Chapter 3

Atoms, elements and compounds

3.1 Atomic structure and the Periodic Table

01. 0620_m21_qp_22 Q: 4

Which statement about the atoms of all the isotopes of carbon is correct?

A They are all radioactive.

B They have the same mass.

C They have the same number of neutrons.

D They have the same number of electrons in the outer shell.

---

02. 0620_s21_qp_21 Q: 4

Element X has 7 protons.

Element Y has 8 more protons than X.

Which statement about element Y is correct?

A Y has more electron shells than X.

B Y has more electrons in its outer shell than X.

C Y is in a different group of the Periodic Table from X.

D Y is in the same period of the Periodic Table as X.

---

03. 0620_s21_qp_22 Q: 4

Element X has 7 protons.

Element Y has 8 more protons than X.

Which statement about element Y is correct?

A Y has more electron shells than X.

B Y has more electrons in its outer shell than X.

C Y is in a different group of the Periodic Table from X.

D Y is in the same period of the Periodic Table as X.

---

04. 0620_s21_qp_23 Q: 4

Element X has 7 protons.

Element Y has 8 more protons than X.

Which statement about element Y is correct?

A Y has more electron shells than X.

B Y has more electrons in its outer shell than X.

C Y is in a different group of the Periodic Table from X.

D Y is in the same period of the Periodic Table as X.

---

05. 0620_w21_qp_21 Q: 4

Which statement explains why metals conduct electricity when solid?

A They have atoms which are free to move.

B They have electrons which are free to move.

C They have molecules which are free to move.

D They have positive ions which are free to move.

---

06. 0620_w21_qp_23 Q: 4

The nucleus of a particular atom consists of nineteen particles.

Nine of them are positively charged and ten of them are uncharged.

Which statement about this nucleus is correct?

A The nucleus has a nucleon number of nine.

B The nucleus has a nucleon number of ten.

C The nucleus has a proton number of nine.

D The nucleus has a proton number of ten.

---

07. 0620_m20_qp_22 Q: 5

$^{14}_{6}C$ and $^{12}_{6}C$ are isotopes of carbon.

Which statement about these isotopes is correct?

A $^{12}_{6}C$ is more reactive than $^{14}_{6}C$ because the atoms have less mass.

B $^{12}_{6}C$ is more reactive than $^{14}_{6}C$ because the atoms have different numbers of neutrons.

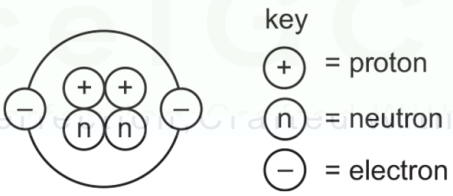
C The reactions of $^{12}_{6}C$ are similar to $^{14}_{6}C$ because they have the same number of outer shell electrons.

D The reactions of $^{12}_{6}C$ are similar to $^{14}_{6}C$ because they have the same number of protons in the nucleus.

---

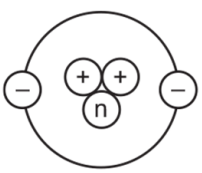
08. 0620_p20_qp_20 Q: 3

The diagram shows the structure of an atom.

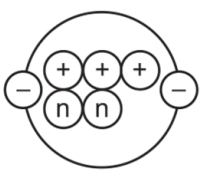


Which diagram shows the structure of an isotope of this atom?

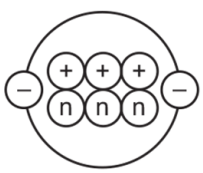
A



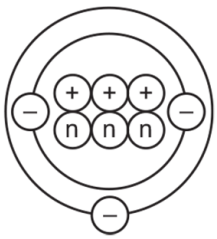
B



C



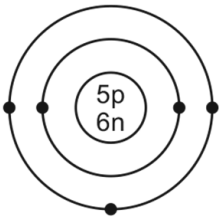
D



---

09. 0620_s20_qp_23 Q: 4

The structure of an atom of element X is shown.



key
● = electron
n = neutron
p = proton

What is element X?

A boron

B carbon

C sodium

D sulfur

---

10. 0620_w20_qp_21 Q: 5

The atomic structure of four particles are shown.

	electrons	protons	neutrons
P	18	17	18
Q	18	17	20
R	17	17	18
S	17	17	20

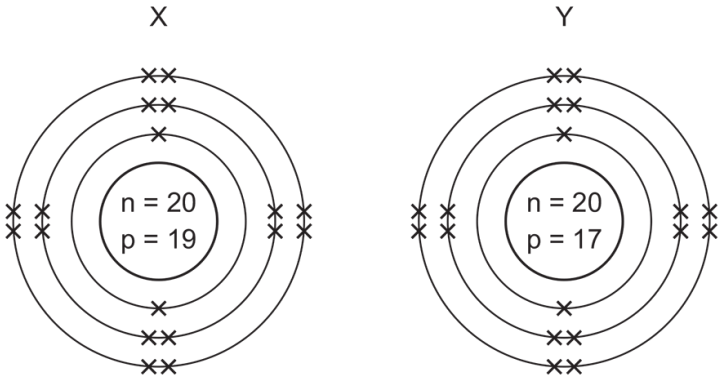
Which particles have the same chemical properties?

