Paya Lebar Methodist Girls' School (Secondary)
Preliminary Examination 2016
Secondary 4 Express

CANDIDATE NAME		CLASS		CLASS INDEX NUMBER	

CENTRE NUMBER					INDEX NUMBER				

BIOLOGY (SPA) 5158

Paper 1 Multiple Choice 19 August 2016

Additional Materials: Multiple Choice Answer Sheet **1 hour**

READ THESE INSTRUCTIONS FIRST

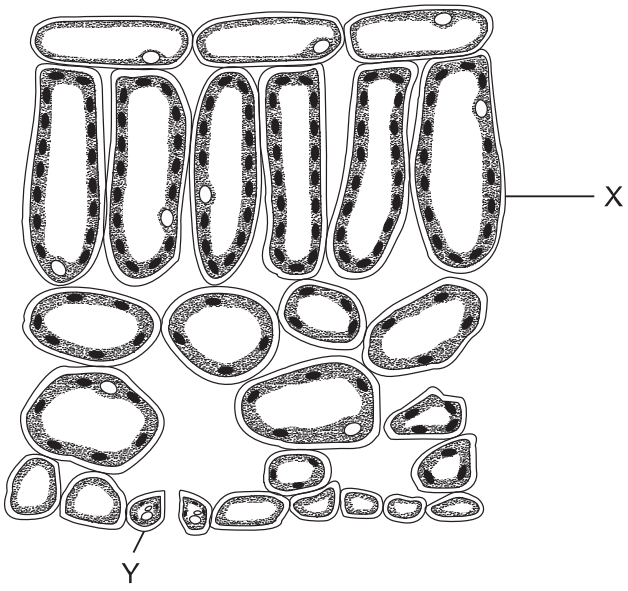
Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name and index number on all the work you hand in.

There are **forty** multiple-choice 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.

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.

This paper consists of **20** pages including this cover page

1 The diagram shows part of a leaf in cross-section.



Structures X and Y are both part of the same

A cell.

B organ.

C tissue.

D vessel.

2 The diagram shows a male gamete.

Which term describes the level of organisation of this gamete?

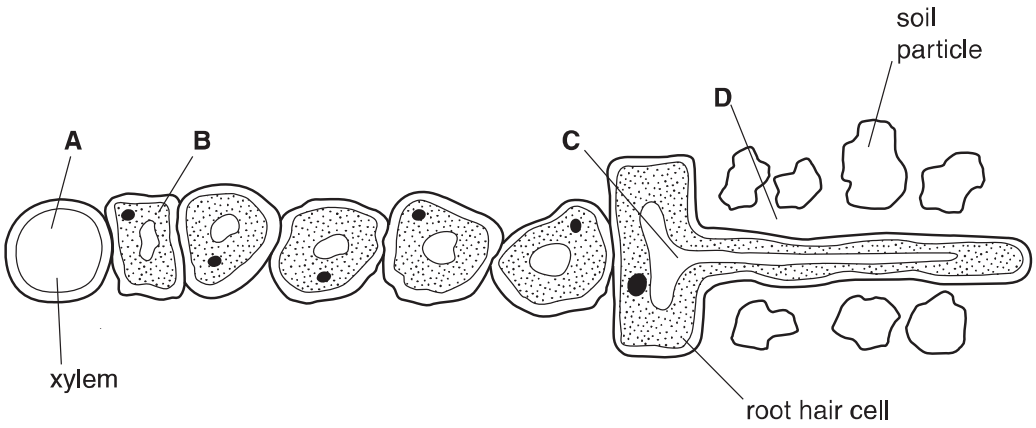
A cell

B organ

C organism

D tissue

3 The diagram shows part of a plant root in the soil. The root is absorbing water. At which labelled point is the water potential highest?



