Surname	Centre Number	Candidate Number
Other Names		0

GCSE

0247/01

SCIENCE PHYSICS
FOUNDATION TIER
PHYSICS 3

A.M. THURSDAY, 24 May 2012

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**5**	
2.	**3**	
3.	**9**	
4.	**4**	
5.	**5**	
6.	**9**	
7.	**5**	
8.	**5**	
9.	**5**	
Total	**50**	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

A list of equations is printed on page 2 of the examination paper. In calculations you should show all your working.

EQUATIONS

speed = gradient of a distance-time graph

distance travelled = area under a velocity-time graph

acceleration = gradient of a velocity-time graph

$$a = \frac{v - u}{t}$$

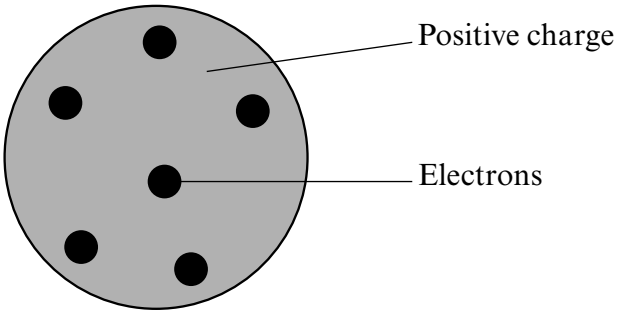
$$x = \frac{1}{2}(u + v)t$$

where u is the initial velocity,
v is the final velocity,
a is the acceleration,
t is the time,
x is the distance travelled,

momentum = mass × velocity

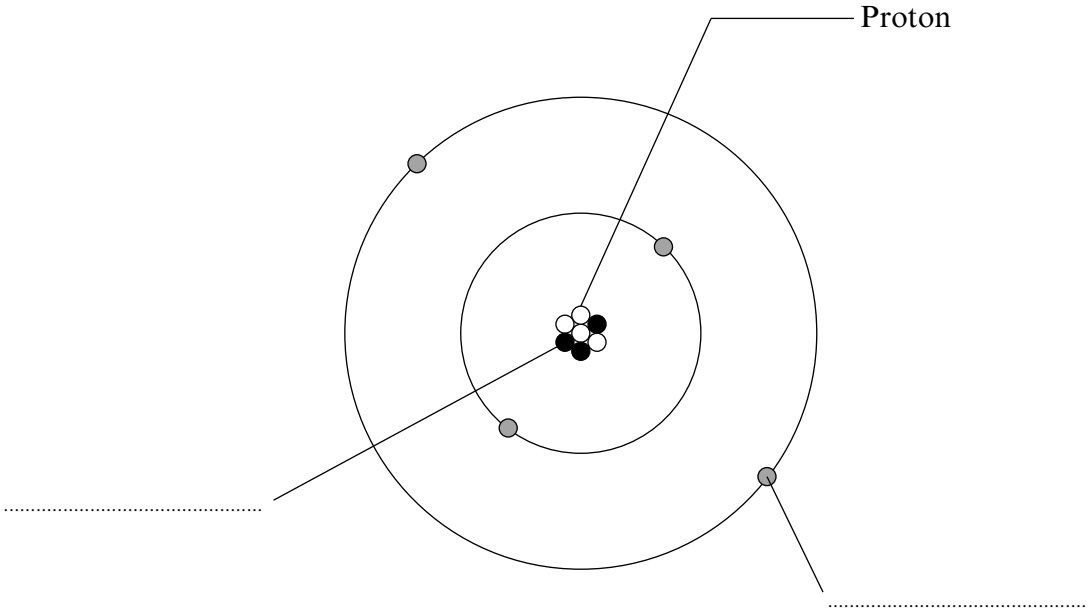
Answer **all** *questions*

1. J. J. Thomson thought that atoms were like a 'plum pudding'. His model is shown in the diagram below.



Plum pudding model

The current nuclear model is shown below.



