Questions are for both separate science and combined science students unless indicated in the question

Q1.

The nervous system allows humans to:

- respond to stimuli
- coordinate their behaviour.

(a) Complete the order of structures to link a stimulus to a response.

Choose answers from the box.

coordinator	**effector**	**receptor**

stimulus → _____ → _____ → _____ → response

(2)

(b) Some human actions are reflex actions.

What is a reflex action?

_____

_____

_____

_____

(2)

(c) Which is an example of a reflex action?

Tick (✓) **one** box.

Blinking in sudden bright light ☐

Kicking a ball in a game ☐

Writing a message to a friend ☐

(1)

(d) Many reflex actions are movements.

What type of tissue causes movement?

Tick (✓) **one** box.

Blood ☐

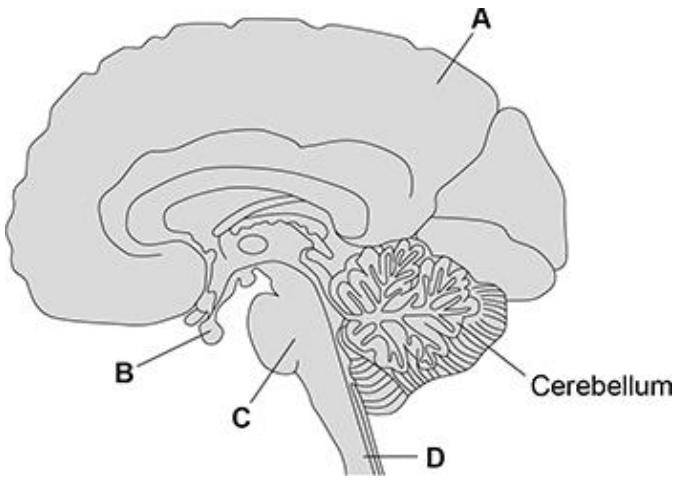
Gland ☐

Muscle ☐

(1)

Many human activities are coordinated by the brain.

The figure below shows the human brain.



(e) Which structure in the figure above is the pituitary gland? **(biology only)**

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(f) Which structure in the figure above is the cerebral cortex? **(biology only)**

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(g) What is the function of the cerebellum? **(biology only)**

Tick (✓) **one** box.

Balance ☐

Hearing ☐

Sight ☐

(1)

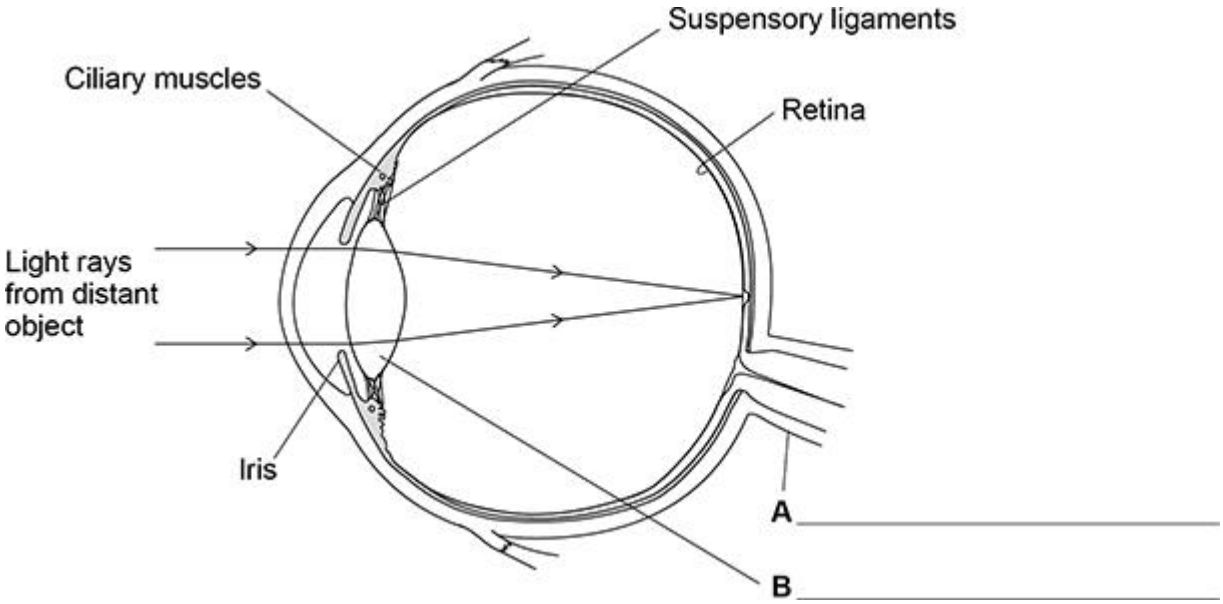
(Total 9 marks)

