Anglo-Chinese School
(Barker Road)
A Methodist Institution
Founded in 1886

CHEMISTRY
DEPARTMENT OF SCIENCE

Name: ..... ( ) Class: SEC 3 .....

CHEMICAL BONDING – ASSIGNMENT

Multiple-Choice Questions [20 Marks]

TOTAL SCORE / 30

Write in your selected answer for the multiple-choice questions in the boxes provided.

1	2	3	4	5	6	7	8	9	10

11	12	13	14	15	16	17	18	19	20

1. Metals are defined as elements which

   A are shiny in appearance.
   B are malleable and ductile.
   C can conduct electricity when solid.
   D readily give away electrons.

2. Two non-metals can form a chemical bond

   A by delocalizing their valence electrons.
   B by generating a magnetic attraction.
   C by overlapping their valence shells.
   D by transferring electrons to each other.

3. Which of the following elements does **not** form an ion which has the same electronic configuration as an argon atom?

   A chlorine **B** phosphorus **C** potassium **D** sodium

4. The element **X** has an electronic configuration of 2, 8, 18, 6. What ion will it form?

   A X^{2+} **B** X^{6+} **C** X^{2-} **D** X^{4-}

5. When magnesium forms a compound with oxygen, each magnesium atom

   A gives four electrons to oxygen.
   B gives two electrons to oxygen.
   C shares four electrons with oxygen.
   D shares two electrons with oxygen.

6. The element **Y** is highly unreactive, and does not form any chemical bonds under normal circumstances. Which of the following is a possible electronic configuration of **Y**?

   A 2 **B** 2, 2 **C** 2, 6 **D** 2, 8, 8, 2

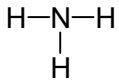
7. A 'triple covalent bond' refers to the

   A sharing of six electrons between a metal and a non-metal.
   B sharing of six electrons between two non-metals.
   C sharing of three electrons between two metals.
   D sharing of three electrons between two non-metals.

8. Which of the following statements pertaining to compounds of calcium is true?

   A Calcium atoms have a tendency to gain two electrons during bonding.
   B Calcium bonds with other metallic atoms by sharing electrons.
   C Calcium bonds with other non-metallic atoms by transferring electrons.
   D Calcium can form simple molecules which have a low melting point.

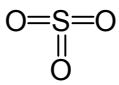
9. A molecule of ammonia is shown below.



   How many <u>bonded</u> electrons are there surrounding the nitrogen atom?

   A 1 **B** 3 **C** 6 **D** 8

10. A molecule of sulfur trioxide is shown below.

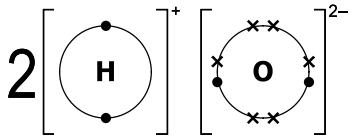


   How many <u>bonded</u> electrons are there surrounding the sulfur atom?

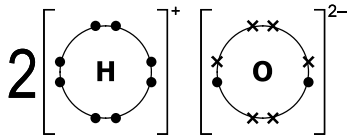
   A 2 **B** 6 **C** 8 **D** 12

11. Which of the following best illustrates the bonding present in water?

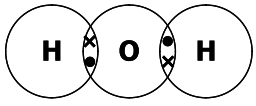
A



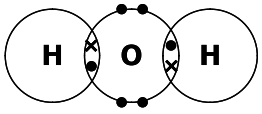
C



B



D



12. Which of the following statements about ionic compounds is **incorrect**?

   A Ionic compounds are generally more soluble in water than covalent compounds.
   B Ionic compounds can conduct electricity at room temperature.
   C Ionic compounds form giant ionic lattices.
   D Ionic compounds have high boiling points.

13. Which pair of elements below is most likely to form a compound with a low melting point?

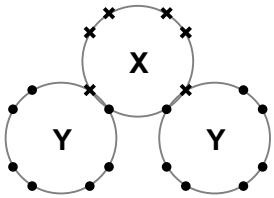
A calcium, silicon **B** carbon, hydrogen **C** fluorine, sodium **D** barium, zinc

14. An element **Q**, found in Group V of the periodic table, forms a compound with element **R**, found in Group VII of the periodic table. It hence can be deduced that the compound

A has a formula of $\mathbf{Q_3R}$.
B has a low boiling point.
C is soluble in water.
D is able to conduct electricity when liquid.

15. A diagram illustrating the bonding in a molecule of XY_2, showing only the valence electrons, is shown below. What could elements X and Y be?

	Element X	*Element Y*
A	oxygen	fluorine
B	potassium	sulfur
C	sulfur	oxygen
D	sulfur	sodium



16. Which substance in the table could be ethanol, CH_3CH_2OH?

	m.p. / °C	*b.p. / °C*	*electrical conductivity*
A	– 114	– 85	good when liquid
B	– 114	78	none when liquid
C	580	718	none when liquid
D	808	1465	good when liquid

17. What are the forces that hold together a crystal of table salt (solid sodium chloride) and dry ice (solid carbon dioxide)?

	table salt	*dry ice*
A	attraction of charged ions	covalent bonds
B	attraction of charged ions	intermolecular forces
C	covalent bonds	attraction of charged ions
D	covalent bonds	intermolecular forces

18. The table gives information about the ability of three substances to conduct electricity.

Substance	*Property*
X	does not conduct under any conditions
Y	conducts in both molten and solid states
Z	conducts in both molten and aqueous states

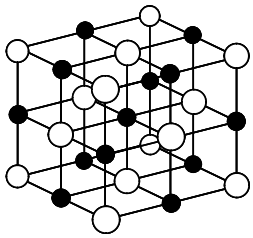
What could these three substances be?

	X	*Y*	*Z*
A	NaCl	S	Pb
B	Pb	NaCl	S
C	S	NaCl	Pb
D	S	Pb	NaCl

19. A molten sample of zinc chloride is able to conduct electricity because

A it possesses a metallic element.
B it possesses mobile electrons.
C its ions are free to move.
D its molecules are free to move.

20. The diagram below shows part of a crystal of calcium sulfide (CaS).



Legend:
○ calcium ion
● sulfide ion

How many sulfide ions is each calcium ion attached to?

A 1 **B** 2 **C** 4 **D** 6

Structured Questions [10 Marks]

21. Explain, in terms of structure and bonding, why

(a) ionic compounds have higher boiling points than simple covalent compounds, [2]

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(b) ionic compounds can conduct electricity when molten, but not when solid. [2]

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22. Scientists are studying a new element Ze. It does not conduct electricity, and is able to combine with other elements to make covalent and ionic compounds. It forms the ion Ze^{2-}. Give **three** reasons why the element should be classified as a **non-metal**. [2]

1. .....

2. .....

3. .....

23. Draw 'dot-and-cross' diagrams, showing only valence electrons, to illustrate the bonding in

(a) magnesium chloride ($MgCl_2$) [1]

(b) nitrogen gas (N_2) [1]

(c) hydrogen sulfide (H_2S) [1]

(d) lithium phosphide (Li_3P) [1]

END