For this paper you must have:
• a calculator.

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.
INSTRUCTIONS

• Use black ink or black ball-point pen.
• Answer ALL questions.
• You must answer the questions in the spaces provided. Do not write on blank pages.
• Do all rough work in this book. Cross through any work you do not want to be marked.

INFORMATION

• The marks for questions are shown in brackets.
• The maximum mark for this paper is 60.

ADVICE

Read each question carefully.

DO NOT TURN OVER UNTIL TOLD TO DO SO
A man has diarrhoea and goes to see the doctor. The doctor diagnoses irritable bowel syndrome (IBS). IBS can reduce absorption of some nutrients into the blood.

FIGURE 1 shows the digestive system.
01.1 Name the part of the digestive system which is affected by IBS.

Label this part X on FIGURE 1. [2 marks]

Name of part


01.2 The man’s symptoms are worse after eating fatty foods.

Parts A and B in FIGURE 1 are involved in the digestion of fats.

Name parts A and B. [2 marks]

A

B

[Turn over]
Explain how part A helps speed up the digestion of fats. [3 marks]
Lipase is a type of enzyme that digests fats.

Complete TABLE 1 for carbohydrase and protease. [3 marks]

TABLE 1

<table>
<thead>
<tr>
<th>Enzyme substrate</th>
<th>Carbohydrase</th>
<th>Lipase</th>
<th>Protease</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONE place in the body where the enzyme is made</td>
<td></td>
<td>fats</td>
<td>small intestine</td>
</tr>
<tr>
<td>ONE place in the body where the enzyme acts</td>
<td></td>
<td>small intestine</td>
<td></td>
</tr>
</tbody>
</table>
01.5 Vitamins are an essential part of a healthy diet.

What is the name of the deficiency disease caused by vitamin C deficiency? [1 mark]

________________________________________________________________________

________________________________________________________________________

01.6 Give TWO symptoms of vitamin C deficiency. [2 marks]

1 ______________________________________________________________________

________________________________________________________________________

2 ______________________________________________________________________

________________________________________________________________________
Suggest TWO ways in which vitamin C deficiency can be treated. [2 marks]

1 __________________________________________________________

__________________________________________________________

__________________________________________________________

2 __________________________________________________________

__________________________________________________________

[Turn over]
TABLE 2 shows data from hospital admissions in the UK.

TABLE 2

<table>
<thead>
<tr>
<th>Year</th>
<th>Total number of adults and children admitted to hospital with vitamin C deficiency</th>
<th>Number of children admitted to hospital with vitamin C deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>26</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>2014</td>
<td>137</td>
<td>10</td>
</tr>
<tr>
<td>2016</td>
<td>237</td>
<td>48</td>
</tr>
</tbody>
</table>

0.18 Calculate the percentage increase in cases of vitamin C deficiency from 2010 to 2016.

Use information from TABLE 2. [2 marks]

Percentage increase = __________________________
A newspaper makes the following statement:

Malnutrition in children is on the rise in the UK.

Give ONE reason that supports the newspaper’s statement and ONE reason that does not support the newspaper’s statement.

[2 marks]

[Turn over]
Neurologists study the brain and its functions to diagnose disorders.

FIGURE 2 shows the lobes of the brain.
Draw ONE line from each lobe of the brain to the function of the lobe. [4 marks]

<table>
<thead>
<tr>
<th>Lobe of the brain</th>
<th>Function of the lobe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontal</td>
<td>Controlling heart rate</td>
</tr>
<tr>
<td>Occipital</td>
<td>Emotions and reasoning</td>
</tr>
<tr>
<td>Parietal</td>
<td>Memory and speech</td>
</tr>
<tr>
<td>Temporal</td>
<td>Movement and recognition</td>
</tr>
<tr>
<td></td>
<td>Posture and balance</td>
</tr>
<tr>
<td></td>
<td>Visual processing</td>
</tr>
</tbody>
</table>

[Turn over]
Where in the brain are the lobes in Question 02.1 found?

Tick (✓) ONE box. [1 mark]

- Brain stem
- Cerebellum
- Cerebral cortex
When a person is frightened their heart rate increases and their pupils dilate.

Which part of the nervous system causes these symptoms?

