

Physics  
UNIT: 4PH1  
PAPER: 2P

Friday 14 June 2024 – Afternoon

Time: 1 hour 15 minutes

Diagram Booklet

THIS DIAGRAM BOOKLET MUST BE RETURNED WITH THE QUESTION PAPER AT THE END OF THE EXAMINATION.

In the boxes below, write your name, centre number and candidate number.

|                  |  |  |  |  |  |
|------------------|--|--|--|--|--|
| Surname          |  |  |  |  |  |
| Other names      |  |  |  |  |  |
| Centre Number    |  |  |  |  |  |
| Candidate Number |  |  |  |  |  |

## INSTRUCTIONS

There may be spare copies of some diagrams in case you need them.

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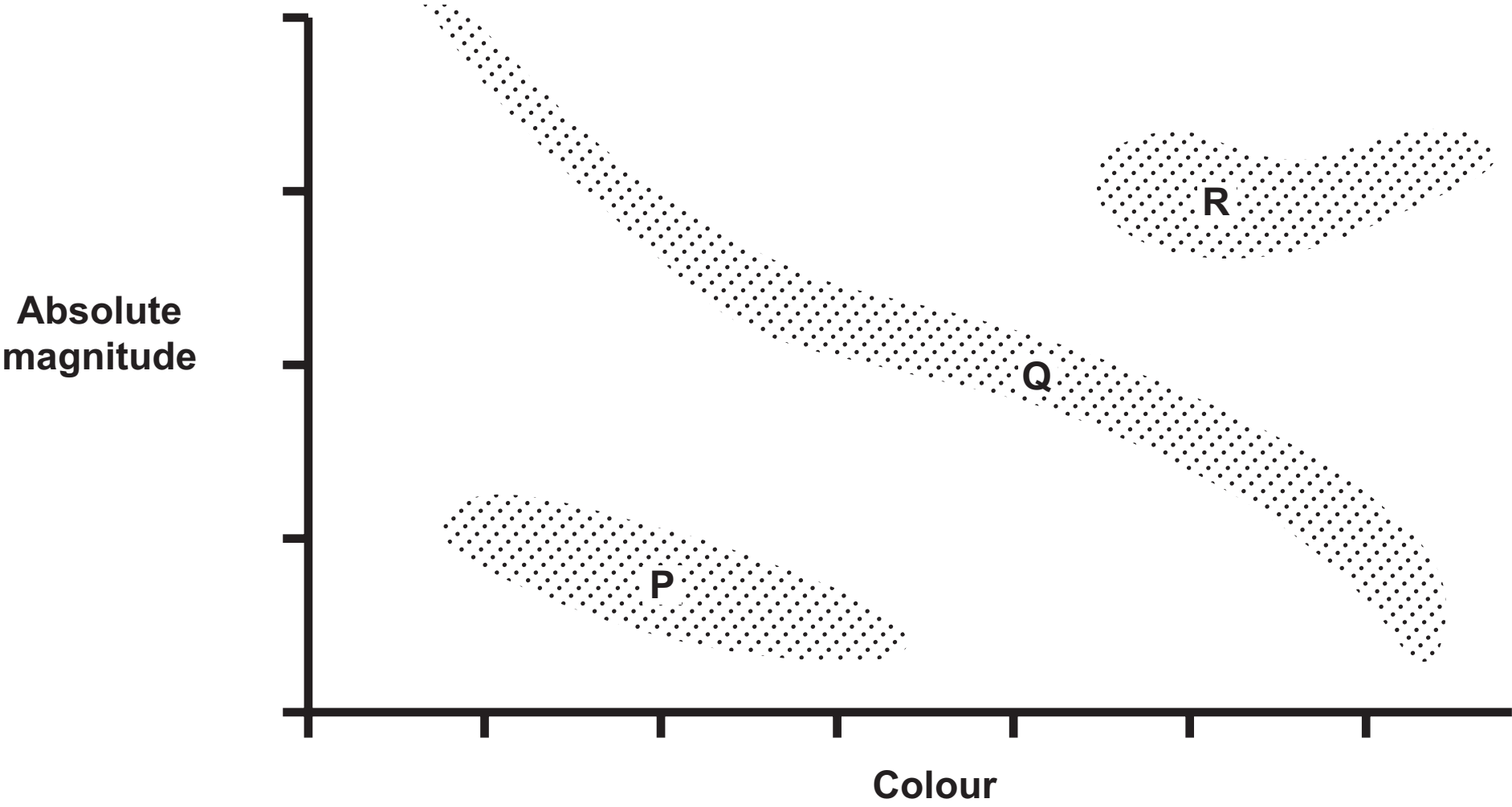
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Question 1

