Atomic structure – AS 2022 Chemistry P1

1. June/2022/Paper_7404/1/No.5

   A sample of antimony is analysed in a time of flight (TOF) mass spectrometer and is found to contain two isotopes, ^{121}Sb and ^{123}Sb

   After electron impact ionisation, all of the ions are accelerated to the same kinetic energy (KE) and then travel through a flight tube that is 1.05 m long. A $^{121}Sb^+$ ion takes 5.93×10^{-4} s to travel through the flight tube.

   The kinetic energy of an ion is given by the equation $KE = \frac{1}{2}mv^2$

   KE = kinetic energy / J
   m = mass / kg
   v = speed / m s^{-1}

   Calculate the mass, in kg, of one $^{121}Sb^+$ ion.

   Calculate the time taken for a $^{123}Sb^+$ ion to travel through the same flight tube.

   The Avogadro constant, $L = 6.022 \times 10^{23}$ mol^{-1}

   [5 marks]

   Mass of one $^{121}Sb^+$ ion _____ kg

   Time taken by a $^{123}Sb^+$ ion _____ s

2. June/2022/Paper_7404/1/No.9

Which atom has two more protons and two more neutrons than $^{52}_{24}Cr$?

[1 mark]

A $^{54}_{26}Cr$ ◯

B $^{56}_{26}Cr$ ◯

C $^{54}_{26}Fe$ ◯

D $^{56}_{26}Fe$ ◯

3. June/2022/Paper_7404/1/No.13

Which statement about isotopes of an element is **not** correct?

[1 mark]

A They have the same chemical properties. ◯

B They have the same number of electrons in ions of the same charge. ◯
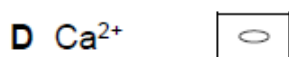
C They have the same number of neutrons. ◯

D They have the same number of protons. ◯

4. June/2022/Paper_7404/1/No.17
Which of these ions has the largest ionic radius?

[1 mark]

A S^{2-} ◯

B Cl^- ◯

C K^+ ◯

D Ca^{2+} ◯

5. June/2022/Paper_7404/1/No.20

Which block in the Periodic Table contains the element samarium (Sm)?

[1 mark]

A d block

B f block

C p block

D s block