4 Which statement describes active transport?

A the movement of ions through a cell membrane, releasing energy

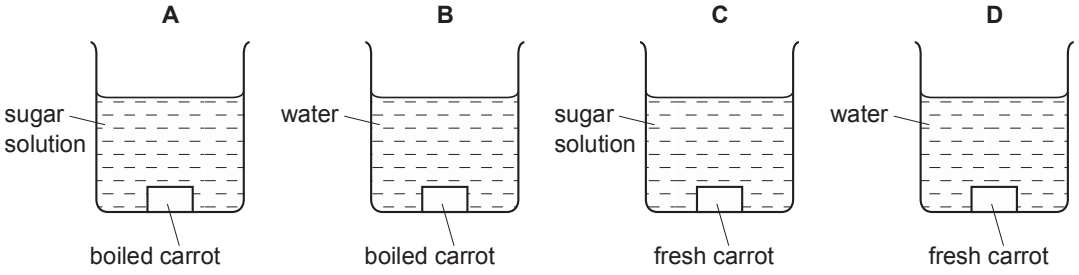
B the movement of ions through a cell membrane, using energy

C the movement of water through a cell membrane, releasing energy

D the movement of water through a cell membrane, using energy

5 A student cuts out four pieces of carrot root of equal size. The pieces are treated as shown in the diagram, and then left for two hours.

After two hours, which piece of carrot will be the smallest?



[Turn over

6 Some organisms live at the bottom of the seas where it is very dark. To synthesise glucose, they use energy from chemicals in very hot water that comes out of volcanoes. What is a distinguishing feature of these organisms?

A Their enzymes are easily denatured by heat.

B They do not need carbon dioxide.

C They do not need to be green.

D They obtain energy only as carnivores.

7 Which group of compounds ensures that metabolic reactions take place effectively?

A carbohydrates

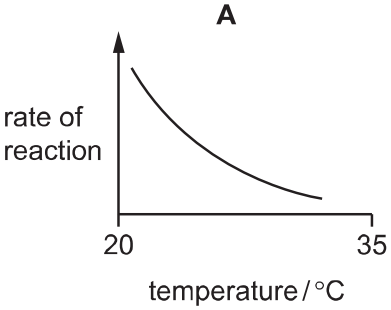
B enzymes

C fatty acids

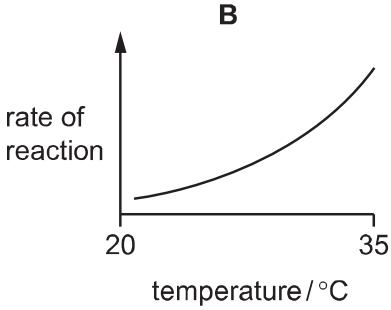
D hormones

8 Which graph shows the effect of temperature between 20 °C and 35 °C on the activity of a human digestive enzyme?

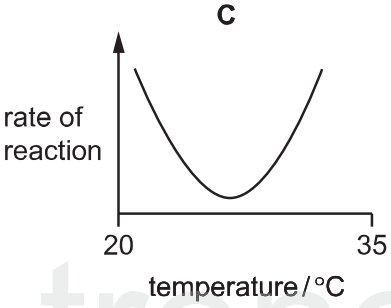
A



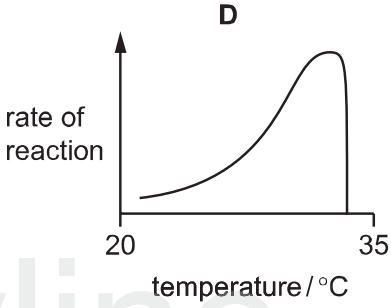
B



C



D



9 What is an example of assimilation?

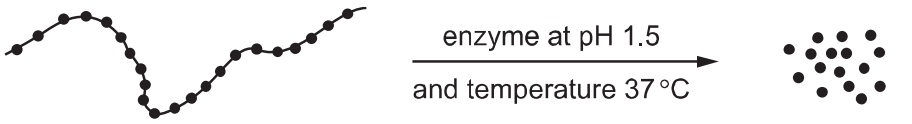
A absorption of glycerol into lacteals

B breakdown of alcohol in the liver

C building of proteins from amino acids

D release of a hormone from a gland

10 The diagram shows the effect of an enzyme working in the human digestive system.



protein amino acids

What would **reduce** the rate of production of amino acids?