Q2.

The human eye can make clear images of objects.

Figure 1 shows how the human eye focuses light rays from a distant object onto the retina.

Figure 1



(a) Label structures **A** and **B** on **Figure 1**. **(biology only)**

Choose answers from the box.

cornea	**lens**	**optic nerve**	**sclera**

(2)

The eye in **Figure 1** is focused on a distant object.

(b) Complete the sentence. **(biology only)**

Choose the answer from the box.

contract	**expand**	**stretch**

To focus on a **near** object the ciliary muscles _____.

(1)

(c) Complete the sentence. **(biology only)**

Choose the answer from the box.

longer	**thicker**	**thinner**

To focus on a **near** object structure **B** in **Figure 1**

becomes _____ .

(1)

(d) The eye in **Figure 1** is looking at an object in dim light.

Complete the sentence. **(biology only)**

Choose the answer from the box.

iris	**retina**	**suspensory ligaments**

When the eye looks at an object in **bright** light the pupil gets smaller.

The size of the pupil is controlled by the _____ .

(1)

(e) The retina is sensitive to light.

How does information from the retina reach the brain via structure **A** in **Figure 1**? **(biology only)**

_____

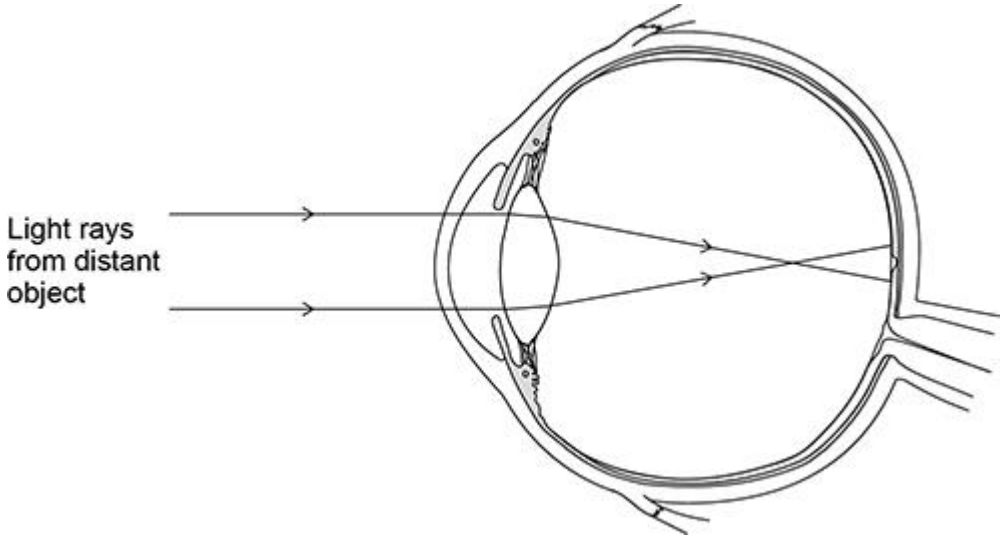
_____

(1)

Figure 2 shows the eye of a person who is short sighted looking at a distant object.

The person **cannot** see the object clearly.

Figure 2



(f) Give the reason why the person **cannot** see the object clearly. **(biology only)**

_____

_____

(1)

(g) Short sightedness can be corrected using spectacle lenses.

Give **one** other way short sightedness can be corrected.

