

**BIOLOGY**

Paper 2 Multiple Choice (Extended)

**0610/22**

**May/June 2019**

**45 minutes**

Additional Materials: Multiple Choice Answer Sheet  
Soft clean eraser  
Soft pencil (type B or HB is recommended)

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

**Read the instructions on the Answer Sheet very carefully.**

Each correct answer will score one mark. A mark will **not** be deducted for a wrong answer.

Any rough working should be done in this booklet.

Electronic calculators may be used.

\* 2 8 4 9 5 5 2 1 2 7 \*

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

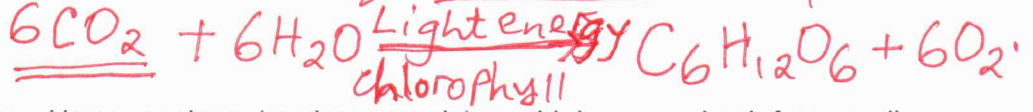
1 Carbon dioxide diffuses into a leaf.

Which characteristic of living things requires this?

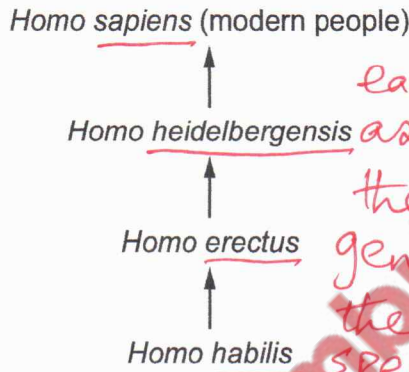
- A excretion
- B movement
- C nutrition
- D respiration

into a leaf is used as a raw material for photosynthesis, alongside water; in the presence of light energy, and chlorophyll to form glucose, and oxygen

as a by-product; This is an example of nutrition in plants.



2 The diagram shows how *Homo sapiens* (modern people) could have evolved from earlier ancestors.



- In binomial system of naming organisms, each organism is assigned two names, the first one is the genus name, while the second name is the species name. In the above illustration, all the organisms share a common genus; HOMO; however, each of them belong to a unique species (species names are underlined in the illustration); hence the answer is C.

Which statement about modern people and their ancestors is correct?

- A They are in the same species and the same genus.
- B They are in the same species but not the same genus.
- C They are in the same genus but not the same species.
- D They are neither the same species nor the same genus.

3 Heart muscle cells have a high rate of metabolism.

Which structure do they require to be present in high numbers?

- A chloroplasts
- B mitochondria
- C cell walls
- D vacuoles

- All Metabolic reactions (Reactions taking place in the cell organelles), require energy to take place; Mitochondria are the organelles in which aerobic respiration take place, releasing energy for use by the cell.

3 wall, but, chloroplasts are not possessed by all plant cells; Examples of plant cells that lack chloroplasts are; Root hair cells, upper epidermal cells of a leaf, etc.

4 Which features are possessed by all plant cells?

	a cell wall	chloroplasts
A	✓	✓
<b>B</b>	✓	x
C	x	✓
D	x	x

key  
 ✓ = present  
 x = absent

5 The diagram shows a xylem vessel in a plant stem. The magnification is  $\times 400$ .



$XY = 35 \text{ mm}$   
 $= 35 \times 1000$   
 $= 35,000 \mu\text{m}$   
 Magnification  
 $= \times 400$

What is the actual width of the xylem vessel along the line XY?

- A  $8.75 \mu\text{m}$       B  $14 \mu\text{m}$       **C  $87.5 \mu\text{m}$**       D  $140 \mu\text{m}$

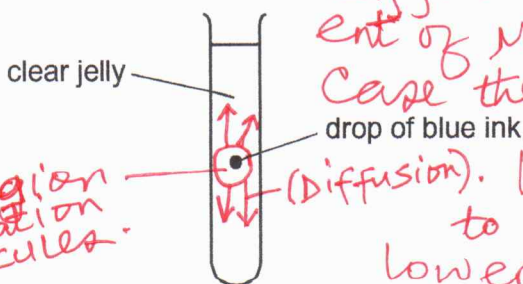
$$\text{Magnification} = \frac{\text{Image length}}{\text{Actual length}}$$

$$\Rightarrow \text{Actual length} = \frac{\text{Image length}}{\text{Magnification}}$$

$$= \frac{35000 \mu\text{m}}{400}$$

$$= 87.5 \mu\text{m}$$

- 6 The diagram shows a test-tube containing clear jelly. A drop of blue ink is injected into the middle of the jelly.



This is the region of higher concentration of ink molecules.

- Diffusion is the net movement of molecules (in this case the ink molecules), from a region of their higher concentration to a region of their lower concentration, down a concentration gradient, as a result of their random movement.

The blue colour of the ink spreads throughout the jelly.

By which process does the blue ink spread through the jelly?

- A active transport  
B catalysis  
C  diffusion  
D osmosis

- 7 Which process describes osmosis?

- A diffusion of water through a cell wall  
B  diffusion of water through a partially permeable membrane  
C diffusion of water through the cell sap  
D diffusion of water through the cytoplasm

- Osmosis is the diffusion of water molecules, from a region of higher water potential (dilute solution), to a region of low water potential (concentrated solution), through a partially permeable membrane.