A removing the amino acids as they are formed

B increasing the amount of protein

C raising the temperature to 40 °C

D raising the pH to 7.5

11 The small intestines of cows are similar in general structure and function to the small intestines of humans.

A disease in cows reduces the number of villi in their small intestines. The cows lose weight and become weak.

What explains this?

A less amylase produced

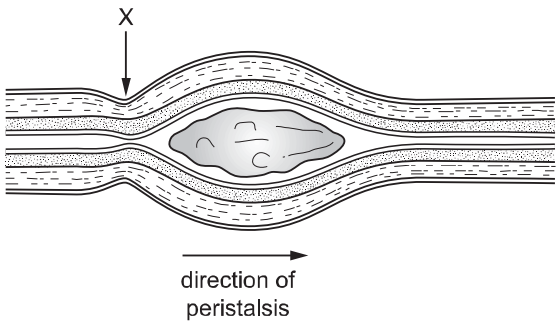
B less peristalsis

C less absorption of nutrients

D slower digestion of proteins

[Turn over

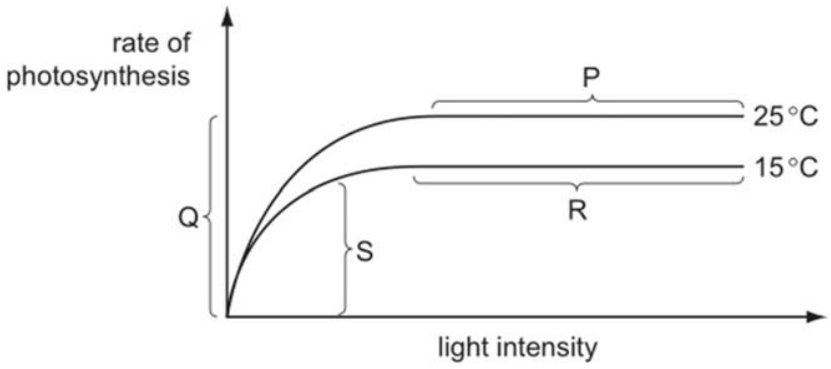
12 The diagram shows a piece of small intestine during peristalsis.



What is happening at X?

	circular muscles	longitudinal muscles
A	contracted	contracted
B	contracted	relaxed
C	relaxed	contracted
D	relaxed	relaxed

13 The graph shows how the rate of photosynthesis varies with light intensity and temperatures. Other variables are kept the same.



In which sections of the graph is light intensity limiting the rate of photosynthesis?

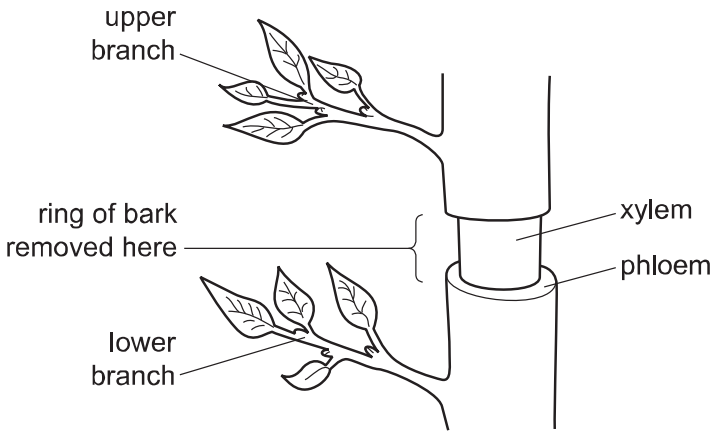
A P and R

B Q and S

C R and Q

D S and P

14 The diagram shows part of the trunk of a small tree with a ring of bark removed. Removing the ring of bark takes away phloem but leaves the xylem intact.



