# OXFORD CAMBRIDGE AND RSA EXAMINATIONS
## GENERAL CERTIFICATE OF SECONDARY EDUCATION

# A214/01/INS

# TWENTY FIRST CENTURY SCIENCE

# SCIENCE A

## Unit 4: Ideas in Context

## (Foundation Tier)

## INSERT

**WEDNESDAY 10 JUNE 2009: Afternoon**
**DURATION: 45 minutes**

**SUITABLE FOR VISUALLY IMPAIRED CANDIDATES**

**Candidates answer on the question paper**

**INSTRUCTIONS TO CANDIDATES**

**This insert contains the three articles required to answer the questions.**

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# DOES HOMEOPATHY REALLY WORK?

**HOMEOPATHY** is a controversial form of alternative medicine. Homeopathic doctors believe in treating 'like with like'. This means an illness is treated with a substance that causes similar symptoms to the illness.

This could, of course, be dangerous so the substances are diluted using large quantities of water or alcohol. The substances are diluted so much that there is very little chance of any molecules of the substance being left in a dose of the medicine.

Homeopathic doctors say that a treatment may make the symptoms of the illness worse at first, but this is part of the healing process.

## DILUTION TABLE

| | typical number of molecules of substance present in 1 $cm^3$ | |
|---|---|---|
| | 1 000 000 000 | original solution |
| diluted by 100 | 10 000 000 | |
| diluted by 100 | 100 000 | |
| diluted by 100 | 1000 | |
| diluted by 100 | 10 | |
| diluted by 100 | 0 | 1 $cm^3$ dose of medicine |

**HOMEOPATHIC DOCTORS believe that homeopathy is safe for everyone, including the young and the old. They explain that the medicine works because the 'memory' of a diluted substance stays in the water or alcohol. Homeopathic doctors say that the treatment restores health by stimulating the body's own healing powers. A survey of patients who have used homeopathic treatments reports that seven out of ten patients say that it has helped with their illness.**

**CONVENTIONAL DOCTORS say there is no scientific evidence to support homeopathy. There is no known mechanism for water or alcohol to keep the 'memory' of a substance that was once dissolved in it. These doctors believe that any benefit experienced by the patient is not due to homeopathy but is due to a placebo effect. Some experiments show that when patients are given a placebo (a dummy pill), they still think they are getting better. Another possibility is that patients simply recover due to natural processes (the patients' own immune systems). Conventional doctors say that patients who are seriously ill are just given false hope which possibly prevents them from receiving a scientifically proved conventional treatment.**

**Read the statements of these people.**

**JANE**
**‘When I took the homeopathic medicine I got better.’**

**RANJIT**
**‘I took the homeopathic medicine but I did not get better.’**

**PETER**
**‘I got better even though I did not take the homeopathic medicine.’**

**STELLA**
**‘When I took the homeopathic medicine I got better. But I may have got better even if I had not taken it.’**

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# CARBON MONOXIDE – THE INVISIBLE KILLER

**Carbon monoxide is a colourless and odourless gas so you cannot easily tell if it is present. It is also very toxic. A concentration of 500 ppm (parts per million) in the air is enough to cause death. In smaller concentrations it is still harmful.**

**The World Health Organisation gives these guidelines for the maximum exposure time for different concentrations of carbon monoxide:**

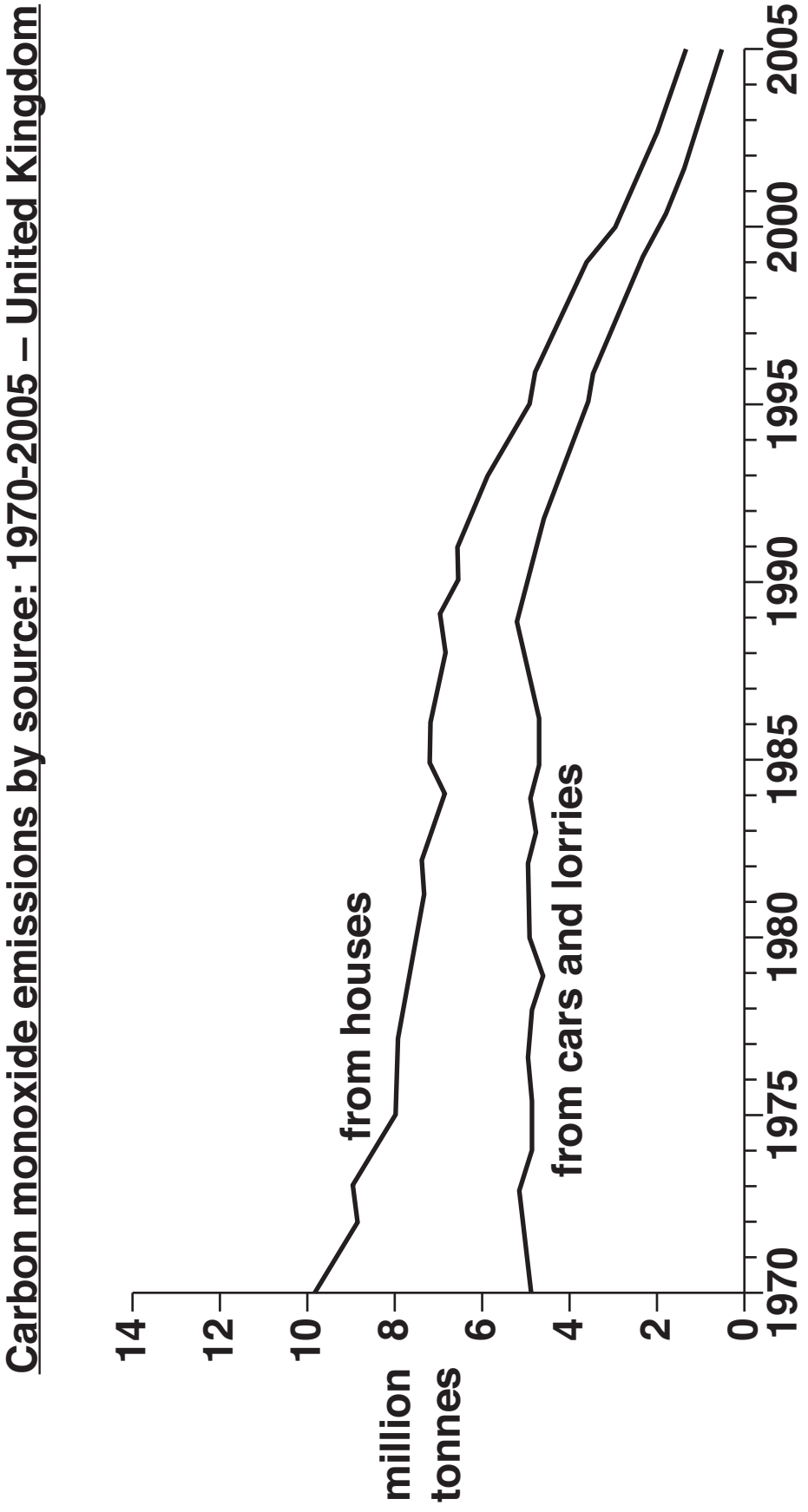
| CARBON MONOXIDE CONCENTRATION IN $mg/m^3$ | CARBON MONOXIDE CONCENTRATION IN ppm | MAXIMUM EXPOSURE TIME |
|---|---|---|
| 100 | 87 | 15 min |
| 60 | 52 | 30 min |
| 30 | 26 | 1 hour |
| 10 | 9 | 8 hours |

