INSTRUCTIONS
• 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 multiple choice answer sheet.
• Follow the instructions on the multiple choice answer sheet.
• Write in soft pencil.
• Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
• Do not use correction fluid.
• Do not write on any bar codes.
• You may use a calculator.

INFORMATION
• The total mark for this paper is 40.
• Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
• Any rough working should be done on this question paper.

This document has 16 pages. Blank pages are indicated.
1 Which structure is present in a liver cell and in a leaf cell?
   A cell wall
   B chloroplast
   C cytoplasm
   D sap vacuole

2 By which process does water vapour pass out of a leaf?
   A active transport
   B diffusion
   C osmosis
   D translocation

3 A student takes a potato and cuts three pieces from it. Each piece is 5 cm × 0.5 cm × 0.5 cm. He places the three potato pieces into three different concentrations of sugar solution.

   After two hours, he removes the potato pieces from the sugar solutions and measures their lengths.

   The results are shown in the table.

<table>
<thead>
<tr>
<th>solution</th>
<th>length of potato piece after two hours/cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>5.2</td>
</tr>
<tr>
<td>Y</td>
<td>4.7</td>
</tr>
<tr>
<td>Z</td>
<td>5.3</td>
</tr>
</tbody>
</table>

   What can be concluded from these results?
   A Solution Y has a lower water potential than the potato cells.
   B Solution Z has the lowest water potential.
   C The potato piece in solution X increases in length because it takes up sugar.
   D The potato piece in solution Y decreases in length because it loses sugar.

4 Which property of enzymes is explained by the lock and key hypothesis?
   A All enzymes are proteins.
   B Enzymes are inactive at very low temperatures.
   C Human enzymes are most active just below 40 °C.
   D Most enzymes can catalyse only one reaction.
The diagram shows a transverse section through a leaf.

What are the functions of the parts labelled 1, 2, 3 and 4?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>gaseous exchange</td>
<td>transporting sucrose</td>
<td>transporting water</td>
<td>photosynthesis</td>
</tr>
<tr>
<td>B</td>
<td>gaseous exchange</td>
<td>transporting water</td>
<td>transporting sucrose</td>
<td>photosynthesis</td>
</tr>
<tr>
<td>C</td>
<td>photosynthesis</td>
<td>transporting sucrose</td>
<td>transporting water</td>
<td>gaseous exchange</td>
</tr>
<tr>
<td>D</td>
<td>photosynthesis</td>
<td>transporting water</td>
<td>transporting sucrose</td>
<td>gaseous exchange</td>
</tr>
</tbody>
</table>
6 The diagram shows a green plant photosynthesising under a glass jar. This was used as a control experiment in a laboratory investigation.

Which diagram shows the experiment carried out to investigate the need for carbon dioxide in photosynthesis?

A

B

C

D
7 The graph shows the rate of photosynthesis in a plant in full sunlight at two different temperatures and different concentrations of carbon dioxide.

At normal atmospheric carbon dioxide concentrations, what limits the rate of photosynthesis?

A carbon dioxide concentration
B light intensity
C temperature
D water availability

8 Which organ produces an acid which kills the bacteria in ingested food?

A liver
B pancreas
C salivary gland
D stomach

9 A patient has her gall bladder surgically removed.

How will this affect the functioning of her body?

A reducing the absorption of carbohydrates
B reducing the digestion of fats
C reducing the liver's ability to convert glucose to glycogen
D reducing the volume of stored urine
10 Four of the organs of the alimentary canal are listed.

J colon
K duodenum
L oesophagus
M stomach

Which sequence shows the order in which food passes through these organs?

A $K \rightarrow J \rightarrow L \rightarrow M$
B $L \rightarrow K \rightarrow M \rightarrow J$
C $L \rightarrow M \rightarrow K \rightarrow J$
D $M \rightarrow L \rightarrow J \rightarrow K$

11 Which feature of root hairs suggests that they take up ions from the soil by active transport?

A Their cell membranes are partially permeable.
B They have a large surface area.
C They have a lower water potential than the soil.
D They take up ions more slowly in low oxygen concentrations.
12 The photomicrograph shows part of a section through a root.

The contents of Y are tested with Benedict’s solution and with iodine solution.

Which results are expected?

<table>
<thead>
<tr>
<th></th>
<th>Benedict’s solution</th>
<th>iodine solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>B</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>C</td>
<td>–</td>
<td>+</td>
</tr>
<tr>
<td>D</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

key

+ = positive result
– = negative result

13 Which blood vessels carry blood to the liver?

<table>
<thead>
<tr>
<th></th>
<th>hepatic artery</th>
<th>hepatic portal vein</th>
<th>hepatic vein</th>
<th>vena cava</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>B</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>C</td>
<td>no</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>D</td>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>
14 Which blood vessels contain valves?