Tick (✓) ONE box. [1 mark]

- [ ] Parasympathetic
- [ ] Peripheral
- [ ] Somatic
- [ ] Sympathetic

[Turn over]
Alzheimer’s disease affects different parts of the brain.

Give THREE symptoms of Alzheimer’s disease. [3 marks]

1. ____________________________
   __________________________________________
   __________________________________________
   __________________________________________

2. ____________________________
   __________________________________________
   __________________________________________
   __________________________________________

3. ____________________________
   __________________________________________
   __________________________________________
   __________________________________________
People with Alzheimer’s disease do NOT produce enough acetylcholine in their brain.

Acetylcholine is a neurotransmitter used in synapses.

Describe the sequence of events that allows an impulse to pass from one neurone to the next neurone at the synapse. [3 marks]

| Turn over |
An elderly woman falls and injures herself. She is taken to hospital to have an X-ray.

FIGURE 3 shows the X-ray.

FIGURE 3
The X-ray shows that the woman has had a joint replaced.

What type of joint has been replaced?

Tick (✓) ONE box. [1 mark]

- Ball and socket
- Gliding
- Hinge
- Pivot

What range of movement does joint C in FIGURE 3 have? [1 mark]
FIGURE 4 shows some parts of the synovial joint in a knee.

FIGURE 4
Name parts P and Q in FIGURE 4. [2 marks]

P

Q

What is the role of part R in FIGURE 4? [1 mark]

[Turn over]
Some people need to have knee replacement surgery.

FIGURE 5 shows a traditional artificial knee joint.

FIGURE 6 shows an artificial knee joint made using 3D printing technology.
What is the function of the plastic between the metal alloy and the bone? [1 mark]

The knee in FIGURE 6 has been made for a specific patient using a 3D printer.

Suggest ONE advantage of the knee joint in FIGURE 6 compared with the knee joint in FIGURE 5. [1 mark]
Sports science students were investigating the effect of fatigue on fast-twitch muscle fibres and slow-twitch muscle fibres.

Give TWO adaptations of slow-twitch muscle fibres. [2 marks]

1

2
In the investigation, the students used muscle fibres from rats. Using data loggers the students measured the force produced by each muscle contraction until the force declined to 50% of the original.

TABLE 3 shows some of their results.

**TABLE 3**

<table>
<thead>
<tr>
<th>Time / ms</th>
<th>Force of muscle contraction as a percentage of the original force</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Slow-twitch leg muscle fibre</td>
</tr>
<tr>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>92</td>
</tr>
<tr>
<td>12</td>
<td>91</td>
</tr>
<tr>
<td>18</td>
<td>87</td>
</tr>
<tr>
<td>24</td>
<td>88</td>
</tr>
<tr>
<td>30</td>
<td>84</td>
</tr>
<tr>
<td>36</td>
<td>78</td>
</tr>
<tr>
<td>42</td>
<td>77</td>
</tr>
</tbody>
</table>
Complete the graph for the fast-twitch leg muscle fibre on FIGURE 7. [2 marks]

FIGURE 7

Key

- Fast-twitch leg muscle fibre
- Slow-twitch leg muscle fibre

[Turn over]
Give TWO conclusions the sports science students could make from the data shown in TABLE 3 and FIGURE 7. [2 marks]

1. 

2. 

[Turn over]
Explain why muscles become fatigued.

Use knowledge of the sliding filament theory of muscle contraction in your answer. [2 marks]
Some athletes take creatine supplements.

Explain why the force of a muscle contraction may be greater in someone taking creatine supplements. [3 marks]
Devic disease is a disorder that affects motor neurones.

FIGURE 8 shows a motor neurone from a healthy person.

FIGURE 8

Name S, T and U in FIGURE 8. [3 marks]

S

T

U
Explain how part U enables nerve impulses to travel at high speed along the motor neurone in FIGURE 8. [3 marks]
FIGURE 9 shows changes in membrane potential of a neurone during one action potential.

FIGURE 9

Membrane potential / mV

Time / ms

W X Y
Describe what happens to cause the change in membrane potential between point W and point X on FIGURE 9. [2 marks]
At point Y the neurone is maintaining its resting potential.

Explain how the resting potential is maintained. [3 marks]

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

END OF QUESTIONS
There are no questions printed on this page

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