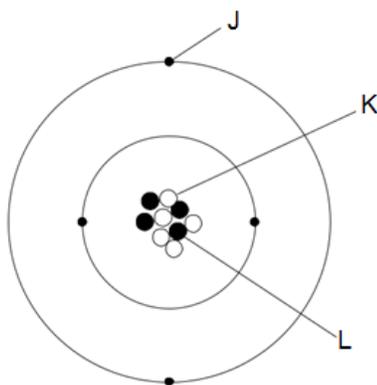


# Developing Atomic Structure And Isotopes 1

Q:1 The diagram represents an atom of beryllium.



(a) Complete the following statements by writing one of the letters, J, K or L, in each box.

Each letter should be used only once.

The particle with a positive charge is

The particle with the smallest mass

The particle with no charge is

(2 marks)

(b) Give the reason why all atoms have a total charge of zero.

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(1 mark)

(c) Complete the following sentence.

There are several isotopes of beryllium. Atoms of different beryllium isotopes will have different numbers of \_\_\_\_\_

(1 mark)

(d) What happens to the structure of an atom to change it into an ion?

\_\_\_\_\_  
\_\_\_\_\_

(1 mark)

**Q:2** The table gives information about the three types of particle that make up an atom.

Particle	Relative mass	Relative charge
Proton		+1
Neutron	1	
Electron	very small	-1

(a) Complete the table by adding the two missing values.

(2 marks)

(b) Use the information in the table to explain why an atom has no overall electrical charge.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(2 marks)

(c) Uranium has two natural isotopes, uranium-235 and uranium-238. Uranium-235 is used as a fuel inside a nuclear reactor.

Inside the reactor, atoms of uranium-235 are split and energy is released.

(c)(i) How is the structure of an atom of uranium-235 different from the structure of an atom of uranium-238?

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(1 mark)

(c)(ii) The nucleus of a uranium-235 atom must absorb a particle before the atom is able to split. What type of particle is absorbed?

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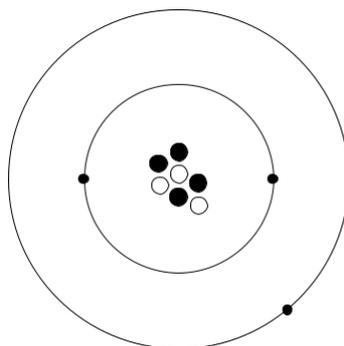
(1 mark)

(c)(iii) The nucleus of an atom splits into smaller parts in a reactor. What name is given to this process?

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(1 mark)

**Q:3** The diagram represents an atom of lithium.



(a)(i) Complete the following table of information for an atom of lithium.

Number of protons	
Number of electrons	
Number of neutrons	

(2 marks)

(a)(ii) What is the mass number of a lithium atom?

3	4	7	10
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Give a reason for your answer.

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(2 marks)

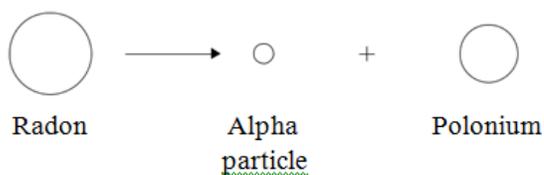
(b) Complete the following sentence by drawing a ring around the correct line in the box.

An atom that has lost an electron is called an

an ion
isotope.
a positive atom

(1 mark)

(c) When an alpha particle is emitted from the nucleus of a radon atom, the radon changes into polonium.



An alpha particle consists of 2 protons and 2 neutrons.

(c)(i) Complete the following sentence by drawing a ring around the correct line in the box.

The mass of a polonium atom is 

greater than
the same as
smaller than

 the mass of a radon atom.

(1 mark)

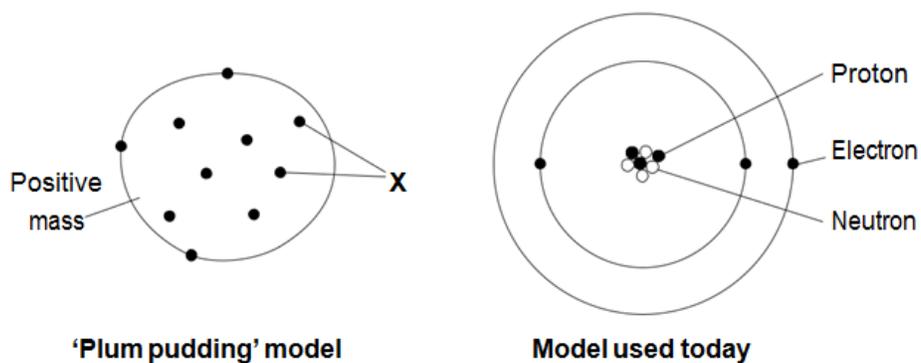
(c)(ii) Give a reason for your answer to part (c)(i).

