B10- The human nervous system Exam Practice 2

Name:

Score:

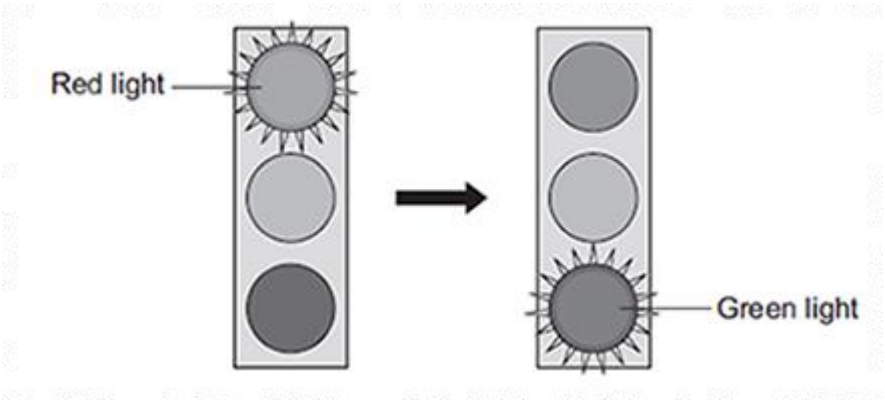
Q1.

Car drivers need quick reactions to avoid accidents.

A student uses a computer program to measure reaction time.

The computer screen shows a traffic light on red. The traffic light then changes to green.

The diagram below shows the change the person sees on the computer screen.



When the traffic light changes to green the person has to click the computer mouse as quickly as possible.

The computer program works out the time taken to react to the light changing colour.

(a) Special cells detect the change in colour.

(i) What word is used to describe special cells that detect a change in the environment?

Draw a ring around the correct answer.

receptor cells **reflex cells** **stimulus cells**

(1)

(ii) Where in the body are the special cells that detect the change in colour of the traffic lights?

_____

(1)

(b) The student used the computer program on one computer to measure the reaction times of people of different ages.

(i) Give **one** variable the student should control so that a fair comparison can be made between the people of different ages.

_____

_____

(1)

(ii) The student did each measurement three times to calculate a mean value.

The table shows the results.

Age in years	**Mean reaction time in milliseconds**
15	242
30	
45	221
60	258
75	364
90	526

The reaction times for the 30-year-old person were **192**, **174** and **180** milliseconds.

Calculate the mean reaction time of the 30-year-old person.

_____

_____

Mean reaction time = _____ milliseconds

(1)

(iii) Which **one** of the following is an advantage of repeating each test three times and **not** doing the test just once?

Tick (✔) **one** box.

Any anomalies can be identified. ☐

The results will be more precise. ☐

There will be no errors. ☐

(1)

(iv) Some people think that old people should **not** be allowed to drive a car.

Why is it more dangerous for old people to drive cars?

Use information from the table above to support your answer.

_____

_____

_____

_____

(2)

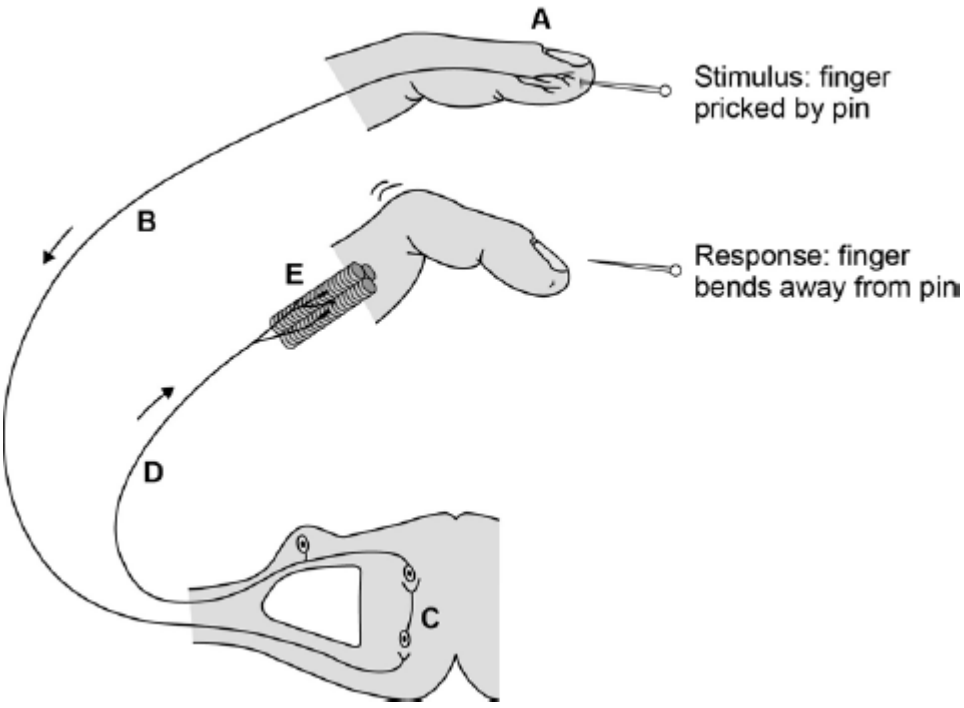
(Total 7 marks)

Q2.

