TOPIC 24 Nucleus

1 What are isotopes?

A atoms which are radioactive
B atoms with too many neutrons
C atoms of the same element with different numbers of neutrons
D atoms of the same element with different numbers of protons
E atoms which have gained or lost an electron J90/I/39

2 Which of the following nuclides has equal numbers of neutrons and protons?

A $^{1}_{1}H$ **D** $^{9}_{4}Be$
B $^{4}_{2}He$ **E** $^{11}_{5}Bo$
C $^{7}_{3}Li$ J91/I/37

3 A nuclide is represented by $^{35}_{17}Cl$.

How many neutrons and protons does each nucleus contain?

	neutrons	*protons*
A	17	18
B	17	35
C	18	17
D	18	35
E	35	17

N91/I/40

4 An atom of an element has a nucleus surrounded by particles.

Which of the following gives its structure?

	nucleus	*surrounded by*
A	electrons and protons	neutrons
B	electrons and neutrons	protons
C	protons and neutrons	electrons
D	electrons	protons and neutrons
E	protons	electrons and neutrons

J92/I/39

5 A nucleus of the element cobalt may be represented by the symbol $^{59}_{27}Co$.

What is the structure of a neutral atom of cobalt?

	number of electrons	*number of protons*	*number of neutrons*
A	27	27	32
B	27	59	32
C	32	27	59
D	59	27	32
E	59	32	27

J92/I/40

6 Deuterium, $^{2}_{1}H$, and tritium, $^{3}_{1}H$, are two isotopes of hydrogen.

Compared to a deuterium atom, how many protons, neutrons and electrons does a tritium atom have?

	protons	*neutrons*	*electrons*
A	more	more	same
B	more	same	more
C	same	more	same
D	same	more	fewer
E	same	fewer	more

J93/I/40

7 The table shows the composition of the nuclei of some atoms.

atom	*number of protons*	*number of neutrons*	*nucleon number*
U	14	14	28
V	13	14	27
W	12	12	24
X	11	13	24
Y	10	12	22
Z	10	10	20

Which two atoms are isotopes of the same element?

A **U** and **V** **D** **W** and **Y**
B **V** and **Y** **E** **Y** and **Z**
C **W** and **X** N93/I/39

8 The neutral atoms of all isotopes of the same element contain the same numbers of

A electrons and of protons.
B electrons and of neutrons.
C neutrons.
D neutrons and of protons. J94/I/40

9 What are isotopes?

A atoms of the same element with different numbers of neutrons
B atoms of the same element with different numbers of protons
C atoms which are radioactive
D atoms which have gained or lost an electron

N94/I/40

10 Three nuclei **X**, **Y** and **Z** have proton numbers and nucleon numbers as shown.

	proton number	*nucleon number*
X	43	93
Y	43	94
Z	44	94

Which nuclei are isotopes of the same element?

A **X** and **Y** only
B **X** and **Z** only
C **Y** and **Z** only
D **X**, **Y** and **Z** J95/I/39

11 A neutral atom consists of seventeen electrons, seventeen protons and eighteen neutrons.

What is its nucleon number (mass number)?

A 17 **C** 35
B 34 **D** 52 N95/I/39

12 How many neutrons and protons does one atom of substance ${}^{A}_{Z}X$ have in its nucleus?

	number of neutrons	*number of protons*
A	A	Z
B	Z	A
C	A-Z	Z
D	Z-A	A

J96/I/40

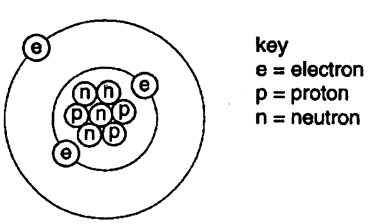
13 The table shows a student's ideas of the possible structure of the calcium atom.

structure	*in nucleus*	*in orbit*
U	20 protons 20 neutrons	20 electrons
V	20 protons 20 electrons	20 neutrons
W	20 neutrons 20 electrons	20 protons
X	20 protons 24 neutrons	20 electrons
Y	20 neutrons 24 electrons	20 protons
Z	20 protons 24 neutrons	24 electrons

Which structures could be neutral atoms?

A U and X **C** W and Y
B U and Z **D** X and Z J97/I/39

14 The diagram shows the structure of an atom of lithium (Li).



What is the nuclide notation of this atom?

