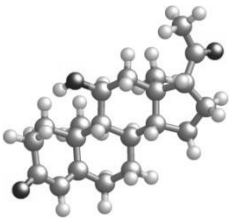

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Revision of Secondary Two Chemistry – Bonding, Formulae, Equations, Acids, Bases and Salts

1. Which particle contains the greatest number of electrons?

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

2. Which compound contains the most covalent bonds?

A Ammonia, NH_3 **B** Carbon dioxide, CO_2

C Chlorine, Cl_2 **D** Water, H_2O

3. Gas **X** has the following properties.

1 Colourless.

2 No effect on either damp red or damp blue litmus paper.

3 No effect on limewater.

4 Flammable.

What is the identity of gas **X**?

A Ammonia **B** Carbon dioxide **C** Hydrogen **D** Oxygen

4. 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 electron configuration.

D Oppositely charged particles strongly attracting each other.

5. How many different chemical elements are present in the compound ammonium sulfate?

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

6. Water in a lake is acidic and the fish are dying. The water in the lake needs to be neutralised. Which compound can be added in excess to neutralise the water in the lake?

A Calcium carbonate **B** Phosphoric acid

C Potassium hydroxide **D** Sodium nitrate

7. Some properties which indicate the differences in elements are listed.

1 Metallic character.

2 Number of electron shells in an atom.

3 Number of protons in an atom.

4 Number of valence electrons in an atom.

Which two properties increase across a Period (from left-to-right) of the Periodic Table?

A 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

8. Elements **X** and **Y** combine to form an ionic compound.

Atoms of **X** have more protons than atoms of **Y**. Atoms of **Y** have more valence electrons than atoms of **X**.

Which statement is correct?

A Ions of **X** are negatively charged.

B Atoms of **X** have more electron shells than atoms of **Y**.

C **X** and **Y** are in the same Group of the Periodic Table.

D **X** and **Y** are in the same Period of the Periodic Table.

9. 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

10. Octane, C_8H_{18}, is a hydrocarbon that undergoes combustion in a petrol engine to form carbon dioxide and water.

$$\ldots W\ldots C_8H_{18} + \ldots X\ldots O_2 \rightarrow \ldots Y\ldots CO_2 + \ldots Z\ldots H_2O$$

Which row shows the figures needed to balance the equation?

	W	*X*	*Y*	*Z*
A	1	8	8	9
B	1	17	8	9
C	2	16	8	9
D	2	25	16	18

11. Which statement describes ionic bonds?

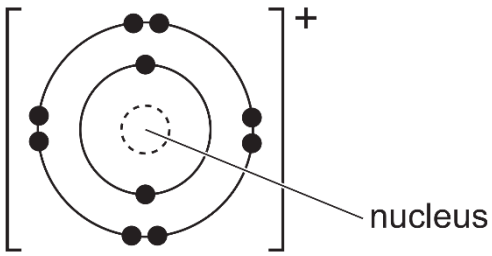
A A lattice of ions in a ‘sea’ of electrons.

B Electrostatic attraction between oppositely charged ions.

C The sharing of electrons between atoms to gain a noble gas configuration.

D The transfer of electrons from atoms of a non-metal to the atoms of a metal.

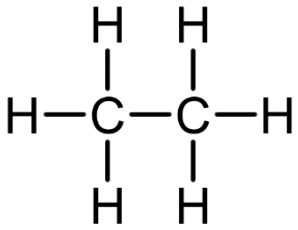
12. The diagram of an ion is shown.



What can be deduced about the number of protons in this ion?

A It has 8 protons.
B It has 9 protons.
C It has 10 protons.
D It has 11 protons.

13. The diagram shows the covalent bonds in a molecule of ethane.



The total number of electrons in one molecule of ethane is …**X**…

The total number of electrons in the bonds in one molecule of ethane is …**Y**…

Which numbers correctly complete the gaps **X** and **Y**?