What effect will removing the bark have on the two branches?

	lower branch		upper branch	
	growth	leaves	growth	leaves
A	normal	normal	normal	wilted
B	normal	wilted	normal	normal
C	reduced	normal	normal	normal
D	reduced	wilted	reduced	wilted

15 Which method could increase the rate of water uptake by a shoot?

A covering the shoot with a black plastic bag

B covering the shoot with a clear plastic bag

C removing the leaves from the shoot

D shining a bright light onto the shoot

[Turn over

16 The list shows four metabolic processes.

1 carbon dioxide + water → glucose + oxygen

2 glucose → alcohol + carbon dioxide

3 glucose → lactic acid

4 glucose + oxygen → carbon dioxide + water

Which of these processes occur in muscles?

A 1 and 2

B 2 and 3

C 3 and 4

D 4 and 1

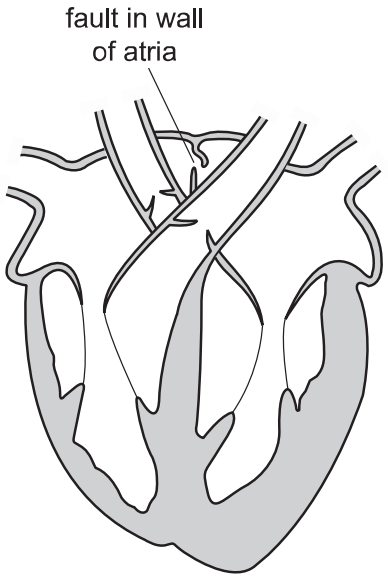
17 The table refers to blood vessels in the human body.

vessel	blood carried		oxygenated / deoxygenated
	from	to	
aorta	**P**	all organs except lungs	oxygenated
pulmonary vein	lungs	heart	**Q**
hepatic artery	aorta	**R**	oxygenated
hepatic portal vein	alimentary canal	liver	**S**

What are **P**, **Q**, **R** and **S**?

	P	Q	R	S
A	left ventricle	deoxygenated	kidney	deoxygenated
B	left ventricle	oxygenated	liver	deoxygenated
C	right ventricle	deoxygenated	kidney	oxygenated
D	right ventricle	oxygenated	liver	oxygenated

18 The diagram shows a defect in the walls between the atria.



What effect would this defect have on the blood circulatory system?

A increased pressure in the pulmonary artery

B irregular heart beat

C reduced oxygen saturation of haemoglobin

D ventricular systole is delayed

19 In the human breathing system, which features maintain the carbon dioxide gradient between the alveoli and the outside air?

