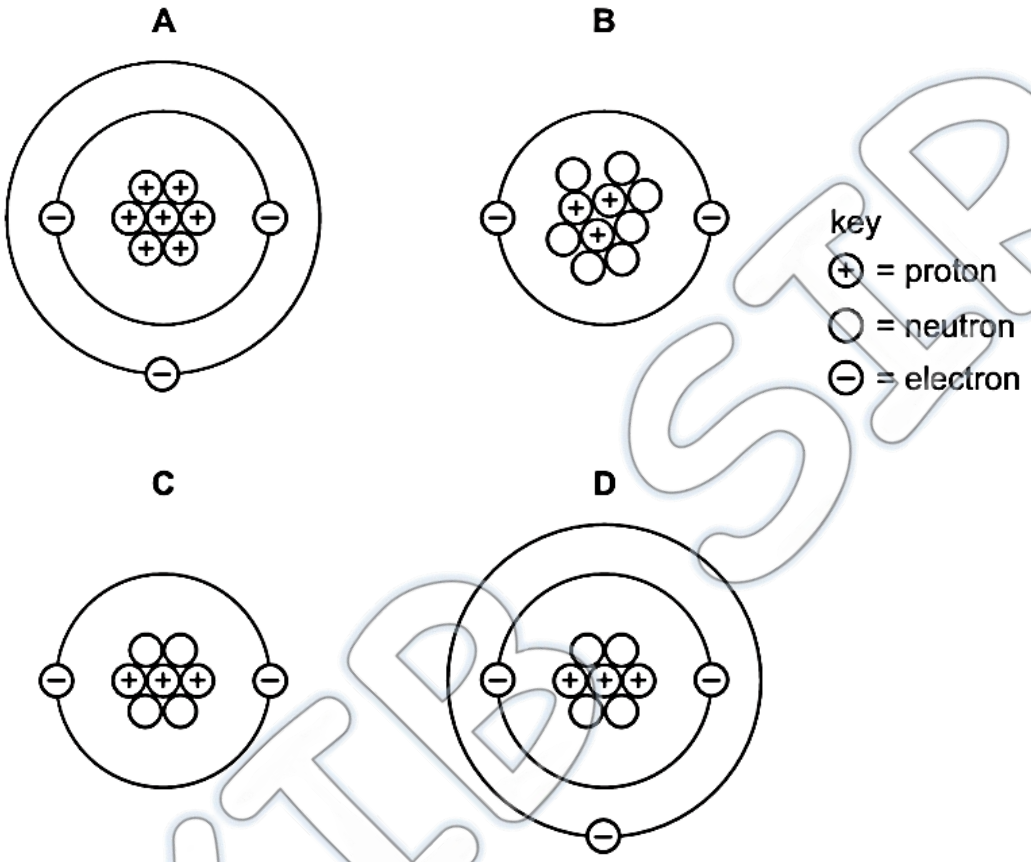
3173/12/M/J/21

1. Which diagram shows the ion $^{7}_{3}Li^{+}$?



2. Three statements about the elements carbon, nitrogen and sulfur are shown.

1 They are in groups next to each other in the Periodic Table.

2 Their neutron to proton ratios are all two to one.

3 They each form an acidic oxide.

Which statements are correct?

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

3. The table shows data for some particles. There are gaps represented by W, X, Y and Z.

particle	proton number	nucleon number	number of neutrons	number of electrons
Ar	18	40	W	18
K^+	19	39	20	X
Sc	21	Y	24	21
S^{2-}	16	32	16	Z

Which row shows the correct values for W, X, Y and Z?

	W	X	Y	Z
A	20	20	42	14
B	20	20	42	16
C	22	18	45	14
D	22	18	45	18

4. Hydrogen can form both H^+ ions and H^- ions.

Which statement is correct?

A An H^+ ion has more protons than an H^- ion.

B An H^+ ion has no electrons.

C An H^- ion has one more electron than an H^+ ion.

D An H^- ion is formed when a hydrogen atom loses an electron.

5. Iodine and sodium chloride are solids at room temperature and pressure.

Which row correctly shows the structure of iodine and the bonding in sodium chloride?

	structure of iodine	bonding in sodium chloride
A	giant molecular	covalent
B	giant molecular	ionic
C	simple molecular	covalent
D	simple molecular	ionic

6. It is possible to produce Ar^{2+} ions from argon atoms in a laboratory.

Which statement is correct?

