Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number	Candidate Number

Physics

Unit P3: Applications of Physics

Foundation Tier

Friday 19 June 2015 – Morning
Time: 1 hour

Paper Reference
5PH3F/01

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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PEARSON

FORMULAE

You may find the following formulae useful

power of lens = $\frac{1}{\text{focal length}}$

frequency = $\frac{1}{\text{time period}}$ $f = \frac{1}{T}$

The relationship between temperature and volume for a gas $V_1 = \frac{V_2 T_1}{T_2}$

The relationship between volume and pressure for a gas $V_1 P_1 = V_2 P_2$

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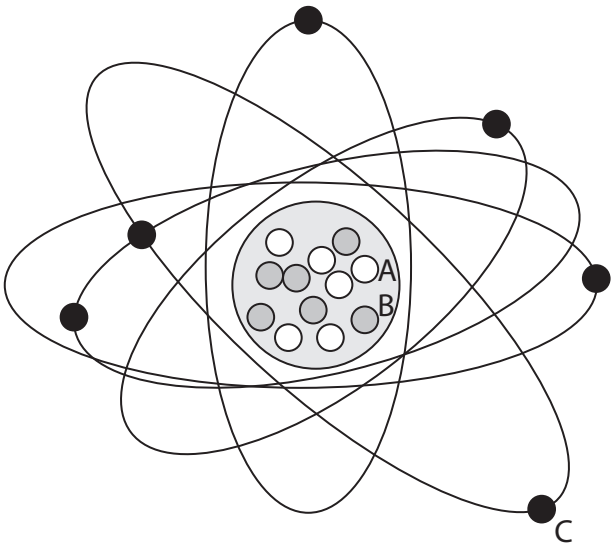
Answer ALL questions.

Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Radioactivity and atoms

1 The diagram shows an atom of carbon.

A, B and C are three different particles.



Not to scale

Key

A	○
B	◌
C	●

(a) (i) Name the three different particles shown.

(3)

A = ...

B = ...

C = ...

(ii) What is the mass (nucleon) number of this carbon atom?

(1)

.....

(b) Which **one** of these statements about alpha radiation is correct?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** Alpha radiation has no charge.

☒ **B** Alpha radiation is very ionising.

☒ **C** Alpha radiation travels very far in air.

☒ **D** Alpha radiation is an electromagnetic wave.

(c) Choose words from the box to complete the following sentences.

Words may be used once, more than once or not at all.

alpha	beta	gamma	positron

The radiation that is a wave is .....

(1)

The particle that is negatively charged is .....

(1)

(d) When an atom emits an alpha particle its nucleus changes.

Which describes the changes in the nucleus?

Put a cross (☒) in the box next to your answer.

(1)

	proton number	**mass number**
☒ **A**	decreases by 2	decreases by 4
☒ **B**	increases by 2	decreases by 4
☒ **C**	decreases by 2	increases by 4
☒ **D**	increases by 2	increases by 4

(Total for Question 1 = 8 marks)

Kinetic theory and gases

2 (a) Kinetic theory describes the movement of particles in the three states of matter.

Gas is one of the states of matter.

(i) Name the other two states of matter.

(2)

1 .....

2 .....

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The average kinetic energy of the particles in a gas is directly proportional to

(1)

☒ **A** the pressure of the gas

☒ **B** the temperature of the gas measured in degrees Celsius

☒ **C** the temperature of the gas measured in Kelvin

☒ **D** the volume of the gas

(b) The photograph shows an oxygen cylinder that can be used in an ambulance.

(i) Explain how particles of oxygen gas exert a pressure on the inside of the cylinder.

(2)

.....

.....

.....

.....

(ii) This cylinder can release 340 litres of oxygen at a pressure of 101 000 Pa.

The inside volume of the cylinder is 2.5 litres.

Use the equation

$$P_2 = \frac{P_1 V_1}{V_2}$$

to calculate the pressure of the oxygen in the cylinder before the gas is released.

(3)

pressure of oxygen = ... Pa

(Total for Question 2 = 8 marks)

X-rays

3 (a) A CAT scanner uses X-rays.

It is used in hospitals to 'see' inside the body.

(i) Describe **one** other use of X-rays.

(2)

.....

.....

