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**Assignment**

Outline the toxicity values are deficiency manifestations of the following minerals:

* POTASSIUM
* CALCIUM
* MAGNESIUM
* CHLORIDE
* IRON

**IRON**

Toxicity values: Toxic effect of iron begin to occur at doses a bone 10-20 mg/kg of elemental iron. Ingestions of more than 50mg/kg of elemental iron are associated with severe toxicity. In terms of blood values, iron levels above 350-500ug/dL are considered toxic, and levels over 1000ug/dL indicate severe iron poisoning.

Deficiency manifestations: A deficiency of iron causes a reduction in the rate of haemoglobin synthesis and erythropoiesis and can result in iron deficiency anaemia.

Anaemia is a condition characterized by a reduced amount of haemoglobin in the cells or reduced number if circulating red blood cells or both.

The main causes of iron deficiency are:

* Deficient intake
* Impaired absorption
* Excessive loss.

Iron deficiency causes low haemoglobin resulting in hypochromic-microsytic anaemia in which the size of the red blood cells are much smaller than normal and have much reduced haemoglobin content.

**POTASSIUM**

Toxicity values: Abnormally elevated serum potassium concentrations are referred to as hyperkalemia. Hyperkalemia occurs when potassium intake exceeds the capacity of the kidneys to eliminate it. Acute or chronic kidney failure, the use of potassium-sparing diuretics, and insufficient aldosterone secretion (hypoaldosteronism) may result in the accumulation of potassium due to a decreased urinary potassium excretion. Oral doses of potassium >18 g taken at one time in individuals not accustomed to high intakes may lead to severe hyperkalemia, even in those with normal kidney function. Hyperkalemia may also result from a shift of intracellular potassium into the circulation, which may occur with the rupture of red blood cells (hemolysis) or tissue damage (e.g., trauma or severe burns). Symptoms of hyperkalemia may include tingling of the hands and feet, muscular weakness, and temporary paralysis. The most serious complication of hyperkalemia is the development of an abnormal heart rhythm (cardiac arrhythmia), which can lead to cardiac arrest. A meta-analysis of randomized controlled studies showed that heart rate in healthy adults was unlikely to be affected by the chronic use of supplemental potassium doses of 2 to 3 g/day.

Deficiency metabolism: Potassium deficiency is associated with an increase in renal net acid excretion. This effect is multifactorial. First, chronic K+ deficiency increases the proximal tubule apical membrane Na+-H+ antiporter and basolateral membrane Na+-HCO3−-CO32− cotransporter activities. This effect is similar to that seen with chronic acidosis and may be due to intracellular acidosis. Chronic K+ deficiency also increases proximal tubular ammonia production. Last, chronic K+ deficiency leads to an increase in collecting duct H+ secretion. This appears to be related to increased activity of the apical membrane H+,K+-ATPase. Such an effect increases the rate of H+ secretion and the rate of K+ reabsorption in the collecting duct. Finally, ammonia, whose production is stimulated by hypokalemia, has direct effects that stimulate collecting duct H+ secretion. Counterbalancing these effects is that K+ deficiency decreases aldosterone secretion, which can inhibit distal acidification. Thus, in normal individuals, the net effect of K+ deficiency is typically a minor change in acid-base balance. However, in those in whom mineralocorticoid secretion is nonsuppressible (e.g., hyperaldosteronism, Cushing's syndrome), K+ deficiency can markedly stimulate renal acidification and cause profound metabolic alkalosis.

Hyperkalemia appears to have opposite effects on renal acidification. The most notable effect of hyperkalemia is inhibition of ammonia synthesis in the proximal tubule and ammonia absorption in the loop of Henle, thereby resulting in inappropriately low levels of urinary ammonia excretion. This contributes to the metabolic acidosis seen in patients with hyperkalemic distal (type 4) renal tubular acidosis.

**CALCIUM**

Toxicity values: Calcium toxicity is rare, occurring in those with hyperparathyroidism or high calcium supplementation levels. Like vitamin D, toxicity can lead to calcification of soft tissues. In addition, a very high intake of calcium can lead to kidney stone formation.

Deficiency manifestations: A calcium deficiency may have no early symptoms. To avoid complications, a person should seek prompt diagnosis and treatment if they experience any of the symptoms listed below.

What are the symptoms?

### 1. Muscle problems

Share on PinterestCalcium deficiency can lead to extreme tiredness and fatique

Muscle aches, cramps, and spasms are the earliest signs of a calcium deficiency. People tend to feel pain in the thighs and arms, particularly the underarms, when walking and otherwise moving.

A calcium deficiency can also cause numbness and tingling in the hands, arms, feet, legs, and around the mouth.

These sensations may indicate a more severe deficiency.

These symptoms can come and go, but they do not disappear with activity, and a person may have to wait them out.

