CLASS 10 SCIENCE NCERT SOLUTIONS

NCERT Solutions for Class 10 Science Chapter 3: Metals and Non-metals – Free PDF Download

Metals and Non-metals is one of the most reaction-heavy chapters in the current 2026-27 CBSE Class 10 Science syllabus, testing both conceptual understanding of the reactivity series and the ability to write balanced equations. Below are complete, original, step-by-step solutions to the end-of-chapter exercise. Thes...

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NCERT Solutions for Class 10 Science Chapter 3: Metals and Non-metals

Q1. Which of the following pairs will give displacement reactions? (a) NaCl solution and copper metal (b) $MgCl_2$ solution and aluminium metal (c) $FeSO_4$ solution and silver metal (d) $AgNO_3$ solution and copper metal
A displacement reaction happens only when the free metal is more reactive than the metal in the salt solution. Copper is higher in the reactivity series than silver, so copper can displace silver from silver nitrate solution.
Answer: (d).

Q2. Which of the following methods is suitable for preventing an iron frying pan from rusting? (a) Applying grease (b) Applying paint (c) Applying a coating of zinc (d) All of the above
Rusting needs both air (oxygen) and moisture to reach the iron surface. Grease, paint, and a zinc coating each work by physically sealing the surface away from air and moisture, so any of them (and all of them together) prevent rusting.
Answer: (d).

Q3. An element reacts with oxygen to give a compound with a high melting point. This compound is also soluble in water. The element is likely to be (a) calcium (b) carbon (c) silicon (d) iron
A high melting point plus water solubility points to an ionic oxide of a reactive metal. Calcium oxide (CaO) is a high-melting solid that dissolves in water to form calcium hydroxide.
Answer: (a).

Q4. Food cans are coated with tin and not with zinc because (a) zinc is costlier than tin (b) zinc has a higher melting point than tin (c) zinc is more reactive than tin (d) zinc is less reactive than tin
Zinc is more reactive than tin, so if the coating gets scratched, the more reactive zinc could react with acidic food substances and contaminate the food. Tin is safer for food contact because it is less reactive.
Answer: (c).

Q5. You are given a hammer, a battery, a bulb, wires and a switch. (a) How would you use them to distinguish between samples of metals and non-metals? (b) Assess the usefulness of these tests in distinguishing between metals and non-metals.
(a) Use the hammer to strike each sample: metals are malleable and flatten into sheets without breaking, while most non-metals are brittle and shatter into pieces. Then connect each sample into a circuit made from the battery, bulb, wires and switch: if the bulb glows, the sample conducts electricity (a metal); if it doesn't glow, the sample is a non-conductor (a non-metal).
(b) These tests are useful for most common elements, but they are not completely reliable: graphite (a non-metal) conducts electricity, and some metals like sodium and potassium are too soft to hammer safely. So the tests give a good first indication but exceptions exist.

Q6. What are amphoteric oxides? Give two examples of amphoteric oxides.
Amphoteric oxides are metal oxides that show both acidic and basic character — they react with acids as well as with bases to form a salt and water. Examples: aluminium oxide (Al_2O_3) and zinc oxide (ZnO).
$Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$

$Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$

Q7. Name two metals which will displace hydrogen from dilute acids, and two metals which will not.
Metals above hydrogen in the reactivity series displace it from dilute acids; metals below hydrogen do not.
Displace hydrogen: zinc (Zn) and magnesium (Mg).
Do not displace hydrogen: copper (Cu) and silver (Ag).

Q8. In the electrolytic refining of a metal M, what would you take as the anode, the cathode and the electrolyte?
Anode: a thick block of the impure metal M.
Cathode: a thin strip of pure metal M.
Electrolyte: an aqueous solution of a salt of the same metal M (for example, a solution of MSO_4).
On passing current, the anode dissolves and pure metal deposits on the cathode, while insoluble impurities settle as anode mud.