	X	**Y**
A	14	12
B	14	14
C	18	12
D	18	14

14. Which molecules contain at least one double covalent bond?

1 C_2H_4
2 O_2
3 C_2H_6
4 CO_2

A 1, 2 and 3 only
B 2, 3 and 4 only
C 1, 2 and 4 only
D 1, 3 and 4 only

15. Element **X** forms an oxide with the formula $\mathbf{X}_2O_3$.

In which two Groups of the Periodic Table could element **X** be found?

A Either Group 1 or Group 17
B Either Group 2 or Group 16
C Either Group 13 or Group 15
D Either Group 14 or Group 18

16. The ion $\mathbf{Q}^{2+}$ has three complete electron shells. What is **Q**?

A Calcium **B** Magnesium **C** Oxygen **D** Sulfur

17. Which statement is correct?

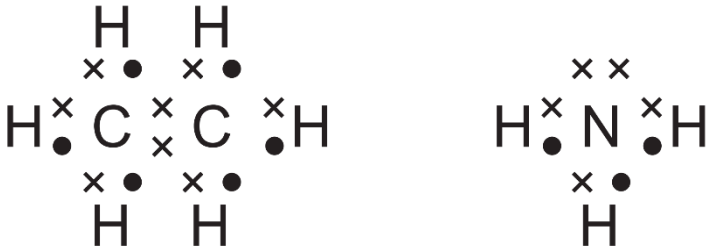
A All compounds are ionic.

B Ions contain equal numbers of protons and electrons.

C The noble gases are unstable because they have incomplete valence shells.

D In a compound, the ratio of the elements is always the same.

18. Ethane, C_2H_6, and ammonia, NH_3, are covalent compounds. The dot-and-cross diagrams of these compounds are shown below.



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 valence 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

19. In which molecule does the underlined element have a valence shell in which **all** of the electrons are involved in bonding?

A $\underline{C}H_4$ **B** H$\underline{C\mathit{l}}$ **C** $H_2\underline{O}$ **D** $\underline{N}H_3$

20. Three different elements react by losing electrons. The ions formed all have the electronic configuration of 2, 8.

Which statement about these three elements is correct?

A They are in the same Group. **B** They are in the same Period.

C They are noble gases. **D** They are transition metals.

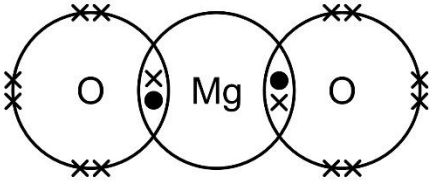
21. Which substance is an ionic compound?

A Ammonia **B** Calcium chloride

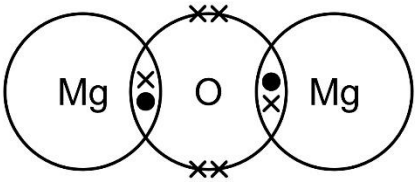
C Ethanoic acid **D** Hydrogen chloride

22. Which diagram best represents the outer electron arrangement in magnesium oxide?

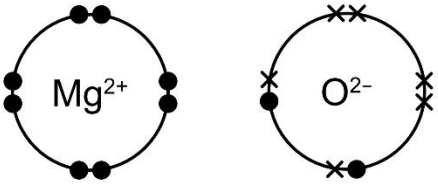
A



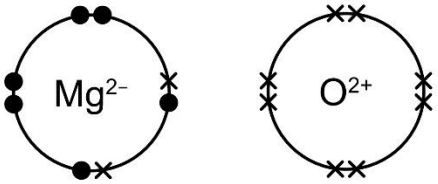
B



C



D



key:
● = valence electron of Mg
× = valence electron of O

23. Which aqueous reagent liberates ammonia from ammonium nitrate on warming?

A Calcium nitrate
B Potassium hydroxide
C Sodium chloride
D Sulfuric acid

24. Which statement about the properties of some elements is correct?

A The noble gases are unreactive because they all have eight electrons in their outer shells.
B The valency of a metal equals the number of electrons one atom gains when it reacts.
C There are more non-metallic elements in the Periodic Table than metallic elements.
D The elements in Group 17, fluorine, chlorine, bromine and iodine, are all diatomic.

