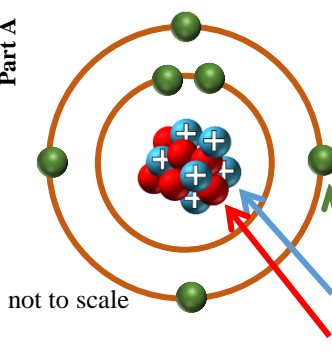


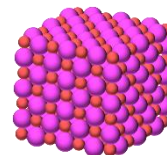
Part A



1. A carbon atom has _____ protons (which have a _____ charge) and _____ electrons (which have a _____ charge). Overall, the charge on a carbon atom is zero and the atom is said to be _____.

The nucleus of an atom is made up of _____ and _____, and the _____ spin around the nucleus at really high speeds.


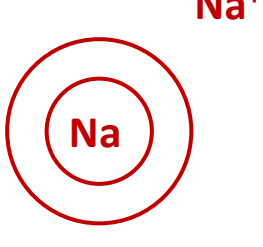
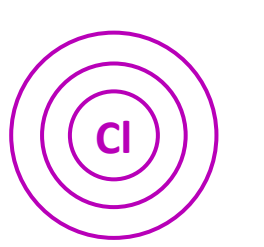
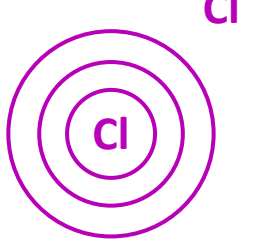
2. _____
3. _____
4. _____



Part B

5. Describe the arrangement of the atoms in a crystal of table salt (sodium chloride, NaCl).

6. Fill in the table below and complete the electron configuration diagrams by drawing in the position of each atom's or ion's electrons.



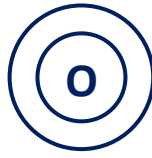
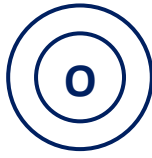
Sodium Atom, Na	Sodium Ion, Na ⁺	Chlorine Atom, Cl	Chloride Ion, Cl ⁻
Electron Configuration: _____	Electron Configuration: _____	Electron Configuration: _____	Electron Configuration: _____
Electron Configuration Diagram: 	Electron Configuration Diagram: 	Electron Configuration Diagram: 	Electron Configuration Diagram: 
No. of protons: _____	No. of protons: _____	No. of protons: _____	No. of protons: _____
No. of electrons: _____	No. of electrons: _____	No. of electrons: _____	No. of electrons: _____
Overall Charge: _____	Overall Charge: _____	Overall Charge: _____	Overall Charge: _____

7. What is an ion?

8. What is an ionic compound?

9. While covalent bonds usually form between the atoms of non-metals, ionic bonds form...

10. Fill in the table below and complete the electron configuration diagrams by drawing in the position of each atom's or ion's electrons.

Magnesium Atom, Mg	Magnesium Ion, Mg ²⁺	Oxygen Atom, O	Oxide Ion, O ²⁻
Electron Configuration: _____	Electron Configuration: _____	Electron Configuration: _____	Electron Configuration: _____
Electron Configuration Diagram: 	Electron Configuration Diagram: 	Electron Configuration Diagram: 	Electron Configuration Diagram: 
No. of protons: _____	No. of protons: _____	No. of protons: _____	No. of protons: _____
No. of electrons: _____	No. of electrons: _____	No. of electrons: _____	No. of electrons: _____
Overall Charge: _____	Overall Charge: _____	Overall Charge: _____	Overall Charge: _____

11. Fill in the table with the ions that each of the elements form.

PERIODIC TABLE OF IONS (first 18 elements)									
Charge of Ions	1+	_____	_____	NA	3-	_____	_____	_____	NA
	Group 1	Group 2	Group 13	Group 14	Group 15	Group 16	Group 17	Group 18	Group 18
Period 1	hydrogen H, 1 H ⁺								helium He, 2 NA
Period 2	lithium Li, 3 _____	beryllium Be, 4 _____	boron B, 5 NA	carbon C, 6 NA	nitride N, 7 _____	oxide O, 8 _____	fluoride F, 9 _____	neon Ne, 10 NA	
Period 3	sodium Na, 11 _____	magnesium Mg, 12 _____	aluminium Al, 13 _____	silicon Si, 14 NA	phosphide P, 15 _____	sulfide S, 16 S ²⁻	chloride Cl, 17 _____	argon Ar, 18 NA	

12. In the tables on the next two pages, **write...**

(a) **the name of the ionic compound** that forms when the positive ions (the cations) bond with the negative ions (the anions). By an agreed convention, the metal ion is written first and the non-metal ion is written second.