- 8 Which row shows the chemical elements contained in fats?

	carbon	hydrogen	nitrogen	oxygen
A <input checked="" type="radio"/>	✓	✓	✗	✓
B	✓	✓	✓	✓
C	✗	✓	✓	✗
D	✓	✗	✓	✓

- Fats/lipids, just like carbohydrates are composed of the elements, C, H & O. Proteins contain the elements, C, H, O and N.

key  
✓ = present  
✗ = absent

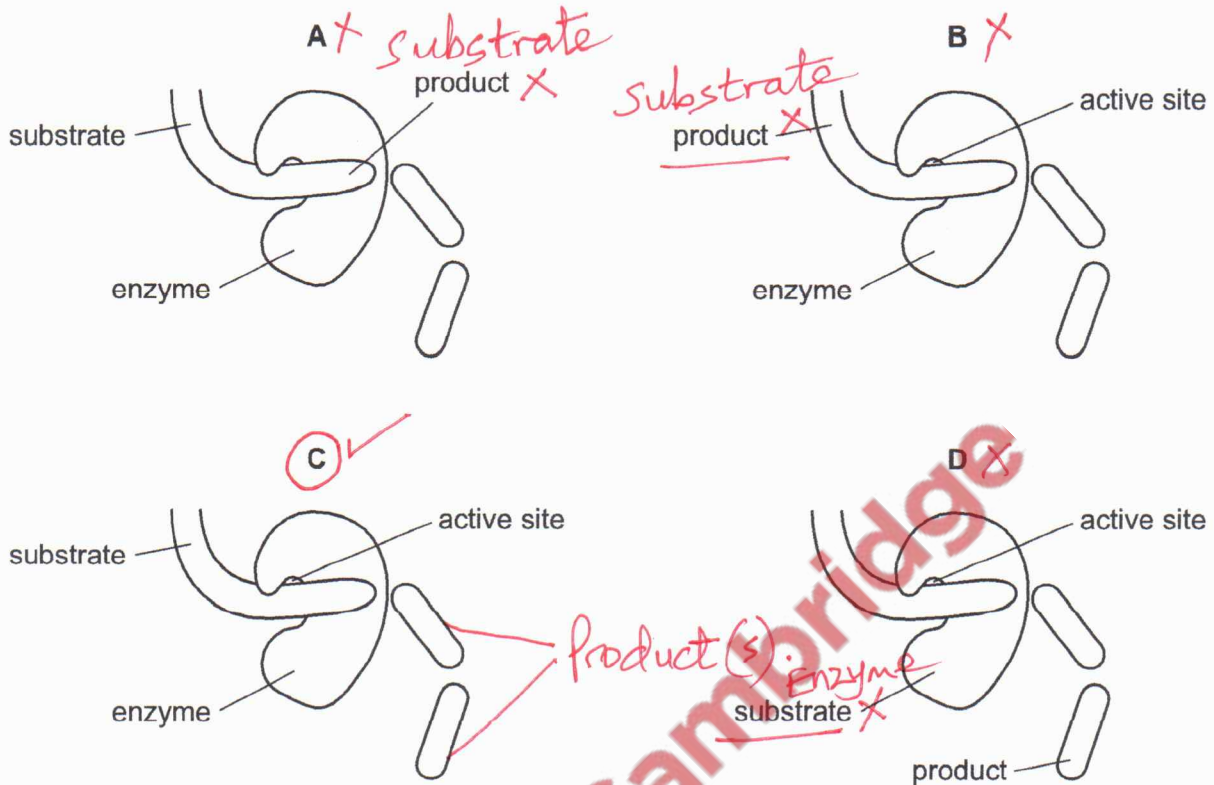
- 9 Small molecules are used as the basic units in the synthesis of large food molecules.

Which statement is correct?

- A  Amino acids are basic units of carbohydrates. ~~Proteins.~~
- B  Fatty acids are basic units of glycogen. ~~Lipids.~~
- C  Glycerol is a basic unit of oils. ~~fatty acids and glycerol are the basic units of lipids (fats and oils).~~
- D  Simple sugar is a basic unit of protein. ~~carbohydrates.~~

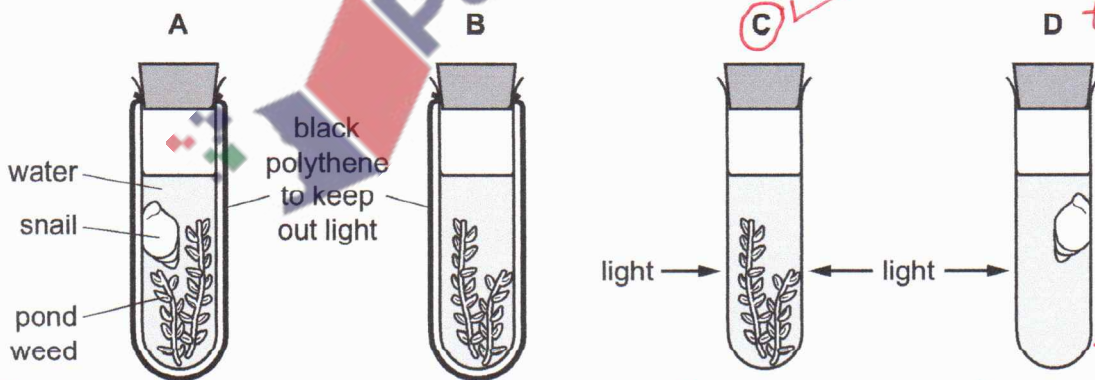
10 The diagrams show a protease enzyme catalysing the breaking of part of a protein molecule into smaller pieces.

Which diagram has three correct labels?



11 The diagram shows an experiment to investigate the balance between respiration and photosynthesis.

In which tube are photosynthesis and respiration taking place at the same time?



- In A and B, the organisms are respiring but the plants can't photosynthesise because they lack light energy, since the black polythene keeps out the light.

Polythene, keeps out the light, which is necessary for photosynthesis to take place. The plant in C is both photosynthesising (due to availability of light), and also respiring, hence it's the correct answer. - In D, only respiration is taking place, since animals (snail), don't usually photosynthesise.

- 12 Some gardeners use Epsom salts (magnesium sulfate) as a fertiliser for their plants. Epsom salts release magnesium ions into the soil.

How would this benefit the plants?

A prevents pests from eating the leaves

B prevents the leaves from going yellow

C prevents water loss from the leaves

D prevents the growth of weeds

- 13 The food label is from a packet of cereal.

The label can help someone who is concerned about their diet.

Nutrition	
Typical values	100 g contains
Energy	985 kJ 235 kcal
Fat	1.5 g
of which saturates	0.3 g
Carbohydrate	45.5 g
of which sugars	3.8 g
<b>Fibre</b>	<b>2.8 g</b>
Protein	7.7 g
Salt	0.5 g

A person eats 45 g of cereal.