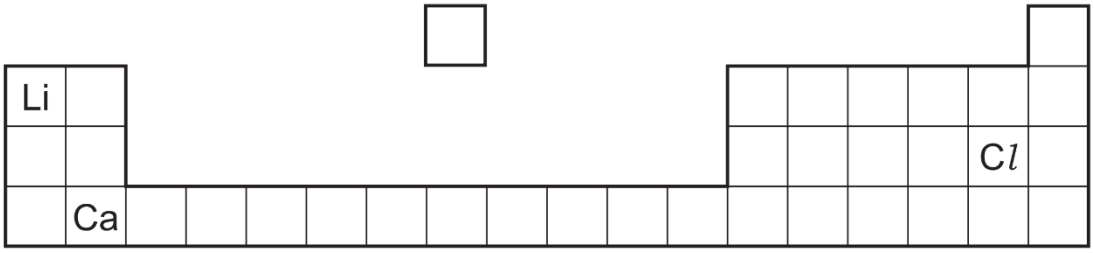
25. When they react together, which pair of elements forms an ionic compound?

A Carbon and hydrogen
B Hydrogen and chlorine
C Lithium and oxygen
D Sulfur and oxygen

26. How many shared electrons are there in one molecule of methane?

A 2 **B** 4 **C** 8 **D** 12

27. The diagram shows part of the Periodic Table.



Which element has the highest proton number, and which element has the highest number of electrons in its valence shell?

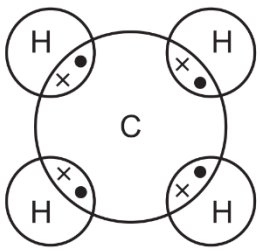
	highest proton number	highest number of electrons in its valence shell
A	Ca	Ca
B	Ca	Cl
C	Li	Ca
D	Li	Cl

28. The dot-and-cross diagrams of four compounds are shown.

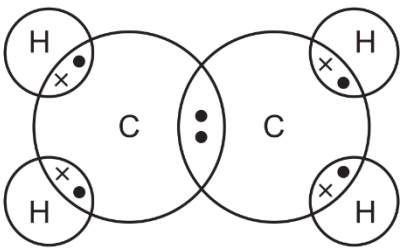
Note that only electrons in the valence electron shells are shown.

Which diagram is correct?

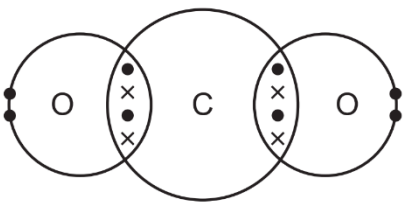
A



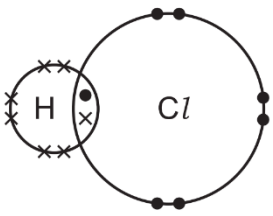
B



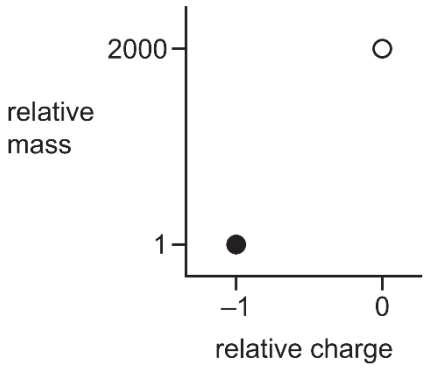
C



D



29. The diagram shows the relative mass and relative charge of two particles, ● and ○, present in atoms and ions.



Which of these particles are present in a hydrogen atom, H, and in a hydrogen ion, H^+?

	hydrogen atom, H	hydrogen ion, H^+
A	both ○ and ●	both ○ and ●
B	both ○ and ●	○ but not ●
C	● but not ○	neither ○ nor ●
D	○ but not ●	● but not ○

30. Which statement about methane and carbon dioxide is **incorrect**?

A Carbon dioxide and methane both turn damp red litmus paper blue.

