Specimen Paper

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use
Examiner's Initials

Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
TOTAL	

General Certificate of Secondary Education
Foundation Tier

Further Additional Science [CODE]

Unit 3 Physics 3

F

For this paper you must have:
- a ruler
- the Equations Sheet (enclosed).

You may use a calculator.

Time allowed
- 60 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

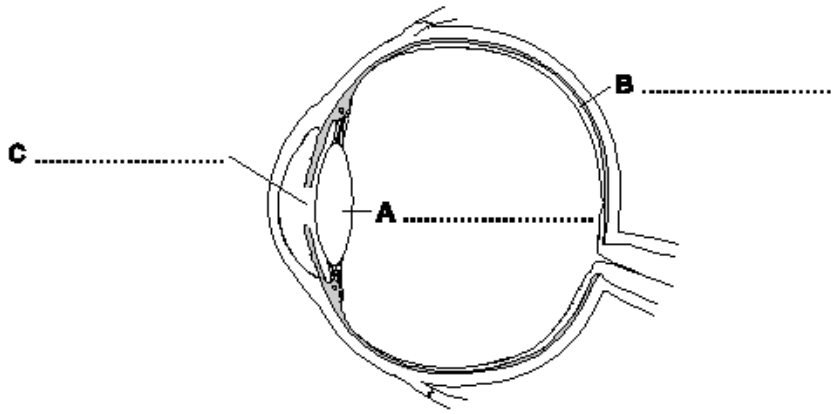
Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 11 should be answered in continuous prose. In this question you will be marked on your ability to:
  - use good English
  - organise information clearly
  - use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

[CODE]

Answer **all** questions in the spaces provided.

1 (a) The diagram shows the cross-section of an eye.

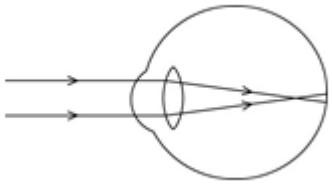


Use words from the box to label the parts, **A**, **B** and **C.**

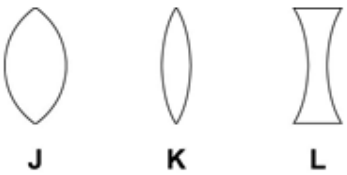
cornea	**iris**	**lens**	**pupil**	**retina**

(3 marks)

1 (b) The diagram shows one of the eyes of a person who is short-sighted.



Which **one** of the following lenses, **J**, **K** or **L**, could be used to correct the person's eyesight?



Lens .....

Give a reason for your choice.

.....

.....

(2 marks)

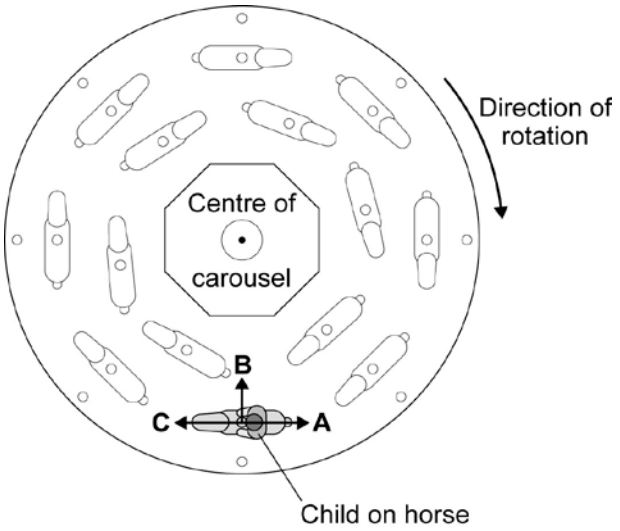
5

2 The picture shows a fairground carousel.

The diagram shows the position of one child, at one point in the ride, viewed from above.

Picture

Diagram



Draw a ring around the correct answer to complete the following sentences.

2 (a) The resultant force needed to keep the child moving in a circular path is

called the | centripetal / circular / gravitational | force.

(1 mark)

2 (b) The resultant force on the child acts in the direction | **A**. / **B**. / **C**.

