Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/13**

Paper 1 Multiple Choice **October/November 2015**

1 hour

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

2701008671

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.

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

CAMBRIDGE International Examinations

1 Which size of ribosome is found in chloroplasts?

A 60S **B** 70S **C** 80S **D** 90S

2 Different units are used when measuring biological specimens.

In which rows are the same measurements correctly expressed in each of the units shown in the column headings?

	mm	μm	nm
1	1.0	1.0×10^3	1.0×10^6
2	2.5	2.5×10^3	2.5×10^6
3	5.0	5.0×10^4	5.0×10^7
4	25.0	2.5×10^4	2.5×10^7

A 1, 2, 3 and 4

B 1, 2 and 4 only

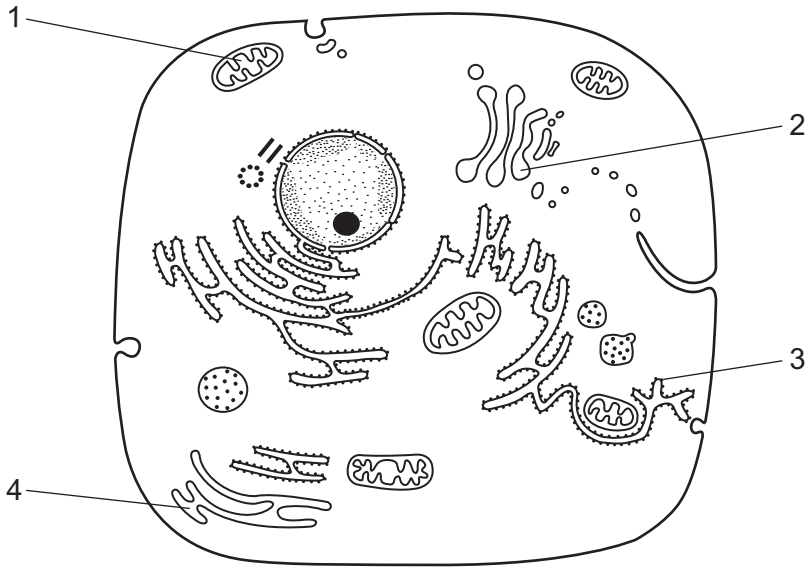
C 1 and 2 only

D 3 and 4 only

3 Which features of cilia and root hairs are correct?

	increase cell surface area	cannot be resolved with the light microscope	contain vacuoles	more than one present on a cell
A	cilia	cilia	root hairs	root hairs
B	cilia	root hairs	cilia	cilia
C	root hairs	cilia	root hairs	cilia
D	root hairs	root hairs	cilia	root hairs

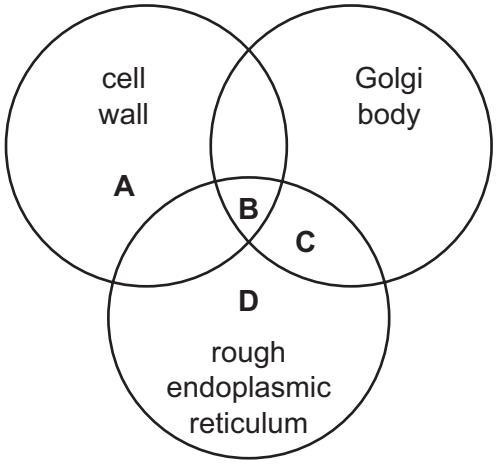
4 The diagram shows a typical animal cell. Each labelled structure is involved with the synthesis of biological molecules.



