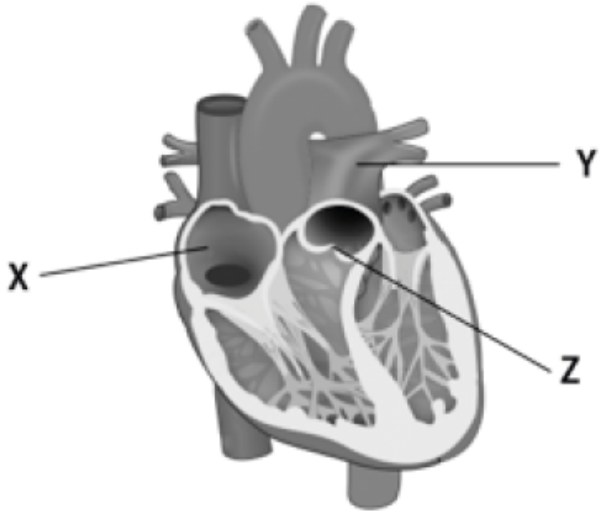
Markscheme

C

Examiners report

[N/A]

The diagram below shows the human heart.



[Source: © International Baccalaureate Organization 2014]

What structures are indicated by the labels X, Y and Z?

	X	Y	Z
A.	semilunar valve	pulmonary artery	right atrium
B.	right atrium	semilunar valve	pulmonary artery
C.	right atrium	pulmonary artery	semilunar valve
D.	pulmonary artery	right atrium	semilunar valve

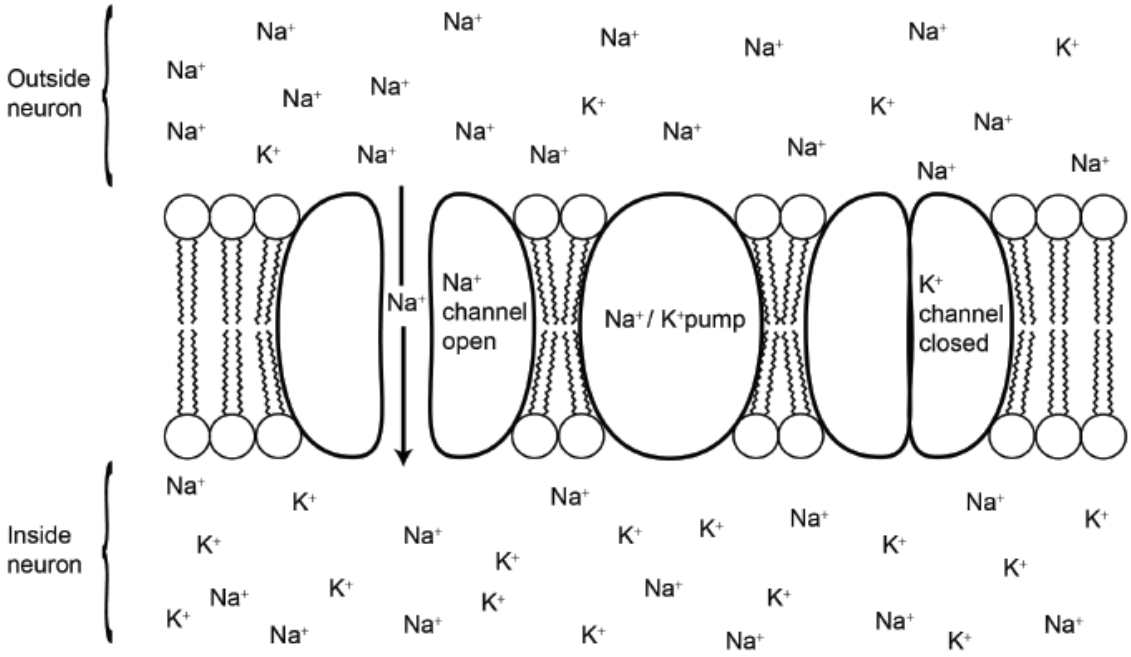
Markscheme

C

Examiners report

[N/A]

The diagram below shows part of the membrane of a neuron. What stage of the action potential does it depict?