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(1 mark)

**Q:4** The diagrams show two different models of an atom.



(a) The particles labelled 'X' in the plum pudding model are also included in the model of the atom used today. What are the particles labelled 'X' ?

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(1 mark)

(b) Scientists decided that the 'plum pudding' model was wrong and needed replacing.

Which one of the following statements gives a reason for deciding that a scientific model needs replacing?

Tick (✓) one box.

The model is too simple.

The model has been used by scientists for a long time.

The model cannot explain the results from a new experiment.

(1 mark)

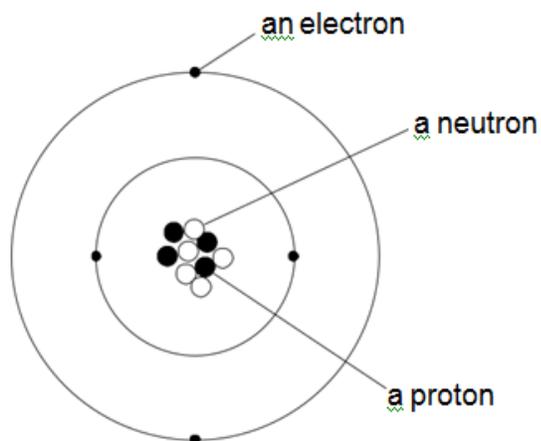
(c) The table gives information about the three types of particle that are in the model of the atom used today.

Particle	Relative mass	Relative charge
	1	+1
	very small	-1
	1	0

Complete the table by adding the names of the particles.

(2 marks)

**Q:5** The diagram represents an atom of beryllium. The three types of particle that make up the atom have been labelled.



(a) Use the labels from the diagram to complete the following statements. Each label should be used once.

The particle with a positive charge is \_\_\_\_\_

The particle with the smallest mass is \_\_\_\_\_

The particle with no charge is \_\_\_\_\_

(2 marks)

(b) What is the atomic number of a beryllium atom?

Draw a ring around your answer.

4    5    9    13

Give a reason for your answer.

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(2 marks)

(c) Which one of the following statements describes what can happen to an atom to change it into an ion?

Tick (☑) one box.

The atom loses a neutron

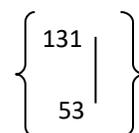
The atom loses an electron

The atom loses a proton.

(1 mark)

**Q:6** In 2011 an earthquake caused severe damage to a nuclear power station in Japan. The damage led to the release of large amounts of radioactive iodine-131 into the atmosphere.

(a) The table gives some information about an atom of iodine-131



Complete the table.

mass number	131
number of protons	53
number of neutrons	

(1 mark)

(b) Complete the sentence.

The number of protons in an atom is called the proton number or the \_\_\_\_\_ number.

(1 mark)

(c) An atom of iodine-131 decays into an atom of xenon (Xe) by emitting a beta particle.

(c) (i) The decay of iodine-131 can be represented by the equation below.

Complete the equation by writing the correct number in each of the two boxes.

(2 marks)

(c) (ii) A sample of rainwater contaminated with iodine-131 gives a count rate of 1200 counts per second.

Calculate how many days it will take for the count rate from the sample of rainwater to fall to 75 counts per second.

Half-life of iodine-131 = 8 days

Show clearly how you work out your answer.

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\_\_\_\_\_ days

(2 marks)

(c) (iii) If people drink water contaminated with iodine-131, the iodine-131 builds up in the thyroid gland. This continues until the thyroid is saturated with iodine-131 and cannot absorb any more. The radiation emitted from the iodine-131 could cause cancer of the thyroid.

In Japan, people likely to be drinking water contaminated with iodine-131 were advised to take tablets containing a non-radioactive isotope of iodine.

Suggest why this advice was given.

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(2 marks)

**TOTAL MARKS=36 MARKS**