Within which structures are glycoproteins, proteins and steroids synthesised?

	glycoproteins	proteins	steroids
A	2	3	1
B	2	3	4
C	4	2	3
D	4	1	2

5 What is present in a *Vibrio cholerae* cell?



6 What is correct for a typical prokaryotic cell?

	cell wall	cell diameter	ribosomes
A	cellulose	1-5 μm	70S
B	cellulose	5-40 μm	70S and 80S
C	peptidoglycan	1-5 μm	70S
D	peptidoglycan	5-40 μm	70S and 80S

7 The table shows the results of tests carried out on a sample of biological molecules.

test	colour observed
Benedict's	blue
biuret	purple
iodine	blue-black

Which shows the types of molecules present in the sample?

	protein	reducing sugar	starch
A	✓	✗	✗
B	✗	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key
✓ present
✗ absent

8 The synthesis of biological molecules requires the formation of bonds.

Which row is correct?

	a bond forms between the phosphate of one monomer and the sugar of the next monomer	a β-1,4 bond forms between the monomers to give an unbranched chain	the hydroxyl group of the carboxylic acid group is removed and a carbon-nitrogen bond is formed to give an unbranched chain
A	polynucleotide	amylose	polypeptide
B	polynucleotide	cellulose	polypeptide
C	phospholipid	amylose	polynucleotide
D	phospholipid	cellulose	polynucleotide

9 Which row describes a triglyceride?

	hydrophobic	insoluble in alcohol
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ correct

✗ not correct

10 High concentrations of urea break all bonds, except covalent bonds, in protein molecules.

Which level of protein structure would remain unchanged when a protein is treated with urea?

A primary

B secondary

C tertiary

D quaternary

11 Haemoglobin, a globular protein, consists of four polypeptide chains, two alpha chains and two beta chains. In normal individuals, in the DNA which codes for each beta chain, the sixth triplet has a code for glutamic acid.

In individuals with sickle cell anaemia this base triplet mutates and codes for valine.

What does this mutation change in the haemoglobin molecule?

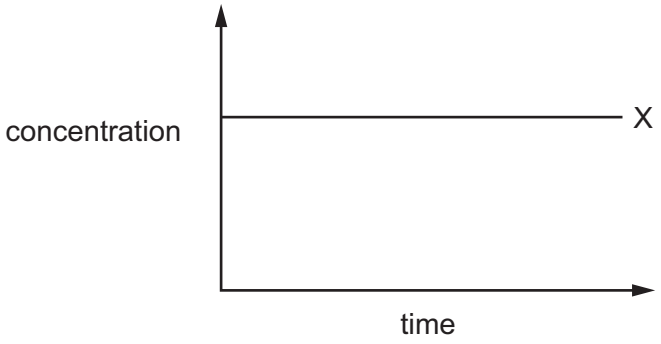
A the iron content

B the primary structure

C the quaternary structure

D the secondary structure

12 The graph shows the concentration of one of the substances which is involved in an enzyme-catalysed reaction.



Which substance is shown by line X?

A enzyme

B enzyme-product complex

C enzyme-substrate complex

D substrate

13 What describes the induced fit mode of action of an enzyme?

A The binding of the active site to the substrate causes the enzyme to change shape.

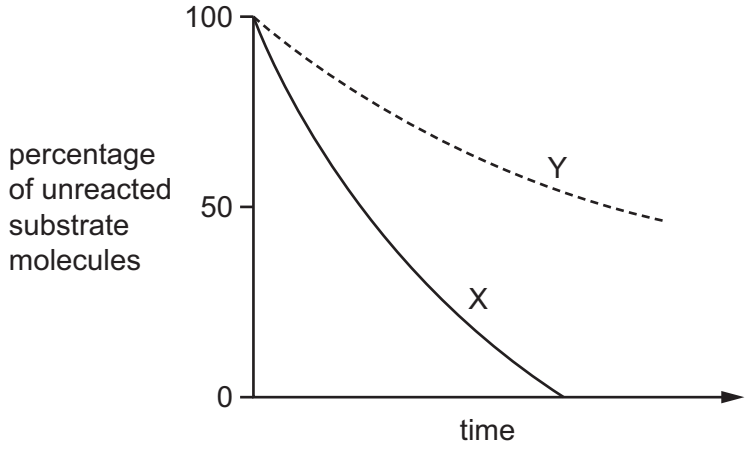
B The substrate and active site have complementary shapes that form temporary bonds.

C The substrate causes a change in enzyme shape so the active site can bind.

D The substrate changes shape so it can bind to the active site.

14 Line X represents the course of an enzyme-catalysed reaction under optimum conditions.

Line Y shows the action of the same enzyme on the same substrate but with one variable changed: substrate concentration or pH or temperature.