B Carbon dioxide and methane each contain a total of four covalent bonds.

C Carbon dioxide and methane are both gases at room temperature and pressure.

D Methane burns in air to form carbon dioxide as one of the products.

31. Which of the following salts are insoluble in water?

1 AgC*l*

2 $BaSO_4$

3 $Cu(NO_3)_2$

A 1 only

B 1 and 2 only

C 1 and 3 only

D 2 and 3 only

32. Which reagents should be added together to produce calcium chloride, water and carbon dioxide as the reaction products?

A Calcium and hydrochloric acid.

B Calcium carbonate and hydrochloric acid.

C Calcium hydroxide and hydrochloric acid.

D Calcium oxide and hydrochloric acid.

33. Which reaction will produce a gas which extinguishes a burning splint with a squeaky 'pop' sound?

A Copper and hydrochloric acid.

B Copper(II) carbonate and hydrochloric acid.

C Magnesium and hydrochloric acid.

D Magnesium carbonate and hydrochloric acid.

34. Which solution will form a precipitate when added to an aqueous solution of sodium chloride?

A Aqueous ammonium nitrate **B** Aqueous calcium nitrate

C Aqueous potassium nitrate **D** Aqueous silver nitrate

35. What is the balanced chemical equation for the reaction between calcium and water?

A $Ca + H_2O \rightarrow CaOH + H_2$

B $Ca + H_2O \rightarrow Ca(OH)_2 + H_2$

C $Ca + 2H_2O \rightarrow CaOH + H_2$

D $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$

36. Which row shows appropriate pH values for aqueous solutions of ammonia, hydrochloric acid, sodium chloride and sodium hydroxide?

	pH values			
	$NH_3(aq)$	HC*l*(aq)	NaC*l*(aq)	NaOH(aq)
A	1	7	13	11
B	7	1	11	13
C	11	1	7	13
D	13	11	7	1

37. 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.

38. The total number of electrons in one atom of element **Q** is 17 and in one atom of element **R** is 19. Which statement about elements **Q** and **R** is correct?

A **Q** and **R** react together to form a covalent compound.

B **Q** forms positive ions.

C **R** has more outer shell electrons than **Q**.

D **R** is more metallic than **Q**.

39. A household cleaning compound is used to remove calcium carbonate from bathroom surfaces. The compound reacts with the calcium carbonate to form a soluble salt, carbon dioxide and water.

What is the pH of this cleaning compound?

A pH = 2 **B** pH = 7 **C** pH = 10 **D** pH = 14

40. Sodium hydroxide is added to a solution to adjust its pH. A neutral solution is formed.

Which statement is correct?

A Sodium hydroxide is an acid and reacts with an alkali to form water as a product.

B Sodium hydroxide will lower the pH of the solution.

C The pH of the neutral solution is 14.

D The pH of the solution before the sodium hydroxide is added is below 7.

41. **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

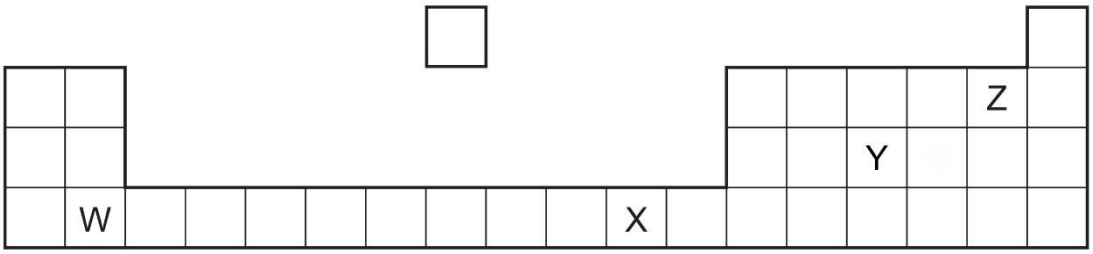
42. Dilute hydrochloric acid is added separately to samples of copper, copper(II) oxide, and copper(II) carbonate.