[Source : © International Baccalaureate Organization, 2017]

A. Depolarization

B. Repolarization

C. Resting potential

D. Hyperpolarization

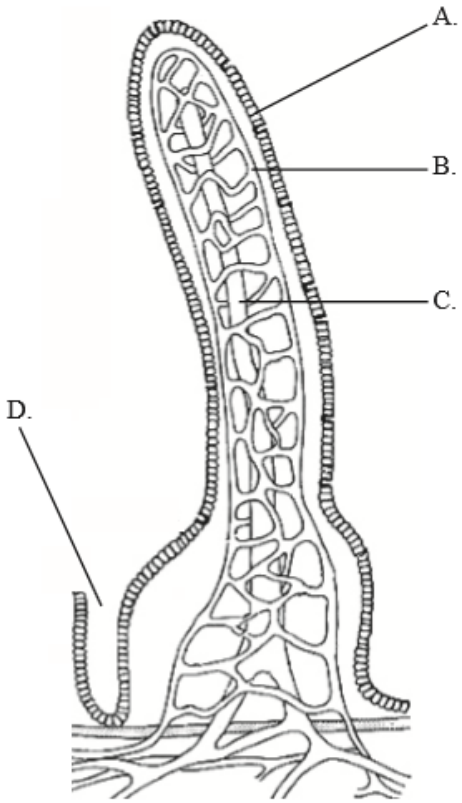
Markscheme

A

Examiners report

[N/A]

Which label represents the lacteal?



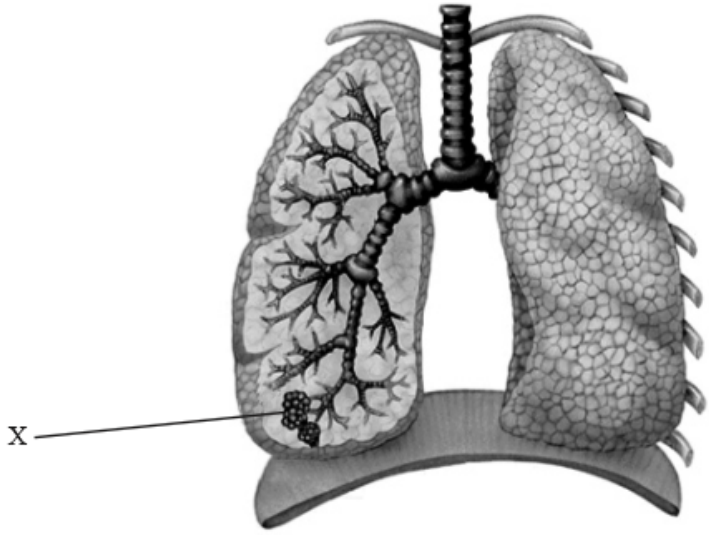
Markscheme

C

Examiners report

Several teachers commented that the term lacteal is not specified in the programme and should therefore not have been tested in Question 25. This question was based on Assessment Statement 6.1.7, which specifies that students should be able to explain the relationship between the structure of the villus and its functions in absorption and transport. There is no teacher note accompanying this question so no specific structures are included or excluded and the examining team's view was that it was reasonable to expect knowledge of lacteals which have an important role in transport of absorbed. Two other labels on the diagram were the epithelium and capillaries and well-prepared candidates should have been able to eliminate them even if they then had to guess between the other two answers. In fact nearly 60% of candidates answered this question correctly and the discrimination index was good.

What is the function of the structure labelled X?



[Source: adapted from http://www.medicalook.com/systems_images/lungs.gif]