Which changes to the variables could give the results shown by line Y?

1 decreased substrate concentration

2 higher pH

3 lower temperature

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

15 Which descriptions are correct about transport across cell surface membranes?

	active processes	passive processes
A	active transport	exocytosis and osmosis
B	active transport and exocytosis	endocytosis and diffusion
C	endocytosis and exocytosis	diffusion and osmosis
D	exocytosis and active transport	osmosis and endocytosis

16 Which statements about the fluid mosaic model of a membrane are correct?

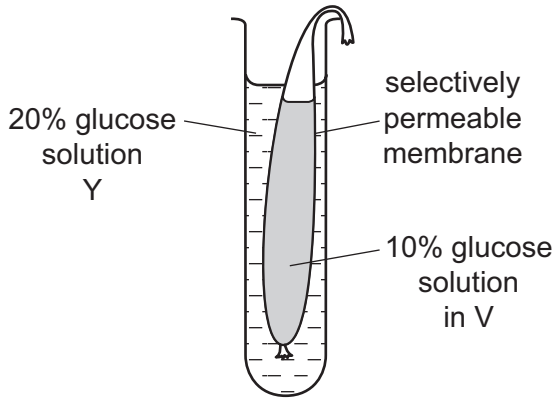
1 Saturated fatty acid tails inhibit the movement of phospholipids in the membrane.

2 Glycoproteins in the outer layer of the membrane can move.

3 Channel proteins are fixed in position.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

17 The diagram shows apparatus set up to investigate diffusion.



What shows net diffusion of glucose and water molecules?

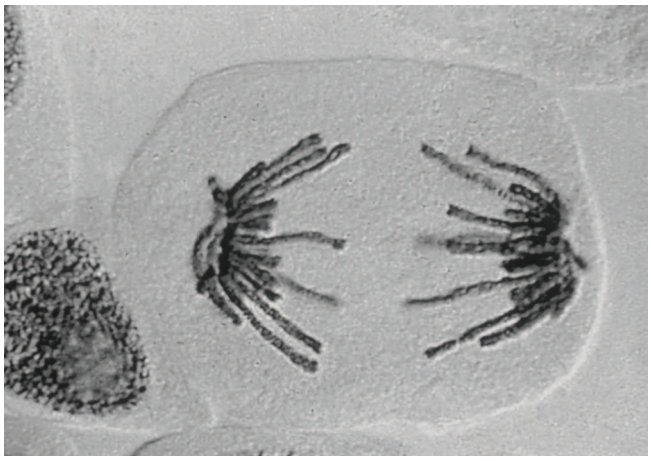
A glucose and water into V

B glucose and water into Y

C glucose into V and water into Y

D glucose into Y and water into V

18 The photomicrograph shows a cell undergoing mitosis.



What is happening in this cell?

A Centrioles are replicating.

B Chromatin is condensing.

C DNA is replicating.

D Spindle microtubules are shortening.

19 Which row shows the products of mitosis, reduction division (meiosis) and fertilisation?

	products of mitosis	products of meiosis	product of fertilisation
A	four diploid cells	two diploid cells	diploid cell
B	four haploid cells	four diploid cells	haploid cell
C	two diploid cells	four haploid cells	diploid cell
D	two diploid cells	two haploid cells	haploid cell

20 Which statements describe how a gene mutation can lead to the production of a non-functional protein?

1 During transcription an incorrect nucleotide is added to a DNA molecule.

2 A codon in the mRNA transcribed from the mutated gene is changed.

3 The order of the bases in an anticodon on tRNA is altered during translation.

A 1, 2 and 3 **B** 1 and 2 only **C** 2 and 3 only **D** 2 only

21 Some antibiotics kill prokaryotes by binding to RNA polymerase.

What effect will this have on protein synthesis?

A Codons on mRNA will be unable to hydrogen bond to complementary anticodons on tRNA.

B Condensation reactions joining RNA nucleotides will not take place to form mRNA.

C DNA will not unwind and unzip to allow for base-pairing with RNA nucleotides.

