

AQA 1 Questions – The Atom and Specific Charge (set 2)

June 12 Q2

2 (a) The nucleus of a particular atom has a *nucleon number* of 14 and a *proton number* of 6.

2 (a) (i) State what is meant by nucleon number and proton number.

nucleon number

.....

.....

proton number

.....

.....

(1 mark)

2 (a) (ii) Calculate the number of neutrons in the nucleus of this atom.

answer =

(1 mark)

2 (a) (iii) Calculate the specific charge of the nucleus.

answer = C kg^{-1}

(3 marks)

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2 (b) The specific charge of the nucleus of another isotope of the element is $4.8 \times 10^7 \text{ C kg}^{-1}$.

2 (b) (i) State what is meant by an isotope.

.....

.....

.....

(2 marks)

2 (b) (ii) Calculate the number of neutrons in this isotope.

answer =
(3 marks)

AQA 1 Questions – The Atom and Specific Charge (set 2)

Jan 13 Q1

1 (a) Name the constituent of an atom which

1 (a) (i) has zero charge,

.....
(1 mark)

1 (a) (ii) has the largest specific charge,

.....
(1 mark)

1 (a) (iii) when removed leaves a different isotope of the element.

.....
(1 mark)

1 (b) The equation



represents the decay of technetium-99 by the emission of a β^- particle.

1 (b) (i) Identify the particle X.

.....
(1 mark)

1 (b) (ii) Determine the values of A and Z.

A =

Z =

(2 marks)

1 (b) (iii) Calculate the specific charge of the technetium-99 (${}_{43}^{99}\text{Tc}$) nucleus. State an appropriate unit for your answer.

specific charge = unit
(4 marks)

AQA 1 Questions – The Atom and Specific Charge (set 2)

June 13 Q1

1 An atom of calcium, ${}^{48}_{20}\text{Ca}$, is ionised by removing two electrons.

1 (i) State the number of protons, neutrons and electrons in the ion formed.

protons

neutrons

electrons

(3 marks)

1 (ii) Calculate the charge of the ion.

charge C
(1 mark)

1 (iii) Calculate the specific charge of the ion.

specific charge C kg^{-1}
(2 marks)

AQA 1 Questions – The Atom and Specific Charge (set 2)

June 14 Q2

- 2 (a) Table 2 contains data for four different nuclei, P, Q, R and S.

Table 2

Nuclei	Number of neutrons	Nucleon number
P	5	11
Q	6	11
R	8	14
S	9	17

- 2 (a) (i) Which nucleus contains the fewest protons?

[1 mark]

nucleus

- 2 (a) (ii) Which **two** nuclei are isotopes of the same element?

[1 mark]

nuclei and

- 2 (a) (iii) State and explain which nucleus has the smallest specific charge.

[2 marks]

.....

.....

.....

.....

.....

.....

- 2 (a) (iv) Complete the following equation to represent β^- decay of nucleus R to form nucleus X.

[3 marks]



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- 2 (b) (i) The strong nuclear force is responsible for keeping the protons and neutrons bound in a nucleus.
Describe how the strong nuclear force between two nucleons varies with the separation of the nucleons, quoting suitable values for separation.

[3 marks]

.....

.....

.....

.....

.....

.....

- 2 (b) (ii) Another significant interaction acts between the protons in the nucleus of an atom.
Name the interaction and name the exchange particle responsible for the interaction.

[2 marks]

Interaction

Exchange particle

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June 15 Q1

- 1 **Table 1** contains five statements that refer to isotopes and some radium isotopes.

Table 1

	$^{223}_{88}\text{Ra}$	$^{224}_{88}\text{Ra}$	$^{225}_{88}\text{Ra}$	$^{226}_{88}\text{Ra}$
Isotope with the smallest mass number	✓			
Isotope with most neutrons in nucleus				
Isotope with nucleus which has the largest specific charge				
Isotope decays by β^- decay to form $^{225}_{89}\text{Ac}$				
Isotope decays by alpha decay to form $^{220}_{86}\text{Rn}$				

- 1 (a) Complete **Table 1** by ticking **one** box in each row to identify the appropriate isotope. The first row has been completed for you.

[4 marks]

- 1 (b) (i) An atom of one of the radium isotopes in **Table 1** is ionised so that it has a charge of $+3.2 \times 10^{-19} \text{ C}$.

State what happens in the process of ionising this radium atom.

[1 mark]

.....

.....

- 1 (b) (ii) The specific charge of the ion formed is $8.57 \times 10^5 \text{ C kg}^{-1}$.

Deduce which isotope in the table has been ionised. Assume that both the mass of a proton and the mass of a neutron in the nucleus is $1.66 \times 10^{-27} \text{ kg}$.

[3 marks]

isotope =

AQA 1 Questions – The Atom and Specific Charge (set 2)

June 16 Q1

1 The element uranium has an isotope $^{237}_{92}\text{U}$.

1 (a) Explain what is meant by an isotope.

[2 marks]

1 (b) Determine the charge in coulomb of the $^{237}_{92}\text{U}$ nucleus.

[2 marks]

charge = _____ C

1 (c) A positive ion of $^{237}_{92}\text{U}$ has a charge of $+4.80 \times 10^{-19} \text{ C}$.

Determine the number of electrons in the ion.

[2 marks]

number of electrons = _____

1 (d) $^{237}_{92}\text{U}$ decays by β^- emission to form an isotope of neptunium (Np).

Complete the equation for this decay.

[3 marks]

