Science Faculty | Directed Improvement Sheet

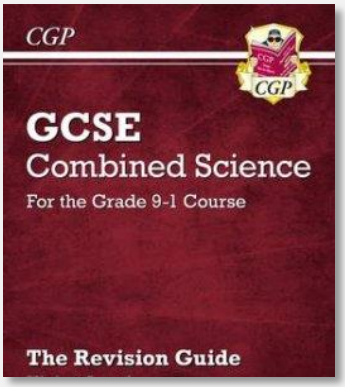
Year 10

Explain how the current model of the atom developed

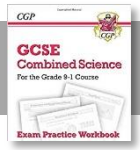
Step 1 What do I need to know?

- What the atom was thought to look like initially (tiny spheres)
- How to describe the plum pudding model of the atom
- How the alpha particle scattering experiment lead to the nuclear model of the atom replacing the plum pudding model
- How Niels Bohr adapted the nuclear model
- The order electrons, protons and neutrons were named
- How and when James Chadwick added to the model of the atom

Step 2 How do I find out about it?

Revision Guide Page		Web Links
		BBC Bitesize Atomic Structure Plum Pudding Model The Nuclear Model Alpha Scattering Experiment
Higher	**Pg. 195**	
Foundation	**Pg. 104, 197**	

Step 3 What can I do to help me learn it?



Complete the relevant questions in your CGP Science Workbook	Higher	Pages 204
	Foundation	Pages 177

TASK 1- Describe the first model of the atom.

TASK 2- Describe the plum-pudding model of the atom.

TASK 3- Explain how the alpha scattering experiment, lead to the plum pudding model being replaced by the nuclear model. (Hints: Why did most of the alpha particles pass straight through? Why did some bounce back?) Make sure you describe the nuclear model in your answer.

TASK 4- State how Niels Bohr updated the nuclear model- which subatomic particle did he name? Where did he say these were found?

TASK 5- What did James Chadwick prove also existed in an atom? When did he do this?

Science Faculty | Directed Improvement Sheet

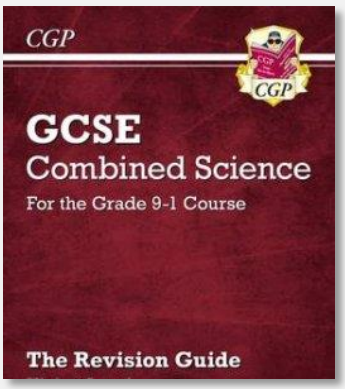
Year 10

Explain how alpha, beta and gamma radiation is produced and compare their properties

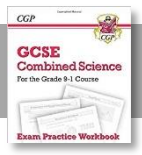
Step 1 What do I need to know?

- That radioactive decay is a random process where an unstable nucleus gives out radiation as it changes to become more stable.
- Definition of the term 'Activity' and state its units
- Definition of the term 'Count-rate'
- Descriptions of an alpha particle (α), a beta particle (β) and a gamma ray (γ)
- Comparison of the penetration strengths, range in air and ionising power for alpha, beta and gamma
- How to apply their knowledge to the uses of radiation and evaluate the best sources of radiation to use in a given situation.
- How to use the names and symbols of common nuclei and particles to write balanced equations that show single alpha (α) and beta (β) decay. This is limited to balancing the atomic numbers and mass numbers.
- Why the emission of a gamma ray does not cause the mass or the charge of the nucleus to change.

Step 2 How do I find out about it?

Revision Guide Page		Web Links
		Bitesize BBC Bitesize Alpha, Beta, Gamma YouTube Types of radiation and their properties Types of radiation and their properties II Writing decay equations
Higher	Pg. 196	
Foundation	Pg. 198	

Step 3 What can I do to help me learn it?



Complete the relevant questions in your CGP Science Workbook	Higher	Pages 206
	Foundation	Pages 178

TASK 1- Define the term 'activity' and state its units

TASK 2- Define the term 'count rate'

TASK 3- Describe the following; a) Alpha particle b) Beta particle c) Gamma ray

TASK 4- Copy and complete to compare properties of alpha, beta and gamma;

i) The least penetrating is .....

ii) The most penetrating is .....

iii) The least ionising is .....

iv) The most ionising is ……..

v) Alpha particles can travel a few ……. in air. This is their range.

vi) Beta particles can travel a few ……. in air. This is their range.

vii) Gamma rays will travel ……. in air. They have the longest range.

TASK 4- Explain why gamma sources can be used in medical tracers, but never alpha sources.