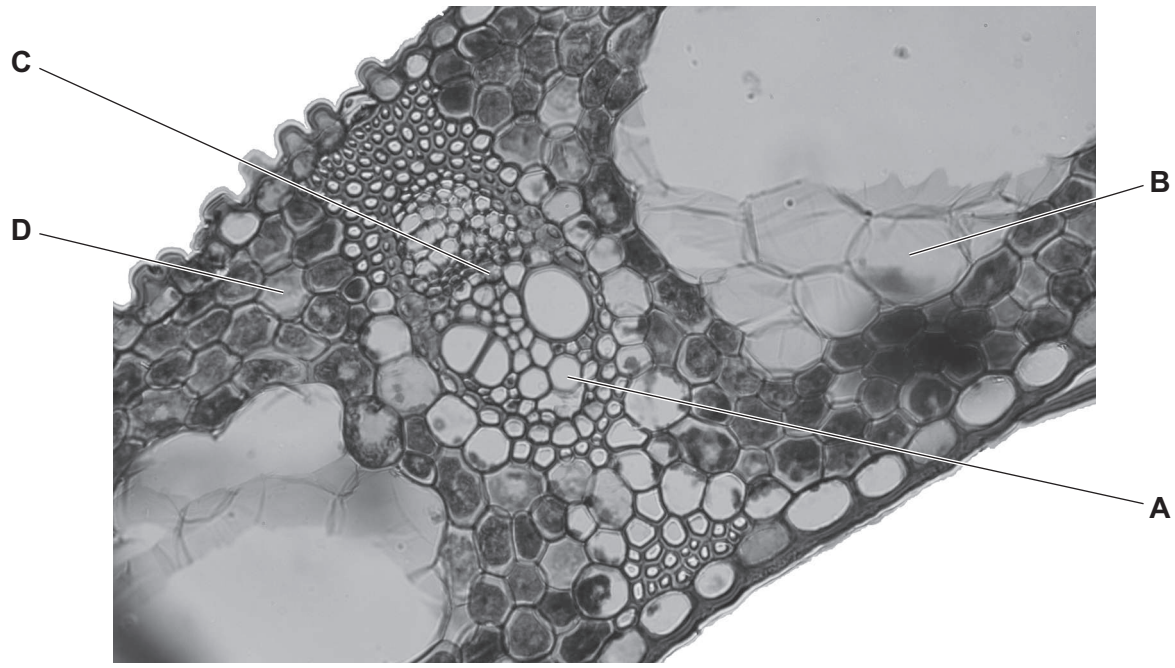
D Free RNA nucleotides will not base-pair to exposed bases on the DNA template strand.

22 Which row correctly describes cytosine?

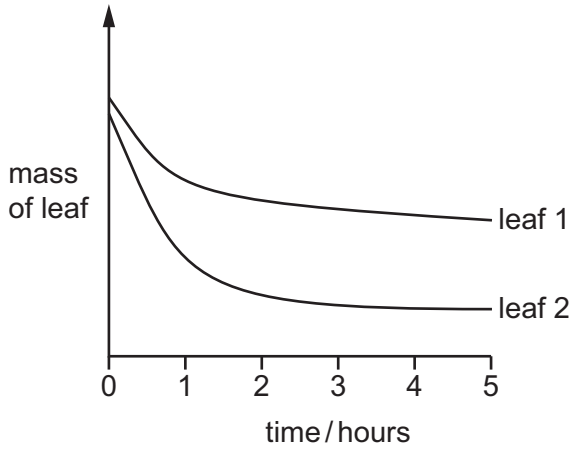
	ring structure	number of hydrogen bonds it forms with its complementary base	type of base
A	double	three	purine
B	double	two	pyrimidine
C	single	three	pyrimidine
D	single	two	purine

23 The photomicrograph shows a transverse section of a leaf.

Which cell has the least negative water potential?



24 The diagram shows the results of an experiment on transpiration using two different leaves. Each leaf was left on a balance in daylight in a closed room and their mass recorded at 1 hour intervals.



Which conclusions could be correct?