(i) **Label** the diagram. [2]

(ii) Give **three** differences between Thomson's 'plum pudding' model and the nuclear model of the atom. [3]

1. .....

.....

2. .....

.....

3. .....

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2. Ultrasound scans are used to produce images of unborn babies.

Complete the sentences below by underlining the correct word or number in brackets. [3]

(i) The minimum frequency for ultrasound is (200 / 2000 / 20 000) Hertz.

(ii) The image of the baby is produced by the (refraction / reflection / diffraction) of ultrasound.

(iii) Ultrasound is a (longitudinal / transverse / seismic) wave.

3

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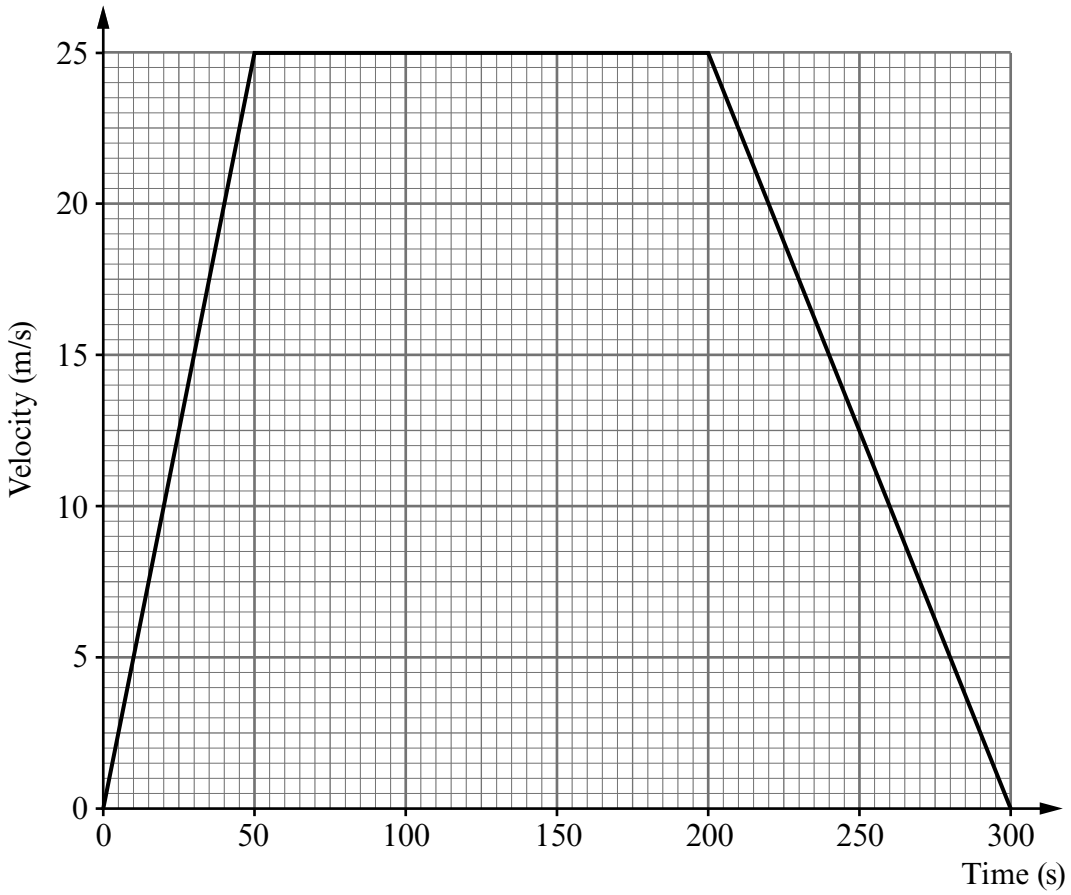
3. The velocity-time graph shows part of the journey of a train.



(a) The gradient of the line gives the acceleration of the train. The area under the line gives the distance travelled by the train.