A P and R only **B** P and S **C** P, Q and R **D** R and S

---

11. 0620_w20_qp_21 Q: 6

The arrangements of the electrons in two ions formed from elements X and Y are shown.



Which equation represents the reaction between elements X and Y?

A $X_2 + 2Y \rightarrow 2X^+ + 2Y^-$

B $X_2 + 2Y \rightarrow 2X^- + 2Y^+$

C $2X + Y_2 \rightarrow 2X^+ + 2Y^-$

D $2X + Y_2 \rightarrow 2X^- + 2Y^+$

12. 0620_w20_qp_22 Q: 3

Which statement about isotopes is correct?

A They have different proton numbers.

B They have different chemical properties.

C They have the same nucleon number.

D They have the same number of electrons in their outer shell.

---

13. 0620_m19_qp_22 Q: 5

Which row describes isotopes of the same element?

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

---

14. 0620_s19_qp_21 Q: 4

Which statement about an atom of fluorine, $^{19}_{9}F$, is correct?

A It contains more protons than neutrons.

B It contains a total of 28 protons, neutrons and electrons.

C Its isotopes contain different numbers of protons.

D Its nucleus contains 9 neutrons.

---

15. 0620_s19_qp_22 Q: 4

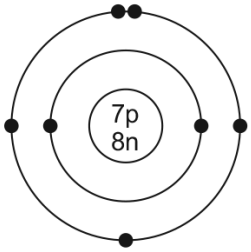
What is an isotope of $^{31}_{15}E$?

A $^{31}_{14}E$ **B** $^{33}_{15}E$ **C** $^{31}_{16}E$ **D** $^{33}_{16}E$

---

16. 0620_s19_qp_23 Q: 4

The structure of an atom is shown.



key

● = electron
n = neutron
p = proton

Which element is the atom an isotope of?

A nitrogen

B oxygen

C phosphorus

D titanium

---

17. 0620_w19_qp_21 Q: 5

An isotope of chromium is represented by $^{52}_{24}Cr$.

Which statement about an atom of this isotope of chromium is correct?

A It contains 24 electrons.

B It contains 24 neutrons.

C It contains 28 protons.

D It contains 52 neutrons.

---

18. 0620_w19_qp_21 Q: 6

Element X has two isotopes, $^{12}_{6}X$ and $^{14}_{6}X$.

Which statement about these isotopes is correct?

A They have different chemical properties because they have different numbers of neutrons.

B They have the same chemical properties because they have the same number of outer shell electrons.

C They have the same nucleon number because the sum of the number of protons and electrons is the same.

D They have different positions in the Periodic Table because they have different numbers of neutrons.

---

19. 0620_w19_qp_22 Q: 5

What is the total number of electrons in one molecule of ammonia, NH_3?

A 6 **B** 8 **C** 10 **D** 11

---

20. 0620_w19_qp_22 Q: 6

Rubidium has two isotopes, ${}^{85}_{37}Rb$ and ${}^{87}_{37}Rb$.

Which statement explains why both isotopes have the same chemical properties?

A They have the same number of protons.

B They have the same number of outer shell electrons.

C They have different numbers of neutrons.

D They have different mass numbers.

---

21. 0620_w19_qp_23 Q: 5

The numbers of protons, neutrons and electrons present in the atoms P, Q, R and S are shown.

atom	number of protons	number of neutrons	number of electrons
P	4	5	4
Q	5	6	5
R	6	6	6
S	6	7	6

Which atoms are isotopes of the same element?

A P and Q only **B** Q and R only **C** R and S only **D** P and S only

---

22. 0620_w19_qp_23 Q: 6

Carbon has three isotopes, ^{12}C, ^{13}C and ^{14}C.

Why do all three isotopes have the same chemical properties?

A They all have the same atomic mass.

B They all have the same number of electrons in their outer shell.

C They all have the same number of electron shells.

D They all have the same number of nucleons.

---

23. 0620_s18_qp_21 Q: 5

Chlorine exists as two common isotopes, ^{35}Cl and ^{37}Cl.

Information about these two isotopes is shown.

	number of protons	number of neutrons	number of electron shells
^{35}Cl	17	18	3
^{37}Cl	17	20	3

Which statement explains why the two isotopes are of the same element?

A Both have the same number of electron shells.

B Both have the same number of protons.

C Both have 7 outer shell electrons.