A ${}^{3}_{7}Li$ **C** ${}^{4}_{3}Li$
B ${}^{3}_{4}Li$ **D** ${}^{7}_{3}Li$ J98/I/37

15 Atom Q is an isotope of atom P.

How does the composition of neutral atom Q compare with neutral atom P?

	number of protons	*number of neutrons*	*number of electrons*
A	different	different	different
B	different	same	same
C	same	different	same
D	same	same	different

J98/I/38

16 A nucleus is represented by the symbol ${}^{81}_{37}X$.

What does the nucleus contain?

A 37 electrons and 44 neutrons
B 37 neutrons and 81 protons
C 37 protons and 44 neutrons
D 37 protons and 81 neutrons N98/I/38

17 The symbol for one isotope of uranium is ${}^{233}_{92}U$.

How many neutrons, protons and electrons are there in a neutral atom of this isotope?

	number of neutrons	number of protons	number of electrons
A	92	92	141
B	92	141	141
C	141	92	92
D	141	92	141

J99/I/37

18 The table shows the composition of the nuclei of three nuclides, X, Y and Z.

nuclide	number of protons	number of neutrons
X	12	12
Y	13	12
Z	13	13

Which nuclides are isotopes of the same element?

A X and Y only **C** Y and Z only
B X and Z only **D** X, Y and Z N99/I/38

19 Isotopes of an element contain the same number of

A atoms. **C** nucleons.
B neutrons. **D** protons. J2000/I/37

20 The nueleus of a uranium atom is represented by ${}^{218}_{92}U$.

(a) What is

(i) the mass number,

(ii) the atomic number,

of this nucleus?

(b) How many protons are there in the nueleus?

(c) Name the other particles in the nucleus.

How many of these particles are there in this nucleus?

(d) This nucleus is radioactive. Describe briefly how it could be established that a-particles are emitted.

(e) There is a heavier isotope of uranium. What can you say concerning the atomic number and mass number of this isotope? J80/II/15

21 A carbon nuclide can be described by the notation ${}^{14}_{6}C$. In this notation,

(a) what information does the number 6 convey,

(b) what information does the number 14 convey?

N80/I/14

22 A particular nuclide of tin has atomic number 50 and mass number 118.

(a) How many electrons are there outside the nucleus in a neutral atom of tin?

(b) How many neutrons are there in the nucleus?

(c) How many protons are there in the nucleus?

Suggest possible values for the atomic number and mass number of one isotope of this tin nuclide. N82/I/14

23 $^{235}_{92}U$ is an isotope of uranium.

(a) What quantity is the same for the nuclei of all isotopes of uranium? [1]

(b) In each nucleus of $^{235}_{92}U$, how many

(i) protons,

(ii) neutrons,

are there? [2]

N92/II/8

24 $^{112}_{50}Sn$ is a stable isotope of tin.

What information does the symbol $^{112}_{50}Sn$ give us about the isotope? [2]

N94/II/8

25 A chlorine atom, proton number 17, can gain an electron and become a chlorine ion. A sodium atom, proton number 11, can lose an electron and become a sodium ion.

(a) What is the sign of the charge on

(i) a chlorine ion,

(ii) a sodium ion?

Explain how you arrived at your answers.

Sign of charge on a chlorine ion .....

Sign of charge on a sodium ion ..... [3]

(b) How many electrons are contained in

(i) a chlorine ion,

(ii) a sodium ion?

A chlorine ion contains ..... electrons.

A sodium ion contains ..... electrons. [2]

N95/II/8

ANSWERS

1.	**C**	2.	**B**	3.	**C**	4.	**C**	5.	**A**
6.	**C**	7.	**E**	8.	**A**	9.	**A**	10.	**A**
11.	**C**	12.	**C**	13.	**A**	14.	**D**	15.	**C**
16.	**C**	17.	**C**	18.	**C**	19.	**D**		

20. *(a)* (i) 218 (ii) 92
    (b) 92
    (c) neutrons ; 126
22. *(a)* 50 *(b)* 68
    (c) 50 ; A = 117 , 119 etc , z = 50
23. *(a)* Protons
    (b) (i) 92 protons
    (ii) 143 neutrons.
25. *(a)* (i) – (negative) (ii) + (positive)
    (b) (i) 18 electrons (ii) 10 electrons