(i) Calculate the initial acceleration of the train. [2]

Acceleration = ... m/s^2

(ii) Calculate the distance travelled when the train was travelling at a constant velocity. [2]

Distance travelled = ... m

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(b) The train travelled a total distance of 5625 m.
Use the equation

$$\text{mean velocity} = \frac{\text{distance}}{\text{time}}$$

to calculate the mean velocity of the journey shown on the graph. [2]

Mean velocity = ... m/s

(c) The train has a mass of 30 000 kg.
Use the graph and the equation

$$\text{momentum} = \text{mass} \times \text{velocity}$$

to describe how the momentum of the train changes over the 300 s journey. [3]

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9

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4. The diagrams show the nuclei of four different atoms.

Key
○ proton
● neutron


nucleus **A**


nucleus **B**


nucleus **C**


nucleus **D**

(i) Complete the table to show the nucleus that matches with each symbol. [3]

Symbol	Nucleus
$^{4}_{2}He$	.....
$^{7}_{3}Li$	.....
$^{3}_{2}He$	.....
$^{1}_{1}H$	.....

(ii) Which **two** nuclei are isotopes? ..... [1]

4

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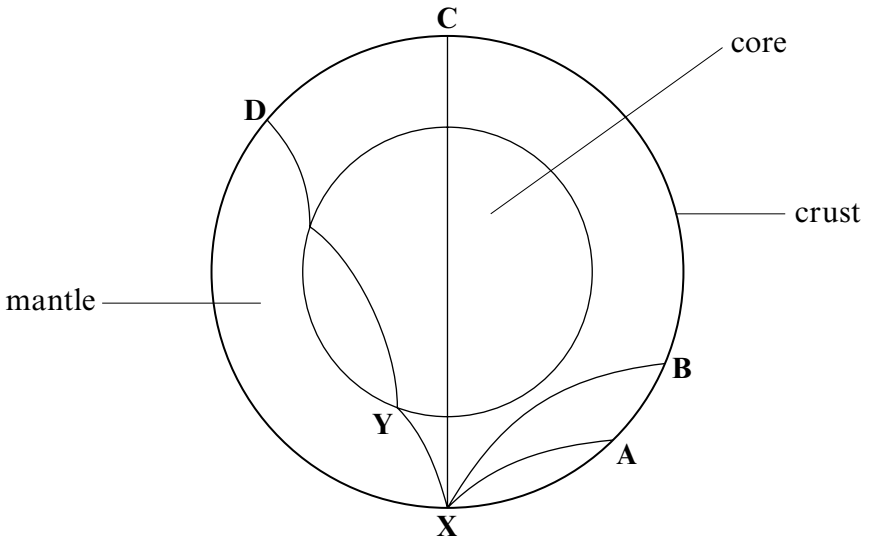
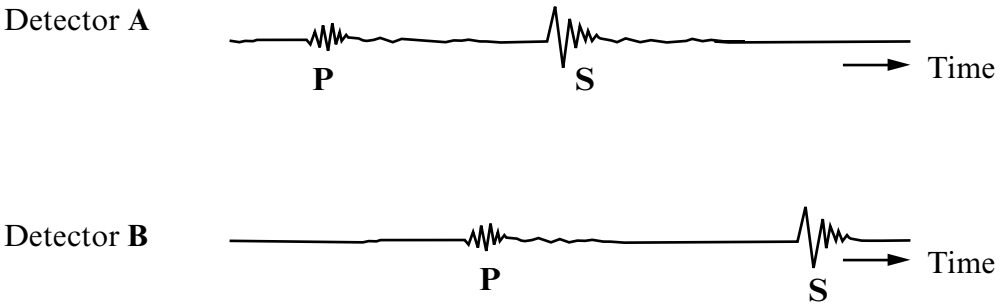
5. The diagram shows the paths of seismic waves through the Earth.