A Each argon atom gains two electrons and loses the electronic configuration of an inert gas.

B Each argon atom gains two electrons and obtains the electronic configuration of an inert gas.

C Each argon atom loses two electrons and loses the electronic configuration of an inert gas.

D Each argon atom loses two electrons and obtains the electronic configuration of an inert gas.

7. Many elements and compounds contain covalent bonds.

Which statement about covalently bonded elements and compounds is correct?

A Aqueous solutions of covalent compounds always conduct electricity.

B Bonding in the nitrogen molecule involves three shared pairs of electrons.

C Double covalent bonds are present in ethene and in water.

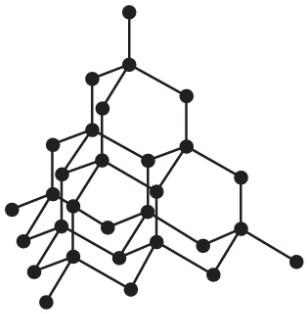
D The formation of covalent bonds always produces atoms with eight electrons in their outer shells.

5070/11/M/J/21

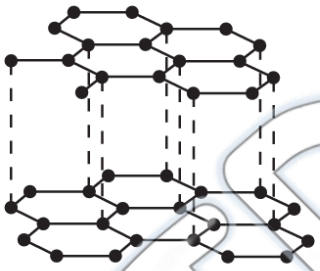
8. Which particle contains most electrons?

A O^{3-} **B** Ne **C** Na^{-} **D** Mg^{3+}

9. The diagrams show the structures of two solids, P and Q.



P



Q

Which row is correct?

	has covalent bonding	conducts electricity
A	P only	P only
B	P only	Q only
C	both P and Q	P only
D	both P and Q	Q only

10. What is a covalent bond?

A a pair of electrons shared by two non-metallic atoms

B electrons being shared by a lattice of positively charged ions

C elements losing electrons to achieve a noble gas structure

D oppositely charged particles strongly attracting each other

5070/12/M/J/21

11. Use the Periodic Table to answer this question.

Which two particles have the same number of electrons?

A Ar and Ca

B Na^+ and K^+

C Fe^{2+} and Fe^{3+}

D Ca^{2+} and Sc^{3+}

12. The table shows data for particles W, X, Y and Z.

particle	proton number	nucleon number	number of electrons
W	6	12	6
X	6	14	6
Y	7	14	7
Z	8	16	10

Which statements are correct?

1 W and X are isotopes of the same element.

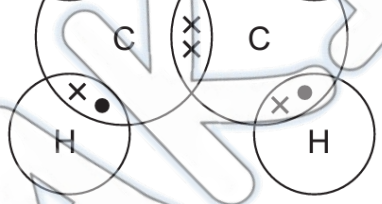
2 Y is in Group V of the Periodic Table.

3 Z is a cation.

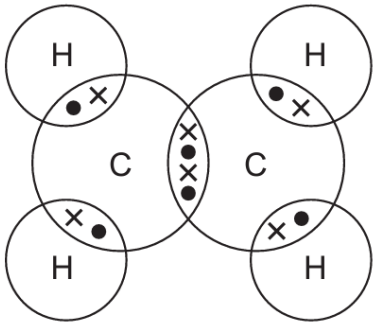
A 1 and 2 **B** 1 and 3 **C** 1 only **D** 2 and 3

13. Which dot-and-cross diagram correctly shows a molecule of ethene?

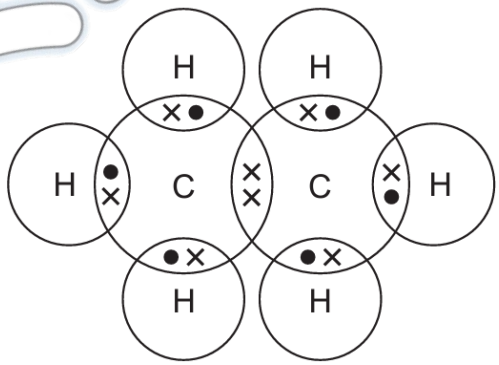
A



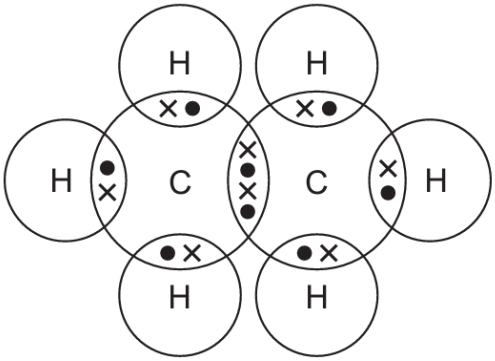
B



C



D



5070/11/O/N/21

14. Which statement about atoms and ions is correct?

A Atoms and ions of the same element must have different numbers of neutrons.

