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IGCSE PHYSICS 0625 · TOPICAL PAST PAPERS

Electromagnetic Induction

Paper 2 — Theory Worksheet (topical compilation)

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PAF CHAPTER

ATP (Paper 4) Worksheet

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1 Thin wire, covered in plastic insulation, is used to make a solenoid (long coil). The solenoid is connected to a sensitive ammeter. Fig. 10.1 shows the N-pole of a steel magnet placed next to the solenoid.

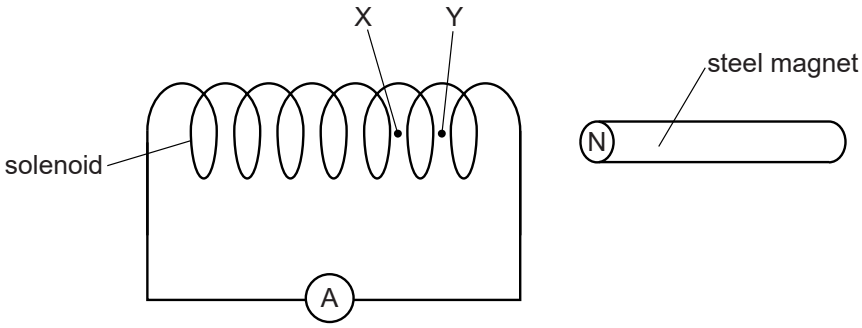

Fig. 10.1

a) In one experiment, the magnet in Fig. 10.1 is moved to the left and passes into the solenoid. The N-pole of the magnet travels from Y to X at a constant speed. As it moves, the ammeter shows a small current.
Explain why there is a current in the solenoid when the magnet is moving.

.....

.....

.....

.....

.....

..... [3]

b) The size of the current is determined by Faraday's law, where as the direction of the current is determined by Lenz's law.

i) State Faraday's law

.....

.....[2]

ii) state Lenz's law

.....

.....

..... [2]

(c) State two ways that increase the induced current.

1. .....

2. .....
[2]

(d) on Fig 10.1, mark an arrow to show the direction of current in the coil. [2]

(e) State two ways in which the equipment shown in Fig. 10.1 can be used to produce a current in the solenoid that is in the opposite direction.

1.....

2..... [2]

2 Fig. 7.1 shows one way to demonstrate an electrical effect.

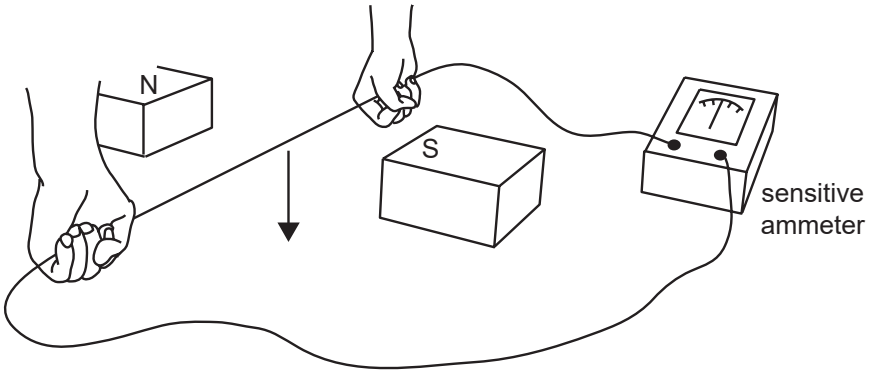

Fig. 7.1

As the wire is moved downwards between the magnetic poles, the needle of the ammeter deflects to the right.

(a) State the name of this electrical effect.

..... [1]

(b) Explain why the needle on the ammeter deflects.

.....

.....

.....[2]

(c) State what happens to the needle of the ammeter when the wire is moved upwards between the magnetic poles.

.....

..... [1]

(d) State and explain what happens when the wire is held stationary between the magnetic poles.

.....

.....

.....

.....