(1 mark)

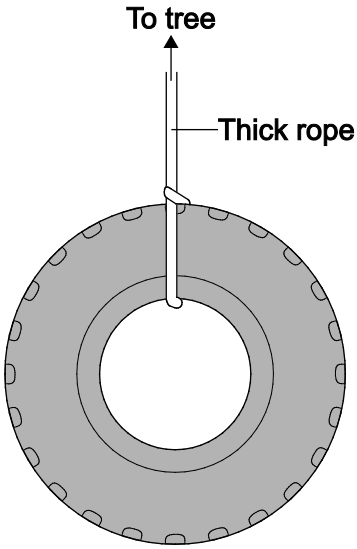
2 (c) At the end of the ride, as the carousel slows down, the resultant force on

the child | decreases. / stays the same. / increases.

(1 mark)

3

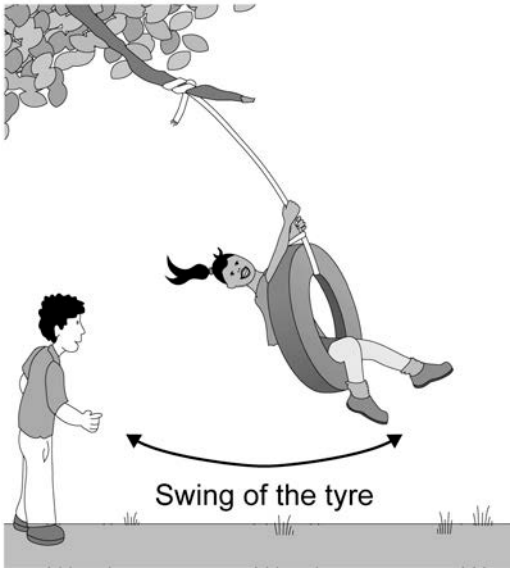
3 The drawing shows a car tyre, which is hanging from the branch of a tall tree.



3 (a) Draw an **X** on the diagram to mark the centre of mass of the tyre.

(1 mark)

3 (b) Some children use the tyre as a swing. Pulling the tyre to one side and letting it go makes the tyre swing backwards and forwards like a pendulum.



The time it takes the tyre to swing from one side to the other and back again is called the time period.

3 (b) (i) What is the unit for time period?

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(1 mark)

3 (b) (ii) How would using a shorter rope change the time period of the swing?

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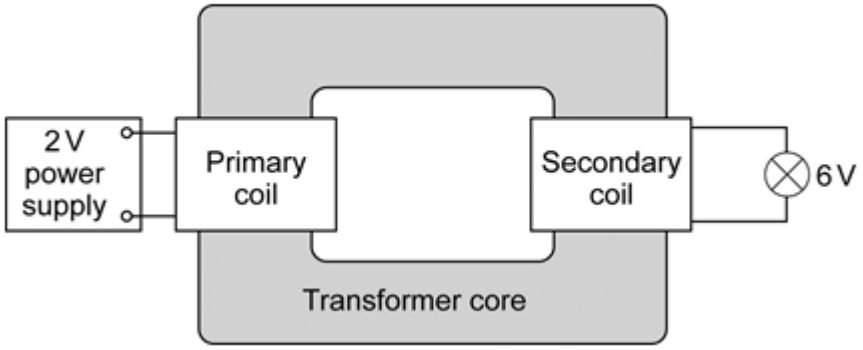
.....

(1 mark)

3

Turn over for the next question

4 The diagram shows a transformer made by a student. The student has designed the transformer to make a 6 V light bulb work using a 2 V power supply.



4 (a) Draw a ring around the correct answer to complete the following sentences.

4 (a) (i) For the transformer to work, the student

must use an a.c.
can use either an a.c. or a d.c.
must use a d.c.

power supply.

(1 mark)

4 (a) (ii) On the primary coil there are 30 turns of wire. For the lamp to work brightly there must be

less than 30
exactly 30
more than 30

turns of wire on the secondary coil.

(1 mark)

4 (b) What is the transformer core made from?

Give a reason for your answer.

