

# MARK SCHEME

## GCSE

### PHYSICS

### AQA - TRIPLE SCIENCE

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P7 - TEST 3

MAGNETISM

Intermediate

## Mark schemes

- 1.** (a) the magnets are not touching 1
- but (each) experiences a force  
*allow but there is a force of attraction between them* 1
- (b) place a (plotting) compass near the (north / south) pole of the magnet and mark the direction that the compass points 1
- move the (plotting) compass around the bar magnet (to the other pole) marking at (regular) intervals the direction the compass points 1
- join the points up and add an arrow pointing from the north pole to the south pole 1
- (c) (closing switch S) causes a current in the coil  
*allow switches on the electromagnet* 1
- a magnetic field is created 1
- a force of attraction acts on the ball bearing 1
- so the ball bearing accelerates (towards the iron rod) 1
- [9]**
- 2.** (a) move a (magnetic / plotting) compass around the wire 1
- the changing direction of the compass needle shows a magnetic field has been produced
- OR**
- sprinkle iron filings onto the card (1)
- tapping the card will move the filings to show the magnetic field (pattern) (1) 1

(b) **Level 2 (3–4 marks):**

A detailed and coherent explanation is provided. The response makes logical links between clearly identified, relevant points that explain how the ignition circuit works.

**Level 1 (1–2 marks):**

Simple statements are made. The response may fail to make logical links between the points raised.

**0 marks:**

No relevant content.

**Indicative content**

- closing the (ignition) switch causes a current to pass through the electromagnet
- the iron core (of the electromagnet) becomes magnetised
- the electromagnet / iron core attracts the (short side of the ) iron arm
- the iron arm pushes the (starter motor) contacts (inside the electromagnetic switch) together
- the starter motor circuit is complete
- a current flows through the starter motor (which then turns)

4

[6]

3.

(a) electric drill, electric fan, electric food mixer and electric screwdriver

*all four ticked and no others (2)*

*either all four of these ticked and only one other (1)*

*or any three of these ticked and none/one/two of the others (1)*

2

(b) (i) reverse (the direction of the) current (1)

*or reverse the connections (to the battery)*

reverse (the direction of the) magnetic field (1)

*or reverse the (magnetic) poles /ends*

*do not credit 'swap the magnets (around)'*

2

(ii) any **two** from:

- increase the strength of the magnet(s)/(magnetic) field  
*do not credit 'use a bigger magnet'*
- increase the current  
*allow 'increase the voltage/p.d.'*  
*allow add cells/batteries*  
*allow increase the (electrical) energy*  
*allow increase the power supply*  
*allow 'decrease the resistance'*  
*allow 'increase charge'*  
*allow 'increase the electricity'*  
*do not credit 'use a bigger battery'*
- reduce the gap (between coil/armature and poles/magnets)  
*allow increase the (number of) coils*
- increase the turns (on the coil/armature)  
*do not credit 'use a bigger coil'*

2

[6]

4.

(a) (i) it moves or experiences a force horizontally to the right  
*for 1 mark*

1

(ii) A – moves in opposite direction or force reversed e.c.f.  
B – faster movement or larger force  
(**not** move further)  
*for 1 mark each*

2

(b) turns clockwise  
oscillates/reverses  
comes to rest facing field/at 90° to field/vertically  
*for 1 mark each*

3

(c) number of turns or linear number density of turns current core  
*for 1 mark each*

3

[9]

5.

(a) a magnetic field  
*accept electromagnetic field*  
*heat is insufficient*

1

that is alternating / changing

1

(b) 20

*allow 1 mark for correct*

*substitution, ie*

$$\frac{230}{11.5}$$

*provided no subsequent step*

2

(c) (most) transformers are not 100% efficient

*allow energy / power is lost to the surroundings*

*allow energy / power is lost as heat / sound*

*power is lost is insufficient*

1

(d) (i) 0.01 (V)

1

because there is a change in p.d. each time (the number of turns changes)

*allow because all the results (to 2 decimal places) are different*

*accept if results were to 1 decimal place, there might not be a difference*

1

(ii) student 2 moved the coil more slowly (than student 1)

*accept student 2 moved the coil at a different speed to student 1*

*do not accept student 2 moved the coil faster (than student 1)*

1

(iii) both sets of results show the same pattern

*accept trend for pattern*

*results are similar is insufficient*

*results follow a pattern is insufficient*

1

(iv) (electromagnetic) induction

*accept it is induced*

*do not accept electric / magnetic induction*

1

(e) any **one** from:

- more economical / cheaper for the consumer  
*allow more convenient*
- easier/cheaper to replace if broken/lost  
*allow in case one gets lost*
- since fewer transformers need to be made less resources are used  
*allow fewer plug sockets are needed*  
*allow fewer transformers are needed*  
*environmentally friendly is insufficient*

1

[11]

6.

