



▲ Figure 27 Humans have been excluded from a large zone near the Chernobyl reactor. Some plants and animals have shown deformities that may be due to mutations

Data-based questions: The aftermath of Chernobyl

Mutations can cause a cell to become a tumour cell. The release of 6.7 tonnes of radioactive material from the nuclear power station at Chernobyl in 1986 was therefore the cause of large numbers of deaths due to cancer. The UN Chernobyl Forum stated that “up to 4,000 people” may ultimately die as a result of the disaster, but Green Party members of the European Parliament commissioned a report from a radiation scientist, which gave an estimate of 30,000 to 60,000 extra deaths. One way of obtaining an estimate is to use data from previous radiation exposures, such as the detonation of nuclear warheads at Hiroshima and Nagasaki in 1945. The data below is an analysis of deaths due to leukemia and cancer between 1950 and 1990 among those exposed to radiation from these warheads. It was published by the Radiation Effects Research Foundation.

Radiation dose range [Sv]	Number of deaths in people exposed to radiation	Estimate of excess deaths over control groups	Percentage of deaths attributable to radiation exposure
Leukemia			
0.005–0.2	70	10	
0.2–0.5	27	13	48
0.5–1	23	17	74
>1	56	47	
Cancer			
0.005–0.2	3391	63	2
0.2–0.5	646	76	12
0.5–1	342	79	23
>1	308	121	39

- 1 Calculate the percentage of excess deaths over control groups due to leukemia in people exposed to (a) 0.005–0.02 Sv (sieverts) of radiation (b) >1 Sv of radiation. [4]
- 2 Construct a suitable type of graph or chart to represent the data in the right-hand column of the table, including the two percentages that you have calculated. There should be two y-axes, for the leukemia deaths and the cancer deaths. [4]
- 3 Compare the effect of radiation on deaths due to leukemia and deaths due to cancer. [3]
- 4 Discuss, with reasons, what level of radiation might be acceptable in the environment. [4]