B Isotopes of different elements must have different numbers of neutrons.

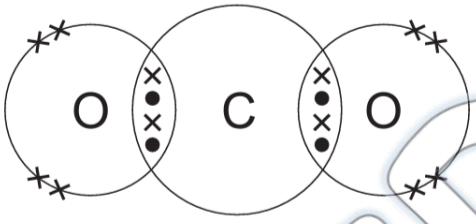
C The charge on a positive ion = (nucleon number – number of neutrons – number of electrons).

D The number of protons and number of neutrons in an atom must be the same.

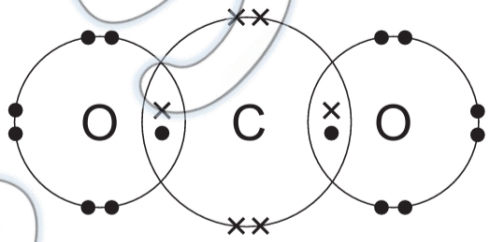
15. The bonding in a molecule of carbon dioxide can be represented by a dot-and-cross diagram.

Which diagram is correct?

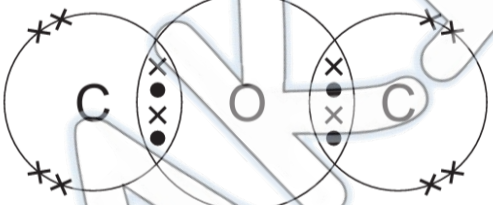
A



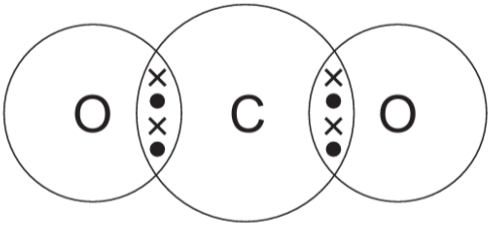
B



C



D



16. Which statement about the structure or bonding of metals is correct?

A A metal lattice consists of negative ions in a ‘sea of electrons’.

B Electrons in a metal move randomly through the lattice.

C Metals are malleable because the ions present are mobile.

D The ions in a metal move when positive and negative electrodes are attached.

5070/12/O/N/21

17. The table shows data for some particles.

particle	proton number	nucleon number	number of protons	number of neutrons	number of electrons
sodium ion	11	23	11	W	10
fluoride ion	9	19	9	10	X
magnesium ion	12	24	Y	12	10

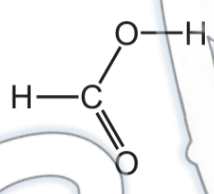
What are the values of W, X and Y?

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

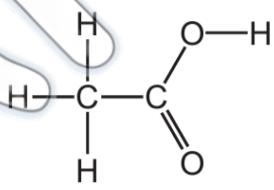
18. A covalent compound P has the empirical formula CH_2O.

Which structure represents P?

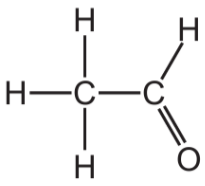
A



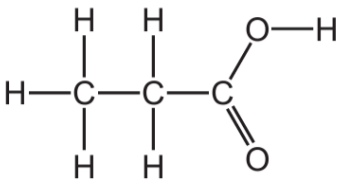
B



C



D



19. Which statement about the structure or bonding of metals is correct?

A A metal lattice consists of negative ions in a 'sea of electrons'.

B Electrons in a metal move randomly through the lattice.

C Metals are malleable because the ions present are mobile.

D The ions in a metal move when positive and negative electrodes are attached.

5070/11/M/J/19

20. Cobalt is a transition element.

A particle of cobalt contains 24 electrons and has a nucleon number of 60.

Which statement about this particle is correct?

A It is a 3+ ion.

B It is a 3– ion.

C It contains 24 neutrons.

D It contains 24 protons.