1 blood continually pumped to the alveoli

2 breathing in and out

3 moist alveolar surfaces

4 thin alveolar walls

A 1 and 2

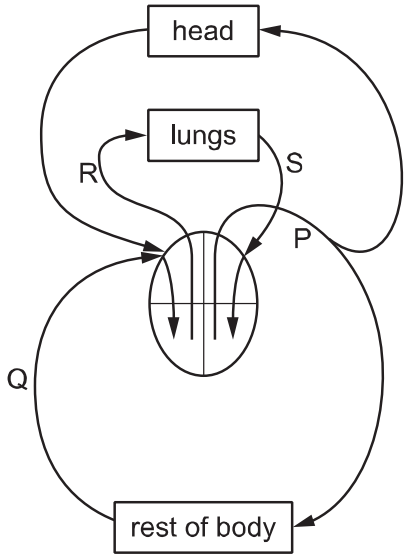
B 1 and 4

C 2 and 3

D 3 and 4

[Turn over

20 The diagram represents the heart and some major blood vessels.

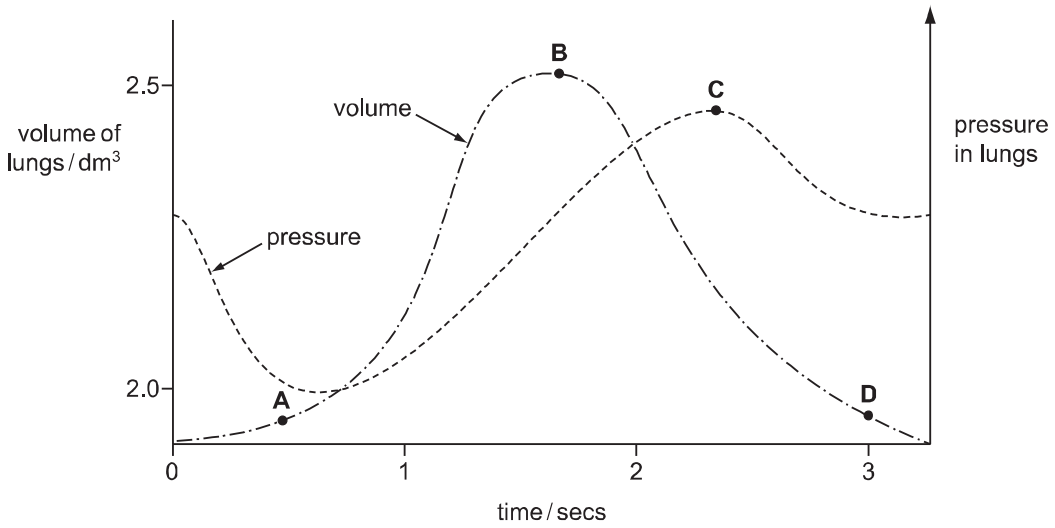


What are possible blood pressures (in kPa) for the vessels shown on the diagram?

	P	Q	R	S
A	1	4	2	16
B	4	16	2	1
C	16	2	4	1
D	16	4	1	2

21 The graph shows how the pressure and volume inside the lungs change during one complete breath.

At which point are the muscles of the diaphragm contracting?



22 Why is glucose found in the urine of diabetics?

A increased uptake and use of glucose by the body cells

B not enough glucose in the blood is converted to glycogen

C stored fats in the body are being oxidized

D too much glucose is absorbed by the kidney cells

23 Which of the following can be an effector in a reflex arc?

A a gland

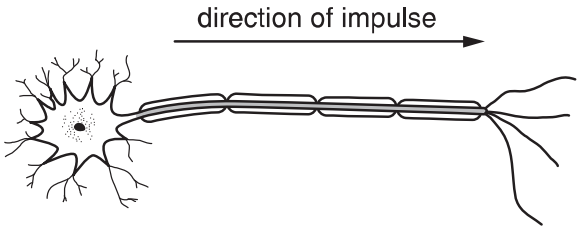
B a light receptor

C the brain

D the spinal cord

[Turn over

24 The diagram shows a neurone carrying an impulse.



Which row describes the type of neurone and the direction of impulse?

	type of neurone	direction of impulse
A	motor	towards the spinal cord
B	motor	away from the spinal cord
C	sensory	towards the spinal cord
D	sensory	away from the spinal cord

25 Opticians sometimes place drops of a chemical in a patient's eye to keep the pupil wide open.

Which muscles contract when this chemical is used?

