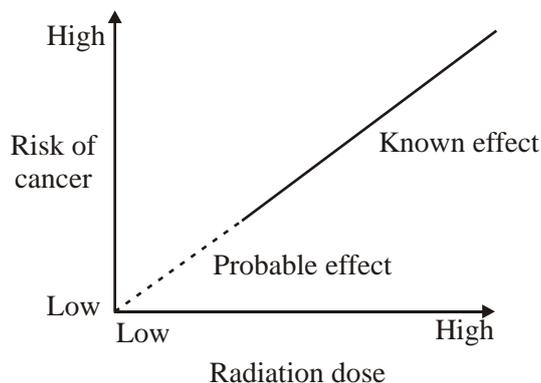


Radioactivity – Past Paper Questions

Name

1. (a) Radiation can cause cancer. The graph shows that the risk of cancer depends on the radiation dose a person is exposed to.



Complete the following sentence.

The the dose of radiation a person gets, the greater the risk of cancer.

(1)

- (b) A worker in a nuclear power station wears a special badge (diagram 1). Diagram 2 shows what is inside the badge. When the film inside the badge is developed, it will be dark in the places where it has absorbed radiation.

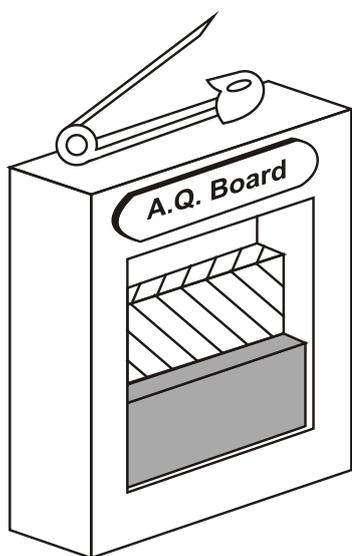
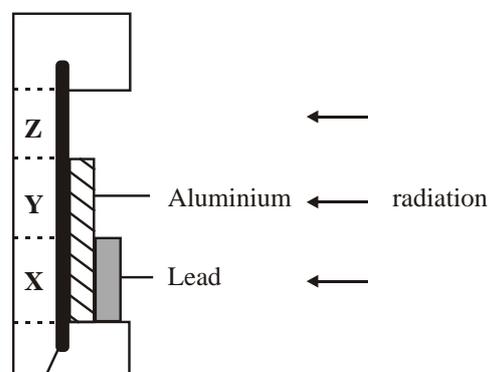


Diagram 1



Photographic film in very thin black plastic jacket

Diagram 2

Which part of the film, X, Y or Z, would darken if the worker had received a dose of alpha radiation?

.....

Give a reason for your answer.

.....

.....

(2)
(Total 3 marks)

2. A beta particle is a high-energy electron.

(i) Which part of an atom emits a beta particle?

.....

(1)

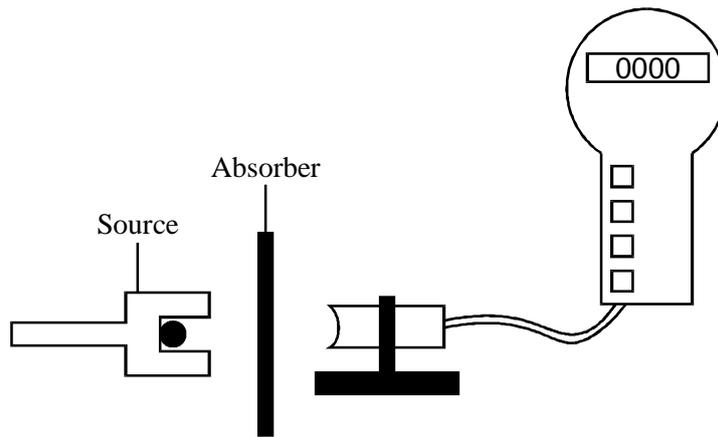
(ii) How does the composition of an atom change when it emits a beta particle?

.....

(1)

(Total 2 marks)

3. The detector and counter are used in an experiment to show that a radioactive source gives out alpha and beta radiation only.



Two different types of absorber are placed one at a time between the detector and the source. For each absorber, a count is taken over ten minutes and the average number of counts per second worked out. The results are shown in the table.

Absorber used	Average counts per second
No absorber	33
Card 1 mm thick	20
Metal 3 mm thick	2

Explain how these results show that alpha and beta radiation is being given out, but gamma radiation is **not** being given out.

.....
.....
.....
.....
.....
.....

(Total 3 marks)

4. Some types of food are treated with *gamma* radiation. Low doses of radiation slow down the ripening of fresh fruit and vegetables while higher doses of radiation kill the bacteria that make the food go off.

(a) (i) What is *gamma* radiation?

.....

(1)

(ii) Food packed in crates or boxes can be treated using this method.

Why must a source that emits *gamma* radiation be used?

.....

.....

(1)

(iii) A suitable source of gamma radiation is the isotope caesium 137.

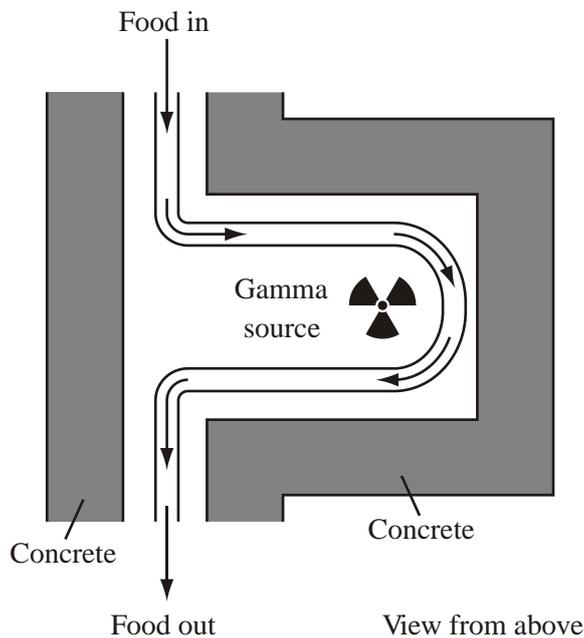
Complete the following sentence by choosing the correct word from the box.

electrons	neutrons	protons
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An atom of caesium 137 has two more than an atom of caesium 135.