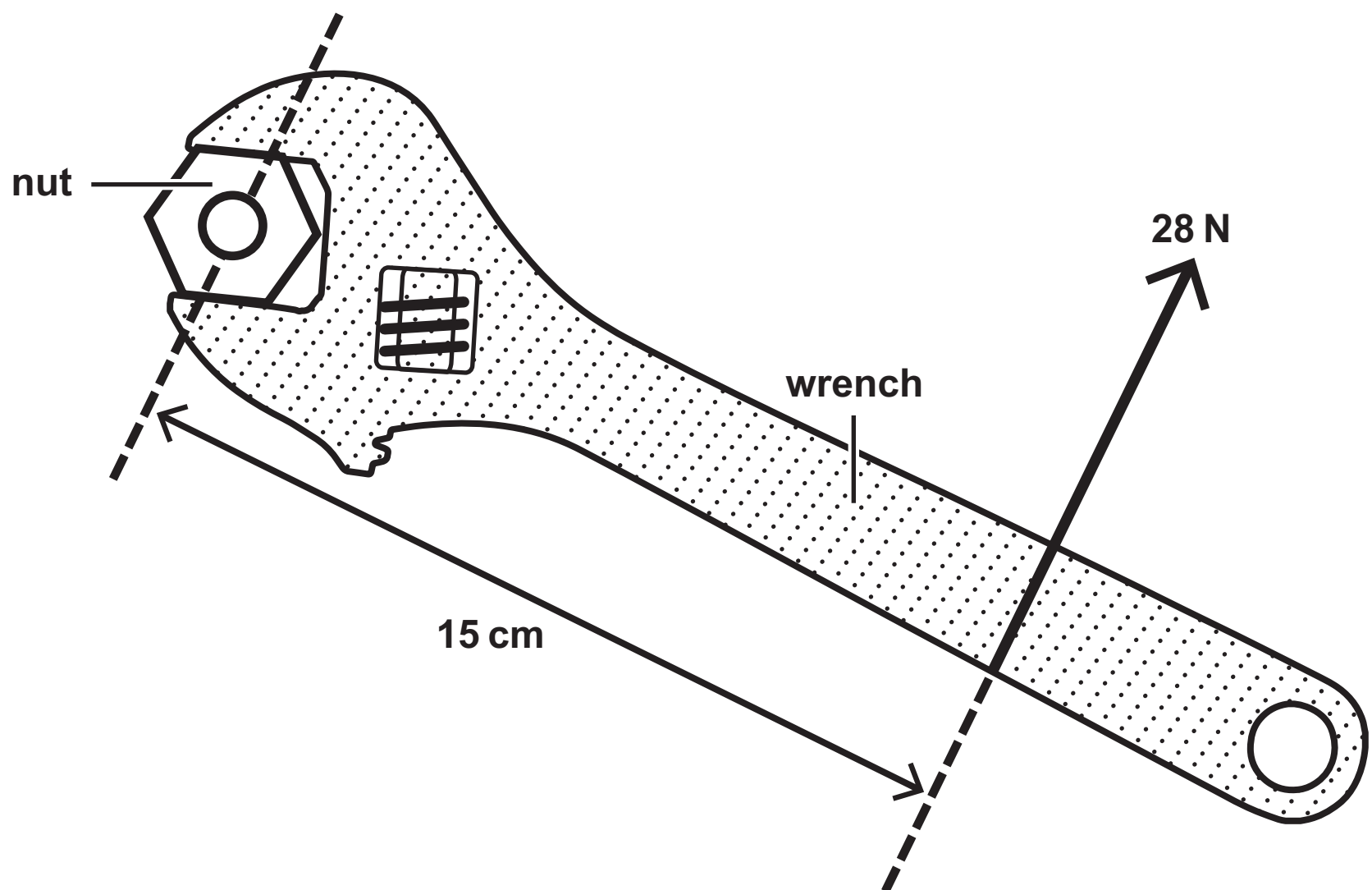


Question 1(a)

| Region                             | Astronomical object                                 |
|------------------------------------|---|
|                                    | <div><div></div><div>black hole</div></div>         |
|                                    | <div><div></div><div>main sequence star</div></div> |
|                                    | <div><div></div><div>nebula</div></div>             |
| <div><div>P</div><div></div></div> | <div><div></div><div>neutron star</div></div>       |
| <div><div>Q</div><div></div></div> | <div><div></div><div>red giant star</div></div>     |
|                                    | <div><div></div><div>supernova</div></div>          |
| <div><div>R</div><div></div></div> | <div><div></div><div>white dwarf star</div></div>   |