Our nervous system controls our reactions.

Figure 1 shows the part of the nervous system involved in the rapid response to a stimulus.

Figure 1



(a) What is this type of rapid response called?

Tick **one** box.

- Circular action ☐
- Fast action ☐
- Forced action ☐
- Reflex action ☐

(1)

(b) Features of the nervous system are labelled **A**, **B**, **C**, **D** and **E** on **Figure 1**.

Draw **one** line from each feature to the correct label from **Figure 1**.

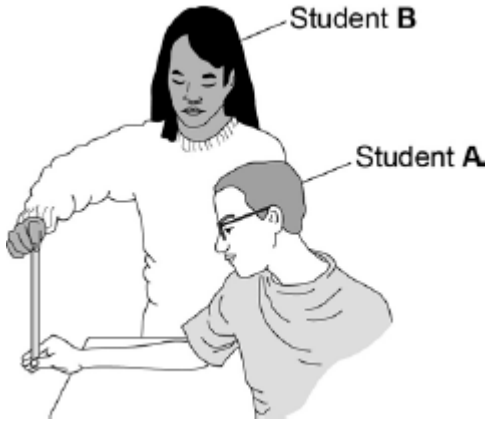
Feature	**Label**
	A
Effector	**B**
Relay neurone	**C**
Sensory neurone	**D**
	E

(3)

(c) Two students compare their reactions using a ruler.

This is the method used.

1. Student **A** sits with his elbow on a table top.
2. Student **B** holds the ruler so the bottom of the ruler is level with the top of student **A**'s thumb.
3. Student **B** drops the ruler.
4. Student **A** catches the ruler.
5. Record the drop distance.
6. Repeat steps 1 to 5 four more times.
7. Repeat the whole experiment with student **A** dropping the ruler and student **B** catching it.



Both students are right-handed.

The students are testing the hypothesis:

the drop distance of the ruler is smaller when a right-handed person uses their right hand to catch the ruler.

Student **A** uses his right hand to catch the ruler.

Student **B** uses her left hand to catch the ruler.

Complete the sentence.

Use an answer from the box.

control	**dependent**	**independent**

The drop distance was the _____ variable.

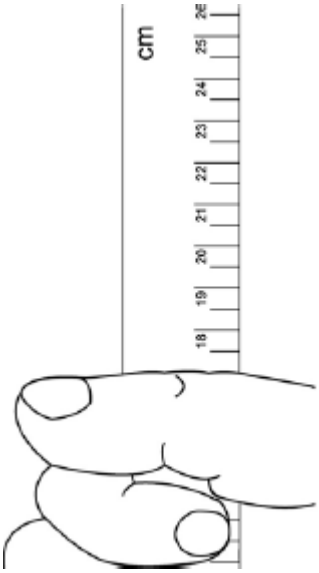
(1)

(d) The table below shows the students' results.

Student	Drop distance in cm				
	Test 1	**Test 2**	**Test 3**	**Test 4**	**Test 5**
Student **A**	17.5	15.5	15.0	23.5	17.0
Student **B**	20.5		19.5	21.0	19.0

Figure 2 shows student **B**'s Test 2 result.

Figure 2



Use **Figure 2** to complete the missing result for Test 2.

Write the answer in the table above.

(1)

(e) What was the resolution of the ruler the students used?

Tick **one** box.

0.1 cm ☐

0.5 cm ☐

1 cm ☐

10 cm ☐

(1)

(f) One of the results in the table above is anomalous.

Identify the anomalous result.

Give the reason why you chose your answer.

_____

_____

_____

(2)

(g) The students are testing the hypothesis:

the drop distance of the ruler is smaller when a right-handed person uses their right hand to catch the ruler.

The results in the table above are not a good test of the hypothesis.

What is one reason why?

Tick **one** box.

The drop distances are very variable	☐
The drop distance for Student **A** is sometimes bigger than the drop distance for Student **B**	☐
The results are for the left and right hands of different people	☐
The drop distances are not measured accurately enough	☐

(1)

(Total 10 marks)

Higher Tier Questions

Q3.

This question is about the nervous system.

(a) Describe the difference between the function of a receptor and the function of an effector.

In your answer you should give **one** example of a receptor and **one** example of an effector.

(4)

(b) Synapses are important in the nervous system.

(i) What is a synapse?

(2)

(ii) Describe how information passes across a synapse.

(2)

(c) Reflexes may be co-ordinated by the brain or by the spinal cord.