1 The loss in mass is mainly due to evaporation of water.

2 The stomata in both leaves close after 1 hour.

3 Leaf 1 has a larger surface area than leaf 2.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

25 Which processes are involved in the transport of sucrose in plants?

1 active transport

2 mass flow

3 osmosis

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

26 Which changes to the water potential and the volume of liquid in the phloem occur when carbohydrate is moved from phloem sieve tubes into a sink?

	water potential in phloem sieve tubes becomes	volume of liquid in phloem sieve tubes
A	less negative	decreased
B	less negative	increased
C	more negative	decreased
D	more negative	increased

27 Which reactions take place in a capillary in an active tissue?

1 the formation of carbonic acid from carbon dioxide and water

2 the formation of carbaminohaemoglobin from carbon dioxide and haemoglobin

3 the formation of haemoglobinic acid from haemoglobin and hydrogen ions

4 the formation of carbon dioxide and water from hydrogen carbonate ions and hydrogen ions

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 2 and 4 only

D 3 and 4 only

28 What is present in the blood in human veins?

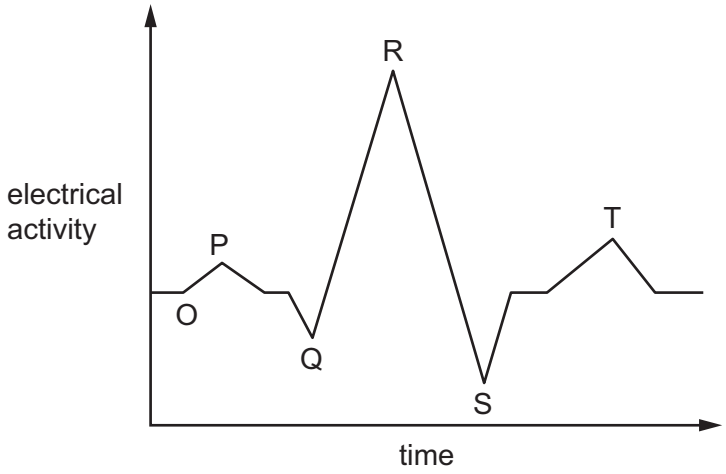
1 collagen

2 carbonic anhydrase

3 oxyhaemoglobin

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

29 The diagram shows the electrical activity in cardiac muscle during one heart beat.



What is happening at each of the labelled stages in the cardiac cycle?

	O	P	QRS	T
A	atria contract	atrio-ventricular valve opens	atria relax	ventricles contract
B	impulse leaves AVN	ventricles contract	atria relax	atrio-ventricular valve closes
C	impulse leaves SAN	atria contract	ventricles contract	ventricles relax
D	ventricles relax	atria contract	atrio-ventricular valve closes	ventricles relax

30 Which statement about the pulmonary artery is correct?

A it contains a series of valves

B it contains blood at high pressure

C it contains blood moving towards the heart

D it contains oxygenated blood

31 Red blood cells may contain a molecule known as 2,3-bisphophoglycerate (2,3BPG). When 2,3BPG binds to haemoglobin a higher partial pressure of oxygen is needed to bring about 50% saturation of haemoglobin with oxygen.

Which statement about the effect of 2,3BPG is correct?

A 2,3BPG in red blood cells causes the oxygen dissociation curve to shift to the left.

B Binding of 2,3BPG to haemoglobin reduces the Bohr effect.

C The binding of 2,3BPG to haemoglobin lowers the affinity of the haemoglobin for oxygen.

D When 2,3BPG is absent, oxyhaemoglobin is less likely to unload oxygen.

32 What is a correct location of cartilage and smooth muscle in the human gas exchange system?

	cartilage	smooth muscle
A	bronchioles	bronchioles
B	bronchioles	trachea
C	trachea	alveoli
D	trachea	bronchi

33 Which factors maintain the diffusion gradient for carbon dioxide at the surface of the alveoli?

1 blood flow past the alveoli

2 breathing movement exchanging air in the lungs

3 thin epithelial lining of the alveoli

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 1 only

34 The surface tension of the layer of liquid lining the alveoli tends to pull the walls inwards so alveoli could collapse.

Which statements could explain how this is prevented?

