Do not write outside the box

[1 mark]

1 2 An electron collides with an isolated atom and raises an atomic electron to a higher energy level.

Which statement is correct?

[1 mark]

A The colliding electron is captured by the nucleus of the atom. ⬭

B A photon is emitted when the electron rises to the higher energy level. ⬭

C An electron is emitted when the excited electron returns to the ground state. ⬭

D The colliding electron transfers energy to the atomic electron. ⬭

Turn over for the next question

Turn over ▶

1 **3** Which graph shows the variation of momentum p with wavelength λ of a photon?

[1 mark]

A

B

C

D

A ⬭

B ⬭

C ⬭

D ⬭

2
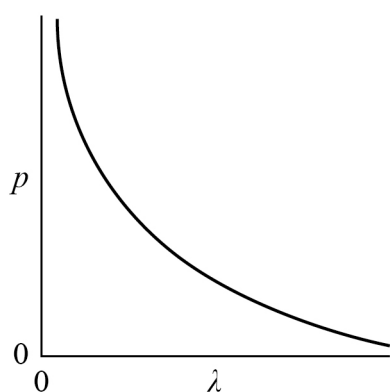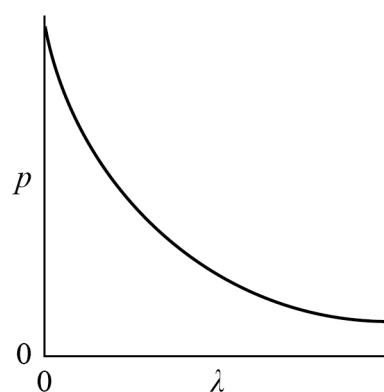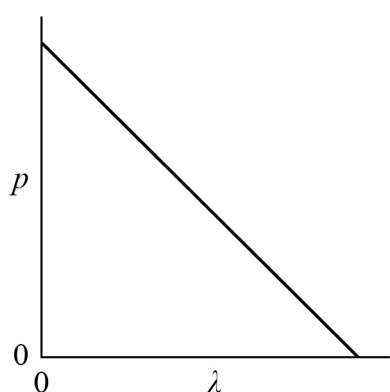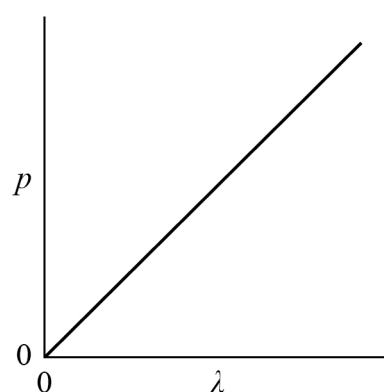
Section A

Answer **all** questions in this section.

0 1 . 1 Two isotopes of iodine are $^{125}_{53}$ I and $^{131}_{53}$ I.

Determine, for these two isotopes, the difference between the constituents of the nuclei.

[1 mark]

_____

_____

0 1 . 2 A $^{131}_{53}$ I nuclide undergoes beta (β^-) decay to form a xenon nuclide.

State the nucleon number of the xenon nuclide.

[1 mark]

_____

0 1 . 3 A $^{125}_{53}$ I nuclide decays by electron capture to form a tellurium nuclide.

State **two** differences between the constituents of the iodine nucleus and the tellurium nucleus it decays into.

[2 marks]

_____

_____

_____

_____

Section B

Each of Questions **8** to **32** is followed by four responses, **A**, **B**, **C** and **D**.

For each question select the best response.

Only **one** answer per question is allowed.
For each question completely fill in the circle alongside the appropriate answer.

CORRECT METHOD ● WRONG METHODS ⊗ ◉ ⬭ ⌀

If you want to change your answer you must cross out your original answer as shown. ⊠
If you wish to return to an answer previously crossed out, ring the answer you now wish to select as shown. ⊖

You may do your working in the blank space around each question but this will not be marked.
Do **not** use additional sheets for this working.

0 8 The process of beta plus (β⁺) decay can be represented by
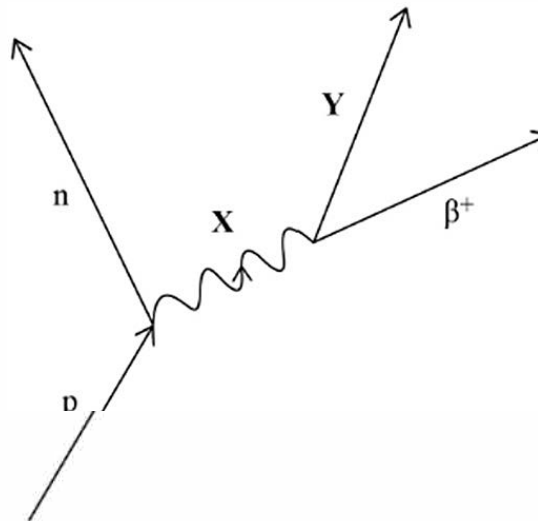
Which row identifies particles **X** and **Y**?

[1 mark]

	X	Y	
A	W^+	ν_e	○
B	W^+	$\overline{\nu_e}$	○
C	W^-	ν_e	○
D	W^-	$\overline{\nu_e}$	○

0 9 An electron collides with an isolated atom and raises an orbiting electron to a higher energy level.

Which statement is correct?

[1 mark]

A The colliding electron is captured by the nucleus of the atom. ⬭

B A photon is emitted when the electron rises to the higher energy level. ⬭

C An electron is emitted when the excited electron returns to the ground state. ⬭

D Energy is transferred from the colliding electron to the orbiting electron. ⬭

1 0 Light of frequency 2.0×10^{15} Hz is incident on a metal surface. The work function of the metal is 4.6×10^{-19} J.

Which statement is correct?

[1 mark]

A No photoelectrons are released. ⬭

B Photoelectrons are released with a maximum kinetic energy of 3.1×10^{-19} J. ⬭

C Photoelectrons are released with a maximum kinetic energy of 8.7×10^{-19} J. ⬭

D Photoelectrons are released with a maximum kinetic energy of 18×10^{-19} J. ⬭

1 1 A photon of ultraviolet radiation has a frequency of 1.5×10^{15} Hz.

What is the momentum of the photon?

[1 mark]

A 3.3×10^{-41} kg m s^{-1} ⬭

B 1.3×10^{-40} kg m s^{-1} ⬭

C 3.3×10^{-27} kg m s^{-1} ⬭

D 1.3×10^{-26} kg m s^{-1} ⬭

Turn over ▶

2 2   Charged plates **X** and **Y** have a potential difference 1.5 V between them.

X   **Y**

0 V   +1.5 V

Which particle gains 3.0 eV of kinetic energy when moving from **Y** to **X**?

[1 mark]

A proton   ☐

B positron   ☐

C electron   ☐

D alpha particle   ☐

Turn over for the next question

Turn over ▶