**The main source of carbon monoxide pollution is the burning of fuel in cars and lorries. When the hydrocarbons in petrol and diesel fuels burn completely, the only products are carbon dioxide and water. But in car and lorry engines, incomplete combustion takes place, producing carbon monoxide. When carbon monoxide is released into the air, it reacts slowly with oxygen to form carbon dioxide. In cities, where high buildings reduce air movement, carbon monoxide can reach harmful levels.**

**Another major source of carbon monoxide pollution is the burning of coal. Coal can be burned to heat homes. It can also be burned in power stations to generate electricity.**

**Annual emissions for carbon monoxide in the United Kingdom have been falling since the 1970s.**

# CARBON MONOXIDE EMISSIONS BY SOURCE: 1970 TO 2005 – UNITED KINGDOM



**One way of removing carbon monoxide from car and lorry exhaust fumes is to use a CATALYTIC CONVERTER (CAT). From 1989 onwards, more and more cars have been made with catalytic converters.**

**In a CAT, carbon monoxide reacts with nitrogen monoxide, producing carbon dioxide and nitrogen.**

$$2CO + 2NO \rightarrow 2CO_2 + N_2$$

**When oil or gas is used as a fuel, much less carbon monoxide is produced than when coal is burned. During the past 40 years, the use of gas and oil for heating homes has increased and the use of coal for heating has decreased. Many power stations have also switched from burning coal to burning oil or gas.**

**Household heaters that burn oil and gas give out carbon monoxide if they are not serviced regularly. In a small space, such as a kitchen or bedroom, this gas can build up to dangerous concentrations. This can cause accidental deaths due to carbon monoxide poisoning. Heaters that are serviced regularly are likely to produce little or no carbon monoxide.**

# THE RISK FROM MICROWAVE RADIATION

**Both mobile phones and wireless (WIFI) laptops use microwave radiation and people worry about their safety.**

**Read these two newspaper extracts.**

## EXTRACT 1

### HEALTH FEARS MAKE SCHOOLS SWITCH OFF WIRELESS NETWORKS

**Parents and teachers are forcing some schools to switch off wireless computer networks. Wireless networks in schools allow pupils to use their laptops to connect to the school computer network and the internet without using cables.**

**Many parents and some scientists fear that low levels of microwave radiation emitted by the transmitters could be harmful. They worry that it might cause loss of concentration, headaches, fatigue, memory problems and possibly even cancer. Some researchers think that children may be more vulnerable than adults because of their thinner skulls and developing nervous systems.**

**One school switched off part of its wireless network after a teacher became ill. The teacher said, 'Whenever I was in the classroom I felt really sick. Over the weekend, away from the classroom, I felt completely normal.' The head teacher at the school now plans to put cabled networks in all new classrooms.**

## EXTRACT 2

### PHONE MASTS MAKE YOU ILL? IT'S ALL IN THE MIND

**People who believe that mobile telephone masts are making them feel ill are mistaken. This is the conclusion of a study at Essex University.**

**The 3-year study was one of the largest of its kind. It found that some people do experience symptoms, such as headaches and sickness, when they know that they are exposed to radio waves. However, they cannot tell when the waves are turned on and off. This proves that they are not 'radiosensitive'.**

**About 4% of the population say that they get these symptoms. They blame them on new technologies. The study was designed to investigate whether the effect was caused by phone masts.**

**Volunteers who claimed to be radiosensitive were matched against volunteers who did not claim to be radiosensitive. Both groups were told when the signals were being switched on and off. The radiosensitive group reported headaches and sickness. The researchers then conducted double-blind trials. If radiosensitivity were real, alleged sufferers should have been able to detect changes and report symptoms. They did not. There was no correlation between illness and exposure to microwave radiation.**

**In the tests, 2 out of 44 radiosensitive individuals and 5 out of 114 control individuals judged correctly when the mast was on or off. The percentage judging correctly was very similar in each case.**

**The study was published in a scientific journal.**