<table>
<thead>
<tr>
<th></th>
<th>capillary</th>
<th>renal artery</th>
<th>renal vein</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>✔</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>B</td>
<td>✗</td>
<td>✗</td>
<td>✔</td>
</tr>
<tr>
<td>C</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>D</td>
<td>✗</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

key: ✔ = contains valves
✗ = does not contain valves

15 Which chamber of the heart would be the first to receive nicotine absorbed into the blood in the lungs of a cigarette smoker?

A left atrium
B left ventricle
C right atrium
D right ventricle

16 Which word equation represents aerobic respiration?

A carbon dioxide + water → glucose + oxygen
B carbon dioxide + oxygen → glucose
C glucose + oxygen → carbon dioxide + water
D glucose + oxygen → water

17 What lines the walls of alveoli?

A a carpet of cilia
B a film of moisture
C a network of veins
D a thin sheet of muscle
18 The graph shows changes in the volume of a person’s lungs over a period of two minutes.

What could cause the change in the pattern of the graph between X and Y?

A changing from running to walking
B changing from walking to running
C decreased frequency of contractions of the internal intercostal muscles
D decreased strength of contractions of the internal intercostal muscles

19 The diagram shows a kidney and blood vessels associated with it.

Which statements are correct?

1 Vessel X contains more urea than vessel Y.
2 Vessel Y contains urine.
3 Vessel X contains more oxygen than vessel Y.

A 1, 2 and 3  B 1 and 3 only  C 1 only  D 2 and 3 only
20 Which of these statements describes control by **negative** feedback?

A An injury to body tissue activates platelets in the blood and these activated platelets release chemicals which activate more platelets.

B During the menstrual cycle, luteinising hormone (LH) stimulates the release of oestrogen which in turn stimulates the release of more LH.

C A higher concentration of carbon dioxide in the atmosphere increases temperature, which increases photosynthesis producing more carbon dioxide.

D When blood pressure is high, nerve impulses from the brain cause the blood vessels to dilate and blood pressure is reduced.

21 Which statements describe the pupil reflex in bright light?

1 ciliary muscles contract
2 ciliary muscles relax
3 circular iris muscles contract
4 circular iris muscles relax
5 lens becomes rounder
6 lens becomes thinner
7 pupil constricts
8 pupil dilates
9 radial iris muscles contract
10 radial iris muscles relax

A 1, 6 and 9  B 2, 5 and 10  C 3, 7 and 10  D 4, 8 and 9

22 Which chemical produced by the body alters the activity of a target organ and is destroyed by the liver?

A bile
B enzyme
C hormone
D saliva
23 The diagram shows a section through the human brain.

Which labelled part contains the temperature regulation centre?

![Diagram of the human brain with labeled parts A, B, C, and D.]

24 Which statements about the elbow joint are correct?

1. When the biceps muscle contracts, the elbow is bent.
2. When the triceps muscle relaxes, the elbow is straightened.

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

25 What are the effects of heroin?

<table>
<thead>
<tr>
<th>can cause addiction</th>
<th>delays sleep and increases alertness</th>
<th>withdrawal symptoms are severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>A ✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>B ✓</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>C ✓</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>D x</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

26 Which process, brought about by microorganisms, does not depend on anaerobic respiration?

A the conversion of milk into yoghurt by bacteria
B the formation of lactic acid in cheese production by bacteria
C the release of alcohol by the action of yeasts on sugars
D the synthesis of single cell protein in fermenters
27 The diagram shows the equipment used in the industrial production of penicillin.

What is the purpose of the structure labelled X?

A to insulate the fermentation vessel
B to maintain the pressure of the fermentation vessel
C to monitor the temperature of the fermentation vessel
D to remove the heat produced by the fermentation process

28 The flow of energy in ecosystems is non-cyclical.

What is the main reason for this?

A Energy can be transferred back to its original source.
B Energy is not transferred from living things to their environment.
C Energy is only transferred from smaller to larger organisms.
D Energy is transferred from living organisms as heat.
29 The diagram shows a food chain.

\[
\text{grasses} \rightarrow \text{zebras} \rightarrow \text{lions} \rightarrow \text{fleas}
\]

Which pyramid of numbers would represent this food chain?

