

# DAPTO HIGH SCHOOL



2008 School Certificate  
Trial Exam

## Science

## Stimulus Booklet

### Source A – The scientific method of Discovery

All scientific research starts with someone making an observation. For example, a scientist might notice that a new fungal disease has suddenly developed and affected thousands of hectares of wheat crops. The question arises, “What has caused this fungal disease?”

A question like this would be answered with an educated guess or a hypothesis which would lead to further observations and some experiments to see if the answer was correct.

If the results of the experiments show that the hypothesis is wrong, then a new hypothesis should be made and tested. This process may have to be repeated several times before a correct answer to the question is found.

If the results of the experiments support the hypothesis, then the experiments should be repeated several times to make sure the results are correct. This process increases the reliability of those results.

A conclusion, or an answer to the question, is made only if the repeated experiments give the same result as the initial experiment and these results show the answer to the question to be correct.

**This paper MUST NOT be removed from the examination room**

STUDENT NUMBER/NAME: .....

## Source B – Lead sheeting and radioactivity

To investigate the effectiveness of lead in stopping radioactive particles, lead sheets of varying thickness were placed between a radioactive source and a Geiger counter, a device which measures the amount of radiation it receives. The distance between the Geiger counter and the radioactive source was kept constant throughout the experiment.

The following results were obtained.

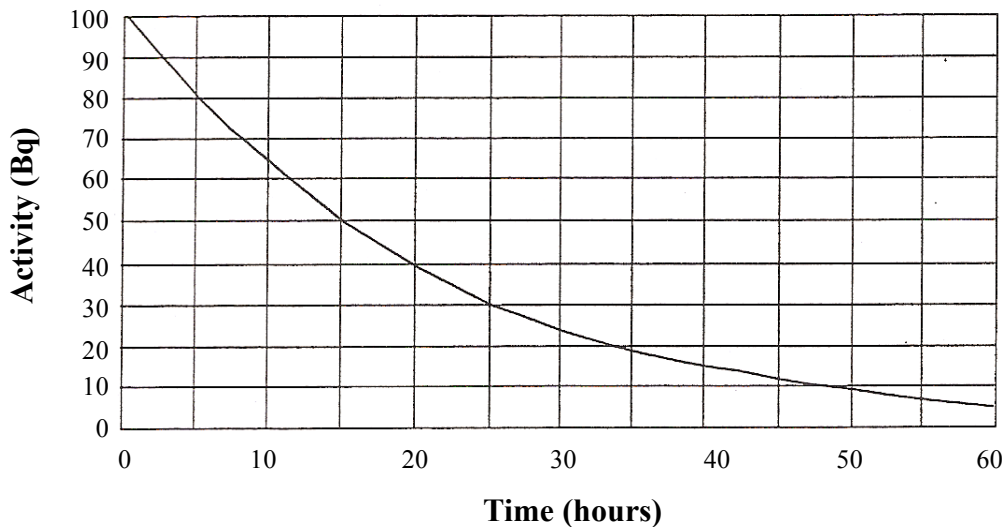
Thickness of lead sheet (mm)	Number of counts recorded per minute
20	59
32	47
48	35
56	28

## Source C – Radioactivity

Radioactive forms of certain elements, called radioisotopes, decay by emitting particles from their nuclei. Each one can be identified by measuring its half-life, the time taken for the activity rate of a sample to be halved

Element symbol	Half-life (hours)
Sm 156	10
Na 24	15
Mg 28	21
Cr 48	25
Te 131	30
Ge 69	40
Zn 72	50
As 71	60
Nb 95	90
I 124	100

The graph below shows how the radioactivity of a sample of an unknown element changes with time.



The radioisotope most widely used in medicine is technetium-99m, employed in some 80% of all nuclear medicine procedures. Technetium generators (lead pots containing the radioisotope molybdenum) are supplied to hospitals from nuclear reactors where radioisotopes are made.

The pots contain molybdenum-99, which progressively decays to technetium-99. The Tc-99 is washed out of the lead pot by saline solution when it is required. By one week, the generator needs to be returned for replacement of molybdenum because the activity rate of technetium-99m production is too low.

## Source D – Is modern technology beating us?

A recent newspaper article suggests that people all over the world are struggling to master the modern technology associated with everyday life.

The article claims that modern designers are making it harder. “Complexity has gotten out of hand. Most of us can’t use the devices modern technology forces on us. From computerised components in cars to MP3 players to simply tuning a modern TV to pick up the available channels.”

“People, even the professionals, are accused of having problems mastering the skills needed to operate these devices. The real fault lies in the poor design of the devices or the instruction manuals that come with them”.

The writer says that the problem goes beyond annoying, particularly in industrial settings. He says that many major accidents blamed on human error are really the fault of the equipment designers who fail to take into account the fact that the human operators of such equipment don’t understand enough about it to react appropriately in emergency situations.

A simple example of poor technological support, suggests the writer, is the almost unreadable instructions accompanying many devices made overseas, particularly those from some Asian countries.

Such an example is the following sentence from an instruction booklet accompanying audio equipment:

*“To turn this device to activation on it is very preferred that is it firstly adjusted to be level with the bench top and ensure that all containers are connected in the correct positioning.”*