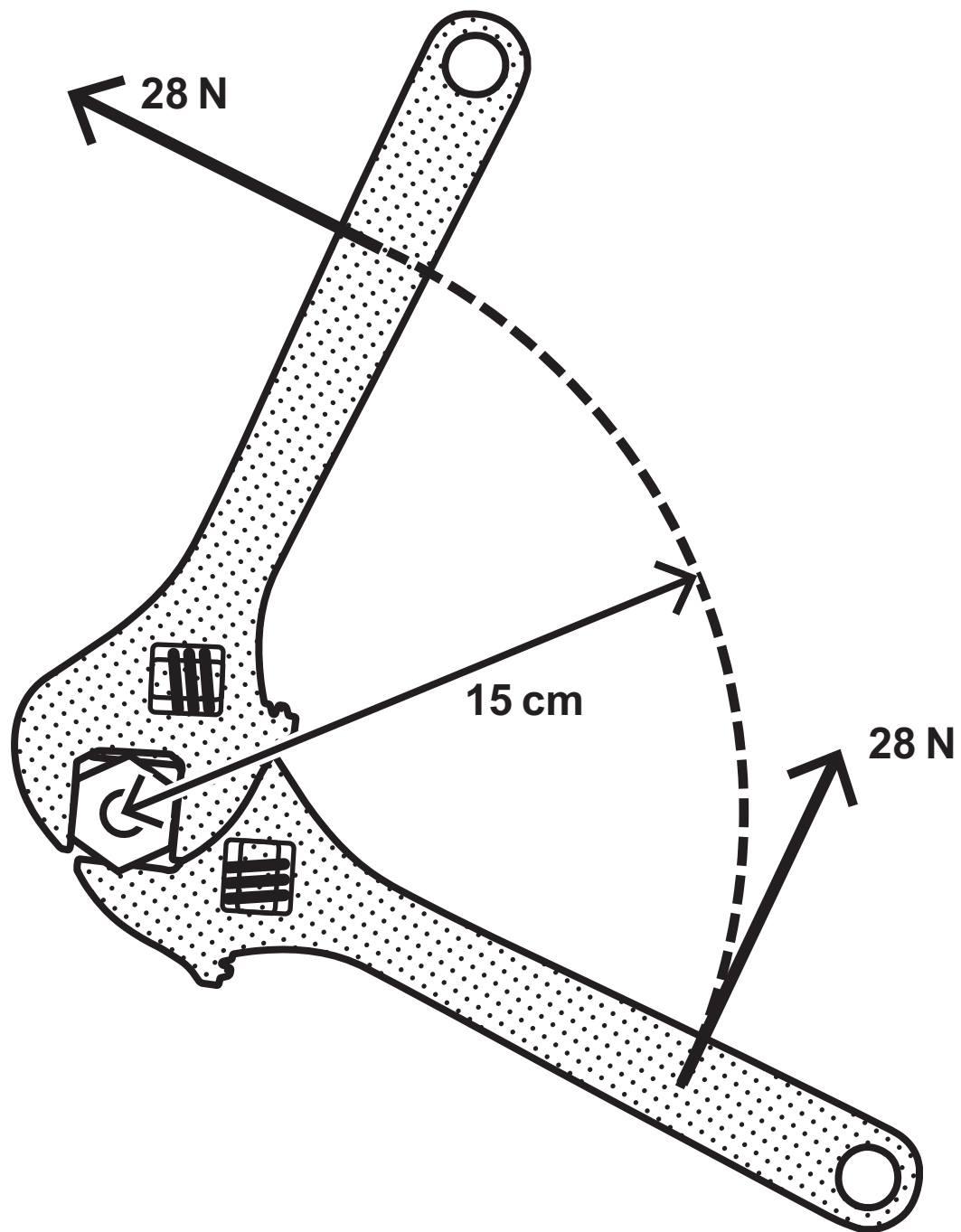
## Question 2(a)