D ^{37}Cl has 2 more neutrons than ^{35}Cl.

---

24. 0620_s18_qp_22 Q: 5

Which pair shows particles with the same chemical properties?

A $^{23}_{11}M$ and $^{23}_{11}M^{+}$

B $^{23}_{11}M$ and $^{24}_{11}M$

C $^{23}_{11}M$ and $^{23}_{12}M$

D $^{24}_{11}M^{+}$ and $^{24}_{12}M^{+}$

---

25. 0620_s18_qp_23 Q: 5

Iron has an atomic number of 26. It occurs as the isotopes ^{54}Fe, ^{56}Fe, ^{57}Fe and ^{58}Fe.

Which statement explains why these isotopes have the same chemical properties?

A They have similar mass numbers.

B They have the same number of electrons in their outer shells.

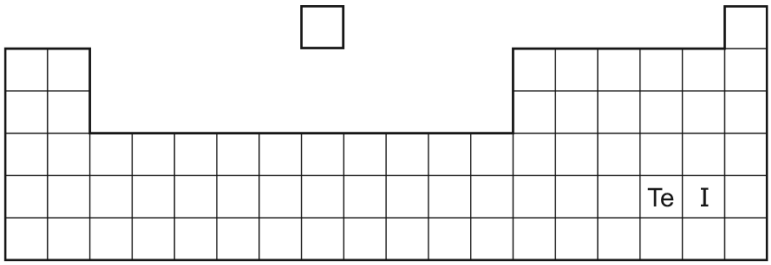
C They have the same number of neutrons in their nuclei.

D They have the same number of protons in their nuclei.

---

26. 0620_w18_qp_21 Q: 3

Iodine, I, has a lower relative atomic mass than tellurium, Te, but is placed after it in the Periodic Table.



Which statement explains why iodine is placed after tellurium in the Periodic Table?

A Iodine has fewer neutrons than tellurium.

B Iodine has fewer protons than tellurium.

C Iodine has more neutrons than tellurium.

D Iodine has more protons than tellurium.

---

27. 0620_w18_qp_21 Q: 4

Which statement about the isotopes of an element is correct?

A Their physical properties are different because they have different proton numbers.

B Their atomic masses are different because they have different numbers of electron shells.

C They have the same chemical properties because they have the same number of electrons in their outer shells.

D They have the same physical properties because they have the same number of neutrons in their nuclei.

---

28. 0620_w18_qp_21 Q: 5

Which two molecules contain the same number of electrons?

A Cl_2 and SO_2

B CH_4 and H_2O

C CO and NH_3

D CO_2 and HCl

---

29. 0620_w18_qp_22 Q: 3

How many neutrons are present in the atom $^{45}_{21}X$?

A 21 **B** 24 **C** 45 **D** 66

---

30. 0620_w18_qp_22 Q: 4

Two naturally occurring isotopes of oxygen are ^{16}O and ^{17}O.

Which statement is correct?

A Both isotopes react with iron to form rust.

B Neither isotope reacts with iron to form rust.

C Only ^{16}O reacts with iron to form rust.

D Only ^{17}O reacts with iron to form rust.

---

31. 0620_w18_qp_23 Q: 3

Which statement describes isotopes?

A Isotopes of the same element have different electron arrangements.

B Isotopes of the same element have different nuclear charges.

C Isotopes of the same element have nuclei with masses that are the same.

D Isotopes of the same element have the same number of protons.

---

32. 0620_w18_qp_23 Q: 4

X and Y are both atoms.

X and Y have the same chemical properties as each other.

Which row describes the atomic structures of X and Y?

	X			Y		
	protons	neutrons	electrons	protons	neutrons	electrons
A	6	6	6	6	6	7
B	6	6	6	6	8	6
C	6	6	6	16	16	16
D	7	6	7	6	6	7

---

33. 0620_m17_qp_22 Q: 4

Which statement explains why isotopes of an element have the same chemical properties?

A They have different numbers of neutrons.

B They have the same number of electrons as protons.

C They have the same number of electrons in the outer shell.

D They have the same number of protons in the nucleus.

---

34. 0620_w17_qp_21 Q: 5

Which statement explains why isotopes of the same element have the same chemical properties?

A They have a different number of neutrons in the nucleus.

B They have the same number of neutrons in the nucleus.

C They have the same number of outer shell electrons.

D They have the same number of protons as neutrons.

---

35. 0620_w17_qp_22 Q: 5

Why do isotopes of the same element have the same chemical properties?

A They have the same nucleon number.

B They have the same number of electrons in the outer shell.

C They have the same number of neutrons in the nucleus.

D They have the same number of protons as neutrons.

---

36. 0620_w17_qp_23 Q: 5

Carbon has three naturally occurring isotopes, ^{12}C, ^{13}C and ^{14}C.

