

Ionic Bonding

Total Marks : 20

Q1.

Calcium oxide is an ionic solid.

Figure 5 shows the arrangement of electrons in a calcium atom and in an oxygen atom.

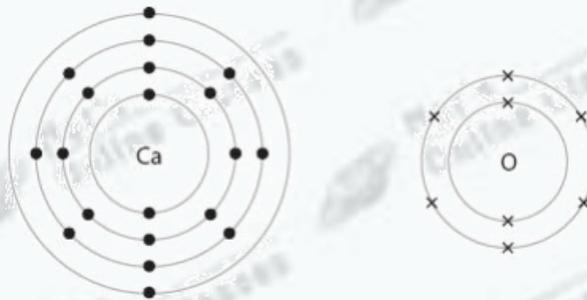


Figure 5

Complete Figure 6 to show the electronic configurations and charges of the calcium ion and the oxide ion.

Use dots to show the electrons originally in the calcium atom and crosses to show the electrons originally in the oxygen atom.



(3)

charge on ion charge on ion
.....

Figure 6

(Total for question = 3 marks)

Q2.

* Figure 6 shows some properties of three substances, **A**, **B** and **C**.

substance	melting point in °C	ability to conduct electricity	
		solid	molten
A	1180	poor	good
B	1538	good	good
C	115	poor	poor

Figure 6

Deduce, using the information in Figure 6, the structure and bonding of substances **A**, **B** and **C**, explaining their properties in terms of their structure and bonding.

(6)

(Total for question = 6 marks)

Q3.

Figure 1 shows the dot and cross diagram for a molecule of ammonia.

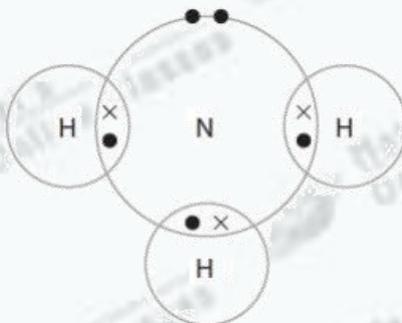


Figure 1

Ammonia reacts with nitric acid to form ammonium nitrate.

(i) Complete the word equation for this reaction.

..... + →

(1)

(ii) An ammonium ion has the formula NH_4^+ .

A nitrate ion has the formula NO_3^- .

Which of the following is the formula for ammonium nitrate?

- A $(\text{NH})_4\text{NO}_3$
- B $(\text{NH}_4\text{NO})_3$
- C NH_4NO_3
- D $(\text{NHNO})_{12}$

(1)

(iii) Explain why farmers spread ammonium nitrate on their fields.

(2)

.....
.....

(Total for question = 4 marks)

Q4.

An ion of element X can be represented as



This ion of element X has 54 electrons.

Calculate the number of protons and the number of neutrons in this ion.

(2)

number of protons

number of neutrons

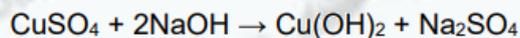
(Total for question = 2 marks)

Q5.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

When copper sulfate solution reacts with sodium hydroxide solution, a precipitate of copper hydroxide and a solution of sodium sulfate are formed.

The equation is



The formula of the sodium ion is Na^+ .

What is the formula of the sulfate ion?

(1)

- A SO_4^+
- B SO_4^-
- C SO_4^{2+}
- D SO_4^{2-}

(Total for question = 1 mark)

Q6.

Salts of metals can be prepared by reacting the metal with an acid to produce the salt and hydrogen.

(i) Describe the test to show that the gas is hydrogen.

(2)

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.....

.....

(ii) Nickel is a metal.

Explain how the structure of a nickel atom, Ni, changes when it forms a nickel ion, Ni²⁺.

(2)

.....

.....

.....

.....

(Total for question = 4 marks)