(1)

(b) The diagram shows how a conveyor belt can be used to move food past the radioactive source.



(i) How do the concrete walls reduce the radiation hazard to workers outside the food treatment area?

.....

.....

(1)

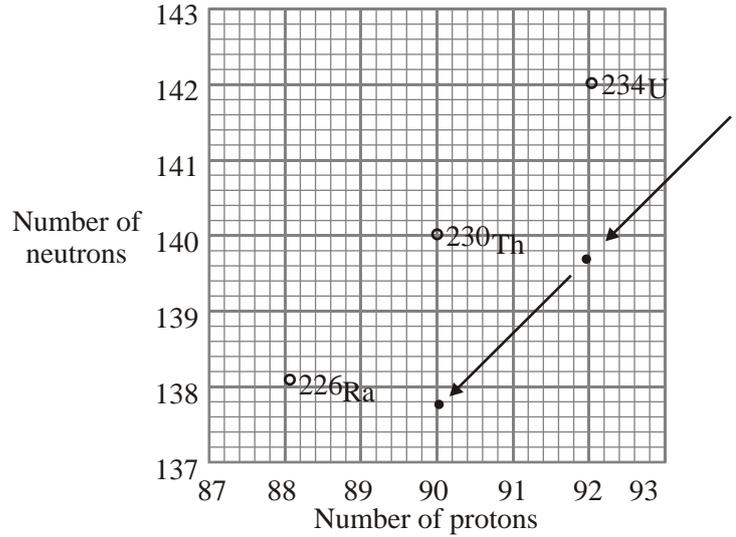
- (ii) Suggest **one** way that the dose of radiation received by the food could be increased other than by changing the radioactive source.

.....

(1)

(Total 5 marks)

5. (a) Uranium-234 (^{234}U) is a radioactive element. The graph shows the number of protons and neutrons in the nuclei of the elements formed when uranium-234 decays.



- (i) How does the graph show that uranium-234 (^{234}U) and thorium-230 (^{230}Th) emit alpha particles?

.....

(1)

- (ii) What makes uranium and thorium different elements?

.....

(1)

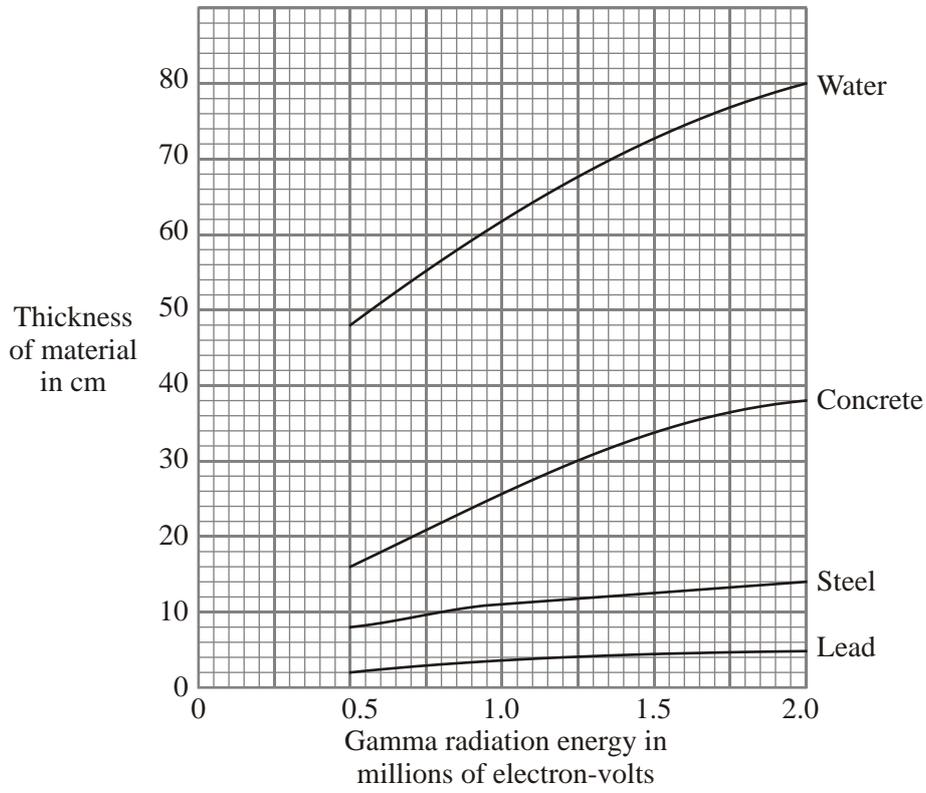
- (iii) Radioactive decay may also produce gamma radiation.

Why does the emission of gamma radiation **not** cause a new element to be formed?

.....

(1)

(b) The graph shows how the thickness of different materials needed to absorb 90% of the gamma radiation emitted by a source depends on the energy of the radiation. The energy of the gamma radiation is given in units called electron-volts.



(i) Which of the materials shown is least effective at absorbing gamma radiation? Use the information in the graph to give a reason for your answer.

.....

(1)

(ii) For gamma radiation of energy 1.5 million electron-volts, how many times more effective is steel than water at absorbing the radiation? Show clearly how you obtain your answer.

.....

(2)

(Total 6 marks)