..... [2]

3 Fig. 8.1 shows the structure of a simple alternating current (a.c.) generator.

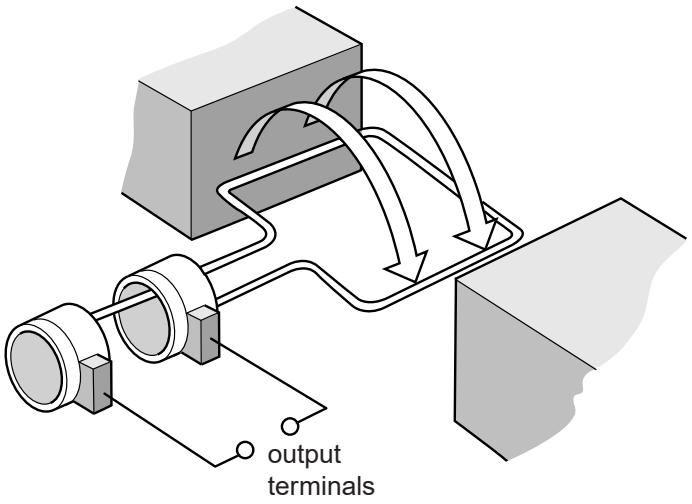

Fig. 8.1

(a) On Fig. 8.1, label

- the coil of the generator with the letter C,
- a slip ring with the letter S,
- a carbon brush with the letter B. [2]

(b) The a.c. generator is operating and the arrows on Fig. 8.1 show the direction of rotation.

Explain why there is an electromotive force (e.m.f.) between the two output terminals.

.....

.....

.....

.....[3]

(c) State the purpose of the slip rings.

.....

..... [1]

(d) The induced e.m.f. can be increased by rotating the coil faster. State two other ways in which the e.m.f. can be increased.

.....

..... [2]

(e) State the position of the coil, where

(i) the emf induced is maximum

..... [1]

(ii) the emf induced is zero

..... [1]

Fig. 6.2 shows how the alternating e.m.f. varies with time as the coil rotates.

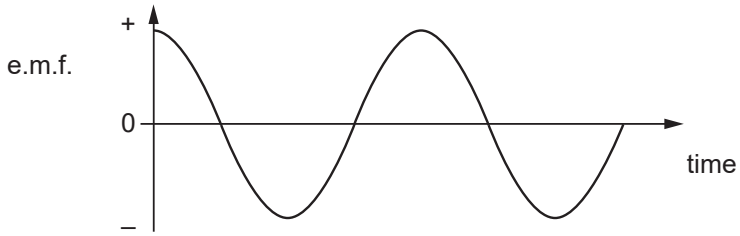

Fig. 6.2

(f) why the e.m.f. is sometimes positive and sometimes negative (alternating)?

.....

.....

..... [1]

(g) Changes are made to the a.c. generator, one at a time:

- stronger magnets are used
- more turns are wound on the coil
- the coil is turned faster.

Complete the table in Fig. 6.3 to show what happens to the maximum value of the e.m.f. and to the frequency of the alternating e.m.f.

changes made	what happens to the maximum value of the e.m.f.	what happens to the frequency of the e.m.f.
stronger magnets		
more turns on the coil		
the coil is turned faster		

Fig. 6.3

[3]

4 Fig. 9.1 shows a rotating magnet in an alternating current generator that is used to power a lamp.

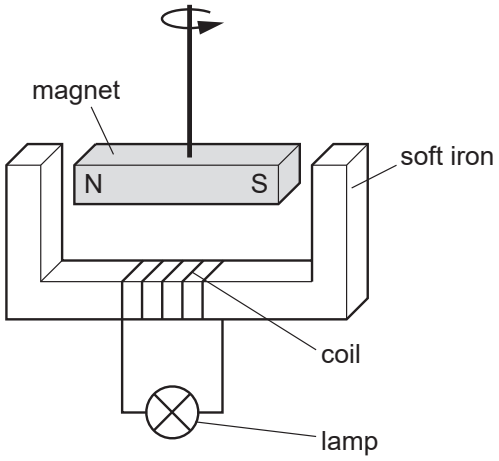

Fig. 9.1

(a) State how an *alternating* current differs from a *direct* current.

.....

.....

..... [1]

(b) Explain, in detail, how **alternating** current is produced by the apparatus shown in Fig. 9.1.

.....

.....

.....

.....

.....

..... [4]

(c) State two ways in which the current in the lamp may be increased.

1. .....

2. .....

[2]

5 Fig. 8.1 shows two coils of wire wound on an iron ring. One coil is connected in series to a switch and a d.c. supply. The other coil is connected to a very sensitive centre-zero ammeter.