Do **not** refer to spectacles in your answer. **(biology only)**

_____

_____

(1)

(Total 8 marks)

Q3.

A person's eyes can focus on objects at different distances.

A person looks at a distant object.

The person then looks at a near object.

The person's eyes make adjustments so that the near object forms a clear image.

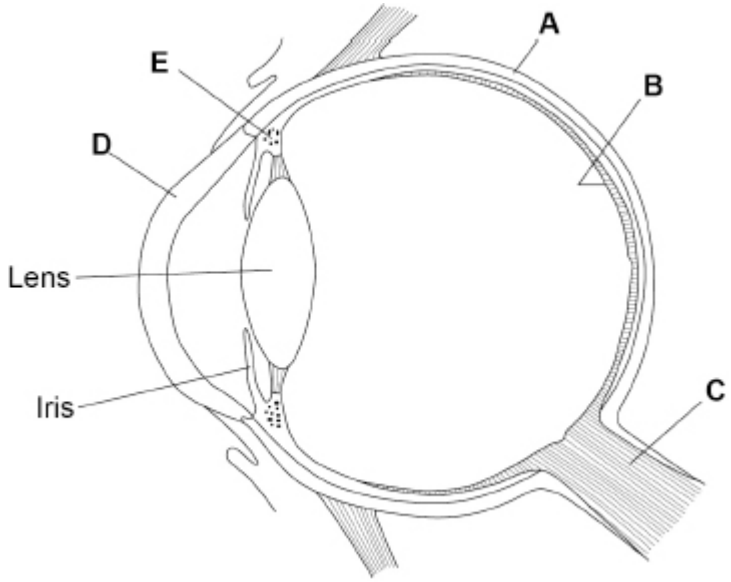
(a) Which term describes the adjustment of focus from the distant object to the near object? **(biology only)**

Tick (✓) **one** box.

Accommodation	☐
Adaptation	☐
Hyperopia	☐
Myopia	☐

(1)

The figure below shows the eye.



(b) Which structure in the figure above is where the image is focused? **(biology only)**

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(c) Which structure in the figure above is a muscle that contracts when focusing on a near object? **(biology only)**

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(d) What happens to the shape of the lens when focusing on a near object? **(biology only)**

_____

_____

(1)

(e) The eyes can function in dimly-lit areas and in brightly-lit areas.

The iris contains muscles.

Describe how muscles in the iris help the person to see clearly when moving from a dimly-lit area to a brightly-lit area. **(biology only)**

_____

_____

_____

_____

(2)

(f) It is important to be able to react quickly.

Many people think that drinking coffee decreases reaction time.

Plan an investigation to test the effect of drinking coffee on reaction time.

You should include:

- the test for reaction time that you would use
- how to make the investigation valid.

(4)

(Total 10 marks)

Q4.

Many human actions are reflexes.

(a) Which statement describes a reflex action?

Tick (✓) **one** box.