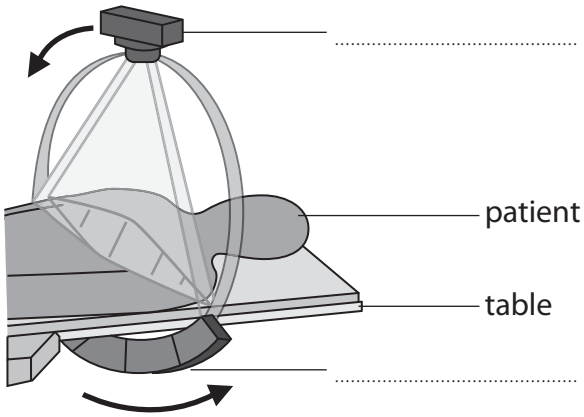
.....

.....

(ii) The diagram shows a CAT scanner in use.

Label the two parts of the scanner.

(2)



(b) A beam of electrons is needed to produce X-rays.

Explain how this beam of electrons is produced.

(2)

.....

.....

.....

.....

.....

(c) People can be protected from X-rays by using an absorber.

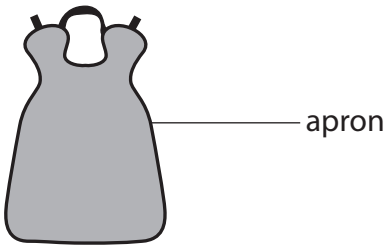
(i) Which of these materials is the best absorber of X-rays?

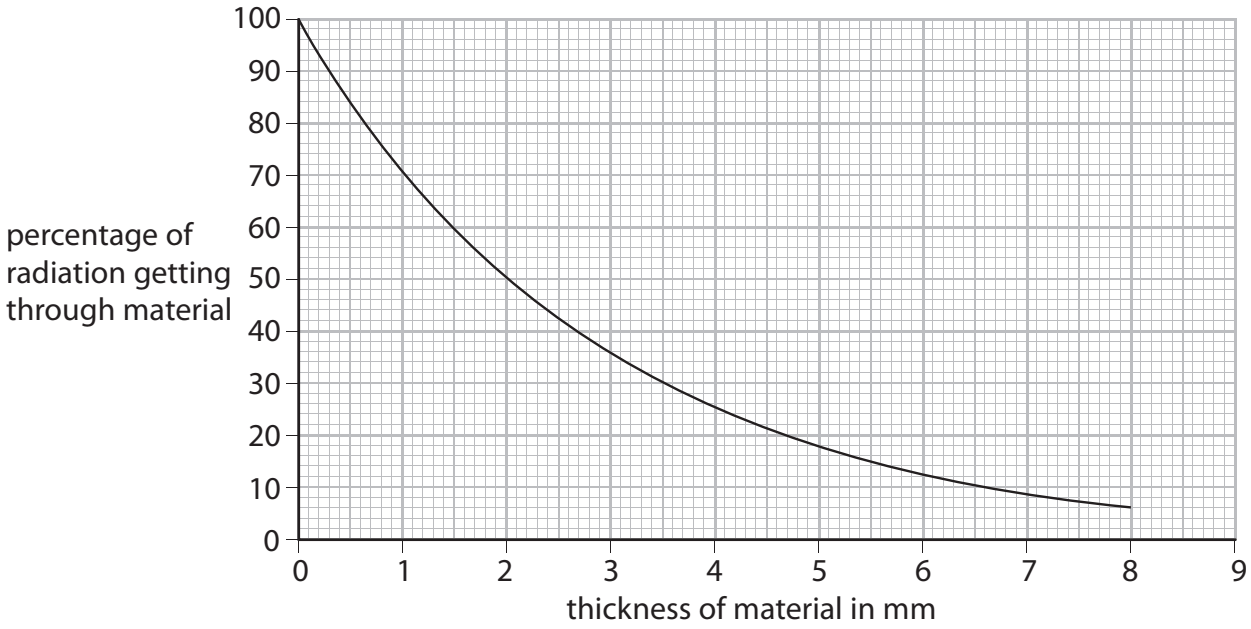
Put a cross (☒) in the box next to your answer.

(1)

- ☒ **A** aluminium
- ☒ **B** copper
- ☒ **C** glass
- ☒ **D** lead

(ii) A new material is used to make an apron to protect people from X-rays.





Describe the relationship shown on the graph using data from the graph.

(3)

.....

.....

.....

.....

.....