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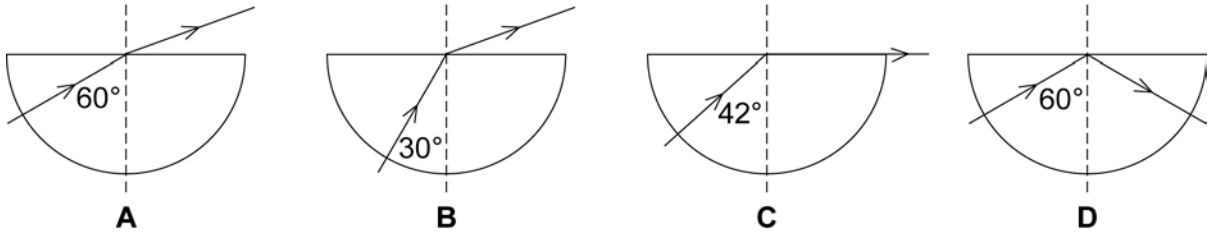
(2 marks)

4

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

5 (a) Each diagram shows a light ray incident on a glass–air boundary.
The critical angle for glass is 42°.



Which **one** of the diagrams, **A**, **B**, **C** or **D**, shows total internal reflection?

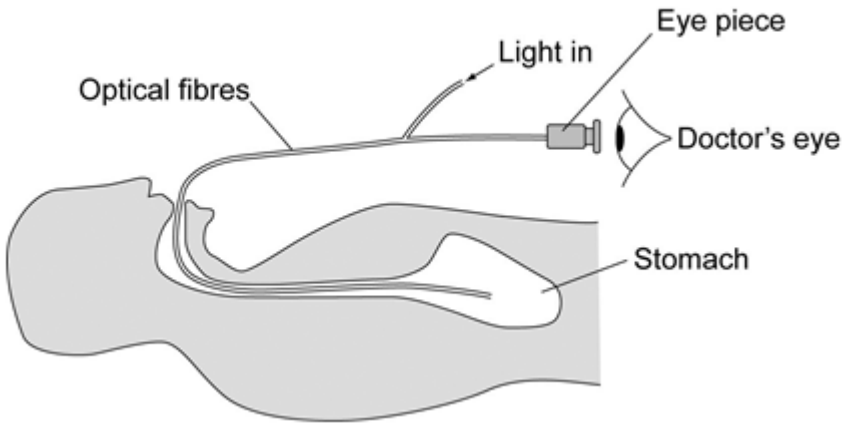
Write the correct letter in the box. ☐

(1 mark)

5 (b) (i) Complete the diagram to show the path taken by the light ray as it travels through the optical fibre.

(2 marks)

5 (b) (ii) The diagram shows an endoscope being used by a doctor to look inside a patient's stomach. Light travels into the stomach through a bundle of optical fibres.



The following sentences describe how the endoscope allows the doctor to see inside the patient's stomach. The sentences are in the wrong order.

Q Light passes through a bundle of optical fibres into the patient's stomach.

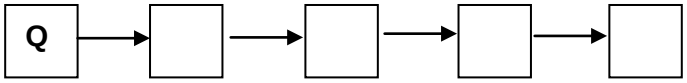
R The inside of the stomach reflects some of the light.

S The optical fibres take the light to an eyepiece.

T The doctor looks through the eyepiece to see inside the patient's stomach.

U The reflected light passes through a second bundle of optical fibres.

Arrange these sentences in the correct order. Start with letter **Q**.