A reflex action does not need a sense organ. ☐

A reflex action is a slow action. ☐

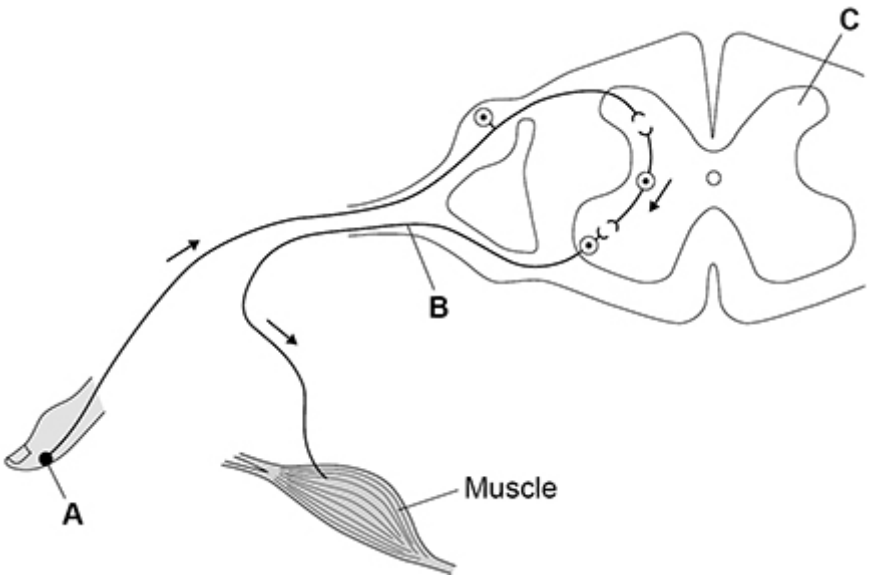
A reflex action is automatic. ☐

(1)

Figure 1 shows the nerve pathway for a reflex action.

The arrows show the direction of the nerve impulse.

Figure 1



(b) Draw **one** line from each part of the nerve pathway to the name of that part.

Use **Figure 1**.

Part of nerve pathway	Name of part
	Motor neurone
A	
	Receptor
B	
	Relay neurone
C	
	Spinal cord

(3)

(c) Which **two** human actions are reflexes?

Tick (✓) **two** boxes.

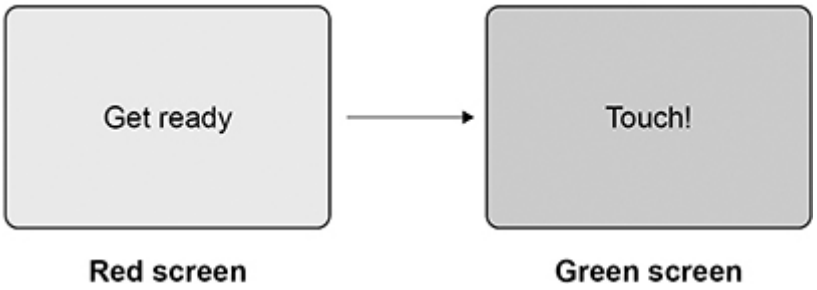
- Blinking when an insect flies into the eye ☐
- Catching a ball in a playground game ☐
- Playing a musical instrument ☐
- Removing the hand from a hot object ☐
- Writing a message to a friend ☐

(2)

Students investigated their reaction times using a computer program.

Figure 2 shows a sequence of two screens in the computer program.

Figure 2



This is the method used.

1. Open the reaction time program.

2. When the screen turns from red to green, touch the screen as quickly as possible.

3. Record the reaction time shown on the screen.

4. Re-set to the red screen.

5. Repeat steps 2 to 4 four more times.

6. Repeat steps 1 to 5 for each student.

The table below shows the results.

Test	**Reaction time in milliseconds**			
	Student P	**Student Q**	**Student R**	**Student S**
1	317	310	367	320
2	309	293	352	304
3	290	312	350	315
4	333	307	359	308
5	328	312	635	313
Mean	315	307	357	**X**

(d) Calculate mean value **X** in above table.

_____

_____

_____

X = _____ milliseconds

(2)

(e) There is an anomalous result for student **R**.

Draw a ring around the anomalous result in the table above.

(1)

(f) Give **two** factors that might affect a person's reaction time.

1 _____

_____

2 _____

_____

(2)

(Total 11 marks)

Q5.