One of the food types listed in the label can help prevent constipation.

How many grams of this food type does the person eat?

A 1.3g

B 2.8g

C 3.5g

D 7.7g

- Magnesium is absorbed by the green plants as Magnesium ions; and these plants need Magnesium to be used in making chlorophyll. Absence of Magnesium means the plant will not make chlorophyll (green in colour), hence their leaves turn yellow.

- fibre or roughage is the food type that prevents constipation.

If in 100 grammes of the cereal, there was 2.8 grammes of fibre;

Then in 45g of the cereal;

$$100g = 2.8g$$

$$45g = ?$$

$$= \frac{45 \times 2.8}{100};$$

$$= 1.26g.$$

$$\approx 1.3g (1 d.p.).$$

concentration, and high solvent concentration), has a high water potential, while a concentrated solution (one with high solute concentration, and low solvent concentration), has a low water potential.

14 The cholera bacterium produces toxins that cause chloride ions to be secreted into the small intestine.

How does this affect the water potential of blood in the intestinal capillaries and the intestinal contents?

- When the walls/lining of the small intestine secrete chloride ions into the lumen of the small intestine, the solute concentration, in the intestinal capillaries, consequently reduced, hence, the water potential in the blood capillaries (in the walls of the intestines), increased. The solute concentration in the lumen of small intestines increased, leading to reduced water potential there.

	water potential	
	blood in capillaries	contents of small intestine
A	lowered	lowered
B	lowered	raised
<b>C</b>	raised	lowered
D	raised	raised

Lumen of small intestines increased, leading to reduced water potential there.

15 A person eats some cheese which contains a lot of fats and protein.

Which row shows the combination of substances that will digest the cheese most effectively?

	substances present			
	amylase	bile	lipase	protease
A	✓	x	✓	x
B	x	✓	x	✓
C	✓	x	✓	✓
<b>D</b>	x	✓	✓	✓

starch  
Lipids (fats & oils)  
proteins

key  
✓ = present  
x = absent

HINT: Bile juice contains bile salts, which emulsifies fats/lipids. Emulsification is a process involving the breaking of large globules of fats into tiny fat droplets, so that they mix easily with water. Emulsification process increases the surface area for enzyme lipase's activity; enzyme lipase catalyses the breakdown of fats/lipids into fatty acids and glycerol.

16 A celery stalk was placed into a beaker of blue dye. When the dye reached the leaves, the stalk was taken out and a section was cut, as shown in the diagram.

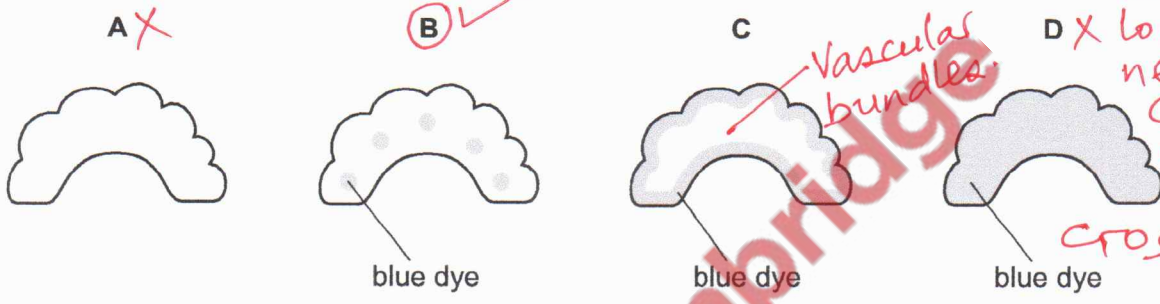
CONT'D:

Xylem is therefore the tissue, where, the blue dye will be spotted, in the cut end of the stalk, hence the correct answer is B.



- The blue dye dissolved in water, forming a solution. In any given plant organ, water is carried by a vascular bundle (tissue called xylem), which is usually located near the centre of any plant (organ's) cross-section.

Which diagram shows the appearance of the cut end of the stalk?



17 The table shows the rate of water flow through a tree over a 12 hour period.

time of day	rate of flow / cm per hour
7:00	100
9:00	120
11:00	140
13:00	250
15:00	300
17:00	260
19:00	180

- The rate of water flow between 11:00 hrs to 13:00 hrs equals;  

$$= \left\{ \frac{(250 - 140)}{140} \right\} \times 100;$$

$$= 78.57\%$$

$$\approx 79\%$$

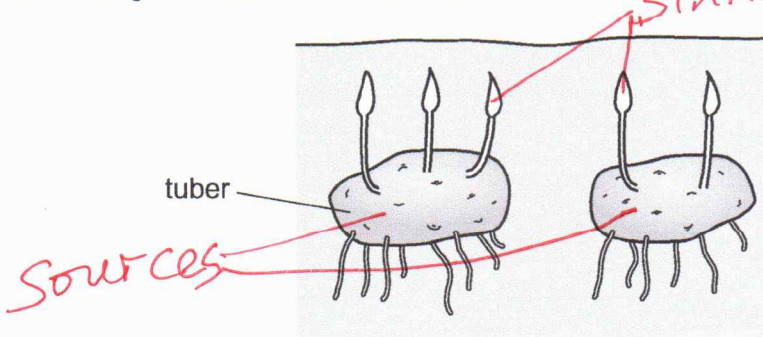
What conclusion can be drawn from the table?

- A Between 7:00 and 17:00 hours the rate of flow continuously increases.
- B** The greatest increase in rate of flow in a two-hour period is between 11:00 and 13:00 hours.
- C Water does not flow up through a tree at night.
- D Water flow is affected by humidity.

- This is the greatest percentage increase in any two hour period, from 7:00 hrs to 19:00 hrs.

photosynthesise and produce sucrose which is sent from the leaves (sources) to the tubers (sinks). During winter, starch is stored in the tubers and all shoots have withered out. - During spring, the situation is as shown in this diagram; New shoots start forming, but they are not able to photosynthesise yet. The starch stored in the tubers is converted to sucrose, and then the sucrose is sent from the tubers (which now become sources), to the new shoots (now the sinks).

