

Atomic Structure

Total marks: 16

Q1.

Titanium and iron are examples of transition metals.

Figure 6 shows the percentage abundance of each isotope in a sample of titanium.

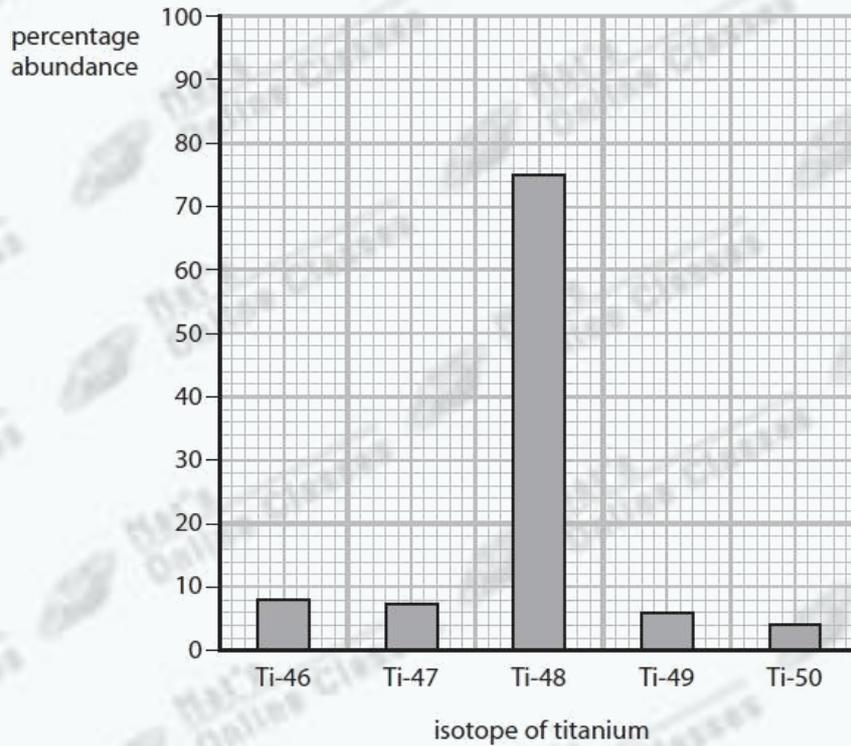


Figure 6

Calculate the relative atomic mass of titanium in this sample.

(3)

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relative atomic mass =

Q2.

The atomic number of magnesium is 12.

Magnesium exists as three isotopes: magnesium-24, magnesium-25 and magnesium-26.

Describe, by referring to the numbers of subatomic particles, the differences between one atom of each of these isotopes.

(2)

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Q3.

In Figure 8, the letters **A**, **E**, **G**, **J**, **X** and **Z** show the positions of six elements in the periodic table.

These letters are not the symbols of the atoms of these elements.

| | | | | | | | | | | | | | | | | | | | |
|--|----------|---|--|--|--|--|--|--|----------|--|--|--|---|----------|---|---|----------|---|----------|
| | 1 | 2 | | | | | | | | | | | 3 | 4 | 5 | 6 | 7 | 0 | |
| | | | | | | | | | | | | | | | | | | | |
| | A | | | | | | | | | | | | | E | | | G | | |
| | J | | | | | | | | | | | | | | | | | | X |
| | | | | | | | | | Z | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

Figure 8

Element **E** has an atomic number of 5.

In a sample of **E** there are two isotopes. One isotope has a mass number of 10 and the other isotope has a mass number of 11.

(i) Explain, in terms of subatomic particles, what is meant by the term **isotopes**.

(2)

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(ii) All atoms of element **E** in this sample contain

(1)

- A** 5 protons
- B** 5 neutrons
- C** 6 protons
- D** 6 neutrons

Q4.

Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

Calcium has an atomic number of 20.
A calcium atom has a mass number of 40.

(i) Which row of the table shows the number of protons and number of neutrons in this atom of calcium?

(1)

| | number of protons | number of neutrons |
|---------------------------------------|-------------------|--------------------|
| <input checked="" type="checkbox"/> A | 20 | 20 |
| <input type="checkbox"/> B | 40 | 20 |
| <input type="checkbox"/> C | 20 | 60 |
| <input type="checkbox"/> D | 60 | 20 |

(ii) Figure 8 shows the arrangement of electrons in an atom of calcium.

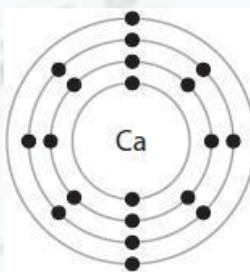


Figure 8

Explain, using the information in Figure 8, in which period of the periodic table calcium can be found.

(2)

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Q5.

Chlorine has an atomic number of 17.

The nucleus of an atom is made up of protons and neutrons.
Atoms of chlorine contain 17 protons.

Figure 4 shows some information about a proton, a neutron and an electron.

| | relative mass | relative charge |
|----------|---------------|-----------------|
| proton | 1 | +1 |
| neutron | 1 | 0 |
| electron | very small | -1 |

Figure 4

(i) Explain, using the information in Figure 3 and Figure 4, why atoms of chlorine have no overall charge.

(2)

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(ii) Atoms of chlorine-37 have a mass number of 37. Calculate the number of neutrons in atoms of chlorine-37.

(1)

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number of neutrons =

(iii) There are two isotopes of chlorine, chlorine-35 and chlorine-37. Explain the meaning of the term **isotopes**.

(2)

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