(a) (i) an electric motor

1

(ii) force

1

(b) any **two** from:

- more powerful magnet  
*do not allow 'bigger magnet'*
- reduce the gap (between magnet and coil)
- increase the area of the coil
- more powerful cell  
*do not allow 'bigger cell'*  
*accept battery for cell*  
*accept add a cell*  
*accept increase current / potential difference*
- more turns (on the coil)  
*allow 'more coils on the coil'*  
*do not allow 'bigger coil'*

2

(c) reverse the (polarity) of the cell

*allow 'turn the cell the other way round'*  
*accept battery for cell*

1

reverse the (polarity) of the magnet

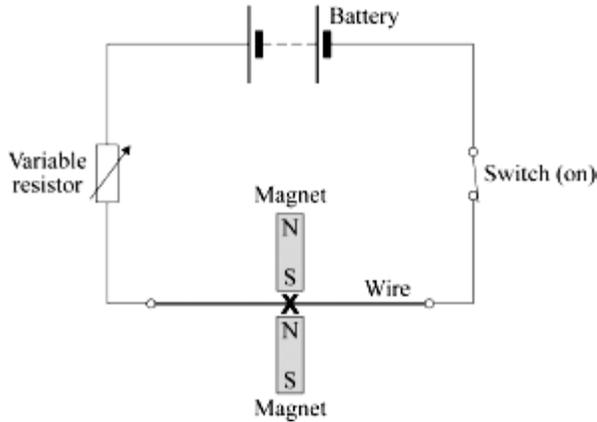
*allow 'turn the magnet the other way up'*

1

[6]

7.

- (a) centre of the **X** midway between the poles  
*intention correct as judged by eye*  
**example**



1

- (b) move the poles further apart  
*accept turn for move*  
*accept ends / magnets for poles*  
*accept use weaker magnets*  
 do **not** accept use smaller magnets

1

- (c) (i) add more cells (to the battery)  
 do **not** accept 'use a bigger battery'  
*accept increase the potential difference / voltage*  
*accept increase the current*

**or**

- reduce the resistance (of the variable resistor)  
 do **not** accept any changes to the magnets, to the wire or to their relative positions

1

- (ii) reverse (the polarity of) the battery  
*accept turn the battery / cells round*  
*accept swap the connections to the battery*  
 do **not** accept any changes to the magnets, to the wire or to their relative positions

1

[4]

8.

- (a) step-down

1

- (b) (i) 1.6

*correct order only*

1

12.8

1

(ii) values of p.d. are smaller than 230 V

1

(c) (i) a.c. is constantly changing direction

*accept a.c. flows in two / both directions*

*accept a.c. changes direction(s)*

*a.c. travels in different directions is insufficient*

1

d.c. flows in one direction only

1

(ii) an alternating current / p.d. in the primary creates a changing / alternating magnetic field

1

(magnetic field) in the (iron) core

*current in the core negates this mark*

*accept voltage for p.d.*

1

(and so) an alternating p.d.

1

(p.d.) is induced across secondary coil

1

[10]

9.

(i) iron

*for 1 mark*

1

(ii) 20

*gains 2 marks*

else working

*gains 1 mark*

2

(iii) reverse input/output

*for 1 mark*

**or** increase secondary turns

1

[4]

10.

(a) (i) (quickly) becomes magnetized

**or** *(quickly) loses its magnetism*

**or** *'it's (a) magnetic (material)'*

*any reference to conduction of electricity/heat nullifies the mark*

1

(ii) any **four** from:

- insulation prevents electricity/current flowing through the iron/core  
*or 'insulation so electricity/current only flows in the wires/turns/coils'*
- alternating current/a.c. in the primary (coil)
- produces a changing magnetic field (in the iron/core)
- (and hence magnetic) field in the secondary (coil)
- induces/generates/produces an alternating potential difference/p.d./voltage across the secondary (coil)
- (and hence) alternating current/a.c. in the secondary (coil)

4

(b) 80 (turns)

*or credit (1) for any equation which if correctly evaluated would give 80 example example*

$$\frac{230}{5.75} = \frac{3200}{\text{number of turns}}$$

2

[7]

11.

(a) induced

1

(b) any **two** from:

- use the same (strength) magnet  
*same size magnet is insufficient*
- the speed that the magnet is moved  
*accept movement of the magnet*
- the area of the turns  
*same type / length of wire is insufficient*
- the magnetic pole being moved towards the coil (of wire).  
*use the same voltmeter is insufficient*

2

(c) (i) voltmeter misread

**or**

number of turns miscounted

*result misread is insufficient*

*human error is insufficient*

*allow the magnet was moved at a (slightly) different speed (into the coil) than for the other readings*

*allow spacing between the turns had changed*

1

- (ii) line of best fit passing through all points except (100, 0.034)  
*line does not need to go back to origin*

1

(d) any **one** from:

- can re-check data / readings.  
*accept can go back to data*
- can take more readings (in a given time)  
*can store data is insufficient*
- easier to identify maximum value.  
*automatically records data is insufficient*  
*accept is more accurate*  
*accept eliminates human error*

1

**[6]**