Do not write outside the box

0 2 **Figure 3** shows a computer keyboard.

There is a spring under each key.

Figure 3

0 2 . 1 Why do the keys have springs under them?

[1 mark]

Tick (✓) **one** box.

Springs make the keys easier to press. ☐

Springs make the keys lighter. ☐

Springs push the keys back to their original position. ☐

0 2 . 2 Why does every spring used in the keyboard have the same spring constant?

[1 mark]

Tick (✓) **one** box.

So that more than one key can be pressed at the same time. ☐

So that the same force is needed to press each key. ☐

So that the springs are all the same length. ☐

Turn over ►

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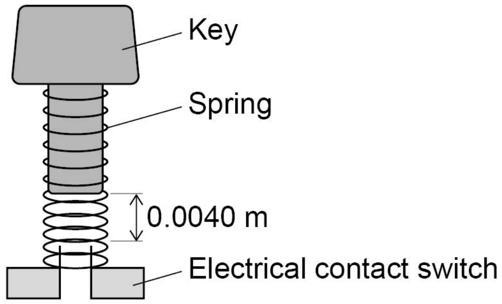
Figure 4 shows one of the keys and its spring.

Figure 4



0 2 . 3 What happens to the length of the spring when the key is pressed?

[1 mark]

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____

0 2 . 4 How far must the key move before it touches the switch?

[1 mark]

Tick (✓) **one** box.

4.0 mm ☐ 4.0 cm ☐ 4.0 µm ☐

0 2 . 5 If a key is not pressed with enough force, no signal is sent to the computer.

Explain why.

[2 marks]

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0 2 . 6 The spring in **Figure 4** has a spring constant of 200 N/m

Calculate the force on the spring when the key moves a distance of 0.0040 m

Use the equation:

force = spring constant × compression

[2 marks]

Force = ____________________ N

0 2 . 7 Suggest **two** ways the spring in the key in **Figure 4** could be changed so that the switch can be closed more quickly.

[2 marks]

1 ____________________

2 ____________________

10

Turn over for the next question

question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	springs push the keys back to their original position		1	AO1 6.5.3
02.2	so that the same force is needed to press each key		1	AO3 6.5.3
02.3	(the length) decreases	allow the spring compresses	1	AO1 6.5.3
02.4	4.0 mm		1	AO2 6.5.3
02.5	the spring/key will not move far enough so will not press the (electrical contact) switch		1 1	AO3 6.5.3
02.6	F = 200 × 0.0040 F = 0.80 (N)	 allow 0.8 (N)	1 1	AO2 6.5.3
02.7	shorter spring spring with a lower spring constant	 allow spring that requires less force to compress allow weaker spring allow spring that is easier to compress	1 1	AO3 6.5.3
Total			**10**	