(b) **the ionic compound's formula**. The negative ion of a single atom gets a name change so that it ends in "-ide". Eg. fluoride, chloride, oxide, sulfide and nitride.

NOTES:

- Many metals can form different ions. For example, lead can form Pb²⁺ and Pb⁴⁺ ions. In the formulas, these variations are indicated by the charge written as a Roman numeral within brackets next to the name of the metal: lead(II) and lead(IV). The formula lead(II) sulfide is pronounced lead two sulfide.
- The bracketed Roman numerals are only used if an atom can form more than one ion. For example, K only ever forms K⁺ when it chemically reacts, so you don't need to write, for example, potassium(I) chloride; you can just write potassium chloride.
- Many ions are made of more than one atom and are called polyatomic ions. Eg: sulfate ions, SO₄²⁻ and nitrate ions, NO₃⁻. In formulas, brackets are used if there is more than one polyatomic ion.

Pb ²⁺ F ⁻ PbF ₂ lead(II) fluoride	Pb ⁴⁺ F ⁻ PbF ₄ lead(IV) fluoride
K ⁺ Cl ⁻ KCl potassium chloride	Mg ²⁺ NO ₃ ⁻ Mg(NO ₃) ₂ magnesium nitrate

TABLE D		Anions (negatively charged ions)				
		Cl ⁻ (chloride)	F ⁻ (fluoride)	O ²⁻ (oxide)	S ²⁻ (sulphide)	N ³⁻ (nitride)
Cations (positively charged ions)	K ⁺	potassium chloride KCl			potassium sulfide K ₂ S	
	Na ⁺					
	Mg ²⁺			magnesium oxide MgO (not Mg ₂ O ₂ : we use the simplest ratio)		
	Al ³⁺			aluminium oxide Al ₂ O ₃		

TABLE E		Anions (negatively charged ions)			
		Cl ⁻	O ²⁻	S ²⁻	N ³⁻
Cations (positively charged ions)	Cu ⁺ copper(I)	copper(I) chloride CuCl			
	Cu ²⁺ copper(II)				
	Fe ²⁺ iron(II)		iron(II) oxide FeO		
	Fe ³⁺ iron(III)				

13. A sulfate ion, SO_4^{2-} , is made of _____ sulfur atom and _____ oxygen atoms, and has an overall charge of _____.
14. A nitrate ion, NO_3^- , is made of _____ nitrogen atom and _____ oxygen atoms, and has an overall charge of _____.
15. An ammonium ion, NH_4^+ , is made of _____ nitrogen atom and _____ hydrogen atoms, and has an overall charge of _____.

TABLE F

		Polyatomic Anions			
		Hydroxide: OH^-	sulfate: SO_4^{2-}	Nitrate: NO_3^-	Carbonate: CO_3^{2-}
Cations (positively charged ions)	K^+	potassium hydroxide KOH			potassium carbonate K_2CO_3
	Na^+				
	Mg^{2+}	magnesium hydroxide $\text{Mg}(\text{OH})_2$ <small>(the bracket with the 2 subscript indicates that there are 2 OH^- ions for every 1 Mg^{2+} ion.)</small>		magnesium nitrate $\text{Mg}(\text{NO}_3)_2$	
	Fe^{3+} iron(III)				
	NH_4^+ ammonium		ammonium sulfate $(\text{NH}_4)_2\text{SO}_4$		

16. Choose any two ionic compounds (for example, from the tables above or from your own research). For each of them, write...
 (a) its name and formula and (b) at least two uses that it has. (Do not do the same two as the students sitting next to you!)

(a)	
(b)	

Part G 17. Ionic compounds generally have _____ melting points, while covalent compounds (also called molecular compounds because they're made of molecules) generally have _____ melting points.

18. When a substance is cold, the particles that make it up (either atoms or ions or molecules) vibrate (or move) _____. When a substance is hot, the particles that make it up vibrate (or move) _____.

19. Water molecules make up ice (solid water), water (liquid water), and steam (gaseous water). How are ice, water and steam different (or, in other words, what is the difference between a solid, a liquid, and a gas)?

20. Covalent bonds are very strong, and yet covalent compounds usually have low melting points. Why?

21. Ionic compounds usually have high melting points. Why?
