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1. (B)

Colemanite ($\text{Ca}_2\text{B}_6\text{O}_{11} \cdot 5\text{H}_2\text{O}$) or ($\text{CaB}_3\text{O}_4(\text{OH})_3 \cdot \text{H}_2\text{O}$) is a borate mineral found in evaporite deposits of alkaline lacustrine environments. Colemanite is an important ore of boron, and was the most important boron ore until the discovery of kernite in 1926. It has many industrial uses, like the manufacturing of heat resistant glass.

2. (B)

agnesite, the mineral magnesium carbonate (MgCO_3), a member of the calcite group of carbonate minerals that is a principal source of magnesium. The mineral has formed as an alteration product from magnesium-rich rocks or through the action of magnesium-containing solutions upon calcite.

3. (A)

Abundances of the Elements in the Earth's Crust


Element	Approximate % by weight
Oxygen	46.6
Silicon	27.7
Aluminum	8.1

4. (A)

Adsorption: it is a surface phenomenon used in the concentration of ores.

Froth floatation process: It is a process of concentrating the ore in which minerals are separated from impurities by adsorbing them from fluid to solid surface.

So adsorption process is used in the froth floatation of ore.

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5. (B)

NaCN prevents ZnS from forming the froth by reacting with it to form complex $\text{Na}_2 [\text{Zn}(\text{CN})_4]$ and behaves as a depressant. But it does not prevent PbS from forming Froth and both the ores can easily be separated. Froth floatation is a process based on selectivity of material where material is separated as they are either hydrophobic or hydrophilic. NaCN when added to ZnS or PbS, start acting as depressant because NaCN reacts with ZnS and forms a soluble complex with ZnS, this is $\text{Na}_2 [\text{Zn}(\text{CN})_4]$ and thus prevent ZnS from forming froth whereas NaCN doesn't react with PbS and doesn't form a complex. So, it doesn't prevent PbS from forming froth. This way PbS ore is left behind and can be separated easily and can be extracted and afterwards ZnS can also be separated from the complex, $\text{Na}_2 [\text{Zn}(\text{CN})_4]$ Thus, NaCN only reacts with ZnS and not PbS so PbS is left out. NaCN used to stop ZnCN in forming froth whereas it allows PbS to form froth.

6. (C)

Except leaching, in all the remaining options, physical properties of the ore or gangue are used for the process of separation of ore and gangue. In leaching, the ore is treated with chemicals to separate it from gangue.

7. (BC)

If sulphide ore (A) is Ag_2S then, $\text{Ag}_2\text{S} + 4\text{NaCN} \rightarrow 2\text{Na}[\text{Ag}(\text{CN})_2] + \text{Na}_2\text{S}$


Thus B is complex $[\text{Ag}(\text{CN})_2]$ – which is linear and diamagnetic as it has zero unpaired electrons.

8. (B)

(1) Calamine is a historic name for an ore of zinc Zinc carbonate ZnCO_3 or smithsonite

(2) Cassiterite is a tin oxide mineral, SnO_2 . It is generally opaque, but it is translucent in thin crystals. Its luster and multiple crystal faces produce a desirable gem. Cassiterite was the chief tin ore throughout ancient history and remains the most important source of tin today.

(3) Cerussite is a mineral consisting of lead carbonate (PbCO_3), and is an important ore of lead. The name is from the Latin cerussa, white lead.

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(4) Rutile is an oxide mineral composed of titanium dioxide (TiO_2), the most common natural form of TiO_2 . Rutile is a common accessory mineral in high-temperature and high-pressure metamorphic rocks and in igneous rocks.

9. (D)

(1) **Carnallite** (also **carnalite**) is an evaporite mineral, a hydrated potassium magnesium chloride with formula $\text{KCl} \cdot \text{MgCl}_2 \cdot 6(\text{H}_2\text{O})$. It is variably colored yellow to white, reddish, and sometimes colorless or blue. It is usually massive to fibrous with rare pseudohexagonal orthorhombic crystals. The mineral is deliquescent (absorbs moisture from the surrounding air) and specimens must be stored in an airtight container.

(2) **Calamine** is a historic name for an ore of zinc Zinc carbonate ZnCO_3 or smithsonite

(3) **ilmenite**, iron-black, heavy, metallic oxide mineral, composed of iron and titanium oxide (FeTiO_3), that is used as the major source of titanium.

(4) **Chalcopyrite** is a copper iron sulfide mineral and the most abundant copper ore mineral. It has the chemical formula CuFeS_2 and crystallizes in the tetragonal system.

10. (3)

Anglesite is a lead sulfate mineral with the chemical formula PbSO_4

Galena, also called lead glance, is the natural mineral form of lead (II) sulfide (PbS)

Cerussite is a mineral consisting of lead carbonate (PbCO_3), and is an important ore of lead. The name is from the Latin cerussa, white lead.

Chlorargyrite is the mineral form of silver chloride (AgCl). Chlorargyrite occurs as a secondary mineral phase in the oxidation of silver mineral deposits. It is also known as **cerargyrite** and, when weathered by desert air, as **horn silver**.

Chalcopyrite is a copper iron sulfide mineral and the most abundant copper ore mineral. It has the chemical formula CuFeS_2 and crystallizes in the tetragonal system.