

Extended Homework Task Physics P7 Radioactivity Aiming for Grade 4

Name

Please hand in a completed printed version at the end of the topic

Task

Part 1: Radiation and atoms

A Design a game of snap by making cards containing the information in the table below. Play your game.

The symbols for alpha, beta, and gamma radiation, and the neutron.	What stops alpha, beta, and gamma radiation.
What alpha, beta, and gamma radiation actually are.	The charge on alpha, beta, and gamma radiation, and the neutron.
The ionising power of alpha, beta, and gamma radiation.	The range in air for alpha, beta, and gamma radiation.

B Complete the table with the symbols for the isotopes of some common elements, and the number of protons in each one.

Common element	... with one fewer neutron	...with one extra neutron	Number of protons
${}^4_2\text{He}$			
${}^{12}_6\text{C}$			
${}^{14}_7\text{N}$			
${}^{16}_8\text{O}$			

Using radioactivity and risk

You are in charge of a section of a hospital that deals with using radioactivity to explore internal organs and control or destroy cancer cells. You need to write a leaflet for the public explaining the risks and benefits of using radioactive materials in this way. You should include all of the following:

- what radioactive material is and what happens to it when it decays
- how doctors use radioactive material to find out what is wrong with organs of the body
- how doctors use radioactive material to control or kill cancer cells
- the difference between contamination and irradiation
- what radiation does to the body
- the risks and benefits of the treatments on offer
- what doctors do to minimise the risk.
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Questions

Part 1: Radiation and atoms

1 Complete these sentences using the words in the box below. You may need to use some of the words once, more than once, or not at all.

protons isotopes radioactive neutrons electrons neutron

The nucleus of any atom contains two types of particle: protons and _____.

All atoms of the same element have the same number of _____.

However, atoms of the same element can have different numbers of _____ and they

are called _____. For example, carbon-12 has one more _____

than carbon-11. Carbon-11 is _____ and gives out radiation.

(6 marks)

2 Choose words or phrases from each column to make three sentences about alpha, beta, and gamma radiation.

Alpha		lead		is not very ionising.
Beta	is stopped by	aluminium	and	is very ionising.
Gamma		paper		hardly ionises.

.....

(3 marks)

3 Complete these sentences and describe what happens to atomic mass and atomic number.

a When a nucleus emits an alpha particle ...

.....

(2 marks)

b When a nucleus emits a beta particle ...

.....

(2 marks)

c When a nucleus emits a gamma ray ...

.....

(2 marks)

Part 2: Modelling the atom, fission, and fusion

6 Link the sentences together to describe what happens in nuclear fusion.

In fusion two nuclei of light elements	energy.
The two nuclei have the same charge	join together to make a nucleus of a heavier element.
The mass of the fusion products	so they need to be travelling fast to overcome the repulsion.
The mass is converted to	is less than the mass of the two lighter nuclei.

(4 marks)

Part 3: Half-life, using radioactivity and risk

8 Complete these sentences by circling the correct word:

- a Radioactive materials emit **particles/particles and wave/waves**. (1 mark)
- b Over time the amount of radiation that they emit per second **decreases/increases**. (1 mark)
- c When you take radioactive material into your body you are **contaminated/irradiated**. (1 mark)
- d The radiation can damage the **DNA/nucleus** of the cells in your body. (1 mark)
- e This can cause **cancer/heart disease**. (1 mark)

9 Describe two things that doctors do to reduce the risk of radiation damage when they use radioactive material to investigate organs.

.....
.....

(2 marks)

10 Describe two things that doctors do to reduce the risk of radiation damage when they use radioactive material to kill cancer cells.

.....
.....

(2 marks)

11 Describe one thing that you can do to reduce the risk of a build-up of radioactive gas in your house.

.....

(1 mark)