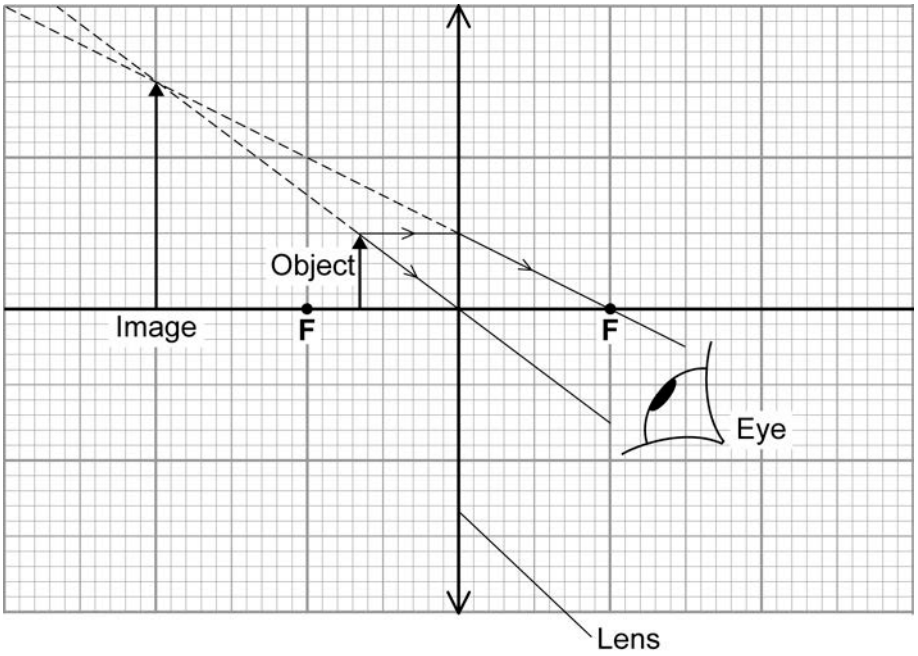


(3 marks)

6

Turn over for the next question

6 The ray diagram shows a lens being used as a magnifying glass.
The diagram has been drawn to scale.



6 (a) What name is given to the type of lens used as a magnifying glass?

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(1 mark)

6 (b) Calculate the magnification produced by the lens.

Write down the equation you use, and then show clearly how you work out your answer.

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Magnification = ...

(2 marks)

6 (c) Describe the image produced by a magnifying glass.

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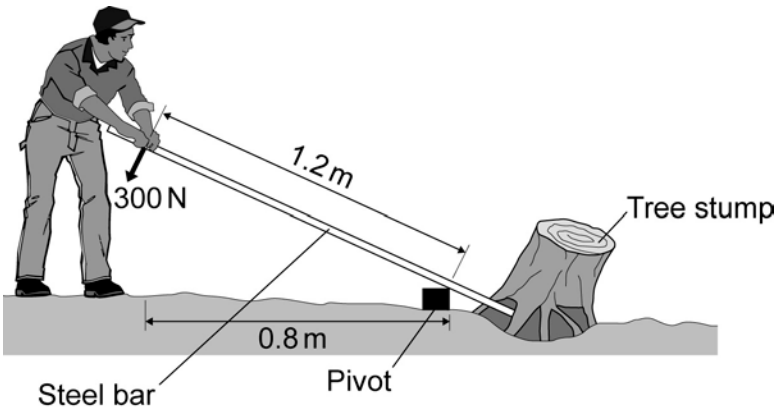
(3 marks)

6

Turn over for the next question

7 (a) The diagram shows a gardener using a steel bar to lever a tree stump out of the ground.



When the gardener pushes with a force of 300 N the tree stump just begins to move.

Calculate the moment produced by the gardener on the steel bar.

Write down the equation you use, and then show clearly how you work out your answer and give the unit.

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Moment = ...

(4 marks)

7 (b) Using a longer steel bar would have made it easier for the gardener to lever the tree stump out of the ground.

Explain why.

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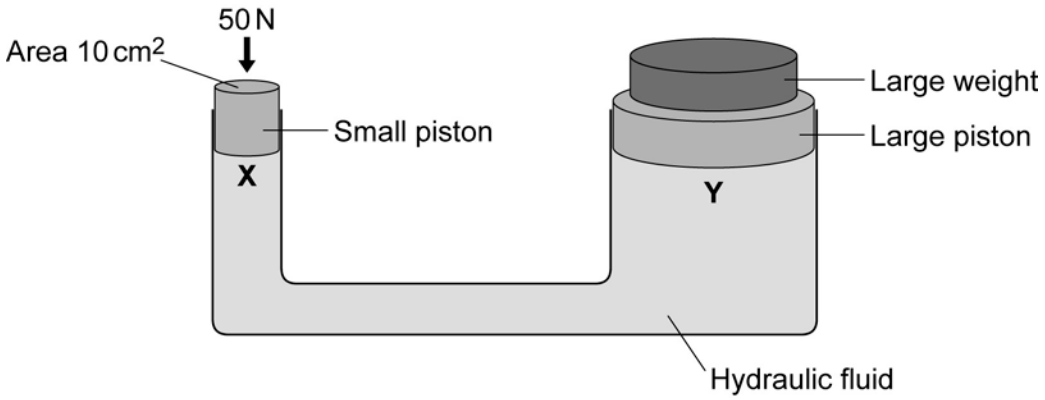
(3 marks)

7

Turn over for the next question

8 The diagram shows a simple hydraulic jack. The jack is designed to lift a large weight using a much smaller force.



8 (a) Complete the following sentence.