A. Gas exchange
B. Ventilation
C. Respiration
D. Inspiration

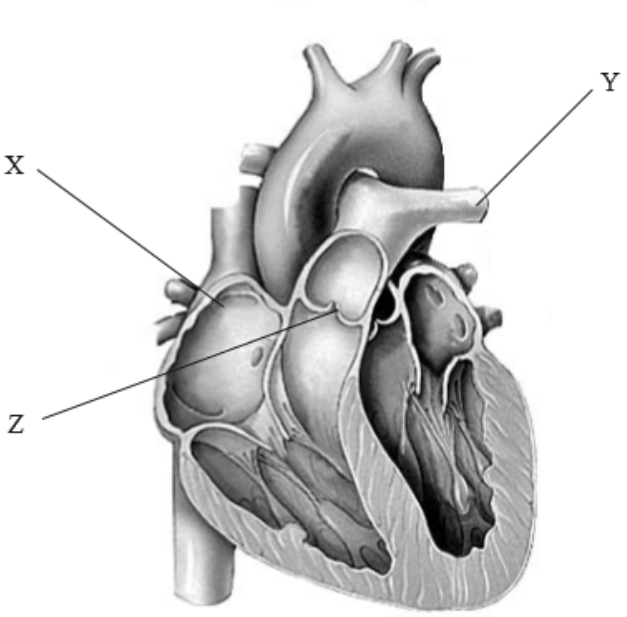
Markscheme

A

Examiners report

N/A

The diagram below shows the human heart. What structures are indicated by the labels X, Y and Z?



[Source: adapted from: http://whyfiles.org/102spareparts/images/heart2.gif]

	X	Y	Z
A.	left atrium	aorta	semi-lunar valve
B.	left atrium	aorta	atrio-ventricular valve
C.	right atrium	pulmonary artery	atrio-ventricular valve
D.	right atrium	pulmonary artery	semi-lunar valve

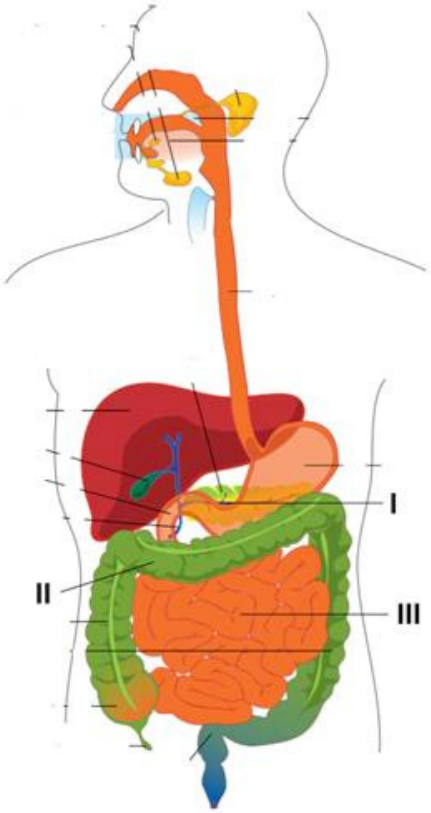
Markscheme

D

Examiners report

N/A

The diagram below shows the human digestive system.



In which parts of the digestive system are most water and glucose absorbed?

	Water	Glucose
A.	II	I
B.	II	III
C.	III	II
D.	III	III

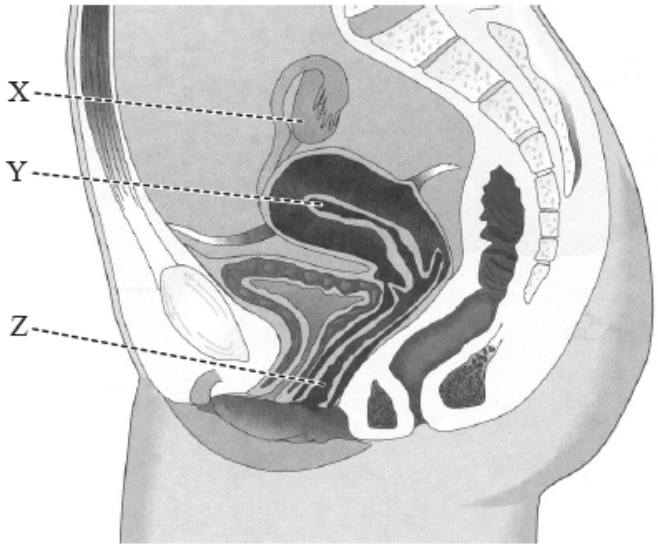
Markscheme

B

Examiners report

N/A

The diagram below shows the female reproductive system.



[Source: © International Baccalaureate Organization 2014]

What are the structures indicated by X, Y and Z?

	X	Y	Z
A.	oviduct	cervix	vagina
B.	ovary	uterus	vagina
C.	oviduct	bladder	cervix
D.	ovary	uterus	cervix

Markscheme

B

Examiners report

There were two comments on G2s about the nature of this diagram of the female reproductive system while others said the diagrams were clear and labelled so that parts were easily identified. Those not getting the correct answer B tended to choose D instead, confusing the vagina and cervix.