

Chemistry

April/May

1 hour and 30 minutes

Paper 2

THE CHEMISTRY DEPARTMENT

S.5 End of term one

Instructions

This paper consists of three items

Attempt all items

All answers should be written in the spaces provided

No extra answer sheets should be used

Non programmable scientific calculators may be used

FOR EXAMINER'S USE ONLY

1	2	3	TOTAL

1. Carbon-14 can be used to determine the age of old objects because it is radioactive and decays by emission of radiations. Its half-life is important in determining the age of objects. Archaeologists carried out an experiment on a given mass of carbon-14 and recorded the remaining mass at given time intervals as provided in the table below.

Mass of C-14 (g)	1000	500	250	125	62.5
Time (years)	0	5700	11400	16100	21800

Task

Use the information provided about carbon-14 radioisotope to:

- Explain the effect of radiations emitted during radioactive decay on the nucleus of carbon 14. (3 scores)
- Use the data in the table to plot a graph of mass against time and use the graph plotted to determine the half-life of carbon-14 isotope (5 scores)
- Explain how carbon-14 can be used to determine the age of an old bone of a monkey (4sc)
- Suggest the application of the radiations emitted during the decay and their health implications (3 scores)

2. A S.5 student found substances P, Q and R in the laboratory. On Analysis, he found out that;

P contains 46.7% silicon and the rest being oxygen

Q contained 88% oxygen and the rest being hydrogen

R contained 100% copper.

He wanted to use these substances for;

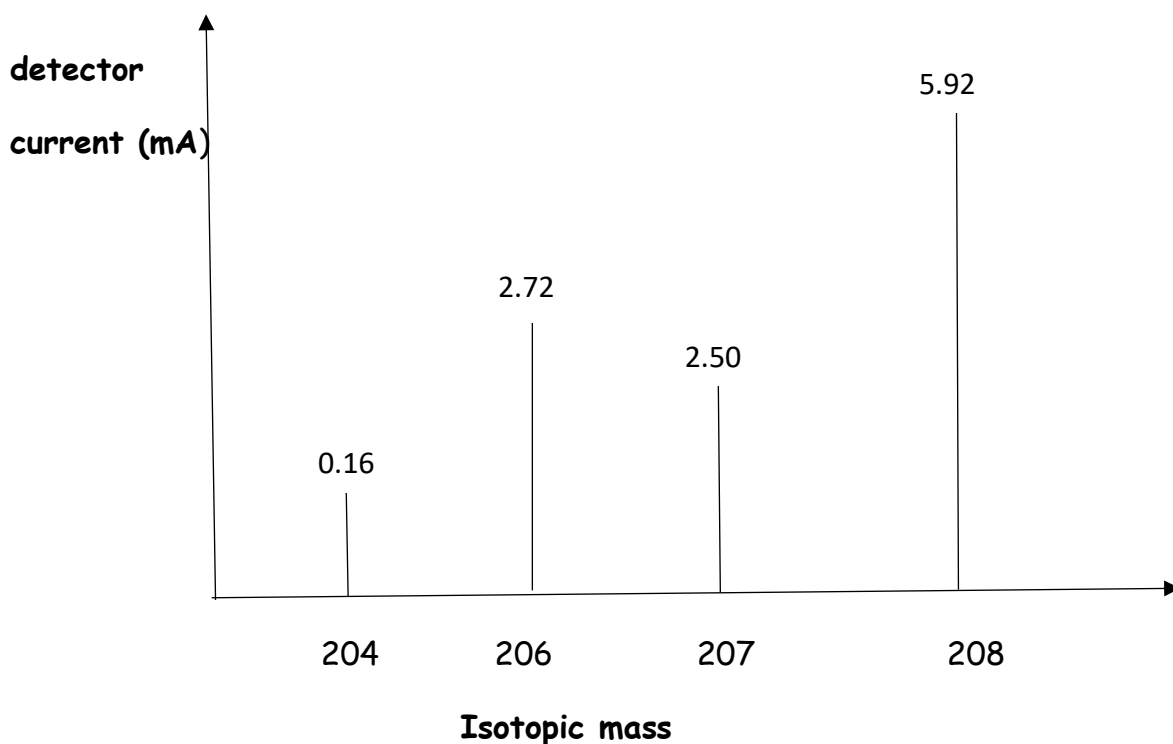
Insulation, electrical conductivity and as a solvent.

(RMM of P=60, RMM of Q=18, H=1, O=16, Si=28, Cu=64)

Task

- a) Using the data provided, calculate the molecular formulae P and Q (04 scores)
- b) Predict the type of bond and structures formed by P, Q and R (03 scores)
- c) Explain how their structures will influence their use in insulation, electrical conductivity and as solvents (08 scores)

3. The Ugandan national bureau of standards received complaints about metal contamination in several imported fruit juices after consumers reported symptoms of headaches, stomach pain and dizziness. The agency suspected that the juice might contain a toxic metal but the exact metal was unknown. When the juice sample was taken and analysed, the suspected metal in juice had mass spectrometry analysis data as shown below.



Task

As a chemistry student,

- a) With the aid of a labelled diagram, describe how the agency could have obtained the above analytical data (08 scores)

b) Using the information provided, show how the above information can be used to determine relative abundance and relative atomic mass of the toxic metal identified (5 scores)

c) what are the other uses of mass spectrometry (2 scores)

END