Detectors at **A** and **B** record the signals shown below.



(i) Give **one** reason why **P** and **S** waves arrive at **A** at different times. [1]

.....

.....

(ii) State **two** other differences between **P** and **S** waves. [2]

1. .....

.....

2. .....

.....

(iii) Explain why the signal received at **C** will be different from the signals at **A** and **B**. [2]

.....

.....

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6. *(a)* The table compares information about nuclear fusion and nuclear fission.

Nuclear Fission	Nuclear Fusion
Produces many highly radioactive particles.	Few radioactive particles are produced.
Fission is the splitting of a large atom into two or more smaller ones.	Fusion is the fusing of two or more lighter atoms into a larger one.
Slow speed neutrons are required.	High density, very high temperature environment is required.
Takes little energy to split two atoms in a fission reaction.	Extremely high energy is required to bring two or more nuclei close enough that nuclear forces overcome their electrostatic repulsion.
The energy released is 223 units per fission.	The energy released is 710 units per fusion.

Use the information in the table to answer the following questions.

(i) Give **two** advantages of producing energy from nuclear fusion. [2]

1. .....

.....

2. .....

.....

(ii) Explain why more energy is needed to start a nuclear fusion reaction. [2]

.....

.....

.....

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(iii) In nuclear fusion atoms are joined together to form a larger one. State how nuclear fission is different from this. [1]

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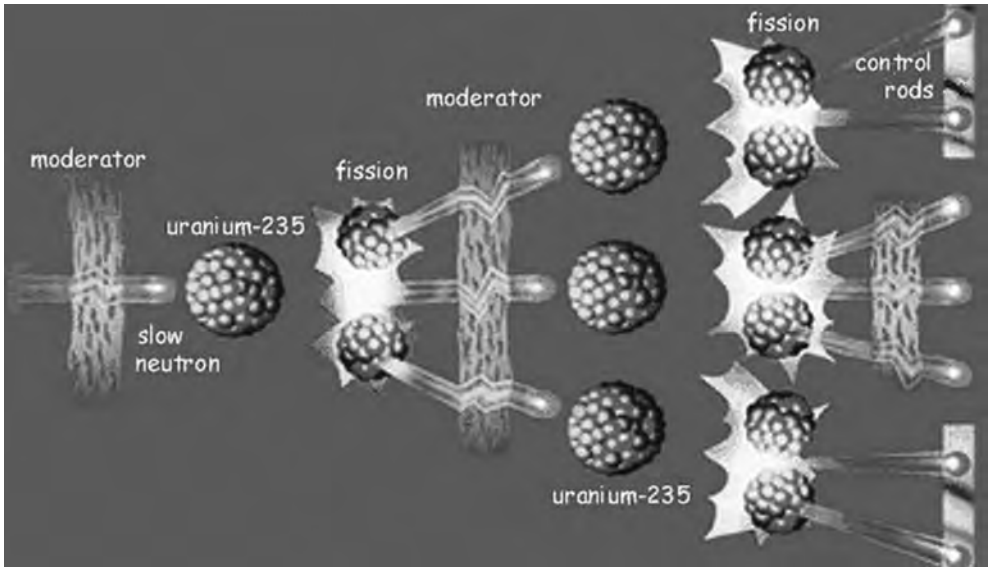
(b) The diagram shows the fission reaction in a nuclear reactor.



(i) Explain the purpose of the moderator. [2]

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(ii) Explain how an uncontrolled chain reaction is prevented. [2]

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9

Turn over.