DIAGRAM 1

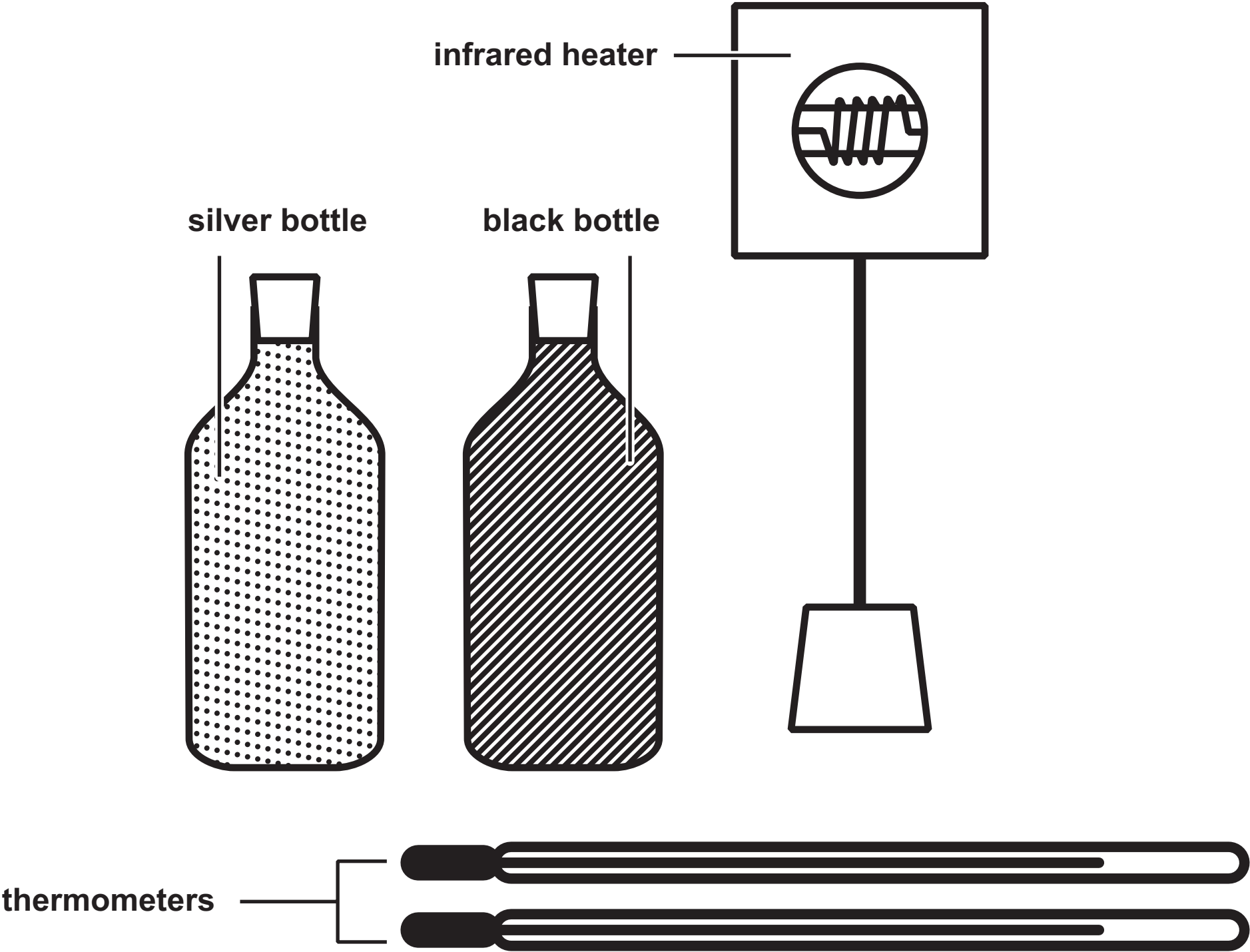


## Question 2(c)

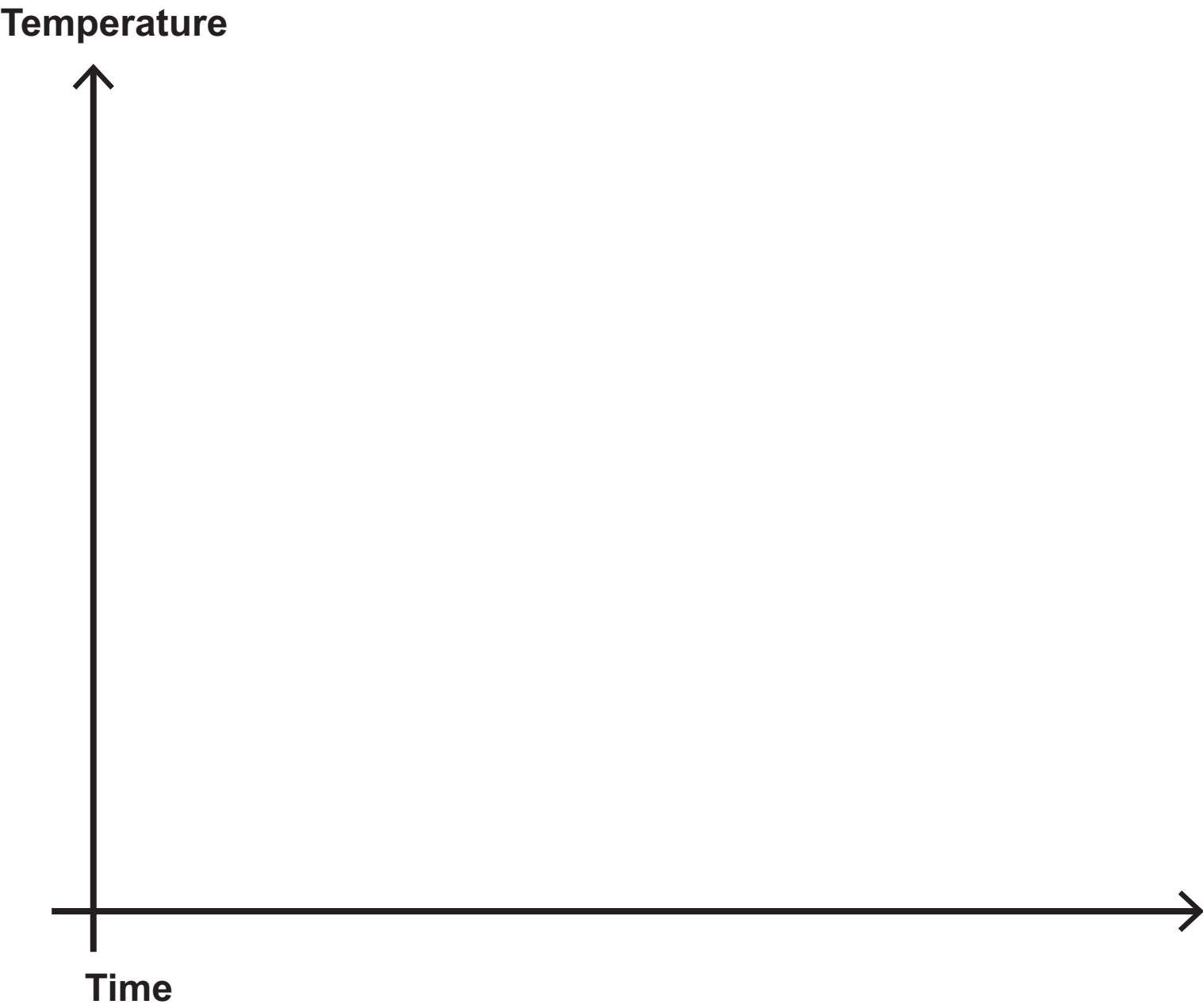
DIAGRAM 2



Question 3(a)



Question 3(b)