Which row correctly shows whether copper(II) chloride is produced?

	Cu	CuO	$CuCO_3$
A	✓	✓	✓
B	✗	✓	✗
C	✓	✗	✓
D	✗	✓	✓

✓ = copper(II) chloride produced
✗ = copper(II) chloride not produced

43. The diagram shows part of the Periodic Table.



Which two letters represent elements that can react together to form covalent compounds?

A **W** and **X** **B** **W** and **Y** **C** **X** and **Y** **D** **Y** and **Z**

44. The carbonate, chloride and sulfate of a metal are all soluble in water.

What is the metal?

A Barium **B** Calcium **C** Potassium **D** Silver

45. Which statement about ammonia is correct?

A It is a compound of carbon and hydrogen.

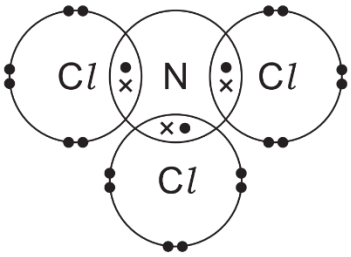
B It is a colourless and odourless gas.

C It is a gas that turns damp blue litmus paper red.

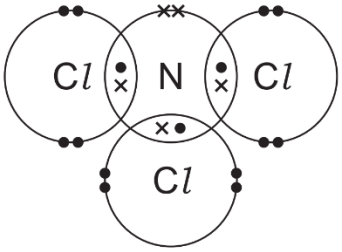
D It is formed when ammonium chloride reacts with aqueous sodium hydroxide.

46. Which one of the following is the correct dot-and-cross diagram for NCl_3?

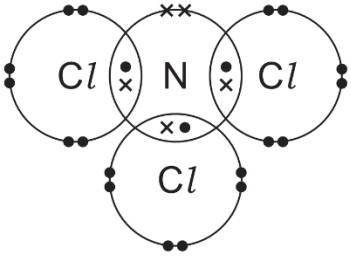
A



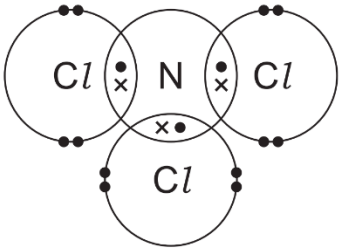
B



C



D



47. Which substance is soluble in water?

A Copper(II) carbonate **B** Copper(II) oxide

C Copper(II) hydroxide **D** Copper(II) nitrate

48. Three separate mixtures of a solution and a solid are made, as shown in the table.

The mixtures are warmed.

In which mixtures does a gas form?

	NaOH(aq) and NH_4Cl(s)	H_2SO_4(aq) and NH_4Cl(s)	H_2SO_4(aq) and Mg(s)
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

✓ = gas is produced
✗ = no gas is produced

49. Solution **T** has the following properties.

1 It reacts with magnesium to form a gas.

2 It reacts with calcium carbonate to form a gas.

Which statement about solution **T** is correct?

A It contains more OH^- ions than H^+ ions.

B It has a pH of 9.

C Its reaction with calcium carbonate produces hydrogen.

D It reacts with sodium hydroxide.

50. The equation for the reaction between copper and nitric acid is shown.

$$v\,Cu + w\,HNO_3 \rightarrow x\,Cu(NO_3)_2 + y\,NO + z\,H_2O$$

Where *v*, *w*, *x*, *y* and *z* are whole numbers.

