**Topic Test 3 Solns: Metals and ionic compounds.**

**SECTION A: Multiple-choice questions (1 mark each)**

**Question 1**

*Answer:* D

*Explanation:*

Metals have a low number of electrons in the outer shell. This element should be a metal when pure. It will be able to react with a non-metal to form an ionic compound.

**Question 2**

*Answer:* C

*Explanation:*

Both metals and ionics conduct as liquids. Ionics do not conduct as solids and they are not ductile.

**Question 3**

*Answer:* D

*Explanation:*

The introduction of electric vehicles is likely to lead to increased demand for copper that will be difficult to meet. The abundance of copper is not the issue so much as the demand.

**Question 4**

*Answer:* B

*Explanation:*

The delocalised electrons in metals lead to their malleability and conductivity, properties that ionics don’t have.

**Question 5**

*Answer:* C

*Explanation:*

If Q forms QF3 then the charge on Q is +3. The charge on a carbonate ion is -2 so the correct answer is Q2(CO3)3.

**Question 6**

*Answer:* A

*Explanation:*

Barium is in Group II of the periodic table and will donate two electrons when it forms an ion. Each fluorine atom can accept one electron. Therefore each barium donates two electrons and these go to two separate fluorine atoms.

**Question 7**

*Answer:* B

*Explanation:*

The more reactive metal can replace the less reactive metal in solution. From the first equation, A must be more reactive than B. From the second, C must be more reactive than A, so the order is, from lowest to highest, B, A, C.

**Question 8**

*Answer:* A

*Explanation:*

The more reactive metal can replace the less reactive metal in solution.

**Question 9**

*Answer:* A

*Explanation:*

The suffix –ide indicates the absence of oxygen, while –ite is less oxygen than –ate.

**Question 10**

*Answer:* B

*Explanation:*

Both nitrogen and hydrogen are non-metals and both need to gain electrons. They will not form an ionic compound.

**SECTION B: Short-answer questions**

**Question 1** (7 marks)

**a**. **i**. Mg2+ ions 1 mark

**ii**. 1:2\*. Each magnesium atom has 2 outer shell electrons that will be delocalised. \* 2 marks

**b**. The delocalised electrons will move to the positive electrode making an electric current\*. The positive ions

do not move\*. 2 marks

**c**. Each magnesium atom will donate the 2 outer shell electrons to a non-metal. Mg2+ ions are formed.

2 marks

**Question 2** (6 marks)

**a**. zinc, calcium, sodium \*

Group I metals are the most reactive, then group II then transition.\*

2 marks

**b**. 2HCl(aq) + Sr(s) 🡪 SrCl2(aq) + H2(g)

1 mark for states and products, 1 for balancing

1. marks

c. 2K(s) + ZnCl2(aq) 🡪 2KCl(aq) + Zn(s)

1 mark for selecting correct equation and for states, one mark for balanced equation 2 marks

**Question 3** (12 marks)

**a**. 1 mark for each row

|  |  |  |
| --- | --- | --- |
|  | magnesium | fluorine |
| Electron configuration before reaction | 2, 8, 2 | 2, 7 |
| Lose or gain electrons to complete outer shell? | Lose | Gain |
| Number of electrons to change to gain a complete outer shell | 2 | 1 |
| Electron configuration of ion | 2, 8 | 2, 8 |
| Formula of ion | Mg2+ | F- |
| Chemical formula of magnesium fluoride | MgF2 | |

6 marks

**b**. **i**. Ionic compounds will not conduct as solids as the ions are in fixed positions\*. They will

conduct as liquids as the ions can move and carry the current\* 2 marks

**ii**. Ionic bonds are strong. The structure is a rigid one that cannot move easily when struck\*. It will be hard

and brittle. \* 2 marks

**iii**. The ions are held together by the opposite charges on the ions\* – these are referred to as ionic bonds.

They are strong. \* 2 marks

**Question 4** (10 marks)

**a**. **i**. Al3+ 1 mark

**ii**. SO42- 1 mark

**iii**. Al2S3 1 mark

**iv**. hard, brittle, high melting point, conduct electricity as liquid 1 mark

**b**. **i**. ammonium sulfate (NH4)2SO4 1 mark

**ii**. barium chloride BaCl2 1 mark

**iii**. magnesium phosphate Mg3(PO4)2 1 mark

**c. i**. LiOH lithium hydroxide 1 mark

**ii**. Na2CO3  sodium carbonate 1 mark

**iii**. Cu(NO3)2  copper (II) nitrate 1 mark

**Question 5**  (5 marks)

**a**. LiCl(aq) + AgNO3(aq) 🡪 Li NO3(aq) + AgCl(s) 1 mark

**b**. Ba(NO3)2(aq) + K2SO4(s) 🡪 BaSO4(s) + 2KNO3(aq) 2 marks

**c**. Cu(NO3)2(aq) + Na2CO3(aq) 🡪 CuCO3(s) + 2NaNO3(aq) 2 marks

Total mark: 50