Mark scheme

Question			Answer/Indicative content	Marks	Guidance
1			C	1 (AO 1.2)	**Examiner's Comments** This question was very well answered, with candidates clearly understanding the difference between aninduced magnet and a permanent magnet.
			Total	**1**	
2	a		Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** Detailed description of the trend using data from the table and detailed suggestions on how to ensure accurate and valid results. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Clear description of the trend and some simple suggestions to ensure accurate or valid results. **OR** Clear suggestions to ensure accuracy and a simple description of the trend. **OR** Detailed description of the trend shown or detailed suggestions on how to ensure accurate and valid results. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** Basic description of the trend indicated. **OR** Some simple suggestions to ensure	6 (2 ×AO 3.3a) (2 ×AO 3.3b) (2 ×AO 3.1a)	**AO3.1a Analyses the results to interpret the trend.** For example: • as current increases the number of paperclips picked up / strength of magnetic field increases • uses data / calculations to demonstrate trend • at 1A 5 paperclips are picked up, at 2A (double) 11 paperclips are picked up (2.2×) • differences between each successive increase calculated e.g. 1A to 2A = 6 • ratio number of paper clips to current calculated • appropriate conclusion • as current doubles the number of paperclips picked up (approximately) doubles • the relationship is (not) linear with reason **AO3.3a and AO3.3b Analyses the information to develop/improve experimental procedures.** For example: • use same size / mass / type of paperclips • repeat readings to take a mean / discard anomalies • measure current to more decimal places / better accuracy / nearest 0.1A / nearest 0.01A • check ammeter for zero error

			accurate or valid results. *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 mark** *No response or no response worthy of credit.*		• use the same nail throughout • use the same number of turns • use the same length of solenoid / fix solenoid to core • use a wider range of currents • allow the coil to cool between readings • hold /fix the coil the same distance from the paperclips on each attempt **<u>Examiner's Comments</u>** The level of response question gives candidates the opportunity of structuring their own response. In this particular question there were two sections that needed to be addressed by the candidate. Firstly, there needed to be reference to the trend shown by the data in the table. Most candidates were able to describe a simple trend; however, high scoring candidates discussed whether the current and number of paper clips were directly proportional with some reasoning. In this case, candidates could have discussed the regular increase in the number of paperclips Secondly, candidates needed to describe the method used to gain accurate and valid results. Many candidates discussed the need to repeat measurements, and a significant number gave extra detail about removing anomalies and calculating a mean. Some candidates identified that the current was recorded to the nearest 1 A and that an ammeter recording to the nearest 0.1 A or 0.01 A would improve the method. Other candidates discussed the quantities that needed to be kept constant to make sure that it was a fair test. A number of candidates discussed using other people to do the experiment (reproducible) which did

					not answer the question since the question was concerned with the candidate's method. Exemplar 1  The candidate describes a simple trend and starts to discuss the type of relationship by the increase in the number of paper clips for an increase in current of 1 A. This line of reasoning could have been developed further both by indicating that the increase was not always the same and what type of relationship could have existed. The candidate has discussed the method of using different currents and repeating the experiment. The reasoning is 'making it valid and accurate'. Overall the scientific content is Level 2 and the communication statement is met so four marks. To have achieved Level 3, the candidate needed to develop the reasoning relating to the trend, by arguing that the relationship was (or was not) directly proportional with some reasoning, and giving some more detail, perhaps by stating quantities that needed to be kept constant and explaining why repeat readings were being taken.

					Assessment for learning Candidates should understand how to test for a proportional relationship. To show that two quantities are directly proportional, candidates should be able to test graphically with a straight line passing through the origin or from a table of results to produce a constant. The testing should be extended to inverse proportional relationships (such as Question 17(a)).
	b		To increase the magnetic effect / magnetic field strength / magnetic flux density✓	1 (AO 1.2)	**IGNORE** iron is a magnetic material **Examiner's Comments** Many candidates simply stated that iron was magnetic rather than suggesting why this was helpful. High scoring candidates stated that the strength of the magnetic field would be increased.
			Total	**7**	
3			D ✓	1 (AO1.2)	**Examiner's Comments** This question was answered well. Candidates needed to know that the direction of the field lines is from north to south.
			Total	**1**	