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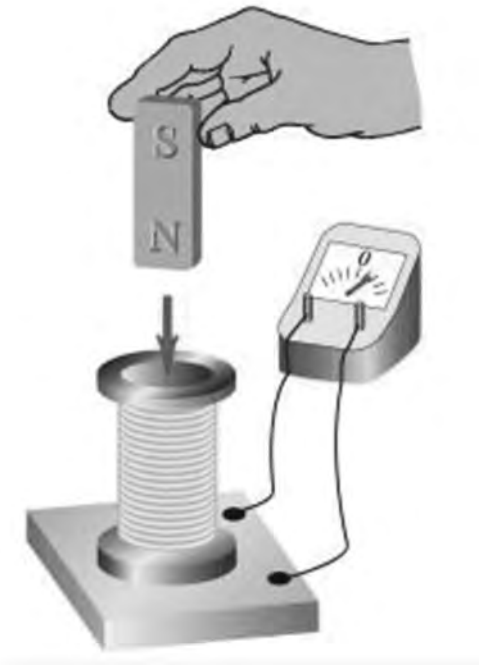
7. *(a)* Electromagnetic induction is investigated using a magnet and a coil of wire.



When the North Pole of the magnet is pushed into the coil, the meter needle flicks to the right and returns to the middle.

Complete the following sentences. [2]

(i) When the North Pole is pulled back out of the coil, the meter needle .....

.....

.....

(ii) When the South Pole of the magnet is pushed into the same end of the coil, the meter needle .....

.....

.....

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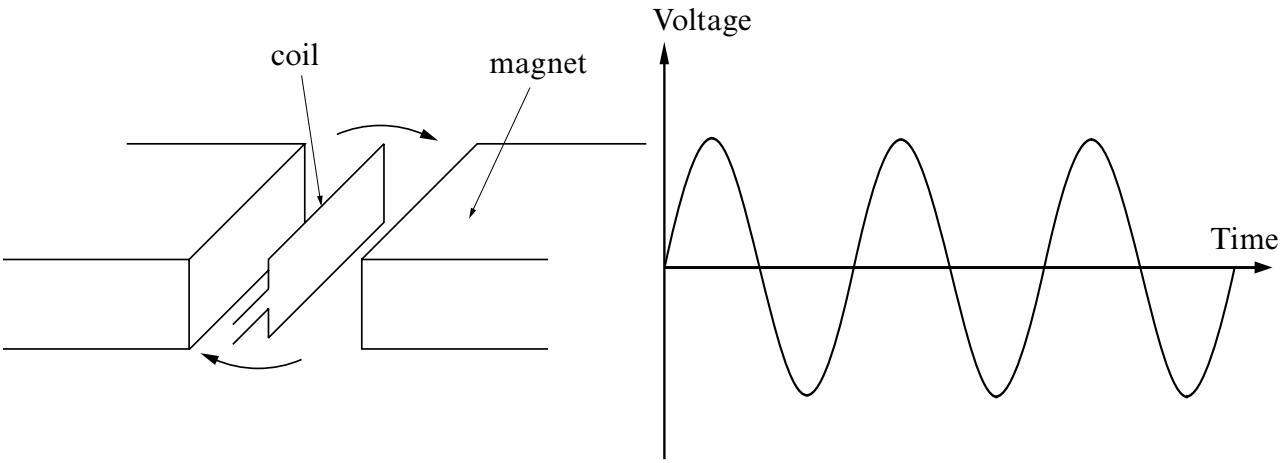
(b) The diagrams show a simple electrical generator and the alternating voltage it produces by electromagnetic induction.



The table below gives changes that could be made to the generator.
For each case, complete the table to show whether the voltage and frequency produced **decreases**, **stays the same** or **increases**. [3]

Change to generator	Effect on voltage	Effect on frequency
More turns on the coil	.....	.....
Spinning the coil slower	.....	.....
Using stronger magnets	.....	.....

5

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8. *(a)* A slinky spring can be used to demonstrate the difference between longitudinal and transverse waves.