Which values of *v*, *w*, *x*, *y* and *z* balance the equation?

	v	*w*	*x*	*y*	*z*
A	1	2	1	1	1
B	1	4	1	2	2
C	3	4	3	2	2
D	3	8	3	2	4

51. Which three elements exist as diatomic molecules at room temperature?

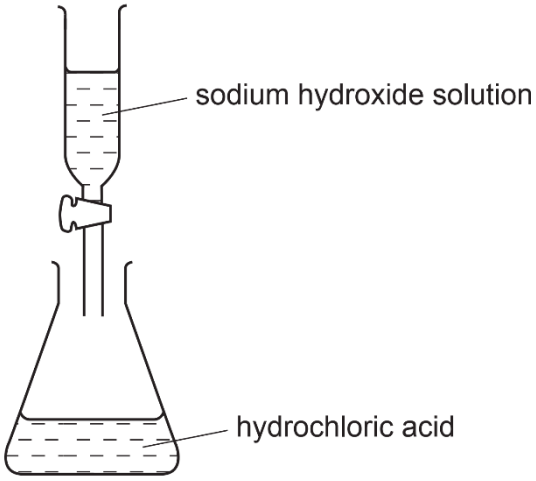
A Hydrogen, oxygen, helium

B Nitrogen, chlorine, neon

C Nitrogen, oxygen, fluorine

D Oxygen, chlorine, helium

52. Sodium hydroxide solution was added to dilute hydrochloric acid. The pH of the solution in the flask was measured at intervals until no further change in pH took place.

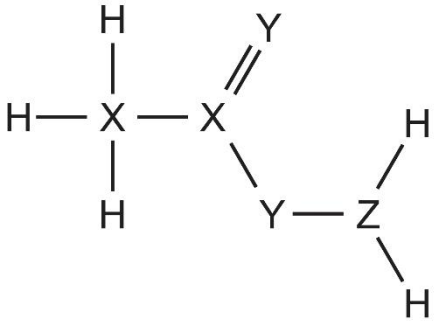


What would be the pH change in this reaction?

A Decrease to 1 **B** Decrease to 7

C Increase to 7 **D** Increase to 12

53. The diagram shows the structure of a covalent compound containing the element hydrogen, H, and the unknown elements X, Y and Z.



To which Groups of the Periodic Table do these three elements, X, Y and Z, belong?

	X	Y	Z
A	1	15	16
B	14	15	1
C	14	16	15
D	15	1	14

54. A metal reacts with dilute hydrochloric acid to produce a gas. What is used to identify this gas?

A A glowing splint **B** A lighted splint

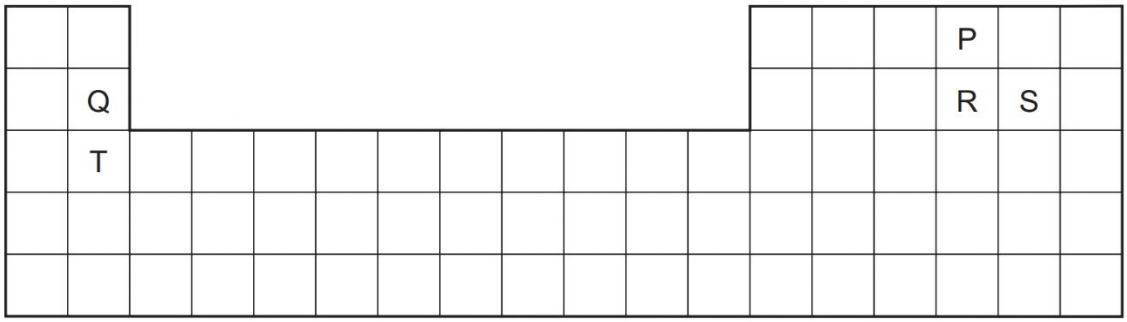
C Damp red litmus paper **D** Limewater

55. Which compound will **not** produce ammonia when heated with ammonium sulfate?

A Calcium oxide **B** Magnesium oxide

C Sodium hydroxide **D** Sulfuric acid

56. The diagram shows part of the Periodic Table.



Which pair of letters represents elements that are in the same Period?

