Atomic Number and Mass Number

Name: _____ **Class:** _____ **Date:** _____

Part A – Key Concepts (8 marks)

1. Define the following terms.

a) Atomic Number

_____ (2)

b) Mass Number

_____ (2)

2. Complete the statements.

a) The atomic number is equal to the number of _____. (1)

b) In a neutral atom, the number of electrons equals the number of _____. (1)

c) The mass number is equal to the number of _____ plus _____. (2)

Part B – Understanding Atomic Notation (10 marks)

3. The following is the standard nuclear notation for carbon.

$^{12}_{6}C$

Complete the table.

Quantity	Answer
Atomic Number	_____
Mass Number	_____
Number of Protons	_____
Number of Neutrons	_____
Number of Electrons	_____

(5)

4. Interpret the following atoms. (8)

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Atomic Number and Mass Number

Atom	Protons	Neutrons	Electrons
$^{23}_{11}Na$			
$^{24}_{12}Mg$			
$^{35}_{17}Cl$			
$^{40}_{20}Ca$			

Part C – Applying Knowledge (12 marks)

5. Complete the table. (10)

Element	Atomic Number	Mass Number	Protons	Neutrons	Electrons
Nitrogen	7	14			
Oxygen	8	16			
Sodium	11	23			
Aluminium	13	27			
Calcium	20	40			

6. Explain why the following statement is incorrect. (2)

"Two different elements can have the same atomic number."

Part D – Isotopes and Atomic Number (8 marks)

7. Carbon has two common isotopes: $^{12}_{6}C$ and $^{14}_{6}C$

a) What is the same about these atoms? (2)

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b) What is different? (2)

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c) Explain why both atoms are still carbon. (4)

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Part E – Interpreting Data (8 marks)

The table below shows information about several atoms.

Atom	Atomic Number	Mass Number
A	3	7
B	8	18
C	15	31
D	17	37

8. Complete the table. (8)

Atom	Protons	Neutrons	Electrons
A			
B			
C			
D			

Part F – Higher Order Thinking (4 marks)

9. A student says: "Mass number identifies an element."

Do you agree? Explain your answer using scientific evidence. (4)

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Atomic Number and Mass Number

Extension Challenge (Optional)

10.

Element X has an atomic number of 26.

One atom has a mass number of 56.

Another atom has a mass number of 57.

Explain:

- why these atoms are the same element,
- how they are different,
- and what they are called.

Reflection

How confident do you feel?

□ Very confident

□ Mostly confident

□ Need more practice

□ Need help

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Atomic Number and Mass Number

Total: 50 Marks

This worksheet deliberately moves from **definitions** to **interpretation**, **calculation**, and finally **scientific reasoning**, making it suitable for a mainstream high school chemistry class while directly addressing all five learning targets. It would also pair well with a follow-up activity where students build or decode atomic notation cards and justify their reasoning before completing the worksheet.

Mark Scheme

Atomic Number and Mass Number

Total Marks: 50

Part A – Key Concepts (8 marks)

Question 1a

Define atomic number. (2 marks)

Award:

- **2 marks** – The number of protons in the nucleus of an atom.
- **1 mark** – Mentions protons but definition is incomplete.
- **0 marks** – Incorrect answer.

Question 1b

Define mass number. (2 marks)

Award:

- **2 marks** – Total number of protons and neutrons in the nucleus.
- **1 mark** – Mentions protons and neutrons but incomplete.
- **0 marks** – Incorrect.

Question 2

a) protons (1)

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b) protons (1)

c) protons and neutrons (2)

Part B – Understanding Atomic Notation (10 marks)

Question 3

$^{12}_{6}C$

Quantity	Answer	Marks
Atomic number	6	1
Mass number	12	1
Protons	6	1
Neutrons	6	1
Electrons	6	1

Total: 5 marks

Question 4

Atom	Protons	Neutrons	Electrons
$^{23}_{11}Na$	11	12	11
$^{24}_{12}Mg$	12	12	12
$^{35}_{17}Cl$	17	18	17
$^{40}_{20}Ca$	20	20	20

Award:

- 0.5 mark per correct entry
- 12 correct entries × 0.5 = **6 marks**

*(Although the worksheet originally listed 8 marks, this section naturally awards 6 marks. To keep the worksheet total at 50, I recommend changing Question 4 to **6 marks**.)*

Part C – Applying Knowledge (12 marks)

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Atomic Number and Mass Number

Question 5

Element	Protons	Neutrons	Electrons
Nitrogen	7	7	7
Oxygen	8	8	8
Sodium	11	12	11
Aluminium	13	14	13
Calcium	20	20	20

Award:

- 0.5 mark per correct entry
- 15 correct entries × 0.5 = **7.5 marks**

Round to **8 marks**.

Question 6

Explain why this statement is incorrect.

"Two different elements can have the same atomic number."

Response	Marks
Explains that atomic number equals the number of protons and each element has a unique number of protons.	2
Mentions unique atomic number but explanation lacks detail.	1
Incorrect.	0

Part D – Isotopes (8 marks)

Question 7a

Same number of protons (or same atomic number).

2 marks

Question 7b

Different numbers of neutrons (or different mass numbers).

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Atomic Number and Mass Number

2 marks

Question 7c

Possible answer:

Both atoms have six protons. The atomic number determines the identity of an element, so both atoms are carbon even though they contain different numbers of neutrons.

Response	Marks
Complete explanation including atomic number and protons.	4
Correct explanation but missing one idea.	3
Basic explanation.	2
Limited attempt.	1
Incorrect.	0

Part E – Interpreting Data (8 marks)

Question 8

Atom	Protons	Neutrons	Electrons
A	3	4	3
B	8	10	8
C	15	16	15
D	17	20	17

Award:

- 0.5 mark per correct answer

12 correct entries

= **6 marks**

*(Again, I recommend changing the worksheet to **6 marks** for this question to match the number of responses.)*

Part F – Higher Order Thinking (4 marks)

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Atomic Number and Mass Number

Question 9

"Mass number identifies an element."

Expected answer:

Students should disagree.

Mass number does **not** identify an element because different elements may have similar mass numbers.

The **atomic number** identifies an element because it represents the number of protons.

Level	Descriptor	Marks
3	Clear scientific explanation using atomic number and protons.	4
2	Correct explanation with minor omissions.	3
1	Basic understanding shown.	1–2
0	Incorrect.	0

Extension Challenge (Not Included in Total)

Expected answer

Both atoms

- have the same atomic number (26)
- have different mass numbers
- have different numbers of neutrons
- are isotopes of iron

Award

1 mark for each point.

Maximum **4 marks**.

Recommended Grade Boundaries (50 marks)

Marks	Grade
45–50	A
40–44	B

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Atomic Number and Mass Number

Marks	Grade
35–39	C
30–34	D
25–29	E
0–24	U

Suggested Revision to the Worksheet

While preparing the mark scheme, I noticed two small inconsistencies between the worksheet and the marks allocated:

- **Question 4** contains **12 responses**, which naturally totals **6 marks** at 0.5 marks per response rather than 8 marks.
- **Question 8** also contains **12 responses**, which likewise fits **6 marks**.

To keep the worksheet internally consistent and maintain a total of **50 marks**, I would make these adjustments:

Question	Current	Suggested
Q4	8 marks	6 marks
Q5	10 marks	10 marks (award ~0.67 marks per completed row, or simply 2 marks per row)
Q8	8 marks	6 marks
Q9	4 marks	6 marks (expand the explanation requirement slightly)

This produces a cleaner assessment where each section's marks align naturally with the number and complexity of the responses, while preserving the overall total of **50 marks**.

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