Transverse wave

Direction of travel

Longitudinal wave

Explain the difference between the two types of waves. [3]

Use the following phrases in your explanation.

at right angles *the vibrations* *are parallel to* *direction of travel*

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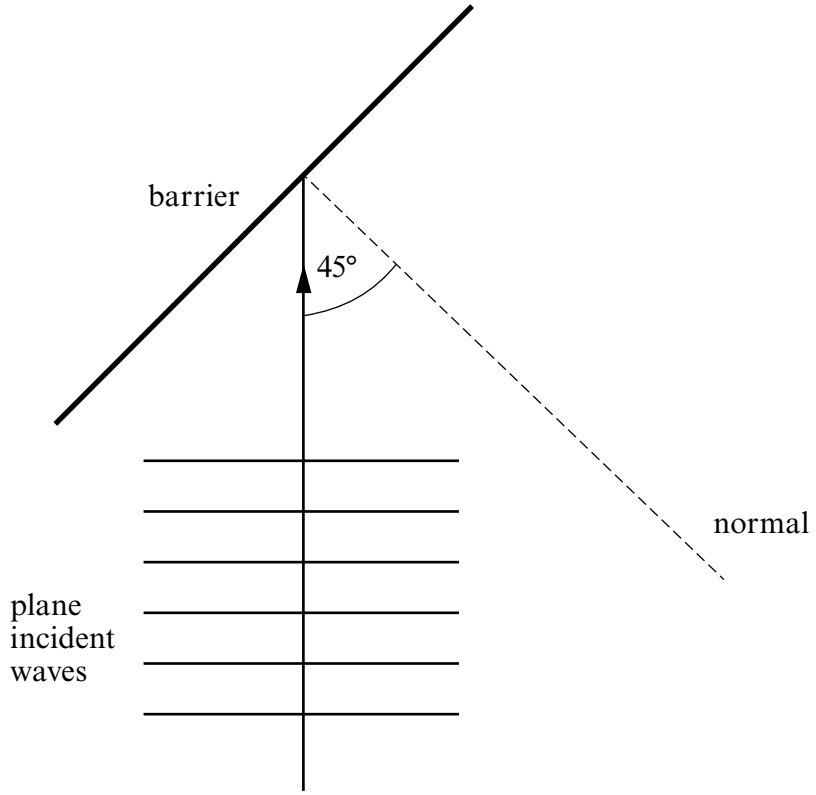
(b) The diagram shows plane waves arriving at a barrier. Complete the diagram to show the path of the reflected waves. [2]



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Turn over.

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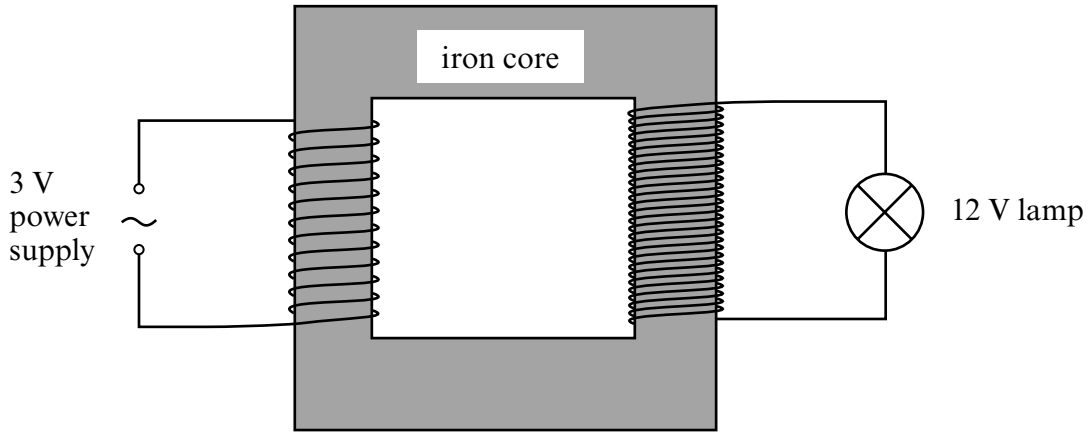
9. The diagram shows a step-up transformer designed to light a 12 V lamp from a 3 V power supply.