(Total for Question 3 = 10 marks)

Cyclotrons and collisions

4 (a) Cyclotrons are used to make radioactive isotopes for medical purposes.

Charged particles move in a circular path.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The field used to keep charged particles moving in a circular path in a cyclotron is

(1)

☒ **A** nuclear

☒ **B** magnetic

☒ **C** gravitational

☒ **D** electric

(ii) State what causes the charged particles to increase their speed as they go around the cyclotron.

(1)

.....

(iii) Describe how scientists use the charged particles from a cyclotron to produce radioactive isotopes.

(2)

.....

.....

.....

.....

(b) Some radioactive isotopes emit positrons.

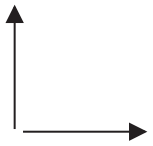
Positrons are used to make gamma rays.

When a positron annihilates an electron, two gamma rays are produced.

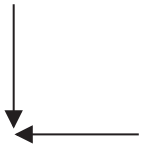
(i) Which diagram shows the directions of the two gamma rays produced?

Put a cross (☒) in the box next to your answer.

(1)



☒ **A**



☒ **B**

☒ **C**

☒ **D**

(ii) Explain how charge is conserved when an electron annihilates a positron.

(3)

.....

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(iii) Explain how mass and energy are conserved when an electron annihilates a positron.

(2)

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(Total for Question 4 = 10 marks)

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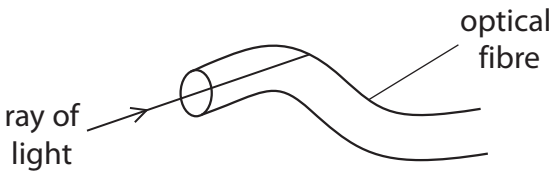
Scanning – endoscopy

5 (a) An endoscope uses glass fibres to enable doctors to 'see' inside a person.



Complete the sentence by putting a cross (☒) in the box next to your answer.

Rays of light travel along the glass fibres by

(1)

☒ **A** total internal correction

☒ **B** total internal diffraction

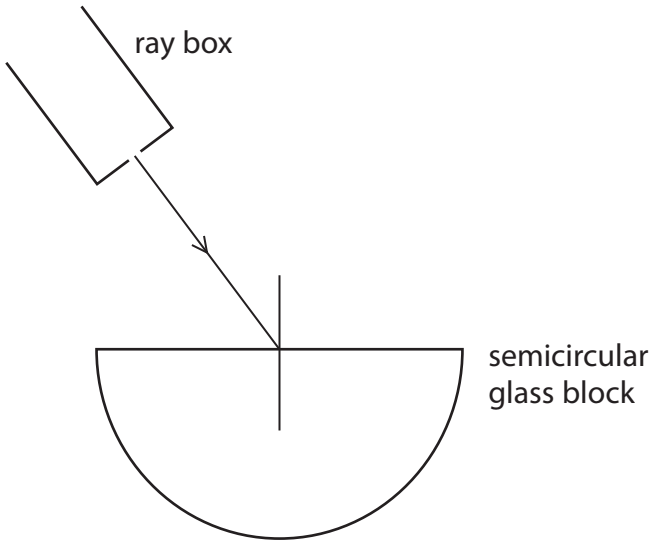
☒ **C** total internal reflection

☒ **D** total internal refraction

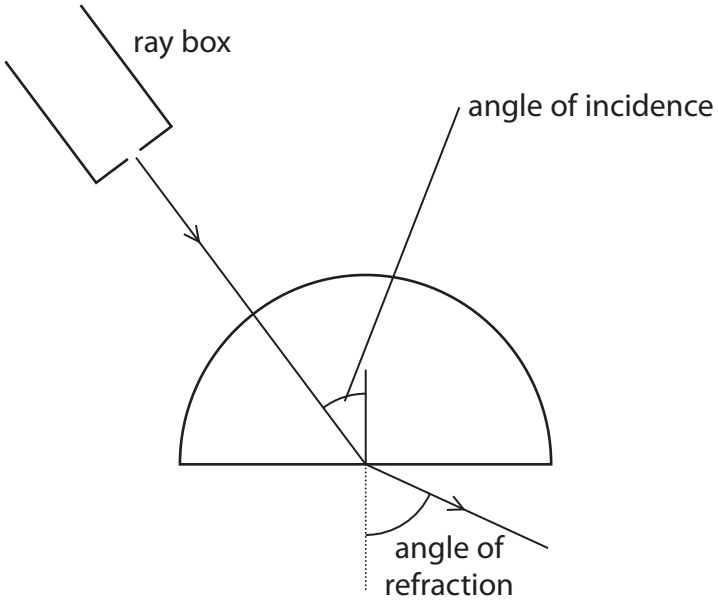
(b) The diagram shows a ray box shining a ray of light at a semicircular glass block.

