***Chemistry***

**18: Representative Metals, Metalloids, and Nonmetals**

**18.2: Occurrence and Preparation of the Representative Metals**

15. Write an equation for the reduction of cesium chloride by elemental calcium at high temperature.

Solution



17. Give balanced equations for the overall reaction in the electrolysis of molten lithium chloride and for the reactions occurring at the electrodes. You may wish to review the chapter on electrochemistry for relevant examples.

Solution

Cathode (reduction):



Anode (oxidation):



Overall reaction:



19. What mass, in grams, of hydrogen gas forms during the complete reaction of 10.01 g of calcium with water?

Solution

The reaction is:





21. Magnesium is an active metal; it burns in the form of powder, ribbons, and filaments to provide flashes of brilliant light. Why is it possible to use magnesium in construction?

Solution

Despite its reactivity, magnesium can be used in construction even when the magnesium is going to come in contact with a flame because a protective oxide coating is formed, preventing gross oxidation. Only if the metal is finely subdivided or present in a thin sheet will a high-intensity flame cause its rapid burning.

23. Describe the production of metallic aluminum by electrolytic reduction.

Solution

Extract from ore:

Recover: 

Sinter: 

Dissolve in Na3AlF6(*l*) and electrolyze: 

25. A chemist dissolves a 1.497-g sample of a type of metal (an alloy of Sn, Pb, Sb, and Cu) in nitric acid, and metastannic acid, H2SnO3, is precipitated. She heats the precipitate to drive off the water, which leaves 0.4909 g of tin(IV) oxide. What was the percentage of tin in the original sample?

Solution

The molar ratios are: . The number of moles of SnO2 or of Sn is: . The mass of Sn is:

.The percentage of tin in the original type of metal is .

27. What mass of magnesium forms when 100,000 A is passed through a MgCl2 melt for 1.00 h if the yield of magnesium is 85% of the theoretical yield?

Solution

100,000 A × 1.00 h × 60 min/h × 60 s/min = 3.60 × 108 A-s;

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two moles of electrons are required to convert, so there are ;

mass (Mg) = 1870 mol × 24.305 g/mol = 45,300 g (45.3 kg);

the yield is only 85% of the theoretical yield, so 

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