(i) The reflexes from sense organs in the head are co-ordinated by the brain.

Name a sense organ involved in a reflex co-ordinated by the spinal cord.

_____

(1)

(ii) The table shows information about reflexes co-ordinated by the brain and reflexes co-ordinated by the spinal cord.

Organ co-ordinating the reflex	**Mean length of neurones involved in cm**	**Mean time taken for reflex in milliseconds**	**Mean speed of impulse in cm per millisecond**
Brain	12	4	3
Spinal cord	80	50	

Calculate the mean speed of the impulse for the reflex co-ordinated by the spinal cord.

_____

_____

Mean speed = _____ cm per millisecond

(1)

(iii) In reflexes co-ordinated by the brain there are **no** relay neurones.

Suggest why there is a difference in the mean speed of the impulse for the two reflexes.

_____

_____

_____

_____

(2)

(Total 12 marks)

Q4.

(a) Give **three** receptors which a mouse might use to detect food under natural conditions.

1. _____

_____

2. _____

_____

3. _____

_____

(3)

(b) Whilst observing mouse behaviour, a student drops a pen near the mouse's cage. The mouse jumps at the noise.

Describe, as fully as you can, the processes by which the mouse responds to the stimulus of the dropped pen.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(Total 9 marks)

Q1.

(a) (i) receptor cells

1

(ii) eye(s)

accept retina

1

(b) (i) any **one** from:

- gender / sex
- quality of eyesight

  eg wearing glasses
- eg of factor that might affect reaction times

  eg alcohol consumption / distractions / tiredness / health / time of day / amount of practice (at this test)

  do not allow time / age

1

(ii) 182

allow 182.0

1

(iii) Any anomalies can be identified.

1

(iv) reaction time (too) long **or** reactions (too) slow

1

allow reaction time (too) slow

*allow examples of data quoted **or** derived from the table, eg (mean) reaction time for 90 year olds is 162 ms longer than for 75 year olds*

(so) more likely to have / cause an accident

1

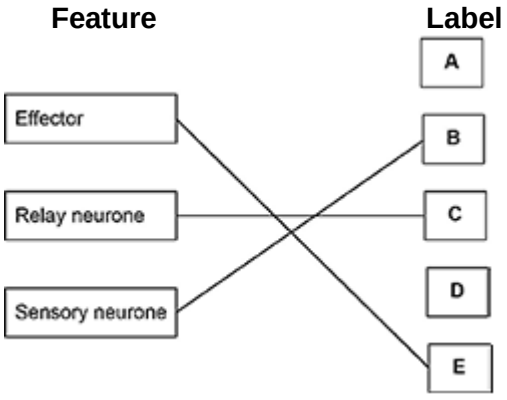
[7]

Q2.

(a) Reflex action

1

(b)



extra lines from the left negate the mark

3

(c) dependent

1

(d) 17.0

allow answers in range 17.0–17.3 cm

1

(e) 0.5 cm

1

(f) 23.5

1

does not fit the pattern **or** at least 5 cm higher than the other values

1

(g) The results are for the left and right hands of different people

1

[10]

Higher Tier Questions

Q3.

(a) receptors detect / sense stimuli / change in surroundings **or** convert stimulus into an impulse

ignore send impulses to brain / spinal cord

1

example of a receptor

allow any appropriate organ or part of an organ, eg eye / retina or named type of receptor eg light receptor

1

effectors allow / make response **or** convert an impulse to an action

ignore receive impulses from brain / spinal cord

1

(effector) muscle / gland

allow an example

ignore eg arm / leg

1

(b) (i) junction

allow idea of a (small) gap / space

*do **not** allow if implication is that the neurones move*

1

between neuron(e)s

allow named types of neurones

1

(ii) chemical

allow answers in terms of specific types of neurone

allow neurotransmitter / named neurotransmitter released

1

any **one** from:

- (chemical released) from one neurone
  ignore produced
- (chemical) passes (across synapse) to next neurone to stimulate / cause (electrical) impulse
  allow diffuses for passes (across)

1

(c) (i) skin

ignore hand / leg

1

(ii) 1.6 (cm per millisecond)

allow 2 if evidence of rounding up of 1.6

1

(iii) any **two** from:

ignore length of neurones

- synapses slow down transmission / impulse
  allow idea of movement of chemical being slower than electrical impulse
- fewer synapses (via brain)
  *allow one synapse compared to two **or** only one synapse*
- (therefore) fewer delays
  allow impulse travels more slowly in relay neurones

2

[12]

Q4.

(a) light/eye
smell/nose
taste/chemical/tongue

for 1 mark each

3

(b) 6 of e.g.
receptors in ear detect sound waves/vibrations
impulses/electrical signals to brain
brain co-ordinates response
impulses sent along nerves
to muscles/effectors which contract to bring about response

any 6 for 1 mark each

6

[9]