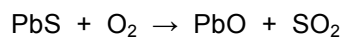




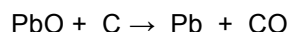
METAL EXTRACTION 2

1 Lead is extracted from the ore galena that contains lead(II) sulphide, PbS.

Step 1 roasting lead(II) sulfide in air to form lead(II) oxide



Step 2 using carbon to displace lead from lead(II) sulfide



a) Galena is an ore of lead. What is an ore?

rock containing compound(s) from which metal can be extracted for profit

b) Why does carbon displace lead in step 2?

carbon is more reactive than lead

c) Explain why the lead(II) oxide is reduced in step 2.

loses oxygen

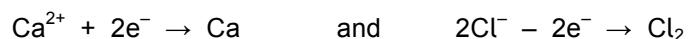
d) Explain clearly why step 2 is a redox reaction.

PbO loses oxygen ∴ reduced

C gains oxygen ∴ oxidised

∴ both oxidation and reduction take place

2 Calcium is often extracted by electrolysis of molten calcium chloride, CaCl₂. The half equations for the reactions at the electrodes are:



a) Why can calcium not be extracted by heating calcium chloride with carbon?

carbon is less reactive than calcium so cannot displace it

b) Write the half equation that shows a reduction process. Explain your answer.



c) Explain clearly why the electrolysis is a redox process.

Ca²⁺ gains electrons ∴ reduced

Cl⁻ loses electrons ∴ oxidised

∴ both oxidation and reduction take place

d) Calcium chloride must be molten to conduct electricity. It melts at 772°C.

i) Explain why the calcium chloride must be molten to conduct.

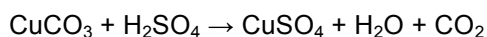
so ions can move to carry charge

ii) Explain why calcium chloride has a high melting point.

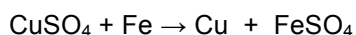
strong attraction between positive and negative ions

3 Copper can be extracted from copper(II) carbonate in the ore malachite by

Step 1 reacting copper(II) carbonate with sulfuric acid to form copper(II) sulfate



Step 2 using iron to displace copper from copper(II) sulfate solution



a) Why does iron displace copper in step 2?

iron is more reactive than copper

b) Write two half equations to show what happens in step 2.



c) Explain clearly why step 2 is a redox reaction.

Cu²⁺ gains electrons ∴ reduced

Fe loses electrons ∴ oxidised

∴ both oxidation and reduction take place

d) Write an ionic equation for step 2.



Area	Strength	To develop	Area	Strength	To develop	Area	Strength	To develop
Done with care and thoroughness			Understand redox in terms of oxygen			Explain conductivity of ionic cpds		
Good SPG			Understand redox in terms of electrons			Write half equations for displacement		
Knows what an ore is			Explain displacement in terms of redox			Write ionic equations for displacement		
Understand why displacement occurs			Explain why ionic cpds have high mpt					