A ciliary muscles

B circular muscles

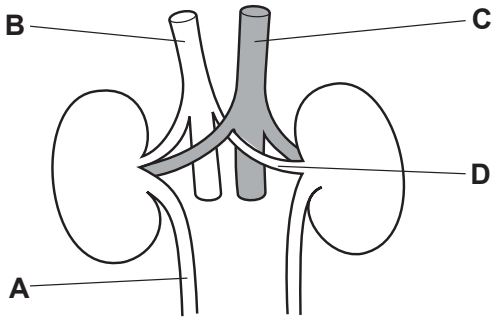
C muscles that move the eyeball

D radial muscles

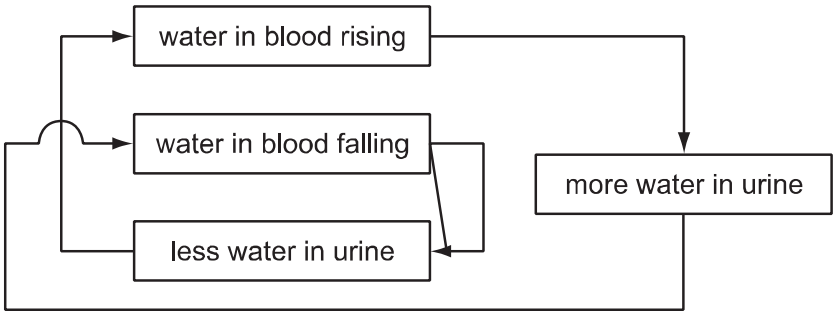
26 The table shows the composition of a liquid found in the human body.

component	concentration / arbitrary units
amino acids	0.00
glucose	0.00
proteins	0.00
salts	1.50
urea	2.00

In a healthy person, which structure contains this liquid?



27 The diagram refers to the control of water concentration in the blood.



Why is this a negative feedback system?

A It decreases the amount of water in the blood.

B It increases any change in the amount of water in the blood.

C It increases the amount of water in the blood.

D It reverses any change in the amount of water in the blood.

[Turn over

28 Which changes occur in the body when a person is shocked?

	increase in	decrease in
A	the diameter of the pupils in the eye	the speed of peristalsis
B	the rate of conversion of glycogen to glucose	the diameter of the pupils in the eye
C	the rate of urine formation	the rate of conversion of glycogen to glucose
D	the speed of peristalsis	the rate of urine formation

29 Which statement correctly describes advantages or disadvantages of self-pollination to a plant?

A It needs a lot of pollen but can happen when a plant is on its own.

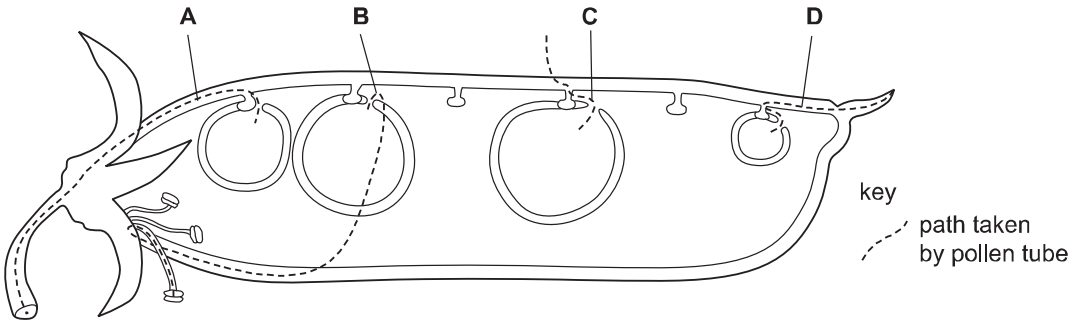
B It needs little pollen but there is a high chance of pollination.

C It needs no agent to transfer pollen but pollination is unlikely.

D It needs two plants of the same species but there is little variation in the offspring.

30 The diagram shows a pod from a pea plant.

Which line correctly shows the path that was taken by a pollen tube to an ovule?



31 Which feature of sexual reproduction helps a species to evolve?

A Fewer offspring are produced than in asexual reproduction.

B Offspring are the result of the fusion of the nuclei of dissimilar gametes.

C Offspring always inherit advantageous characteristics.

D Offspring produced will always be in a suitable environment.