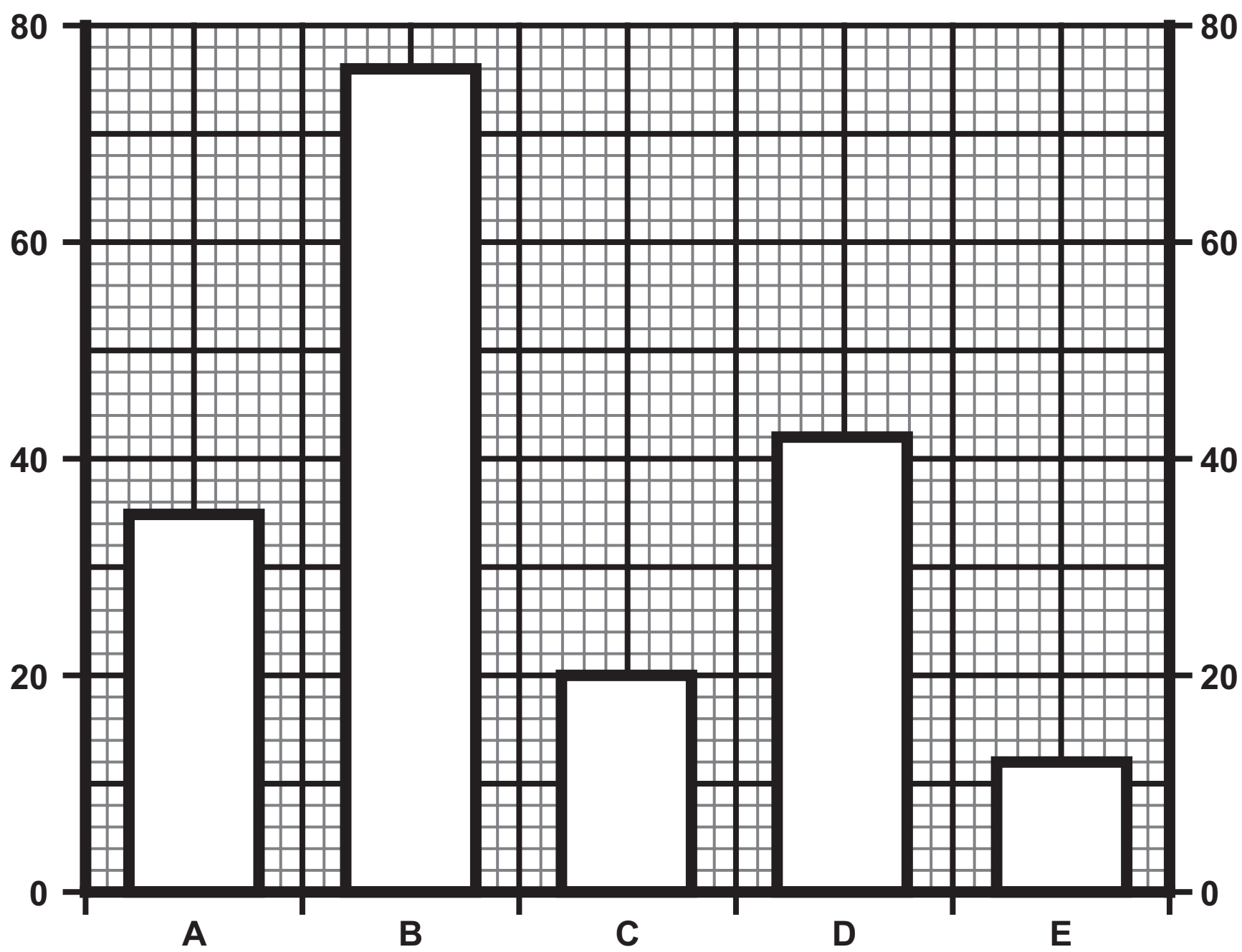


Question 4(b)

| Material  | Charge in nanocoulombs (nC) |      |      |      |
|-----------|-----------------------------|------|------|------|
|           | 1                           | 2    | 3    | Mean |
| glass     | +35                         | +38  | +36  | +36  |
| ebonite   | −168                        | −170 | −171 | −170 |
| polythene | −61                         | −80  | −59  |      |
| acetate   | −20                         | −20  | −18  | −19  |