18 The diagram shows some potato tubers. New shoots are beginning to grow. Sucrose is being translocated from source to sink.

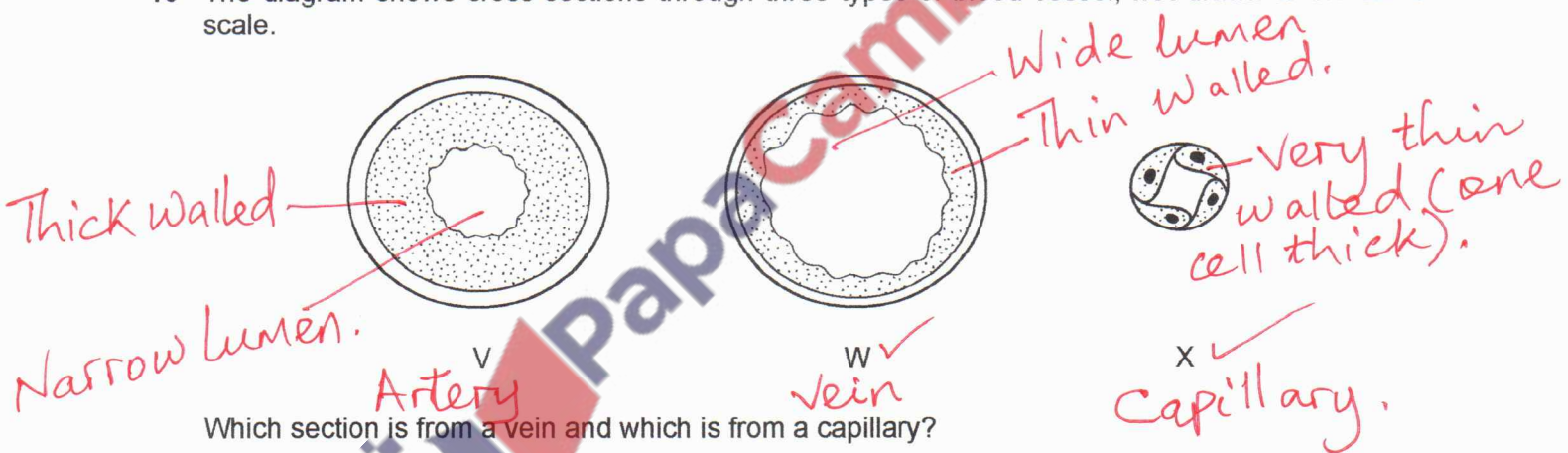


During winter, starch is stored in the tubers and all shoots have withered out. - During spring, the situation is as shown in this diagram; New shoots start forming, but they are not able to photosynthesise yet. The starch stored in the tubers is converted to sucrose, and then the sucrose is sent from the tubers (which now become sources), to the new shoots (now the sinks).

Which statement is correct?

- A The tuber is a sink.
- B The soil is a sink.
- C The shoots are sources.
- D The shoots are sinks.

19 The diagram shows cross-sections through three types of blood vessel, not drawn to the same scale.



Which section is from a vein and which is from a capillary?

	vein	capillary
A	V	W
B	W	V
<input checked="" type="radio"/> C	W	X
D	X	W

20 Which disease is transmissible?

- A cholera
- B coronary heart disease
- C lung cancer
- D scurvy

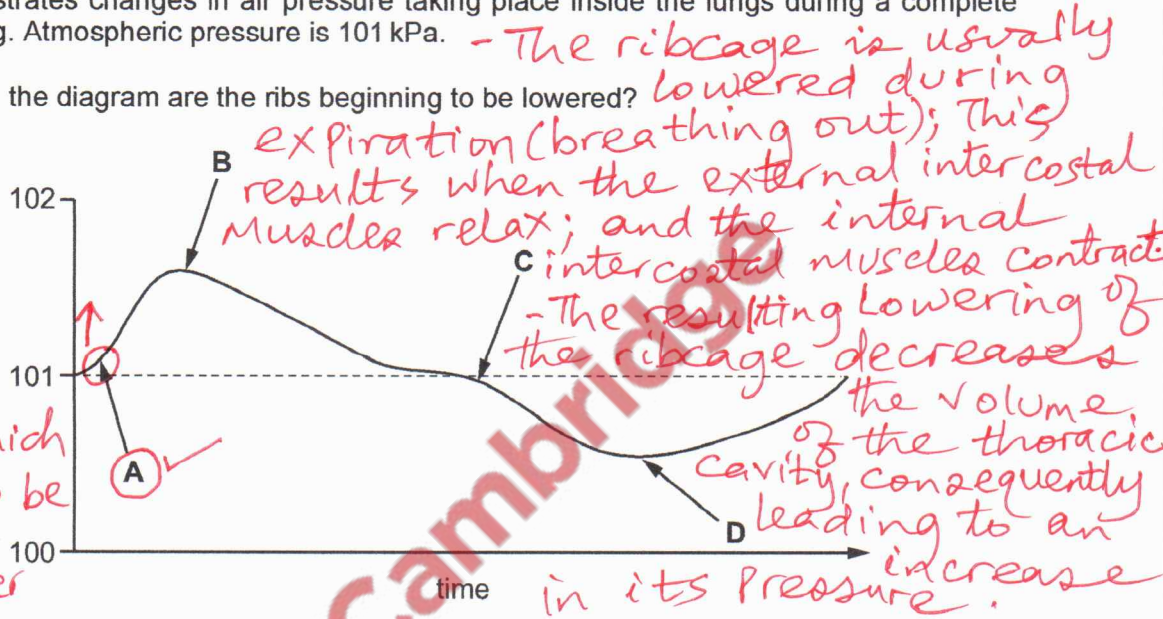
- A transmissible disease is one that is caused by a pathogen (eg Bacteria like the case of cholera, viruses, fungi and protoctists); and can usually be passed from one person to another. Hence A is the correct answer.