A hydraulic jack is an example of a..... multiplier.

(1 mark)

8 (b) Calculate the pressure, in N/cm^2, created on the small piston by the force of 50 N pushing downwards.

Write down the equation you use, and then show clearly how you work out your answer.

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Pressure = ... N/cm^2

(2 marks)

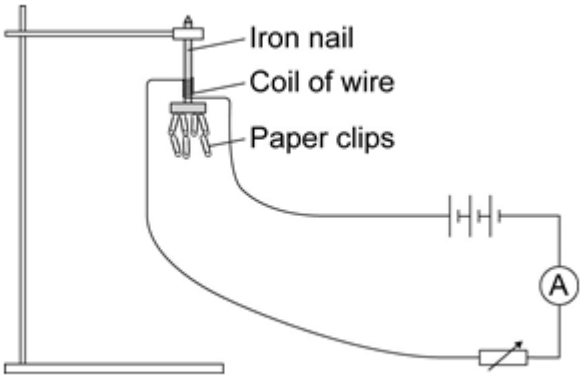
8 (c) Complete the following sentence.

The pressure at **Y** will be ..... the pressure at **X**.

(1 mark)

4

9 The diagram shows the equipment used by a student to investigate the strength of five different electromagnets.



The stronger the electromagnet, the more paper clips it will hold.

9 (a) Why is it important that the paper clips used in the investigation are all the same size?

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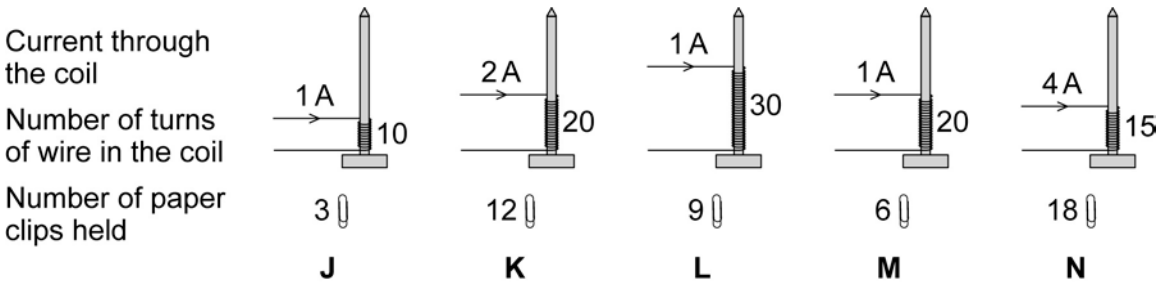
(1 mark)

Question 9 continues on the next page

9 (b) The five electromagnets, **J**, **K**, **L**, **M** and **N**, used by the student are shown below. Each electromagnet was made by wrapping lengths of insulated wire around identical iron nails.



The student wants to find out how the strength of an electromagnet depends on the number of turns of wire in the coil.

Which electromagnets should the student compare in order to do this?

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(1 mark)

9 (c) The student concluded:

'The strength of an electromagnet is always directly proportional to the number of turns on the coil.'

9 (c) (i) Explain how the data from the investigation supports the student's conclusion.

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(2 marks)

9 (c) (ii) The student makes one more electromagnet by winding 100 turns onto a nail.

Before testing the electromagnet, the student predicted the number of paper clips that the electromagnet would hold when the current is 1 amp.

How many paper clips should the student predict that the electromagnet would hold?

Show clearly how you work out your answer.

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Number of paper clips = ...

(2 marks)

9 (c) (iii) When the student tested the electromagnet it held 20 paper clips.
This is not what the student predicted.

Explain what the student should do when new data does not seem to support the prediction that was made.

