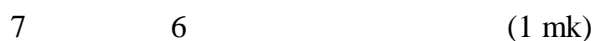
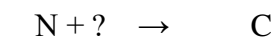


RADIOACTIVITY

1.

Complete the following equation



(b) Give one use of radioactive elements (1 mk)

2.

The table below gives the rate of decay for radioactive element Y

Number of days	Mass (g)
0	348
270	48

Calculate the half – life of the radioactive element “Y” (1 mk)

3.

${}_{81}^{233}\text{Pa}$

100g of radioactive ${}_{81}^{233}\text{Pa}$ was reduced to 12.5g after 81 days

(a) Determine the half life of “Pa”

233

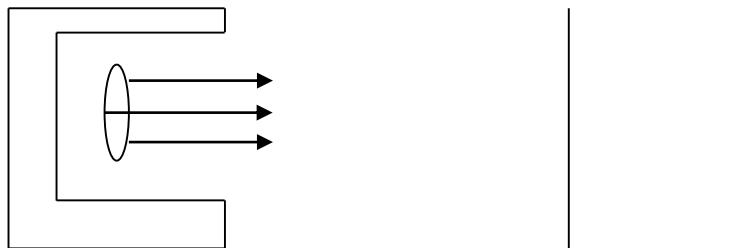
(b) Pa decay by beta emission, what is the mass number and atomic number of

91 the element formed

(1 mk)

4.

Complete the diagram below to show how α and β particles from radioactive can be distinguished from each other. Label your diagram clearly. (3 mks)



Source of radiation

Paper

Metal foil

5.

M grammes of radioactive isotope decayed to 5.0g in 80g. The half life of the isolate is 25 days

- (a) What is meant by half life (1 mk)
- (b) Calculate the initial mass “m” of radioactive isotope (2mks)

6.

234

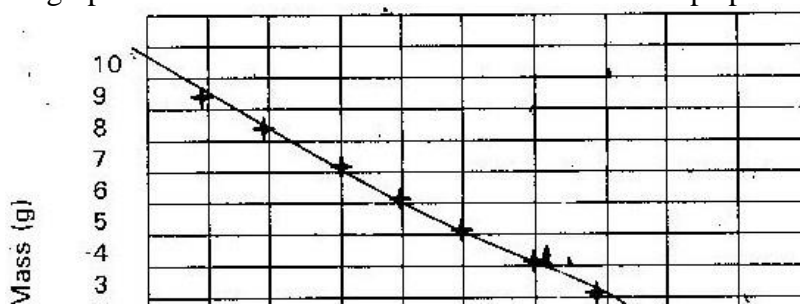
An isotope of uranium ^{234}U , decay by emission of an alpha particle to thorium (Th)

94

- (a) Write the equation for the nuclear reaction undergone by the isotope (1 mk)
- (b) Explain why it is not safe to store radioactive substance in conditions made from aluminum sheet (1 mk)

7.

The graph below shows the mass of a radioactive isotope plotted against time



- (a) Using the graph determine, the half life of the isotope (1 mk)
- (c) Calculate the mass of the isotope present after 32 days (2mks)

8.

A radioactive isotope X_2 decay by emitting two alpha particles and one β particles to form 214

β_1

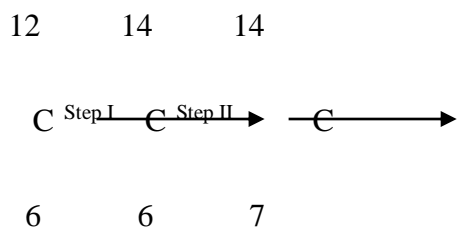
83

- (a) What is the atomic number of X_2 (1 mk)

- (b) After 112 days $\frac{1}{16}$ of mass of X_2 remained. Find the half life of X
(2mks)

9.

Study the nuclear reactions given in the scheme below and answer the questions that follows



12 14

- (a) ${}_{6}^{12}\text{C}$ and ${}_{6}^{14}\text{C}$ are isotopes. What is meant by the term isotopes?