Complete the diagram to show the path of the ray of light inside the glass block.

(2)

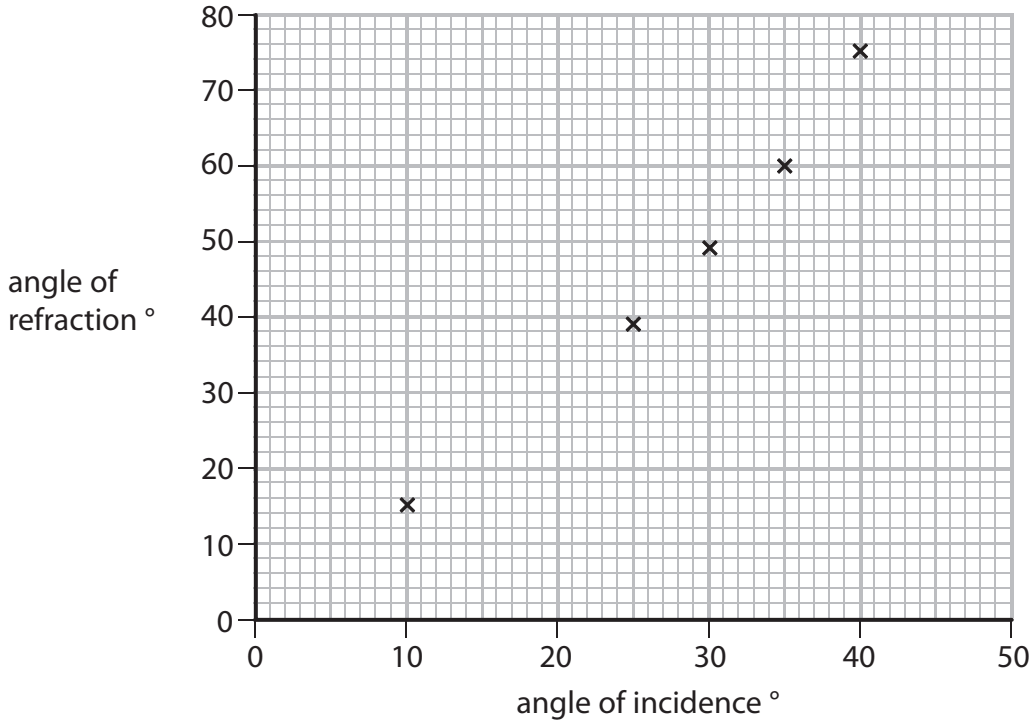


(c) A student shines a ray of light into the block as shown.



He measures the angle of incidence inside the block as shown.
He measures the angle of refraction outside the block as shown.
He repeats these measurements for different angles of incidence.
He records his results in this table and plots a graph.

angle of incidence °	10	15	20	25	30	35	40
angle of refraction °	15	23	31	39	49	60	75



(i) Two points are highlighted in the table.

Plot these points on the graph.

(2)

(ii) Draw the curve of best fit.

(1)

*(iii) The student continues to increase the angle of incidence until it reaches 80°.

The critical angle for this glass is 42°.

Explain what happens to the ray of light as the angle of incidence is increased from 10° to 80°.

(6)

(Total for Question 5 = 12 marks)

Radiation in medicine

6 (a) Many different types of radiation are used by doctors.

Which type of radiation comes from radioactive sources?

Put a cross (☒) in the box next to your answer.

(1)

- ☒ **A** gamma rays
- ☒ **B** ultrasound
- ☒ **C** ultraviolet
- ☒ **D** X-rays

(b) Explain how radiation from radioactive sources can be dangerous to people.

(2)

(c) Medical staff who use radioactive materials need more protection than their patients.

Describe some precautions that medical staff can take to ensure their safety from radioactive materials.

(3)

*(d) Describe how radioactive materials can be used in the diagnosis and treatment of some illnesses.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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