21 The diagram illustrates changes in air pressure taking place inside the lungs during a complete cycle of breathing. Atmospheric pressure is 101 kPa.

At which point on the diagram are the ribs beginning to be lowered?

CONT'D:

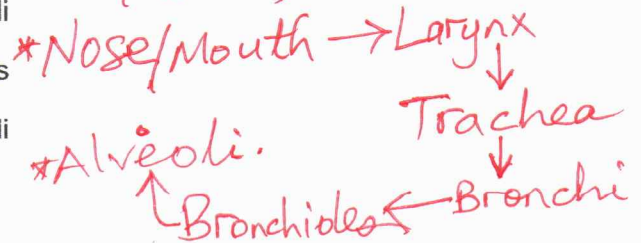
- Therefore, the point at which pressure in the lungs, begin to increase is the point at which the ribs began to be lowered; Hence the correct answer is A.



22 Which pathway is followed by air passing into the body?

- A larynx → trachea → bronchi → bronchioles → alveoli
- B larynx → trachea → bronchioles → bronchi → alveoli
- C trachea → larynx → bronchi → alveoli → bronchioles
- D trachea → larynx → bronchi → bronchioles → alveoli

- The overall pathway of air into the body is as follows;



23 Oxygen is required for aerobic respiration.

How many molecules of oxygen are required for the aerobic respiration of three molecules of glucose?

- A 3
- B 6
- C 12
- D 18

Equation for aerobic respiration;



If 1 molecule of glucose requires 6 molecules of oxygen for its aerobic respiration; then 3 molecules of glucose, will require ( $6 \times 3 = 18$ ); 18 molecules of oxygen for their aerobic respiration.

24 Which statement about involuntary responses is correct?

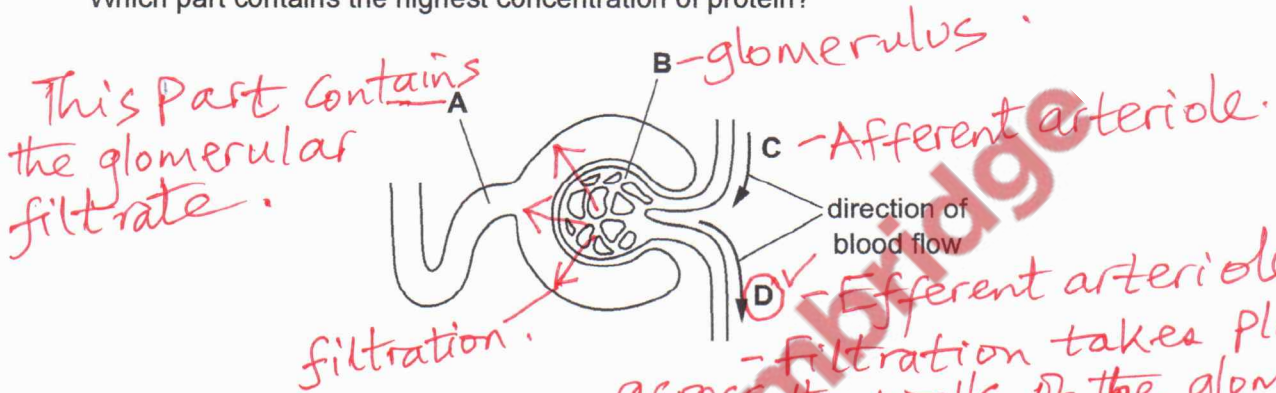
- A They always result in the same response to the same stimulus.
- B They are learned responses.
- C They are slower than voluntary responses.
- D They never use voluntary muscles.

- Involuntary responses are usually not under conscious control of the brain, hence these responses always give the same response to the same stimulus (the responses are taken automatically).

25 The diagram shows the first part of a kidney tubule and its blood supply.

During filtration, protein molecules do not pass through the wall of the glomerulus.

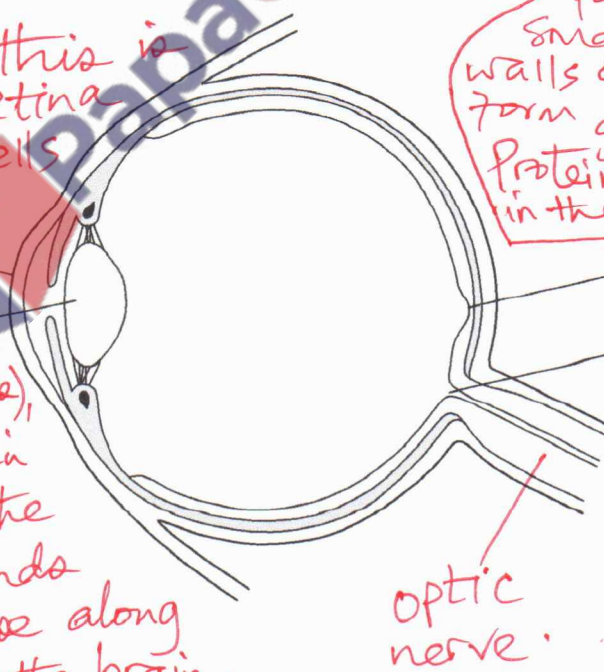
Which part contains the highest concentration of protein?



26 The diagram shows a cross-section of the human eye.

Which label points to the spot in the eye where vision is the sharpest?

- C is the fovea; this is the part of the retina where the receptor cells are packed most closely together. The receptor cells pick the light (stimulus), falling on them, within the retina area; the receptor cells then send an electrical impulse along the optic nerve to the brain, which in turn sorts out all the impulses from each receptor cell and builds up an image; C (fovea is



- filtration takes place across the walls of the glomerulus, small molecules like water, urea, glucose pass through the small pores in the walls of glomerulus, to form glomerular filtrate. Protein molecules remain in the capillaries, due to their large molecular sizes, hence they proceed to the efferent arteriole, D, where we shall have their highest concentration.

therefore the correct answer, since it is where the highest number of receptor cells are concentrated.

27 Three plant shoots have their tips removed. Two of the shoots have a piece of agar gel placed on them, as shown in the diagram. The agar gel contains auxin. The shoots are exposed to light coming from one direction.