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

57. Which row shows the correct number of protons and electrons in the **ion** of an element in Group 2 of the Periodic Table?

	number of protons	number of electrons
A	9	10
B	12	10
C	14	14
D	16	18

58. Which statement about both chlorine atoms and chloride ions is correct?

A They are chemically identical.

B They are isotopes of chlorine.

C They have the same number of protons.

D They have the same physical properties.

59. Which calcium compound does not increase the pH of acidic soils?

A Calcium carbonate **B** Calcium hydroxide

C Calcium oxide **D** Calcium sulfate

60. Element X has the electronic structure 2, 8, 5. Element Y has the electronic structure 2, 8, 7. What is the likely formula of a compound containing only X and Y?

A XY_3 **B** X_2Y_3 **C** X_3Y **D** X_3Y_2

61. How is a covalent bond formed?

A Electron sharing between metals and non-metals.

B Electron sharing between non-metals.

C Electron transfer between non-metals.

D Electron transfer from metals to non-metals.

62. In terms of electrons, what happens when potassium combines with iodine to form a compound?

A The atoms of both elements each lose one electron.

B The atoms of both elements each gain one electron.

C The potassium atoms each lose one electron and the iodine atoms each gain one electron.

D The potassium atoms each gain one electron and the iodine atoms each lose one electron.

63. The proton number of element X is 6. The proton number of element Y is 9.
What is the formula of a compound of these elements?

A X_2Y_3 **B** X_3Y_2 **C** XY_3 **D** XY_4

64. Which electronic configurations represent three metallic elements in the same Period of the Periodic Table?

	element 1	element 2	element 3
A	2, 8, 7	2, 8, 8	2, 8, 1
B	2, 1	2, 8, 1	2, 8, 8, 1
C	2, 2	2, 3	2, 4
D	2, 8, 1	2, 8, 2	2, 8, 3

65. Which statement about oxides is correct?

A Non-metal oxides are basic.

B Acidic oxides contain ionic bonds.

C Metal oxides can neutralise acids.

D Basic oxides are always gases.

66. A piece of magnesium reacts with dilute hydrochloric acid. The resulting solution is then evaporated leaving a solid residue of magnesium chloride. Which statement is correct?

A A covalent solid is formed in this process.

B Each chlorine atom gains one electron in this process.

C Each magnesium atom loses only one electron in this process.

D Molecules of an element are formed during the reaction.

67. The symbols for two ions are shown.

$^{19}_{9}F^{-}$ $^{21}_{11}Na^{+}$

Which statement is correct?

A The fluoride ion contains more electrons than the sodium ion.

B The sodium ion contains more neutrons than the fluoride ion.

C The two ions contain the same number of electrons as each other.

D The two ions contain the same number of protons as each other.

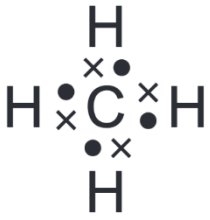
68. Which dot-and-cross diagram, showing all the outer shell electrons of each atom, is **not** correct?

A

B

C

D



69. Which pair of reagents will **not** react together to form copper(II) sulfate as one of the products?

A Copper and sulfuric acid

B Copper(II) oxide and sulfuric acid

C Copper(II) carbonate and sulfuric acid

D Ammonium sulfate and copper(II) oxide

70. Which representation of dilute aqueous sulfuric acid is correct?

A $H_2(aq) + SO_4^{2-}(aq)$

B $2H^+(aq) + SO_4^{2-}(aq)$

C $2H^+(aq) + SO_4^-(aq)$

D $H_2SO_4(l)$

- Scan the QR code to view the answers to this assignment.

http://www.nygh.sg/lower_secondary_science/sec_two_science/sec_two_chemistry/sec_two_chemistry_ans.pdf