Which statement explains why the isotopes have the same chemical properties?

A They have the same number of electrons in the first shell.

B They have the same number of electrons in the outer shell.

C They have the same number of neutrons in the nucleus.

D They have the same number of protons as neutrons.

---

37. 0620_m16_qp_22 Q: 7

X and Y are isotopes of the same element.

Which statement is correct?

A X and Y have atoms with different numbers of electron shells.

B X and Y have atoms with the same nucleon number.

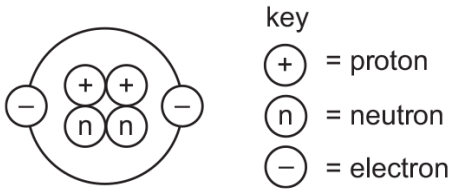
C X and Y have atoms with the same number of outer shell electrons.

D X and Y have different chemical properties.

---

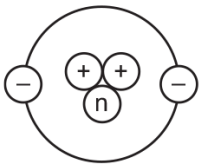
38. 0620_p16_qp_20 Q: 3

The diagram shows the structure of an atom.

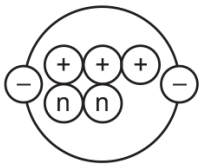


Which diagram shows the structure of an isotope of this atom?

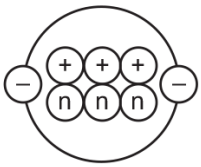
A



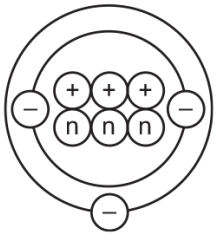
B



C



D



---

39. 0620_s16_qp_21 Q: 4

Which statements about isotopes of the same element are correct?

1 They are atoms which have the same chemical properties because they have the same number of electrons in their outer shell.

2 They are atoms which have the same number of electrons and neutrons but different numbers of protons.

3 They are atoms which have the same number of electrons and protons but different numbers of neutrons.

A 1 and 2 **B** 1 and 3 **C** 2 only **D** 3 only

---

40. 0620_w16_qp_21 Q: 4

The table shows information about atoms of three different elements.

element	proton number	nucleon number	number of protons	number of neutrons	number of electrons
chlorine	17	35	17	W	17
chlorine	17	X	17	19	17
argon	Y	40	18	22	18
potassium	19	39	19	20	Z

What are the values of W, X, Y and Z?

	W	X	Y	Z
A	18	35	18	19
B	18	36	18	19
C	19	35	19	18
D	19	36	19	18

---

41. 0620_w16_qp_22 Q: 4

The table shows information about four different particles.

particle	proton number	nucleon number	number of protons	number of neutrons	number of electrons
Na	11	23	11	W	11
Na^+	11	23	11	12	X
O	8	16	8	Y	8
O^{2-}	8	16	8	8	Z

What are the values of W, X, Y and Z?

	W	X	Y	Z
A	11	10	10	8
B	11	11	8	10
C	12	10	8	10
D	12	11	10	8

SN	Paper	Q. No.	Answer
01	0620_m21_qp_22	4	D
02	0620_s21_qp_21	4	A
03	0620_s21_qp_22	4	A
04	0620_s21_qp_23	4	A
05	0620_w21_qp_21	4	B
06	0620_w21_qp_23	4	C
07	0620_m20_qp_22	5	C
08	0620_p20_qp_20	3	A
09	0620_s20_qp_23	4	A
10	0620_w20_qp_21	5	D
11	0620_w20_qp_21	6	C
12	0620_w20_qp_22	3	D
13	0620_m19_qp_22	5	C
14	0620_s19_qp_21	4	B
15	0620_s19_qp_22	4	B
16	0620_s19_qp_23	4	A
17	0620_w19_qp_21	5	A
18	0620_w19_qp_21	6	B
19	0620_w19_qp_22	5	C
20	0620_w19_qp_22	6	B
21	0620_w19_qp_23	5	C
22	0620_w19_qp_23	6	B
23	0620_s18_qp_21	5	B
24	0620_s18_qp_22	5	B
25	0620_s18_qp_23	5	B
26	0620_w18_qp_21	3	D
27	0620_w18_qp_21	4	C
28	0620_w18_qp_21	5	B
29	0620_w18_qp_22	3	B
30	0620_w18_qp_22	4	A
31	0620_w18_qp_23	3	D
32	0620_w18_qp_23	4	B
33	0620_m17_qp_22	4	C
34	0620_w17_qp_21	5	C
35	0620_w17_qp_22	5	B
36	0620_w17_qp_23	5	B
37	0620_m16_qp_22	7	C
38	0620_p16_qp_20	3	A
39	0620_s16_qp_21	4	B
40	0620_w16_qp_21	4	B
41	0620_w16_qp_22	4	C