${}_{6}^{6}\text{C}$

- (b) Write an equation for the nuclear reaction in step II (1 mk)

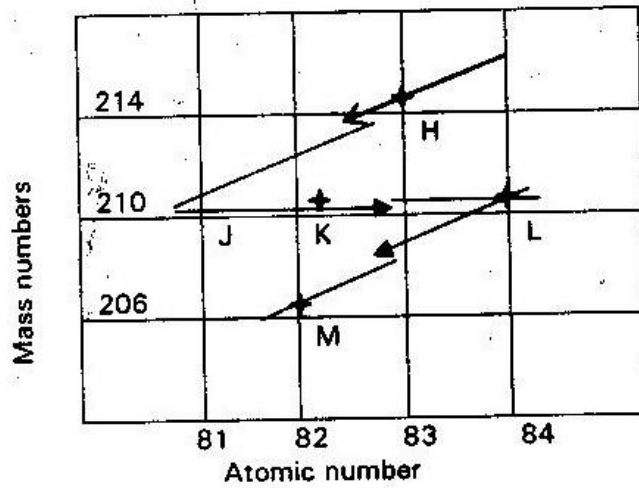
14

- (c) Give one use of ${}_{6}^{14}\text{C}$

16

10.

The graph below represents a radio active decay series for isotope “H”, study it and answer the equations that follows



(a) Name the type of radiation emitted when isotope it changes to isotope “Y”

(1 mk)

(b) Write an equation for the nuclear reaction that occurs when “J” changes to isotope “K”

(1 mk)

(c) Identify a pair of isotope of an element in the decay series (1 mk)

11.

100g of radioactive substance was reduced to 12.5 g within 15.6 years.

Calculate the half life of the substance

(2mks)

12.

(a) Complete the number equation below

$$37 \quad 37$$



$$18 \quad 17$$

(b) State one

(i) Use of radioisotope in agriculture

(ii) Dangers associated with exposure to human being to radioisotopes

(1 mk)

13.

(a) Distinguish between nuclear fission and nuclear fusion

(b) Describe how solid wastes containing radioactive substances should be

disposed of

(1 mk)

14.

(a) A radioactive substance emits three different particles.

Give the symbol of the particles with the highest mass (1 mk)

(b) (i) Find the values of Z_1 and Z_2 in the nuclear equation below

$$Z_1 \quad 1 \quad 94 \quad 140 \quad 1$$



$$92 \quad 0 \quad 38 \quad Z_2 \quad 0$$

(ii) What type of nuclear reaction is represented in b (i) above? (1 mk)

15.

(a) State the difference between chemical and nuclear reactions (2mks)

(b) Below is a radioactive decay series starting from

$^{214}_{83}\text{Bi}$ and ending at $^{206}_{82}\text{Pb}$. Study it and answer the questions

$^{214}_{83}\text{Bi}$ and ending at $^{206}_{82}\text{Pb}$. Study it and answer the questions

$^{214}_{83}\text{Bi}$ and ending at $^{206}_{82}\text{Pb}$. Study it and answer the questions

that follows

$^{214}_{83}\text{Bi}$ $^{219}_{84}\text{Po}$ $^{210}_{82}\text{Pb}$ $^{210}_{83}\text{Bi}$ $^{210}_{84}\text{Po}$ $^{206}_{82}\text{Pb}$

$^{214}_{83}\text{Bi}$ Step I $\xrightarrow{\alpha}$ $^{214}_{84}\text{Po}$ Step II $\xrightarrow{\beta}$ $^{214}_{83}\text{Bi}$ Step III $\xrightarrow{\alpha}$ $^{210}_{81}\text{Pb}$ Step IV $\xrightarrow{\beta}$ $^{210}_{82}\text{Pb}$ Step V $\xrightarrow{\alpha}$ $^{206}_{82}\text{Pb}$

$^{214}_{83}\text{Bi}$ $^{219}_{84}\text{Po}$ $^{210}_{82}\text{Pb}$ $^{210}_{83}\text{Bi}$ $^{210}_{84}\text{Po}$ $^{206}_{82}\text{Pb}$

(i) Identify the particle emitted in step I and III. (2mks)

(ii) Write the nuclear equation for the reaction which takes place in step V

(1 mk)

(c) The table below gives the percentage of radioactive isotope of Bismuth that remains after decaying at different times.

