

**GENERAL CERTIFICATE OF SECONDARY EDUCATION A333/02/RB
TWENTY FIRST CENTURY SCIENCE**

PHYSICS A

Ideas in Context and Unit P7 (Higher Tier)

RESOURCE BOOKLET

JUNE 2008

To be opened and given to candidates upon receipt



INSTRUCTIONS TO CANDIDATES

- This booklet contains one article.
- Take this article away and read it through carefully.
- Spend some time looking up any technical terms or phrases you do not understand.
- For the examination on **Monday 12 May 2008** you will be given a fresh copy of this article, together with a question paper.
- You will **not** be able to take your original copy into the examination with you.

This document consists of **3** printed pages and **1** blank page.

Should We Build New Nuclear Reactors?



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The government is considering the future of nuclear power in the UK.

The UK relies on nuclear power for 20% of its electricity, but by 2023 only one of the existing power stations will still be working and will only supply about 7%.

No new reactors have been built since the 1980s because there have been problems with accidents, high decommissioning costs and the problem of nuclear waste. These problems have reduced political and public enthusiasm. But, with soaring oil and gas prices, dwindling domestic fossil fuel reserves and pressure to tackle climate change, many argue that a new generation of reactors has to be considered.

As well as producing electricity, nuclear reactors also produce radioactive materials. These are used in medicine to treat cancer, track chemicals in the body and sterilise surgical instruments. Radioactive materials are also used to sterilise food and are used in smoke detectors.

The main risk from nuclear power is exposure to radioactivity. The ionising radiation produced is harmful to living cells. This can be a hazard to health, and exposure to too much radiation is very dangerous.

The naturally occurring metal uranium (a heavy, unstable element) is most commonly used in power stations. There are several different types – called isotopes – of uranium, which produce different kinds of ionising radiation.

| isotope | half life | type of radiation produced |
|---------|-------------------|----------------------------|
| U-235 | 700 million years | alpha |
| U-238 | 4.5 billion years | alpha |
| U-239 | 24 minutes | beta |

The worst type of accident in a nuclear power station is a melt-down, when the nuclear chain reaction gets out of control and generates enough heat to melt down the reactor. Modern reactors are designed in such a way that they shut themselves down if left alone. Constant intervention is needed to keep them operating – in contrast to the older reactor designs, which required constant intervention to keep the reaction under control. One recent design also has water stored above the reactor, which can be readily released onto the reactor.

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