National 5 Past-Paper Homework 4 - Radiation

1. A student makes the following statements about a carbon atom.

I The atom is made up only of protons and neutrons.

II The nucleus of the atom contains protons, neutrons and electrons.

III The nucleus of the atom contains only protons and neutrons.

Which of the statements is/are correct?

A I only

B II only

C III only

D I and II only

E I and III only

2. Which of the following describes the term ionisation?

A An atom losing an orbiting electron.

B An atom losing a proton.

C A nucleus emitting an alpha particle.

D A nucleus emitting a neutron.

E A nucleus emitting a gamma ray.

3. Human tissue can be damaged by exposure to radiation.

On which of the following factors does the risk of biological harm depend?

I The absorbed dose.

II The type of radiation.

III The body organs or tissue exposed.

A I only

B I and II only

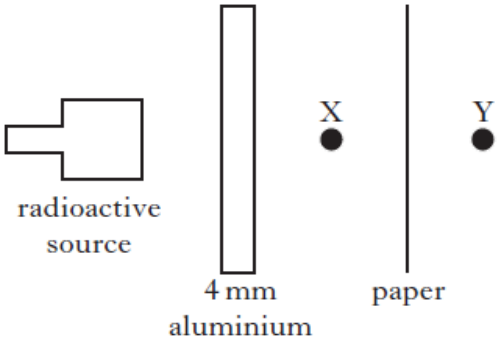
C II only

D II and III only

E I, II and III

4. A radioactive source emits α, β and γ radiation.

Sheets of aluminium and paper are placed close to the source as shown.



Which row in the table shows the radiation(s) from the source detected at points X and Y?

	Radiation(s) detected at X	*Radiation detected at Y*
A	α, γ	γ
B	β,γ	α
C	α	β
D	β	γ
E	γ	γ

Marks

5. In 1908 Ernest Rutherford conducted a series of experiments involving alpha particles.

(*a*) State what is meant by an alpha particle. **1**

(*b*) Alpha particles produce a greater ionisation density than beta particles or gamma rays. What is meant by the term *ionisation*? **1**

(*c*) A radioactive source emits alpha particles and has a half-life of 2·5 hours. The source has an initial activity of 4·8 kBq.

Calculate the time taken for its activity to decrease to 300 Bq. **3**

(*d*) Calculate the number of decays in the sample in two minutes, when the activity of the source is 1·2 kBq. **3**

(*e*) Some sources emit alpha particles and are stored in lead cases despite the fact that alpha particles cannot penetrate paper. Suggest a possible reason for storing these sources using this method. **1**

(9)

Marks

6. A hospital radiographer calculates the equivalent dose of radiation absorbed by a patient. This is done by multiplying the absorbed dose by a radiation weighting factor.

(*a*) State what is meant by a radiation weighting factor. **1**

(*b*) During a scan of the patient's brain, the absorbed dose is measured as 1·5 mGy. The mass of the brain is 1·4 kg.

Calculate the energy absorbed by the brain during the scan. **3**

(*c*) In another medical procedure, a radioactive chemical is injected into a patient.

The chemical is prepared by the technician from a source which has an activity of 320 MBq.

The source has a half-life of 6 hours.

Calculate the activity of the source 18 hours later. **3**

(7)

Homework Total (20)