

GCSE Biology A (Gateway)

J247/03 B1-B3 and B7 Higher (Higher Tier)

Question Set 11

1

A class of students investigate if right-handed people are faster with their dominant right hand.

Student **A** drops a ruler while student **B** catches it.

They then measure the position of student **B**'s thumb on the ruler, this is the drop distance.

Fig. 1.1 shows how the measurements were taken.

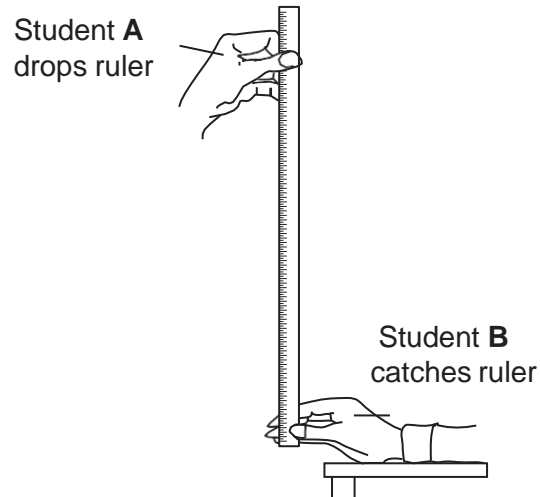


Fig. 1.1

The drop distance is converted into a reaction time.

The reaction time in seconds for each hand is recorded in a table.

- (a) (i) Identify **two** possible sources of error in this method of measuring reaction time.

The release of the ruler may cause an uneven fall.
The fingers cover a range of different readings.

[2]

- (ii) A second method of measuring reaction time involves a computer reaction time program shown in **Fig. 1.2**.

Each student is asked to click the “Start” button. After a 3-second delay, a number randomly flashes up. The student moves the mouse to click on the flashing number.

Left hand is used first then the right hand.

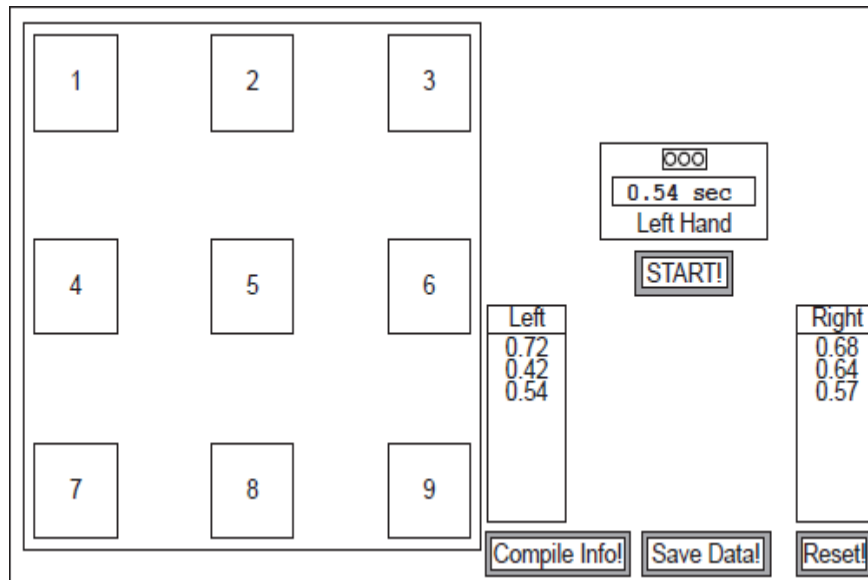


Fig 1.2

This second method is a better design than the first method but it could still be improved.

Explain why it is a better designed experiment than the first method and suggest how this second method could be improved.

Time rather than distance is measured which makes it better.

[3]

It can be improved by randomising the delay time before the number flashes.

Also can be improved by using a touch screen to avoid moving mouse.

- (b) The table shows the results for ten **right-handed** students in the class.

Reaction time (seconds)	
Left non-dominant hand	Right dominant hand
0.22	0.21
0.23	0.25
0.27	0.23
0.24	0.24
0.25	0.24
0.25	0.25
0.25	0.26
0.25	0.26
0.25	0.26
0.27	0.28
Mean = 0.25	Mean = 0.25

- (i) Calculate the **median** for the right dominant hand.

$$\underline{0.21, 0.23, 0.24, 0.24, 0.25, 0.25, 0.26, 0.26, 0.26, 0.28}$$

$$0.25 + 0.25 = 0.50 \quad 0.50 \div 2 = \underline{\underline{0.25}} \quad [2]$$

- (ii) The mean and median for the left non-dominant hand are identical.

What **other** conclusions can be made about reaction times in these ten students?

No difference in reaction times between left non-dominant and right dominant hand. Mean and median same for both hands. [2]
Results from right dominant hand larger range than left non-dominant hand.

- (c) (i) Motor neuron disease (MND) is a condition that affects reaction times. MND affects the speed of nerve impulse in motor neurons.

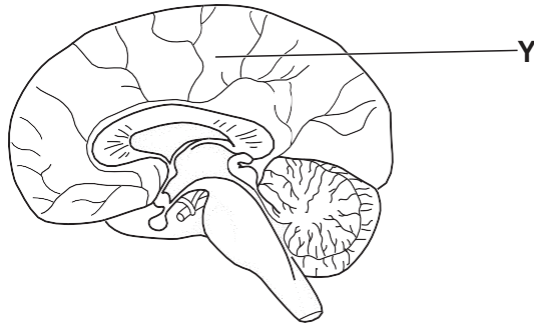
Stem cells taken from the skin of people with MND are used in research. The stem cells can be grown in the lab and used to measure the speed of the nerve impulse.

Which special feature of stem cells makes this possible?

Skin stem cell differentiates into motor neuron.

[1]

- (ii) The diagram shows the brain.



Name part Y and explain why it is an important area of the brain in the research of MND.

Cereberum , its the area of the brain that controls the motor functions like conscious movement.

[2]

- (iii) Measuring the speed of the nerve impulse in the brain is more difficult than using stem cells.

Suggest **two** reasons why.

1) Difficult to access brain due to skull.
Large number of neurones in brain so its difficult to follow a single neurone.

[2]

Total Marks for Question Set 11: 14

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