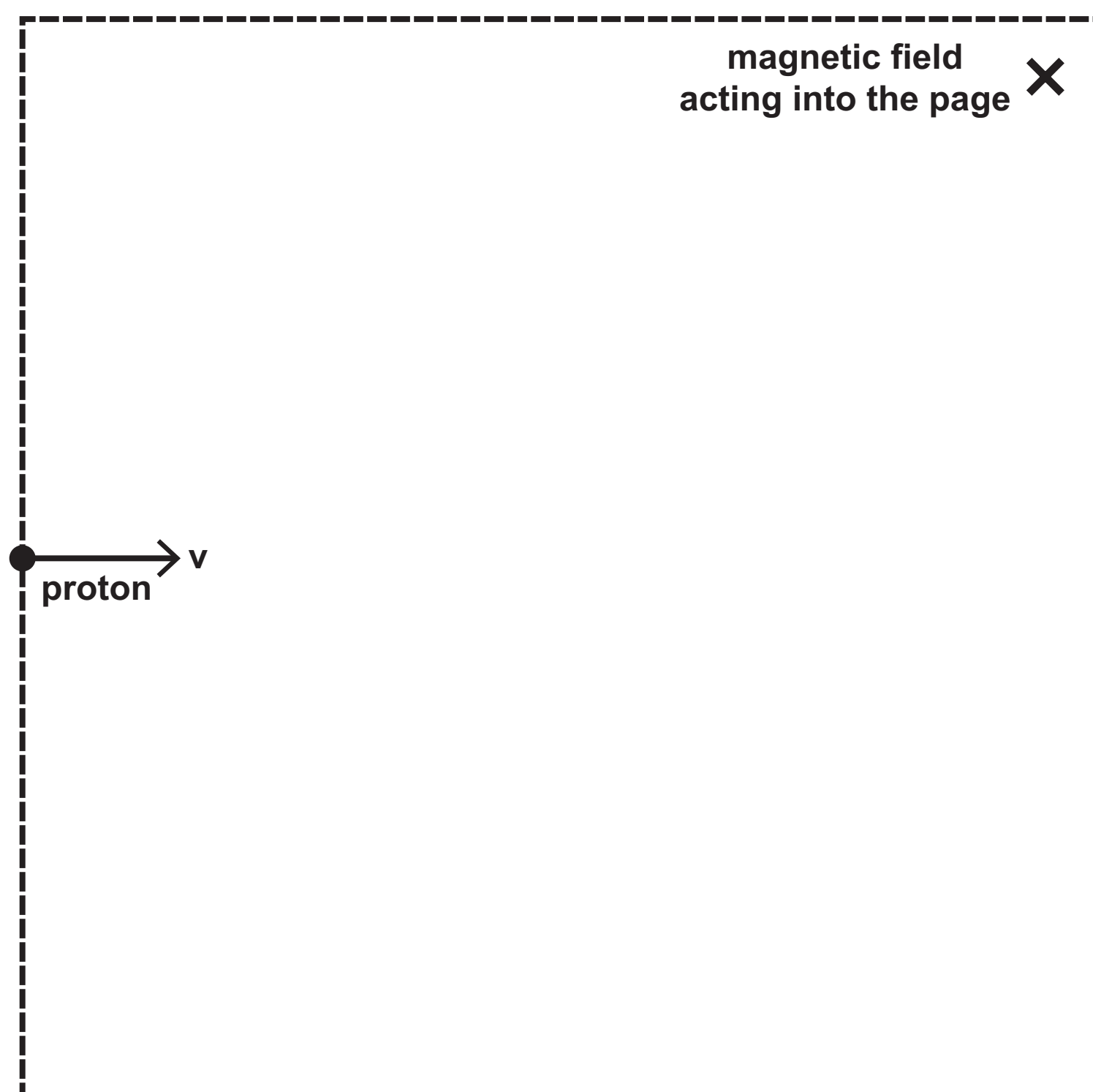
## Question 5(b)