32 Which of these may be heterozygous?

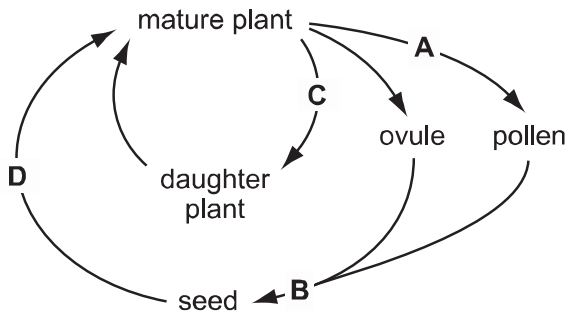
A a haploid cell

B an allele of a gene

C an organism with a dominant phenotype

D an organism with a recessive genotype

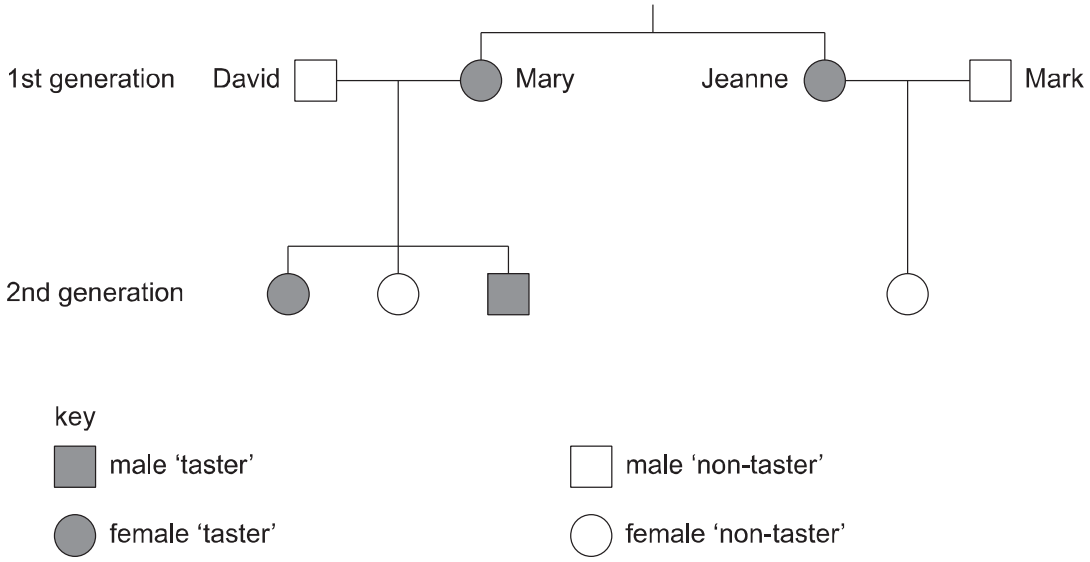
33 The diagram shows the life cycle of a species of plant. During which stage does meiosis (reduction division) occur?



[Turn over

34 The diagram shows a family tree and the inheritance of the ability to taste a certain substance.

The allele for the ability to taste this substance is dominant.



Which statement about the genotypes of the sisters Mary and Jeanne is correct?

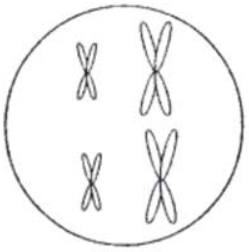
A Mary is heterozygous and Jeanne is homozygous.

B Mary is homozygous and Jeanne is heterozygous.

C They are both heterozygous.

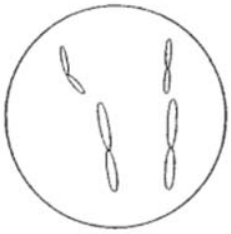
D They are both homozygous.

35 The diagram represents the nucleus of a cell 2n=4 in late prophase of meiosis.

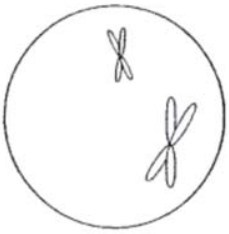


Which diagram represents a cell of the same species in anaphase II of meiosis?