AUXINS absent

agar gel containing auxin

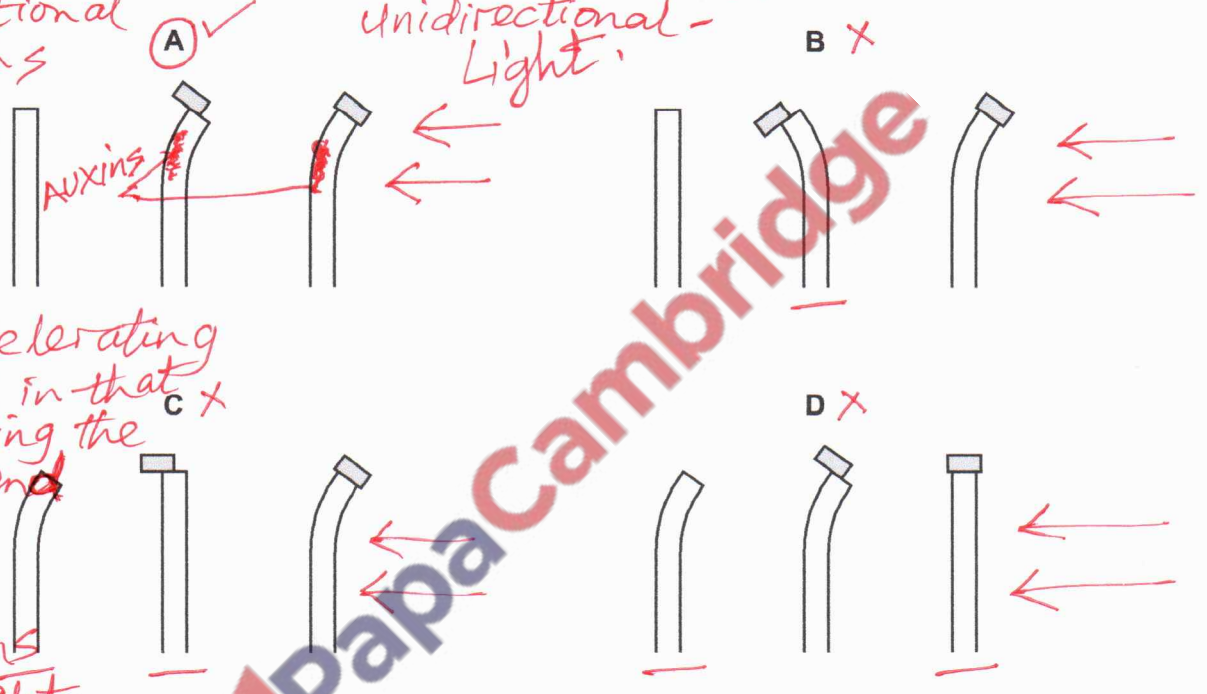
Auxins Present

Auxins Present - Auxins are Plant growth, that stimulate growth in the part of the shoot tip, where they are highly concentrated.

CONT'D:

When a plant shoot is subjected to unidirectional light, Auxins accumulate on the part of the shoot away from the light, hence accelerating growth rate in that side, causing the shoot to bend towards light. The shoot without auxins remains upright.

What is the appearance of the shoots after two days?

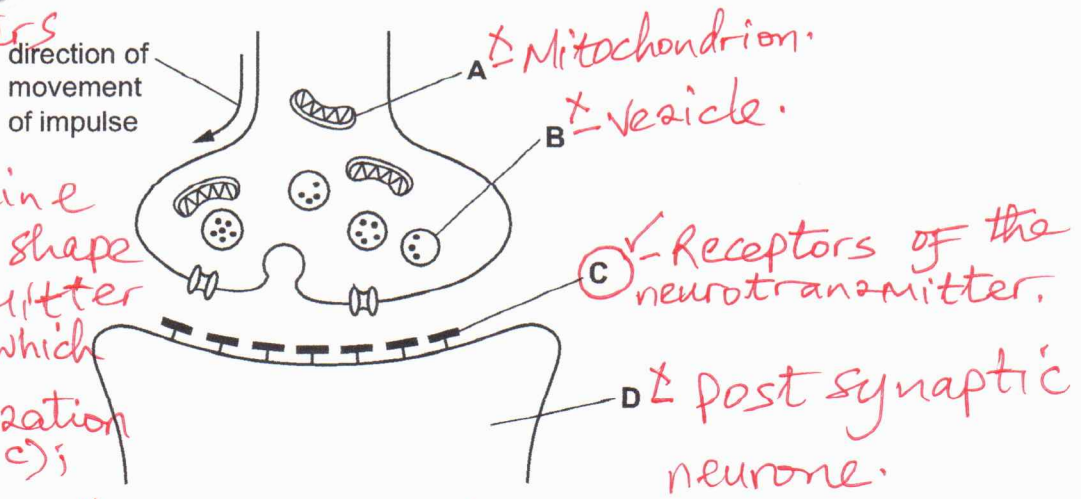


28 The diagram shows a synapse.

Heroin affects the neurone.