Frequency in  
kHz

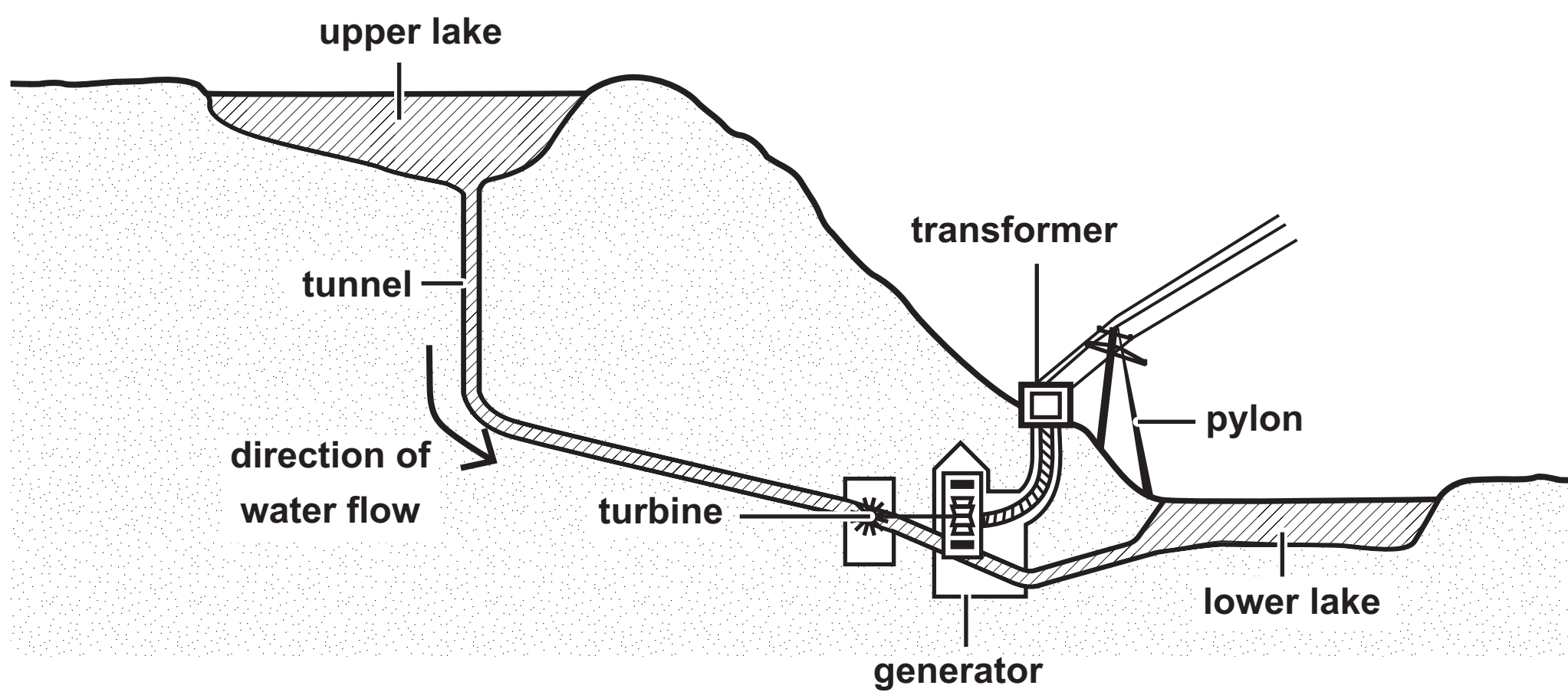


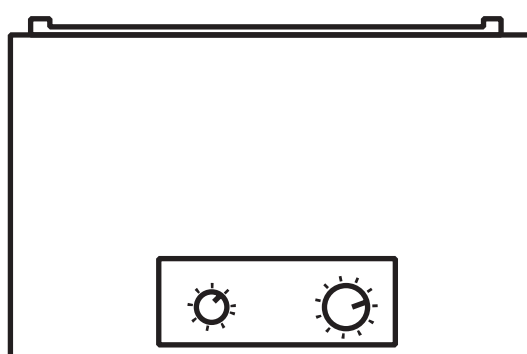


## Question 6(b)



## Question 7(b)



**Question 8**

Question 8(b)(ii)

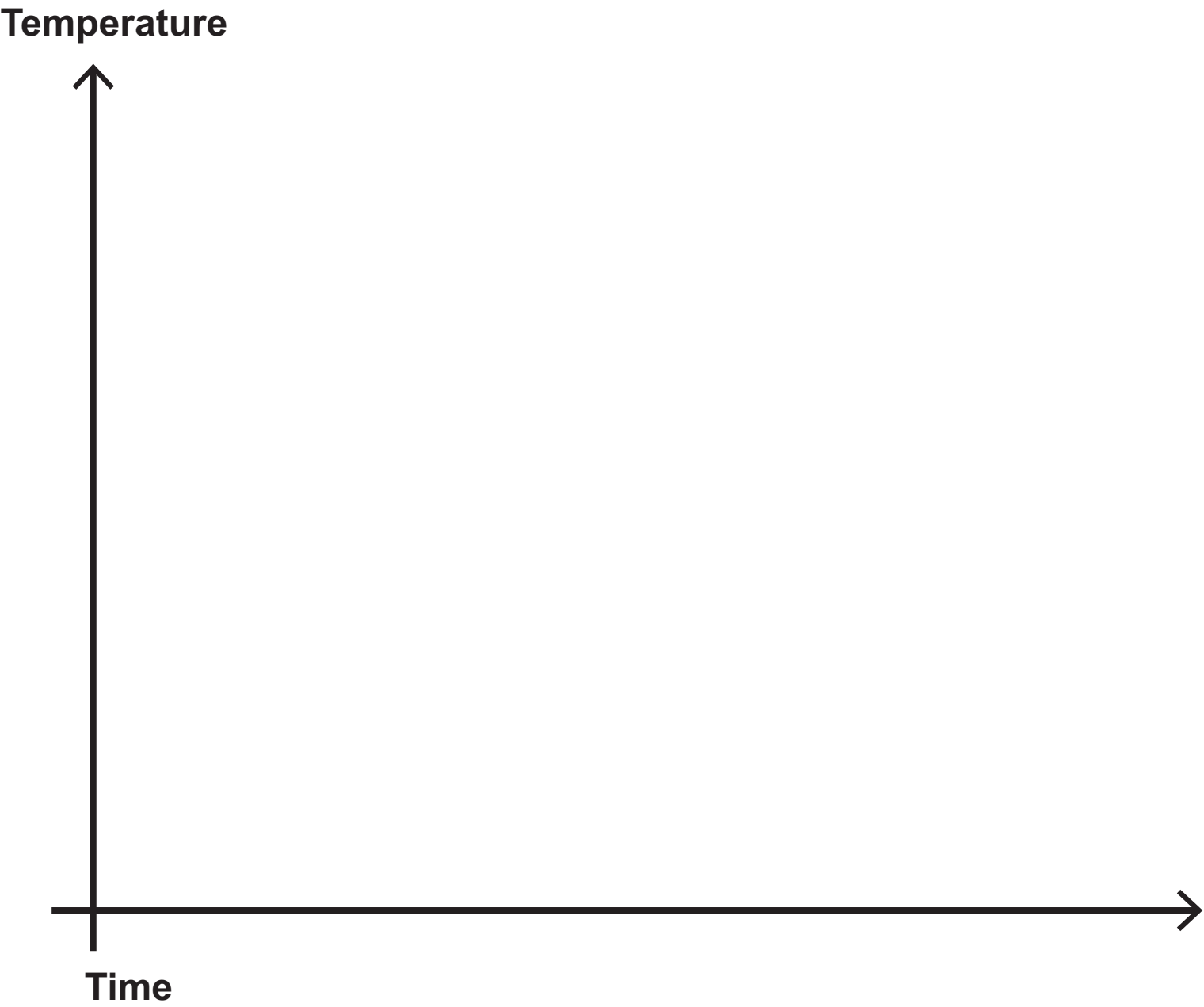
|                              |            |
|------------------------------|------------|
| Initial temperature of water | 15 °C      |
| Final temperature of water   | 60 °C      |
| Voltage of heating element   | 230 V      |
| Current in heating element   | 1·5A       |
| Time taken to heat water     | 45 minutes |