### 2. Extreme fatigue

Low levels of calcium can cause insomnia or sleepiness.

People tend to experience:

* extreme fatigue
* lethargy
* an overall feeling of sluggishness
* lack of energy

Fatigue associated with calcium deficiency can also cause lightheadedness, dizziness, and brain fog, which involves lack of focus, forgetfulness, and confusion.

### 3. Nail and skin symptoms

Chronic calcium deficiency can affect the skin and nails.

The skin may become dry and itchy, and researchers have linked hypocalcemia to eczema and psoriasis. Eczema is a general term for skin inflammation. Symptoms include itchiness, redness, and skin blisters. Eczema is highly treatable, while psoriasis can be managed, but there is no cure.

A calcium deficiency may lead to dry, broken, and brittle nails. It can also contribute to alopecia, a condition that causes hair to fall out in round patches.

### 4. Osteopenia and osteoporosis

Calcium deficiency can lead to osteopenia and osteoporosis.

Osteopenia reduces the mineral density of bones, and it can lead to osteoporosis. Osteoporosis makes bones thinner and more susceptible to fractures. It can cause pain, issues with posture, and eventual disability.

While osteopenia is less severe than osteoporosis, both cause diminished bone density and increased risk of breaks and fractures.

The bones store calcium well, but they require high levels to stay strong. When overall levels of calcium are low, the body can divert it from the bones, making them brittle and prone to injury.

It takes years for bones to lose their density, and a calcium deficiency may take as long to cause serious problems.

### 5. Painful premenstrual syndrome (PMS)

Share on PinterestLow levels of calcium may lead to tooth decay.

Low calcium levels have been linked to severe PMS.

Participants in one 2017 study reported improved mood and reduced rates of fluid retention after taking 500 milligrams (mg) of calcium daily for 2 months.

In 2019, authors of a systematic review concluded that low levels of vitamin D and calcium during the second half of the menstrual cycle might contribute to symptoms of PMS. The team proposed using supplements to help relieve symptoms.

**MAGNESIUM**

Magnesium toxicity: Symptoms of magnesiumtoxicity, which usually develop after serum concentrations exceed 1.74–2.61 mmol/L, can include hypotension, nausea, vomiting, facial flushing, retention of urine, ileus, depression, and lethargy before progressing to muscle weakness, difficulty breathing, extreme hypotension, irregular heartbeat, ...

Magnesium deficiency: Magnesium deficiency is an electrolyte disturbance in which there is a low level of magnesium in the body. It can result in multiple symptoms. Symptoms include tremor, poor coordination, muscle spasms, loss of appetite, personality changes, and nystagmus. Complications may include seizures or cardiac arrest such as from torsade de pointes. Those with low magnesium often have low

Causes include low dietary intake, alcoholism, diarrhea, increased urinary loss, poor absorption from the intestines, and diabetes mellitus. A number of medications may also cause low magnesium, including proton pump inhibitors (PPIs) and furosemide. The diagnosis is typically based on finding low blood magnesium levels (hypomagnesemia) Normal magnesium levels are between 0.6-1.1 mmol/L (1.46–2.68 mg/dL) with levels less than 0.6 mmol/L (1.46 mg/dL) defining hypomagnesemia. Specific electrocardiogram (ECG) changes may be seen.

Treatment is with magnesium either by mouth or intravenously. For those with severe symptoms, intravenous magnesium sulfate may be used. Associated low potassium or low calcium should also be treated. The condition is relatively common among people in hospital

**CHLORIDE**

**Chlorine deficiency**, condition in which chlorine is insufficient or is not utilized properly. Chlorine is a component of all body secretions and excretions resulting from processes of building (anabolism) and breaking down (catabolism) body tissues. Levels of chlorine closely parallel levels of sodium intake and output, since a primary source of both is sodium chloride, or common table salt. Chlorine is stored to a limited extent in the skin, subcutaneous tissues, and skeleton and [constitutes](https://www.merriam-webster.com/dictionary/constitutes) two-thirds of the negatively charged ions (anions) in the blood. Chlorides (chlorine compounds) play an essential role in the electrical neutrality and pressure of extracellular fluids and in the acid-base balance of the body. Gastric secretion is composed of chlorides in the form of hydrochloric acid and salts. Chlorine is readily absorbed during digestion, and similarly its rate of excretion through sweat, kidney excretion, and intestinal expulsion is high. The body’s supplies of chlorine are rapidly depleted during hot weather, when excessive perspiration reduces the fluid content of the body. Also, stored chlorides may become dangerously low in periods of severe [vomiting](https://www.britannica.com/science/vomiting) and [diarrhea](https://www.britannica.com/science/diarrhea) and in diseases that produce severe [alkalosis](https://www.britannica.com/science/alkalosis), an accumulation of base or loss of acid in the body.