1 alveolar fluid is moved around by cilia

2 elastic fibres keep the alveoli open

3 epithelial cells secrete a chemical that reduces the cohesion in water

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 3 only

35 The data shows how the number of human deaths caused by the bacterium *Staphylococcus aureus* has changed over a period of five years.

Methicillin is an antibiotic used to treat a disease caused by *S. aureus*.
MRSA is methicillin-resistant *S. aureus*.

year	total number of deaths caused by *S. aureus*	total number of deaths caused by MRSA
1	369	355
2	452	431
3	456	681
4	420	890
5	428	1512

Which statement is **not** supported by this data?

A More people have MRSA so the disease spreads.

B MRSA is more likely to lead to death than *S. aureus*.

C Resistant strains of MRSA are becoming more common.

D *S. aureus* will always cause humans to die.

36 What describes natural active immunity?

A protection against a pathogen by an injection of antibodies

B protection against a pathogen by drinking colostrum containing antibodies

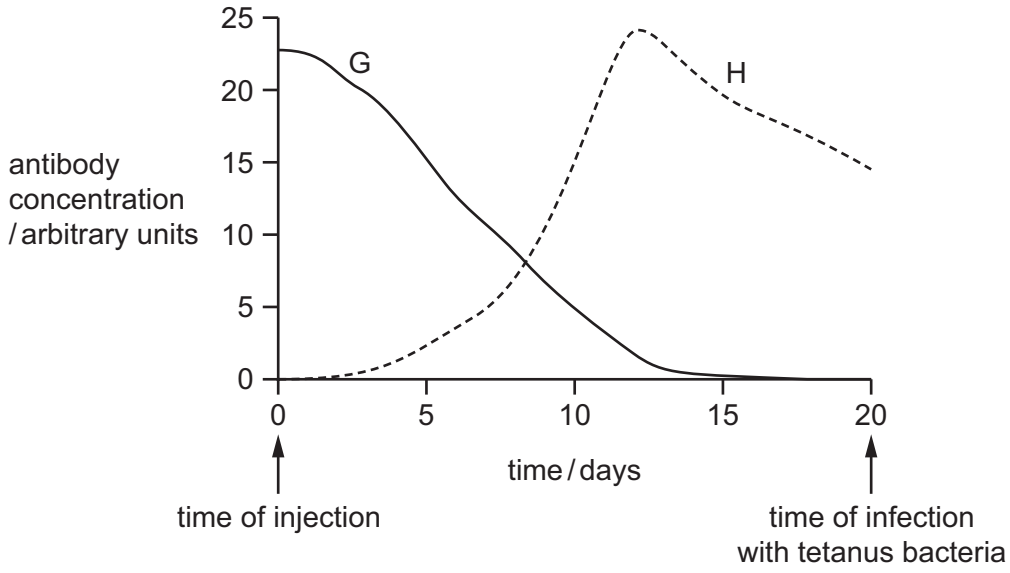
C stimulation of lymphocytes by antigens contained in a vaccine

D stimulation of lymphocytes by antigens on the surface of invading pathogens

37 The bacterium that causes the disease tetanus produces a toxin that acts as an antigen.

The graph shows the concentration of an antibody in the blood of two people, G and H.

On day 0, G was injected with antibodies to the tetanus toxin and H was injected with the vaccine for tetanus.



What would be the result after G and H were infected with the tetanus bacteria on day 20?

A concentration of antibodies in H would remain constant

B G would fail to produce tetanus antibodies

C G would peak in antibody production 12 days after infection

D H would produce a new antibody peak 12 days after infection

38 What name is given to all the organisms of the same species living in an area?

A community

B ecosystem

C niche

D population

39 The table shows the results of a field study of four species in a food chain in an area of woodland.

species	number of individuals	biomass of one individual / arbitrary units	energy value per unit mass / arbitrary units
R	10 000	0.1	1.0
S	5	10.0	2.0
T	500	0.002	1.8
U	3	300 000.0	0.5

What is the energy flow in the food chain?

	from → to			
A	R	T	S	U
B	S	T	R	U
C	U	R	S	T
D	U	S	T	R

40 The diagram shows a simplified nitrogen cycle.

Which arrow represents the activity of nitrogen-fixing bacteria?