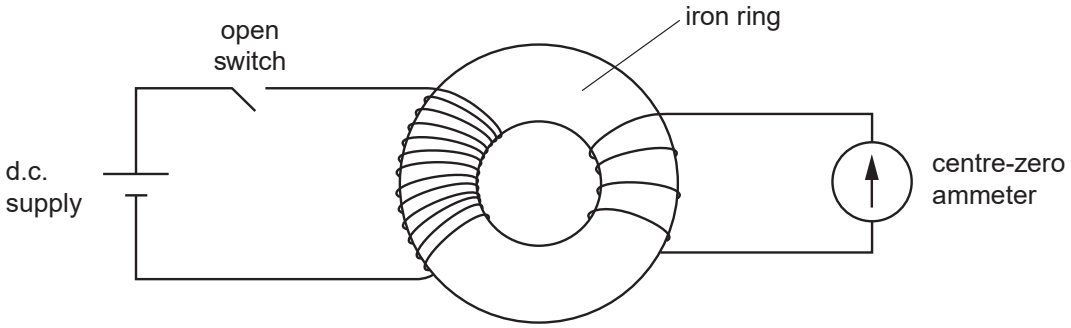

Fig. 8.1

At first the switch is open, as shown in Fig. 8.1.

The following actions are taken in turn.

Describe and explain what happens to the reading on the ammeter in each case.

(a) The switch is closed.

.....

.....

.....

.....[3]

(b) The switch is left closed for a long time.

.....

.....

.....[1]

(c) The switch is opened.

.....

.....

.....[2]

6 Fig. 8.1 shows a simple transformer.

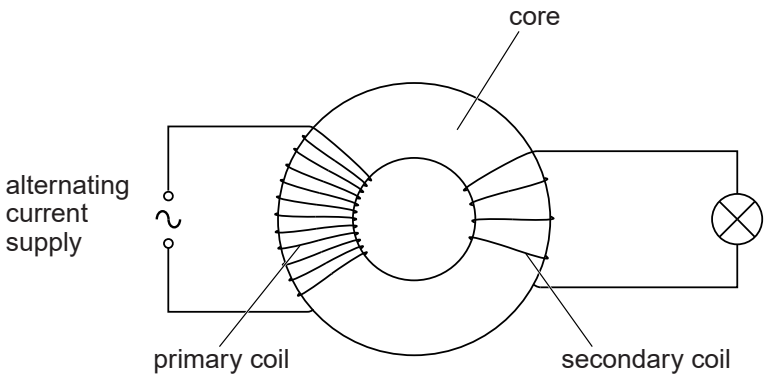

Fig. 8.1

(a) State the metal used for the core of a transformer.

.....[1]

(b) State the purpose of the core/

.....[1]

(b) Explain how an alternating current in the primary coil causes the lamp to light.

.....

.....

.....

.....

.....

.....[3]

7 Fig. 8.1 shows a simple transformer used to light a lamp. The lamp is labelled 24 V, 36 W.

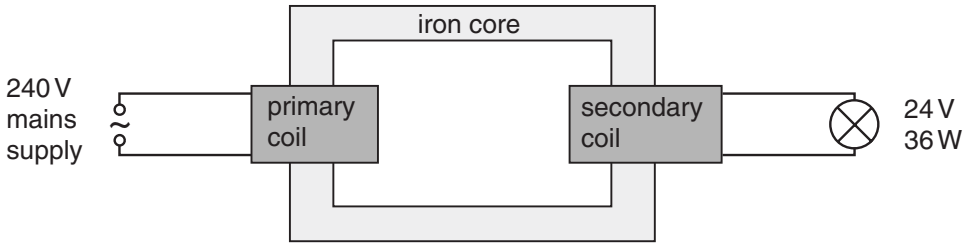

Fig. 8.1

When the mains supply is switched on, the lamp is very dim.

(a) State two ways in which the potential difference across the lamp can be increased without changing the mains supply.

1 .....

2 .....[2]

(b) For the lamp operating at the correct brightness, calculate

(i) the current in the secondary coil,

current = ...
[1]

(ii) the current in the primary coil. Assume that the transformer is ideal.

current = ...
[2]

(iii) the primary coil is 200,000 turns, find the number of turns in the secondary coil

turns = ...
[2]