Question 1(a)

| Region                             | Astronomical object                                 |
|------------------------------------|---|
|                                    | <div><div></div><div>black hole</div></div>         |
|                                    | <div><div></div><div>main sequence star</div></div> |
| <div><div>P</div><div></div></div> | <div><div></div><div>nebula</div></div>             |
| <div><div>Q</div><div></div></div> | <div><div></div><div>neutron star</div></div>       |
|                                    | <div><div></div><div>red giant star</div></div>     |
| <div><div>R</div><div></div></div> | <div><div></div><div>supernova</div></div>          |
|                                    | <div><div></div><div>white dwarf star</div></div>   |



Question 3(b)

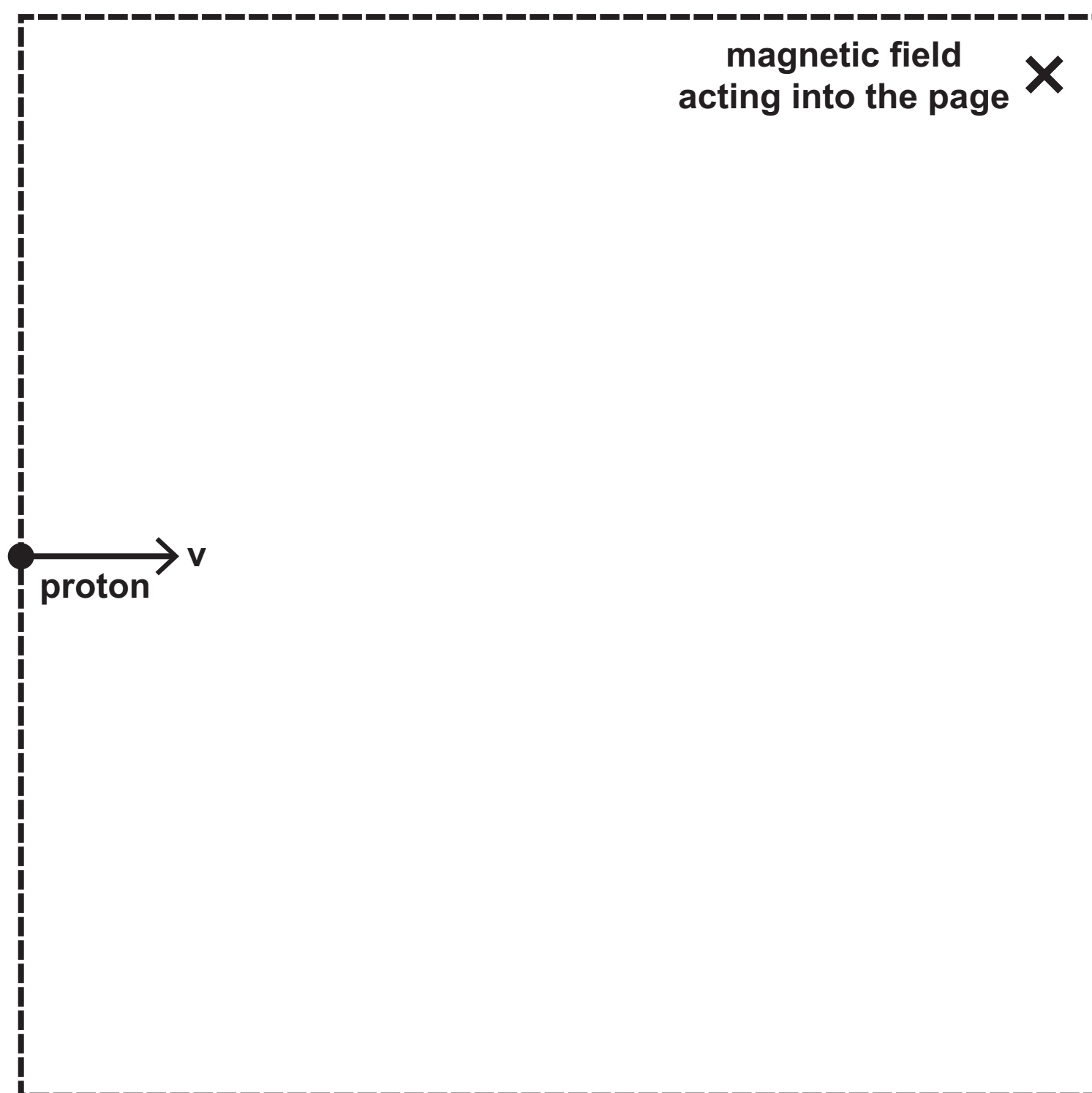


Question 4(b)

| Material  | Charge in nanocoulombs (nC) |      |      |      |
|-----------|-----------------------------|------|------|------|
|           | 1                           | 2    | 3    | Mean |
| glass     | +35                         | +38  | +36  | +36  |
| ebonite   | −168                        | −170 | −171 | −170 |
| polythene | −61                         | −80  | −59  |      |
| acetate   | −20                         | −20  | −18  | −19  |



## Question 6(b)



**Source information:**

**Question 2(a) and 2(c)**

**(Source adapted from: <https://www.shutterstock.com/image-photo/adjustable-spanner-isolated-on-white-chrome-1794553030>)**