Time (min)	0	6	12	22	38	62	100
Percentage of Bismuth	100	81	65	46	29	12	3

(i) On the grid provided plot a graph of the percentage of bismuth remaining (vertical axis) against time (3mks)

(ii) Use the graph, determine the

I. Half life the Bismuth (1 mk)

II. Original mass of bismuth isotope given that the mass remained after 70 minutes was 0.16g (2mks)

d. Give one use of radioactive isotope in medicine (1 mk)

16. Copper 64 has a half life of 12.8 his

(a) What is meant by half life? (1 mk)

(b) Draw a graph to show the decay of copper 64 from an initial activity to 64 counts per minute to four percent minutes (4mks)

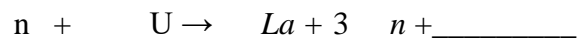
17. Complete the following nuclear equations

(a) $^{55}_{24}\text{Cr}$ \rightarrow $^{55}_{25}\text{Mn}$ + _____

$^{55}_{24}\text{Cr}$ \rightarrow $^{55}_{25}\text{Mn}$ + _____

$^{55}_{24}\text{Cr}$ \rightarrow $^{55}_{25}\text{Mn}$ + _____

(b) $1 \quad 235 \quad 143 \quad 1$



$0 \quad 92 \quad 57 \quad 0$

18. A quality of ^{11}X was mentioned with a G.M tube scalar. The following results were obtained over a period of 70 minutes.

Time	Cents per minute
0	800
10	560
20	427
30	305
40	225
50	165

60	122
70	85

- (a) Plot a graph of time against the counts per minutes (4mks)
- (b) Determine the half life of ^{44}X (3mks)
- (c) Starting with 32g, of ^{44}X how much of the isotope would be remaining after 110 minute? (3mks)

19. Study the nuclear reaction and answer the questions that follows

238



92

Determine the mass number and atomic numbers of X, Y and Z

20. (a) When a stream of low energy particles is directed towards a thin of aluminium, the following observation are made
- (i) Most of particles pass straight the foil
- (ii) The remaining ones are either deflected or emerge from the same as they originally entered (4mks)

- (iii) If the energy of the particles is increased, some are absorbed by the aluminium foil comments on this observation. (4mks)

31

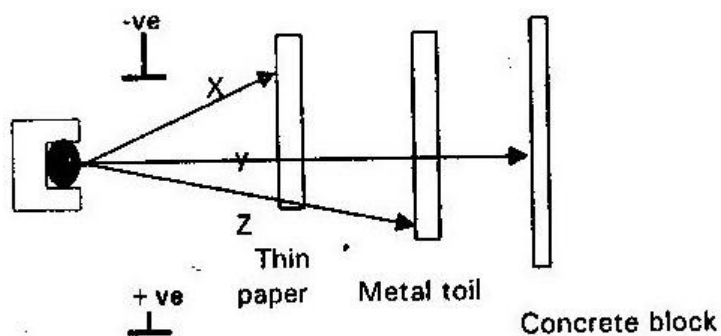
21. The isotope X has a half life of 2.5 hours

14

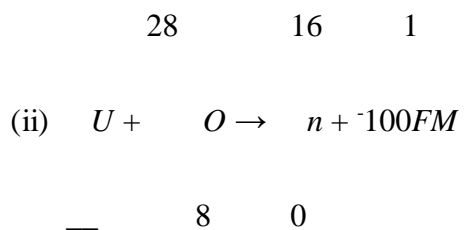
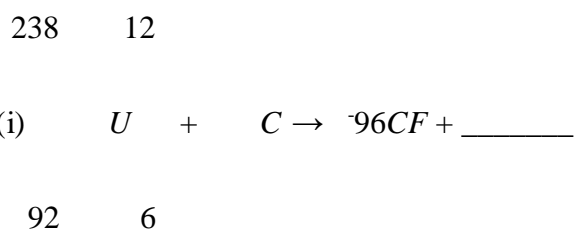
Calculate the % (percentage) of a given mass of the isotope left after 7.5 hours

(1 mk)

22. Below is a diagram of a deflection and penetrating powers of three radiations from a radioactive source



- (a) Name the radiations labeled X, Y and Z (3mks)
- (b) Why are radiation X stopped by a thin piece of paper
23. Complete and balance the following nuclear reaction (3mks)



— 241



94 95