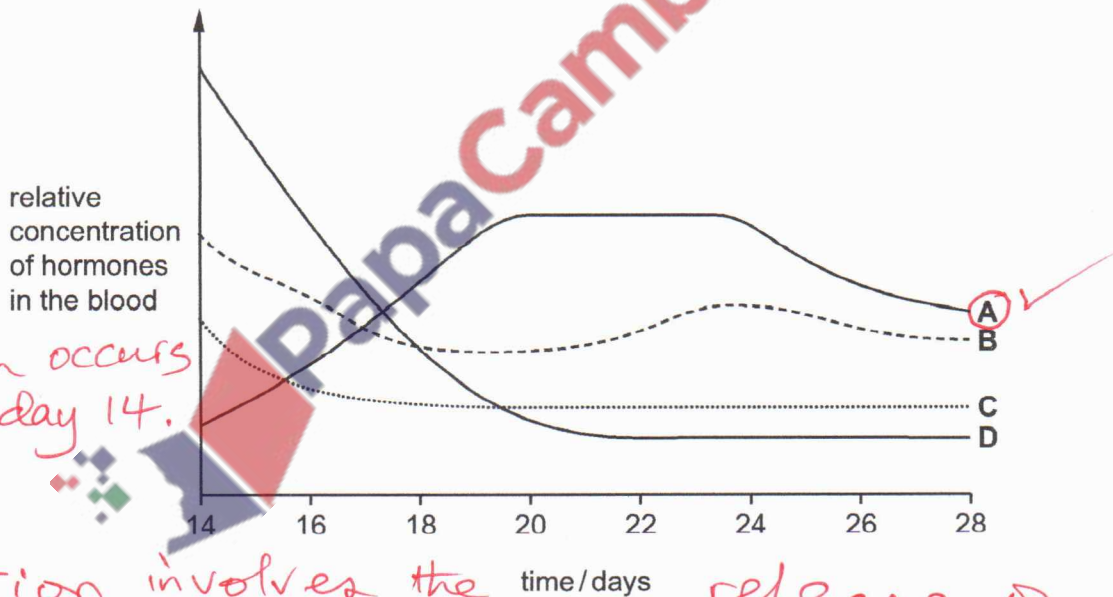
Which labelled part does the heroin directly affect?

- When heroine enters the brain, it is metabolised to Morphine; Morphine molecules have a shape to a neurotransmitter called endorphin (which helps reduce the sensation of pain, hunger etc); Morphine therefore "mimics" endorphin (a neurotransmitter) hence it (morphine/heroin), will directly affect the receptors for the neurotransmitter (Multiple choice - C).



- 29 What is an advantage of self-pollination? - Self pollination is the transfer of pollen from the anther to the stigma on the same plant (but not necessarily the same flower); this therefore allows isolated individuals to reproduce.
- A Evolution is not possible.
- B Genetic variation cannot occur.
- C Isolated individuals can reproduce.
- D It does not require gametes.
- 30 Which feature allows the sperm to dissolve the jelly coating of the egg cell?
- A acrosome - A vesicle containing enzymes, to dissolve a way through the jelly surrounding the egg cell.
- B flagellum - Produces swimming movements.
- C mitochondria - Releases energy, needed for propulsion.
- D nucleus - Contains the genetic material (DNA inside the chromosomes).
- 31 The graph shows the relative concentration of hormones in the blood during days 14-28 of the menstrual cycle.

Which letter represents the hormone progesterone in a woman who is not pregnant?

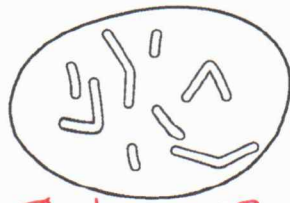


\*Ovulation occurs at around day 14.

- Ovulation involves the release of a fully developed egg cell, from a mature graafian follicle; A process stimulated by a surge in the production of hormone LH. The now empty follicle becomes a corpus luteum, and immediately starts secreting progesterone hormone; whose role is to keep the uterus lining thick, spongy and well supplied with blood, just in case the egg is fertilised during that menstrual cycle; that is why progesterone levels were rising immediately after ovulation (day 14). If fertilisation doesn't occur, corpus luteum disappears, progesterone levels go down.

in Mitosis, the daughter cells are usually genetically similar to the parent cell;

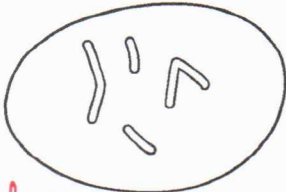
32 The diagram shows the chromosomes in the nucleus of a cell that divides by mitosis.



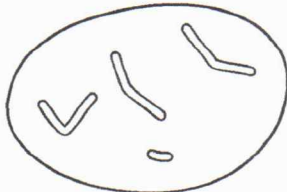
- Therefore, we expect the daughter cell in this case to also have 8 chromosomes, hence, C is the correct

Which diagram shows the chromosomes in the nucleus of one of the daughter cells produced? *answer.*

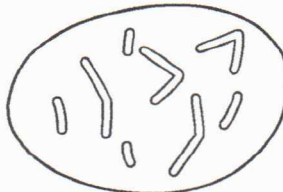
A



B



**C** ✓



D



4 chromosomes.

4 chromosomes.

8 chromosomes.

7 chromosomes.

33 The diploid number for mice is 40 chromosomes.

How many chromosomes will be in a mouse cell formed by meiosis?

A 10

**B** ✓ 20

C 40

D 80

\* Daughter cells of a Meiotic cell division are usually haploid, hence in this case will have 20 chromosomes.

34 Which statement is correct?

**A** ✓ People who are heterozygous for the sickle-cell allele have a resistance to malaria.

B Sickle-cell anaemia is caused by a change in the amino acid <sup>base</sup> sequence of the haemoglobin gene.

C Sickle-cell anaemia is caused by both genetic and environmental factors interacting.

D The sickle-cell allele is rare <sup>common</sup> in human populations in areas where there is malaria.

35 When antibiotics are overused they become less effective.

Which statement is correct?

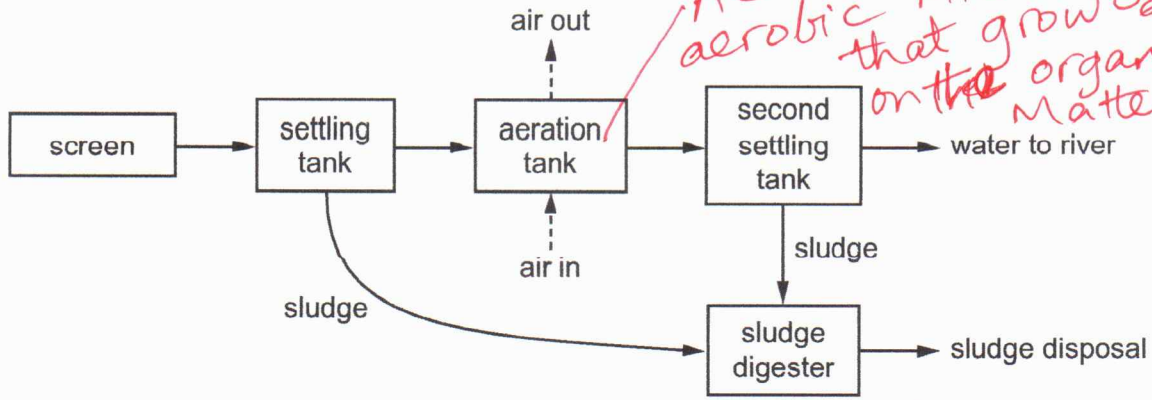
<sup>Natural</sup> **A** ✗ Artificial selection results in resistant strains of bacteria.