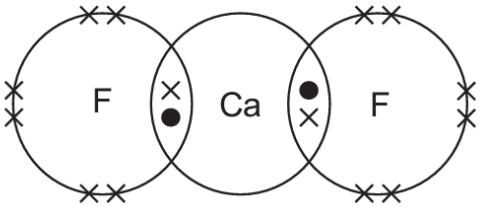
21. Diamond and graphite are two different forms of the element carbon. They each have different uses.

Which row is correct?

	use		
	to cut glass	as an electrode	as a lubricant
A	diamond	diamond	graphite
B	diamond	graphite	graphite
C	graphite	diamond	diamond
D	graphite	graphite	diamond

22. Which diagram shows the outer electron arrangement in calcium fluoride?

A

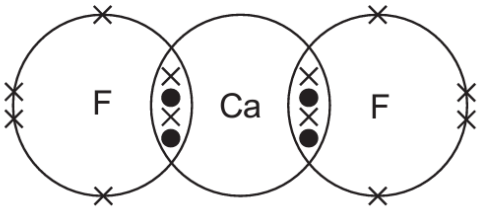


key

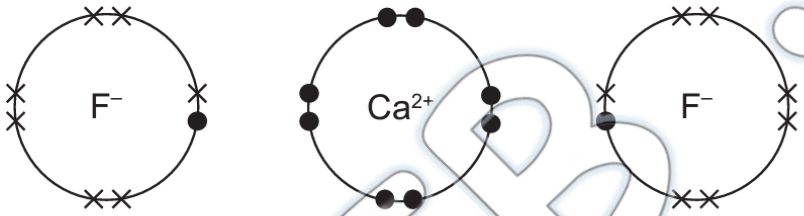
● an electron from calcium

× an electron from fluorine

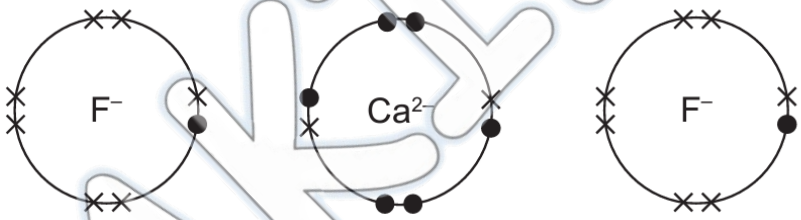
B



C



D



23. What is the number of shared pairs of electrons in an ammonia molecule?

A 3 **B** 4 **C** 5 **D** 6

24. Two statements about metals are given.

1 Metals contain a lattice of negative ions in a 'sea of electrons'.

2 The electrical conductivity of metals is related to the mobility of the electrons in the structure.

Which is correct?

A Both statements are correct and statement 1 explains statement 2.

B Both statements are correct but statement 1 does not explain statement 2.

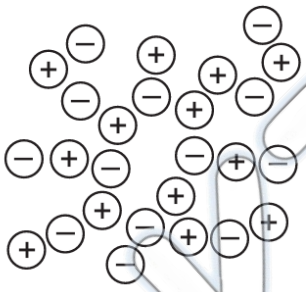
C Statement 1 is correct and statement 2 is incorrect.

D Statement 2 is correct and statement 1 is incorrect.

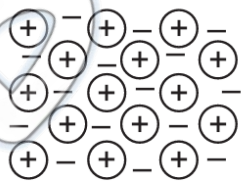
5070/11/O/N/19

25. Which diagram best represents the structure of a solid metal?

A



B



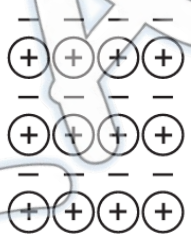
key

⊖ a negative ion

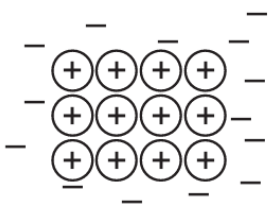
⊕ a positive ion

− an electron

C



D



5070/11/M/J/18

26. The ion Q^{2+} has three complete shells of electrons.

What is Q?

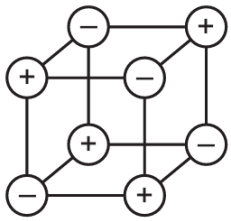
A calcium

B magnesium

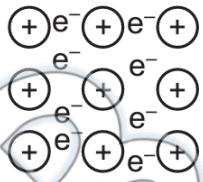
C oxygen

D sulfur

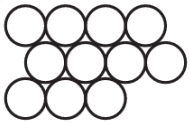
27. The diagrams show the arrangement of particles in three **solids**: X, Y and Z. The three solids are krypton, potassium and sodium chloride.