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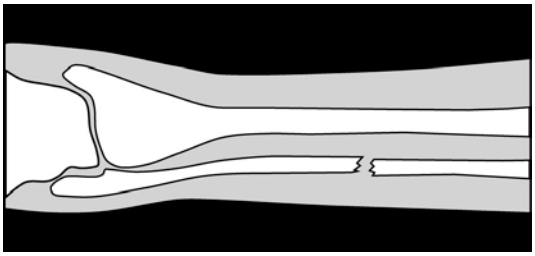
(3 marks)

9

10 Both X-ray machines and CT scanners are used to produce images of the body.

10 (a) The diagram shows an X-ray photograph of a broken leg.



Before switching on the X-ray machine, the radiographer goes behind a screen.

Explain why the radiographer does this.

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(3 marks)

10 (b) The following is an extract from a newspaper article.

> **X-rays cause 700 new cancers each year in the UK**
>
> Each year there are about 125 000 new cancer cases in the UK, of which about 700 may be due to the use of X-rays to diagnose illness.

The article was reporting on a scientific research project first published in a medical journal.

What evidence would the scientists have collected to come to the conclusion that X-rays can cause cancer?

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(2 marks)

10 (c) Explain the advantage of a CT scan compared to an X-ray.

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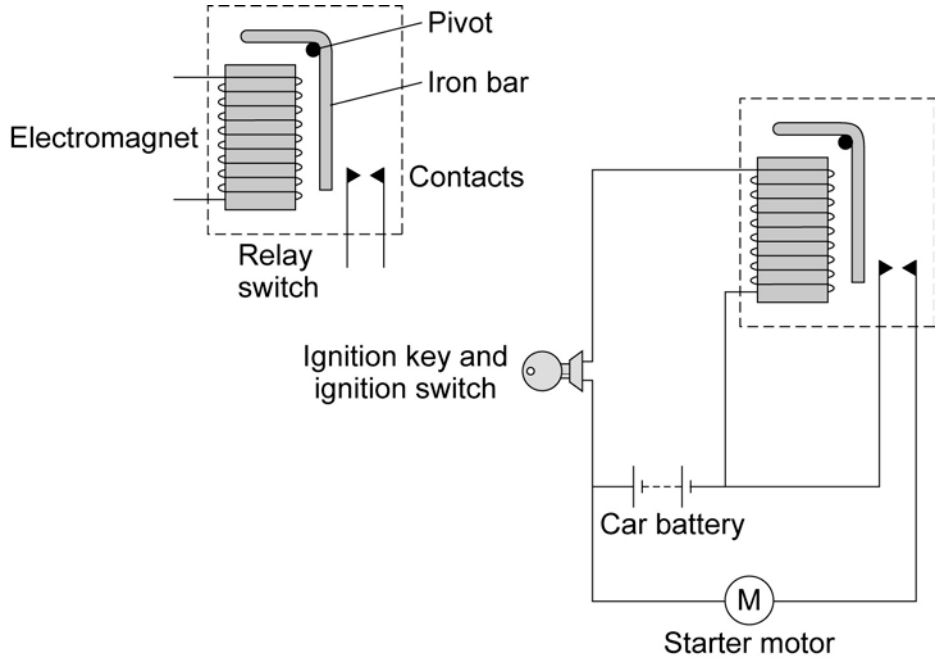
(2 marks)

7

11 *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The diagrams show a relay switch and how it is used in a car ignition circuit.



Turning the ignition key closes the ignition switch.
Explain how this causes the starter motor to operate.

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(6 marks)

END OF QUESTIONS

6

GCSE Physics Equations Sheet

Unit 3 Physics 3F

$s = v \times t$	s distance v speed t time
$\text{refractive index} = \frac{\sin i}{\sin r}$	i the angle of incidence r the angle of refraction
$\text{magnification} = \frac{\text{image height}}{\text{object height}}$	
$P = \frac{1}{f}$	P power of the lens f focal length
$T = \frac{1}{f}$	T periodic time f frequency
$M = F \times d$	M moment of the force F force d perpendicular distance from the line of action of the force to the pivot
$P = \frac{F}{A}$	P pressure F force A cross-sectional area
$\frac{V_p}{V_s} = \frac{n_p}{n_s}$	V_p potential difference across the primary coil V_s potential difference across the secondary coil n_p number of turns on the primary coil n_s number of turns on the secondary coil
$V_p \times I_p = V_s \times I_s$	V_p potential difference across the primary coil I_p current in the primary coil V_s potential difference across the secondary coil I_s current in the secondary coil