<sup>bacteria</sup> **B** ✗ Patients become resistant to the antibiotic.

**C** ✗ The antibiotic causes the bacteria to mutate.

**D** ✓ The antibiotic does not kill resistant bacteria.

36 The diagram shows how sewage is treated.



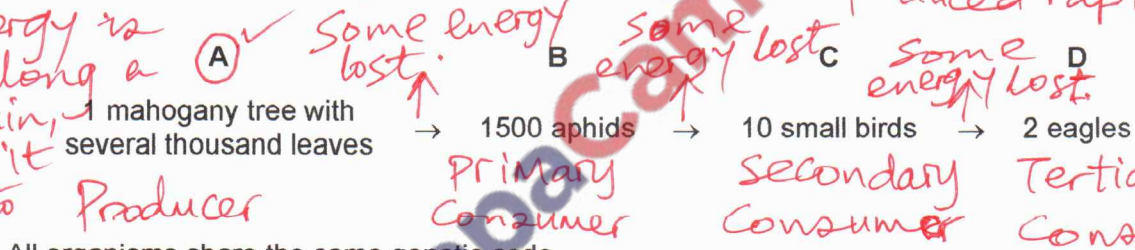
*Aeration tank houses aerobic microorganisms, that grow and feed on the organic matter.*

Why is air bubbled through the aeration tank?

- A to encourage microorganisms to reproduce quickly
- B to float the sludge
- C to settle the sludge
- D to stop microorganisms from reproducing too quickly

*- Aerobic microorganisms respire, exclusively, in the presence of oxygen! The air bubbled through the aeration tank supplied them with oxygen, hence were able to respire constantly, releasing the much needed energy for their metabolism. Hence reproduced rapidly.*

37 Which trophic level has the greatest amount of energy?



38 All organisms share the same genetic code.

This means that bacteria can be used to

- A improve the health of the digestive system.
- B manufacture biofuels in large quantities.
- C produce foods such as yoghurt and cheese.
- D make proteins using human DNA.

*- eg Insulin, an hormone; All hormones are protein in nature.*

39 Evidence shows that some aquatic organisms have been feminised.

What is the most likely cause of this?

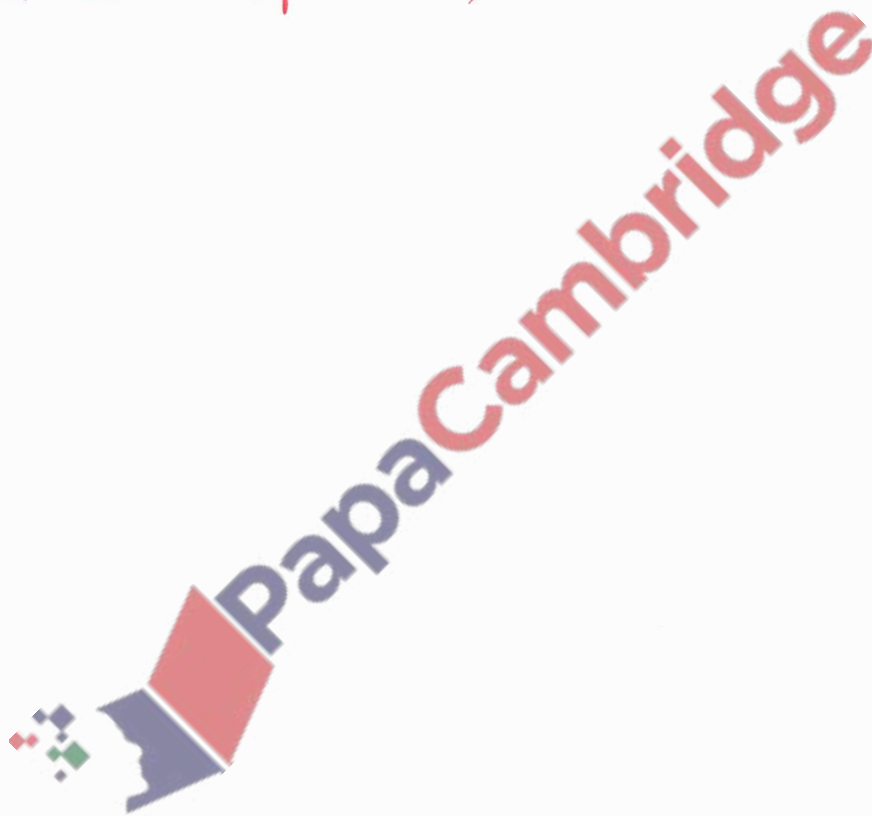
- A increased nitrates running off farmland into the rivers
- B female hormones excreted by women taking contraceptive pills
- C infectious diseases in the fish
- D decreasing levels of oxygen in the rivers

*- Some of the contraceptive pills contain oestrogen. When women take such pills, for birth control, some of these hormones are excreted in the woman's urine and eventually find their way into water ways, in sewage. Fish, molluscs etc are affected by these hormones, by preventing the male hormone, testosterone from working effectively. Male fish have even been made female by the same.*

40 What is **not** a reason for using chemical fertilisers in food production?

- A improving growth rate
- B improving mineral content of the soil
- C increasing yields

D reducing competition with weeds — This will be achieved through the use of herbicides (a chemical substance used for killing or inhibiting the growth of unwanted plants, such as, weeds or invasive species).



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