X



Y



Z

Which row correctly identifies X, Y and Z?

	X	Y	Z
A	krypton	potassium	sodium chloride
B	krypton	sodium chloride	potassium
C	sodium chloride	krypton	potassium
D	sodium chloride	potassium	krypton

5070/12/M/J/18

28. The atomic number of cerium, Ce, is 58. A Ce^{4+} ion has 140 nucleons in its nucleus.

How many protons, neutrons, and electrons are there in one Ce^{4+} ion?

	protons	neutrons	electrons
A	58	82	54
B	58	82	62
C	82	58	54
D	82	58	62

29. Which statement about solid calcium chloride is correct?

A It conducts electricity.

B It has a low melting point.

C It has an ionic lattice structure.

D It is insoluble in water.

30. Which statement about the structure or bonding of metals is correct?

A A metal lattice consists of atoms in a 'sea of electrons'.

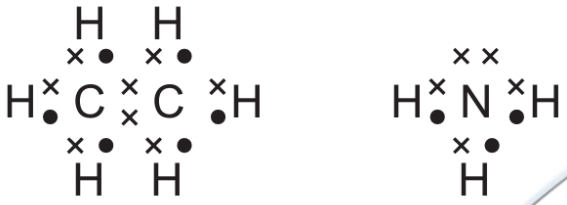
B Electrons in a metal move randomly through the lattice.

C Metals are malleable because the particles present are mobile.

D The ions in a metal move when positive and negative electrodes are attached.

31. Ethane, C_2H_6, and ammonia, NH_3, are covalent compounds.

The dot-and-cross diagrams of these compounds are shown.



Which statements are correct?

1 A molecule of ethane contains twice as many hydrogen atoms as a molecule of ammonia.

2 An unreacted nitrogen atom has five outer electrons.

3 In a molecule of ethane, the bond between the carbon atoms is formed by sharing two electrons, one from each carbon atom.

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

5070/11/O/N/18

32. Which row shows the numbers of particles in $^{34}_{16}S^{2-}$?

	protons	neutrons	electrons
A	16	16	16
B	16	18	18
C	18	16	20
D	20	14	22

33. Which substance has a giant covalent structure at room temperature?

A methane

B sand

C sodium chloride

D water

34. Magnesium oxide has a high melting point. It is used to line the inside of furnaces that operate at high temperatures.

Why does magnesium oxide have a high melting point?

A It has metallic bonds.

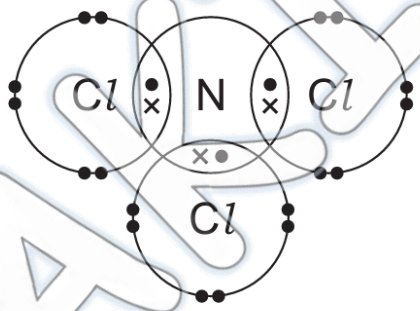
B It has strong forces between its molecules.

C It is a simple molecular substance.

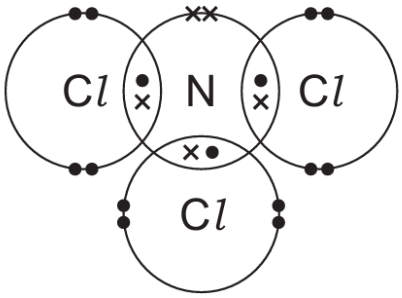
D It is an ionic compound.

35. What is the dot-and-cross diagram for NCl_3?

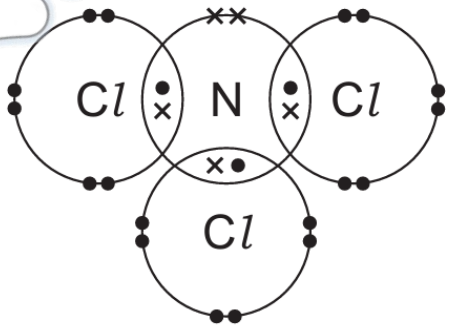
A



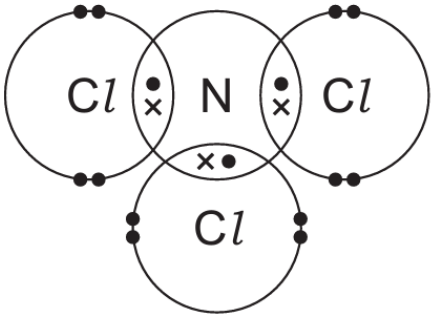
B



C



D



36. Two properties of a metal are given.

1 It is malleable.

2 It conducts electricity.

Which of these properties are due to the layers of positive ions being able to move?