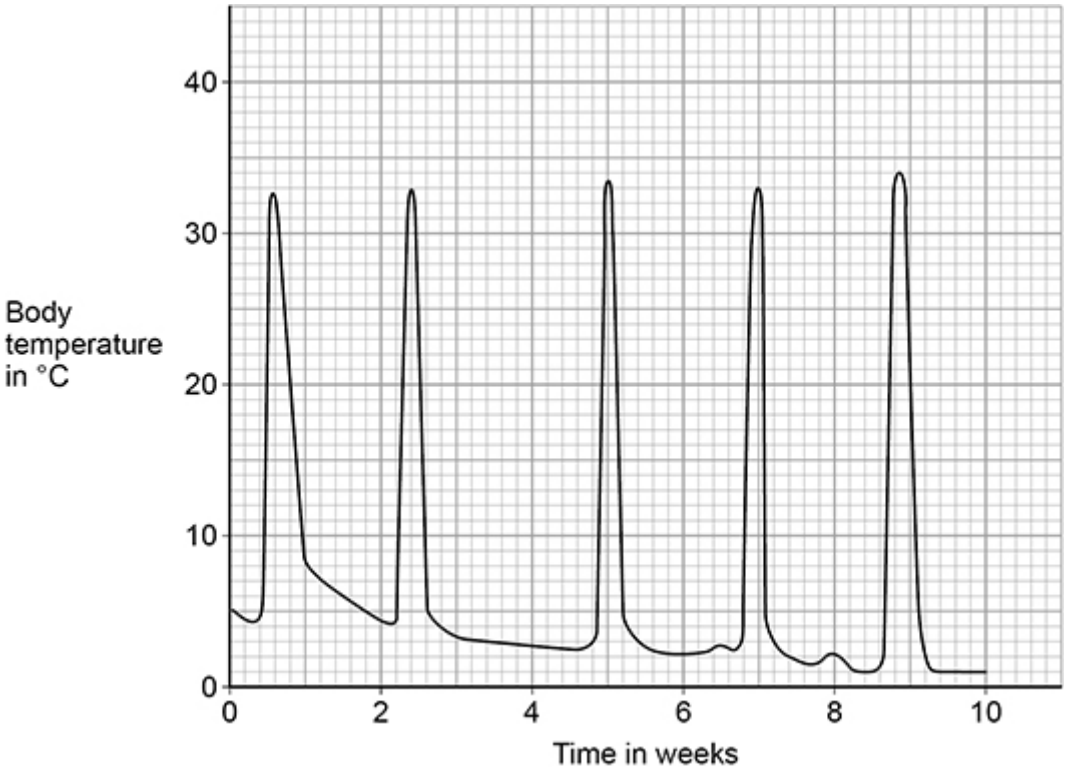
The echidna is a mammal that lives in Australia.

Figure 1 shows an echidna.

Figure 1

Figure 2 shows how the body temperature of the echidna varies during the cold winter months.

Figure 2



(a) Give the lowest and highest body temperatures for the echidna shown in **Figure 2**. **(biology only)**

Lowest temperature = _____ °C

Highest temperature = _____ °C

(1)

In the cold winter months, the echidna hibernates.

Figure 2 shows that the echidna woke up from hibernation several times.

The echidna's body temperature increased to over 30 °C each time the echidna woke up.

(b) How many times did the echidna wake up?

Use information from **Figure 2**. **(biology only)**

_____

(1)

(c) Each time the echidna wakes up, it hunts for food.

Suggest why the echidna needs to eat food several times during hibernation. **(biology only)**

_____

_____

(1)

(d) During hibernation:

- the echidna sleeps
- the echidna's body temperature decreases to below 5 °C
- the echidna uses food stored in its body cells to provide energy.

What process releases energy from stored food? **(biology only)**

Tick (✓) **one** box.

Diffusion ☐

Excretion ☐

Respiration ☐

(1)

(e) Most mammals use a lot of energy to evaporate sweat.

The echidna does **not** sweat.

Suggest **one** use of energy in the echidna's body. **(biology only)**

_____

(1)

The control of body temperature is important in the human body.

An athlete trained in a hot climate.

(f) On one day, the athlete lost 3 200 cm^3 of water in sweat.

Evaporation of 1 cm^3 of sweat requires 2.5 kJ of energy.

Calculate the energy the athlete used for evaporation of sweat. **(biology only)**

_____

_____

_____

Energy = _____kJ

(2)

(g) On a different day the athlete used 6 000 kJ of energy to evaporate sweat.

The athlete's energy intake was 24 000 kJ.

Calculate the percentage of the athlete's energy intake used for evaporation of sweat. **(biology only)**

_____

_____

_____

Percentage = _____%

(2)

(h) Some days the athlete did **not** do any training and rested at home.

What effect would resting have on the volume of sweat produced each day? **(biology only)**

_____

(1)

(Total 10 marks)