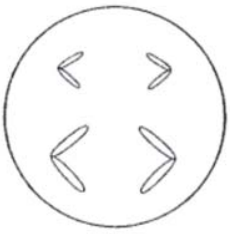
A



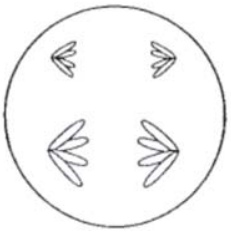
B



C

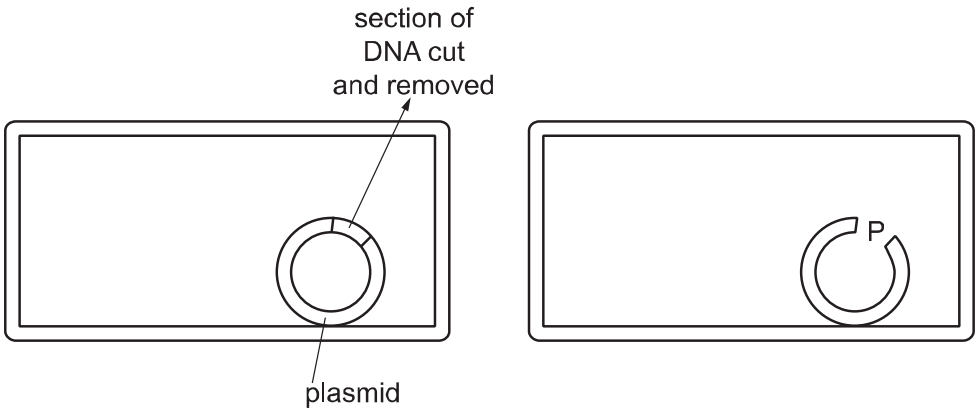


D



[Turn over

36 The diagram shows a bacterium whose plasmid is being used during genetic engineering to produce human insulin.



What is inserted at P so that the bacterium can produce human insulin, and which enzyme is used to catalyse the insertion?

A a section of human DNA, using DNA ligase

B a section of human DNA, using restriction enzymes

C a section of human mRNA, using DNA ligase

D a section of human mRNA, using restriction enzymes

37 The table gives tRNA anticodons for four amino acids.

amino acid	tRNA anticodon
asparagine	UUA
glutamic acid	CUU
proline	GGA
threonine	UGG

A cell makes a polypeptide with the amino acid sequence:

glutamic acid – asparagine – threonine – proline

What was the sequence of bases on the strand of the DNA, which was complementary to the mRNA from which this polypeptide was formed?

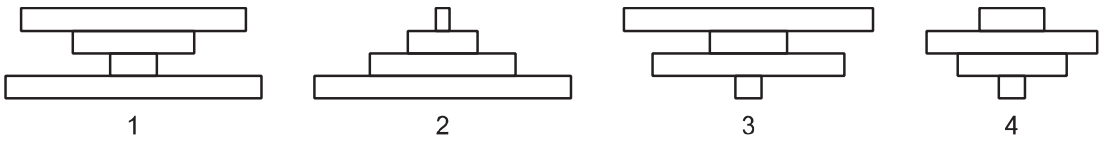
A CTTTTATGGGGA

B CUUUUAUGGGGA

C GAAAATACCCCT

D GAAAAUACCCCU

38 A tree has insect larvae burrowing in its leaves. The emerging insects are eaten by birds and the birds have parasitic fleas living amongst their feathers.



Which is a pyramid of biomass and which is a pyramid of numbers for this food chain?

	pyramid of biomass	pyramid of numbers
A	1	3
B	1	4
C	2	3
D	2	4

[Turn over

39 What is the correct match of example to ecological term?

	community	ecosystem	population	trophic level
A	all lake organisms	freshwater lake	freshwater shrimps	pond weed as primary producer
B	freshwater shrimps	all lake organisms	pond weed as primary producer	freshwater lake
C	freshwater lake	pond weed as primary producer	freshwater shrimps	all lake organisms
D	freshwater shrimps	freshwater lake	all lake organisms	pond weed as primary producer

40 The diagram represents the flow of substances within a balanced ecosystem. The boxes are various trophic levels. Which box represents producers?