A

B

C

D

30 The diagram shows parts of the nitrogen cycle.

Which arrow represents the action of the root nodule bacteria of leguminous plants?

\[
\text{nitrogen-containing green plants} \quad \text{nitrogen gas} \quad \text{decaying remains} \\
\text{nitrates} \quad \text{nitrites} \quad \text{ammonia and ammonium compounds}
\]
31 Which row matches a method of controlling malaria with the explanation of how this method works?

<table>
<thead>
<tr>
<th>Method</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. covering windows with netting</td>
<td>kills mosquitoes</td>
</tr>
<tr>
<td>B. spraying oil on rivers</td>
<td>kills mosquito larvae</td>
</tr>
<tr>
<td>C. taking anti-malarial tablets</td>
<td>stops mosquitoes biting</td>
</tr>
<tr>
<td>D. using insecticides</td>
<td>kills malarial parasites</td>
</tr>
</tbody>
</table>

32 Areas of tropical rainforests are often cut down and cleared. After cutting down the trees, the areas are normally burnt.

What are the effects of this activity?

<table>
<thead>
<tr>
<th>Atmospheric carbon dioxide</th>
<th>Number and variety of species</th>
<th>Soil stability</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. decreases</td>
<td>decreases</td>
<td>increases</td>
</tr>
<tr>
<td>B. decreases</td>
<td>increases</td>
<td>decreases</td>
</tr>
<tr>
<td>C. increases</td>
<td>decreases</td>
<td>decreases</td>
</tr>
<tr>
<td>D. increases</td>
<td>decreases</td>
<td>increases</td>
</tr>
</tbody>
</table>

33 The diagram shows a section of a seed.

What are the numbered parts?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>cotyledon</td>
<td>plumule</td>
<td>radicle</td>
</tr>
<tr>
<td>B</td>
<td>plumule</td>
<td>cotyledon</td>
<td>radicle</td>
</tr>
<tr>
<td>C</td>
<td>plumule</td>
<td>radicle</td>
<td>cotyledon</td>
</tr>
<tr>
<td>D</td>
<td>radicle</td>
<td>plumule</td>
<td>cotyledon</td>
</tr>
</tbody>
</table>
34 Which processes involve parts of the carpel of a flower?

A attracting insects and pollination
B fertilisation and producing pollen
C forming fruit and pollination
D releasing pollen and fertilisation

35 What identifies a cause, a symptom and a treatment for syphilis in humans?

<table>
<thead>
<tr>
<th></th>
<th>cause</th>
<th>symptom</th>
<th>treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>virus</td>
<td>infertility</td>
<td>using antibiotics</td>
</tr>
<tr>
<td>B</td>
<td>bacterium</td>
<td>burning sensation when urinating</td>
<td>vaccination</td>
</tr>
<tr>
<td>C</td>
<td>bacterium</td>
<td>joints becoming painful</td>
<td>using antibiotics</td>
</tr>
<tr>
<td>D</td>
<td>virus</td>
<td>severe headaches</td>
<td>vaccination</td>
</tr>
</tbody>
</table>

36 The diagram shows the female reproductive system.

In which parts are the eggs and the zygote formed?

<table>
<thead>
<tr>
<th></th>
<th>eggs</th>
<th>zygote</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
37 Natural selection plays a role in evolution.

What describes features of natural selection that can affect evolution?

<table>
<thead>
<tr>
<th>better adapted individuals have a greater chance of surviving and breeding</th>
<th>survivors may transfer an advantageous feature to their offspring</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>no</td>
</tr>
<tr>
<td>B</td>
<td>no</td>
</tr>
<tr>
<td>C</td>
<td>yes</td>
</tr>
<tr>
<td>D</td>
<td>yes</td>
</tr>
</tbody>
</table>

38 In guinea-pigs, the allele for black fur (B) is dominant to the allele for brown fur (b). A breeder can sell a brown guinea-pig for more money than a black guinea-pig.

Which cross will produce the most money?

A  BB × BB  
B  BB × Bb  
C  Bb × Bb  
D  Bb × bb

39 The inheritance of the ABO blood groups in humans is controlled by three alleles (I^A, I^B and I^O), only two of which can be present in one individual.

What are the possible blood groups of children born to a homozygous group A woman and a heterozygous group B man?

A  AB and B only  
B  AB and A only  
C  A, B and AB only  
D  A, B, AB and O

40 Which statement is always true of dominant alleles?

A  They cannot undergo mutation.  
B  They give a greater chance of survival than recessive alleles.  
C  They give the same phenotype in heterozygotes and homozygotes.  
D  They occur less frequently in the population than recessive alleles.