TASK 5- Copy and complete the decay equations shown below;

$$^{238}U \rightarrow {}^{234}_{90}Th + \quad He$$

$$^{}_{88}Ra \rightarrow {}^{218}_{86}Rn + \quad He$$

$$^{208}_{84}Po \rightarrow \quad Pb + \quad He$$

$$^{256}_{103}Lr \rightarrow {}^{252}_{101}Md + \quad He$$

$$^{234}_{90}Th \rightarrow {}^{234}Pa + {}^{0}_{-1}e$$

$$^{131}_{53}I \rightarrow {}_{54}Xe + {}^{0}_{-1}e$$

$$^{6}_{2}He \rightarrow \quad Li + {}^{0}_{-1}e$$

$$Na \rightarrow {}^{24}_{12}Mg + \quad e$$

Science Faculty | Directed Improvement Sheet

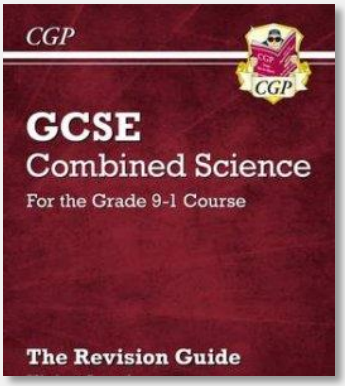
Year 10

Determine the half-life of a radioactive substance

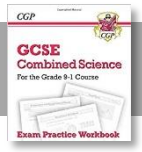
Step 1 What do I need to know?

- That radioactive decay is random.
- The definition for the term 'half-life'
- How to determine the half-life of a radioactive isotope from given information (numbers or a graph)
- **HT only:** How to calculate the net decline, expressed as a ratio, in a radioactive emission after a given number of half-lives.

Step 2 How do I find out about it?

Revision Guide Page		Web Links
		Bitesize BBC Bitesize Half-life YouTube Half-life Calculating half-life Calculating half-life from a graph (Worked Example)
Higher	Pg. 198	
Foundation	Pg. 200	

Step 3 What can I do to help me learn it?

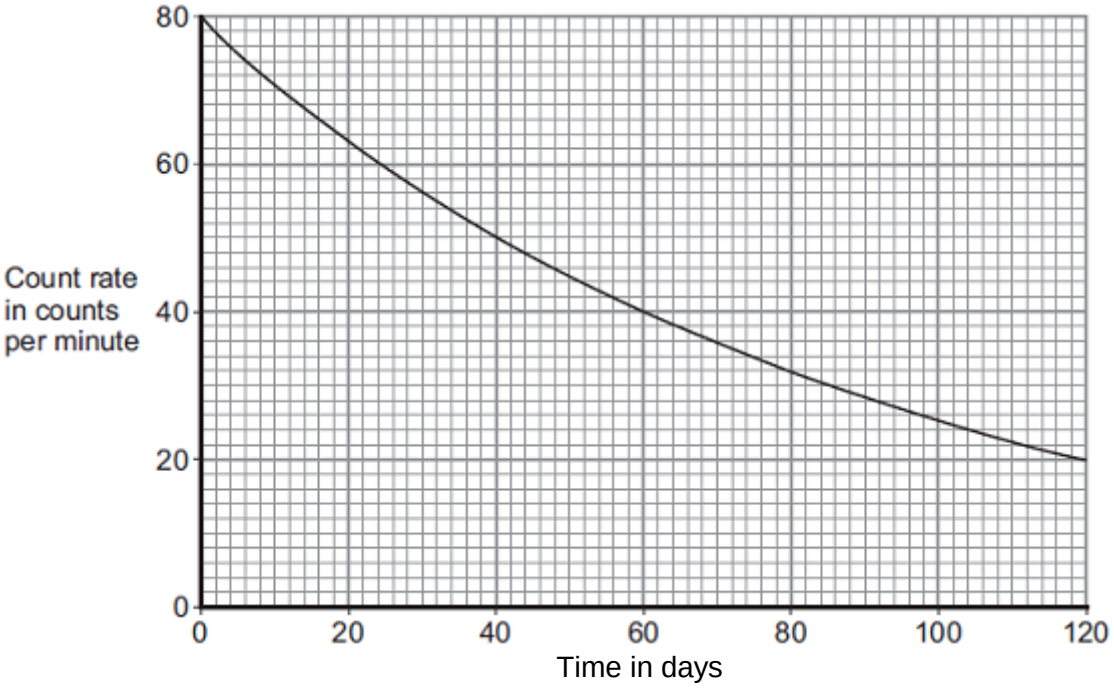


Complete the relevant questions in your CGP Science Workbook		
	Higher	Pages 209
	Foundation	Pages 180

TASK 1- Define the term 'half-life'

TASK 2- Figure 1 shows how the count rate from a sample of a radioactive isotope varies with time.

Figure 1



Use information from **Figure 1** to calculate the half-life of the radioactive isotope.

Show clearly on **Figure 1** how you obtain your answer.

Half-life = _____ days

TASK 3 HT ONLY- Americium-241 is a radioisotope used in smoke detectors. It has a proton number of 95 and a mass number of 241.

How long would it take the americium-241 in a smoke detector to decrease to one eighth of its original number of radioactive atoms?

_____

_____

_____

Answer = _____