A 1 only

B 2 only

C both 1 and 2

D neither 1 nor 2

5070/12/O/N/18

37. Which particle contains the greatest number of electrons?

A Mg^{2+} **B** N^{3-} **C** Ne **D** S^{2-}

38. Which substance has a giant covalent structure at room temperature?

A methane

B sand

C sodium chloride

D water

39. One atom of element X and two atoms of element Y react to form an ionic compound. Element X forms a positive ion.

Which elements could X and Y be?

	X	Y
A	calcium	chlorine
B	calcium	oxygen
C	sodium	chlorine
D	sodium	oxygen

40. An element with a high melting point forms an oxide that is gaseous at room temperature.

Which type of structure or bonding is present in the element?

A giant covalent

B ionic

C metallic

D simple molecular

41. Which statement explains why aluminium is malleable?

A Aluminium has layers of cations that can slide over one another.

B Aluminium has layers of electrons that can slide over one another.

C Aluminium has weak bonds between protons and a 'sea of electrons'.

D Aluminium is covered with a layer of unreactive aluminium oxide.

5070/11/M/J/17

42. Which statement about the particles $^{19}_{9}F^{-}$, $^{20}_{10}Ne$ and $^{23}_{11}Na^{+}$ is correct?

A They all contain more electrons than protons.

B They all contain more neutrons than protons.

C They all contain the same number of electrons.

D They all contain the same number of protons.

43. How many of the molecules shown contain only one covalent bond?

Cl_2 H_2 HCl N_2 O_2

A 2 **B** 3 **C** 4 **D** 5

44. Which substance has a giant covalent structure and contains atoms of more than one element?

A diamond

B graphite

C methane

D sand

45. Metals conduct electricity.

The movement of which particles is responsible for this conductivity?

A anions

B cations

C electrons

D protons

46. Which substance, when molten, conducts electricity?

A bitumen

B caesium iodide

C diamond

D sand

5070/11/O/N/17

47. When two elements react together, a compound is formed.

Which statement is correct?

A Equal masses of the elements must be used.

B The compound shows similar chemical properties to those of the elements.

C The elements must both be non-metals.

D When the elements react together, ionic or covalent compounds form.

48. Which statement is correct for all ionic compounds?

A They dissolve in water.

B They are formed when metals share electrons with non-metals.

C They conduct electricity in the molten state.

D They conduct electricity in the solid state.

49. When a piece of sodium is heated in air, it reacts with oxygen to form the ionic compound sodium oxide, Na_2O.

In terms of electrons, which statement correctly explains what happens when sodium reacts with oxygen?

A An oxygen atom shares two electrons with two sodium atoms.

B A sodium atom loses two electrons which are transferred to an oxygen atom.

C A sodium atom shares its outer shell electron with two oxygen atoms.

D Two sodium atoms each lose one electron which are both transferred to one oxygen atom.

50. X represents the element of atomic number 8 and Y represents the element of atomic number 19.

The two elements react together to form a compound.

Which row is correct for the compound formed?

	formula	type of bonding
A	Y_2X	covalent
B	Y_2X	ionic
C	X_2Y	covalent
D	X_2Y	ionic

Atoms elements and compounds

Questions	Answers	Marks
1.	C	
2.	C	
3.	D	
4.	B	
5.	D	
6.	C	
7.	B	
8.	C	
9.	D	
10.	A	
11.	D	
12.	A	
13.	B	
14.	C	
15.	A	
16.	B	
17.	C	
18.	B	
19.	B	
20.	A	
21.	B	
22.	C	
23.	A	
24.	D	
25.	B	
26.	A	
27.	D	
28.	A	
29.	C	
30.	B	
31.	A	
32.	B	
33.	B	
34.	D	
35.	C	
36.	A	
37.	D	

38.	B	
39.	A	
40.	A	
41.	A	
42.	C	
43.	B	
44.	D	
45.	C	
46.	B	
47.	D	
48.	C	
49.	D	
50.	B	