(a) (i) How can you tell from the diagram that this is a step-up transformer? [1]

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.....

(ii) Describe the purpose of the iron core. [1]

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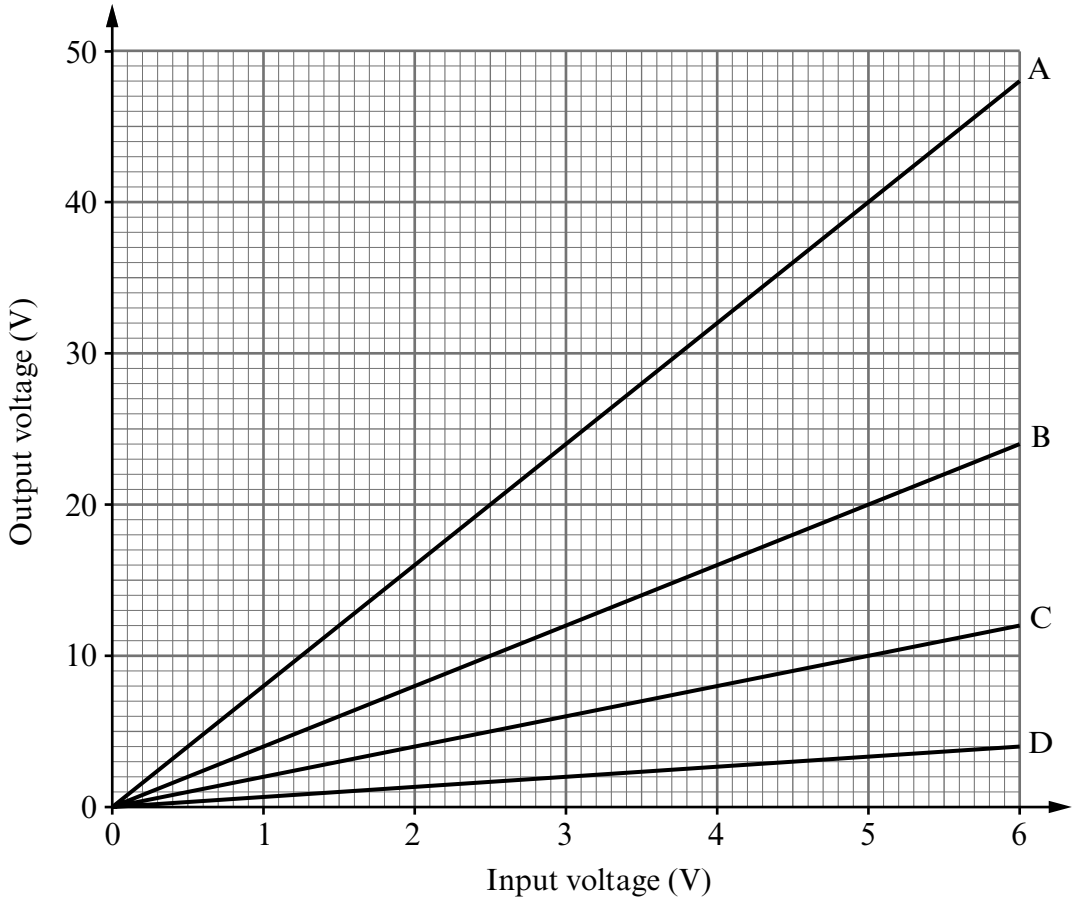
(b) Four different transformers, A, B, C and D are investigated. For each transformer, the input voltage is changed and the output voltage measured each time. The results for each transformer are shown by the graphs.



Use the graphs to answer the following questions.

(i) Which transformer, A, B, C or D, would be used to light the 12 V lamp to normal brightness, from a 3 V supply? [1]

.....

(ii) Which transformer is a step-down transformer? ..... [1]
Give a reason for your answer. [1]

.....

.....

5

THERE ARE NO MORE QUESTIONS IN THE EXAMINATION.

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