Q9. Sulphur powder is heated on a metal spoon, and the gas produced is tested first with dry blue litmus paper and then with moist blue litmus paper. What would you observe, and write the equation for the reaction taking place.
Sulphur burns to form sulphur dioxide gas. Dry blue litmus paper shows no change, because the gas needs to dissolve in water to show its acidic effect. Moist blue litmus paper turns red, because the gas dissolves in the moisture to form sulphurous acid, which is acidic.
$S + O_2 \rightarrow SO_2$
This confirms that non-metallic oxides are acidic in nature.

Q10. State two ways to prevent the rusting of iron.
(i) Painting or applying grease/oil on the iron surface to keep out air and moisture.
(ii) Galvanisation — coating the iron surface with a thin layer of zinc.

Q11. What type of oxides are formed when non-metals combine with oxygen?
Non-metals combine with oxygen to form acidic oxides (or, in some cases, neutral oxides). These oxides either turn moist blue litmus paper red or have no effect on litmus — they never turn litmus blue.

Q12. Give reasons: (i) Platinum, gold and silver are used to make jewellery. (ii) Sodium, potassium and lithium are stored under oil. (iii) Aluminium is a highly reactive metal, yet it is used to make utensils for cooking. (iv) Carbonate and sulphide ores are usually converted into oxides during the process of extraction of metal.
(i) These three metals lie very low in the reactivity series, so they resist corrosion and tarnishing, and being malleable, ductile and lustrous, they retain their shine for a very long time — ideal properties for jewellery.
(ii) Sodium, potassium and lithium are extremely reactive and react vigorously (even catch fire) on contact with air and water, so they are stored under oil to cut off their contact with atmospheric oxygen and moisture.
(iii) Although aluminium is reactive, it instantly forms a thin, tough layer of aluminium oxide on its surface when exposed to air. This oxide layer protects the metal underneath from any further reaction, so aluminium utensils remain safe to use.
(iv) Metal oxides are easier to reduce to the free metal than carbonates or sulphides, so carbonate/sulphide ores are first converted (by calcination or roasting) into oxides before the reduction step.

Q13. Explain why it is important to explore new sources of metals — and separately, why lemon or tamarind juice is effective in cleaning the tarnished surface of copper vessels.
Copper vessels develop a dull, greenish-black tarnish over time because the copper surface reacts with moist air/carbon dioxide to form basic copper compounds (like copper carbonate/oxide), which are mildly

basic. Lemon and tamarind juice contain weak acids (citric acid and tartaric acid respectively). These acids react with the basic tarnish layer and dissolve it away, exposing the shiny copper metal underneath.

Q14. Differentiate between metal and non-metal on the basis of their chemical properties.
Reaction with oxygen: metals form basic oxides; non-metals form acidic or neutral oxides.
Reaction with water: reactive metals react with water/steam to form a metal hydroxide/oxide and release hydrogen gas; non-metals generally do not react with water at all.
Reaction with dilute acids: metals above hydrogen in the reactivity series react with dilute acids to release hydrogen gas; non-metals do not react with dilute acids.
Reaction with solutions of other metal salts: a more reactive metal displaces a less reactive metal from its salt solution; this kind of displacement does not occur for non-metals.

Q15. Gold does not react with any single acid, yet a jeweller can dissolve gold jewellery in one particular freshly prepared liquid to test its purity. Name this liquid, state what it is made of, and explain why it can dissolve gold when ordinary acids cannot.
The liquid is **aqua regia**, a freshly prepared mixture of concentrated hydrochloric acid and concentrated nitric acid in a 3:1 ratio by volume. Although gold does not react with either acid alone, the mixture is far more corrosive than either acid individually and is able to dissolve gold (and platinum). This is why aqua regia is used to test/purify gold and to dissolve gold-plated or fake jewellery samples for identification.

Q16. Give reasons why copper is used to make hot water tanks and not steel (an alloy of iron).
Copper lies below hydrogen in the reactivity series and does not react with water, even hot water, so a copper tank will not corrode from the inside. Steel contains iron, which reacts with hot water and dissolved oxygen over time to rust, weakening and eventually leaking the tank. Copper is also an excellent conductor of heat, which helps water heat up efficiently.

Why This Chapter Matters

Metals and Non-metals is consistently one of the highest-weightage chemistry chapters in the CBSE Class 10 board paper, typically worth 8–10 marks across MCQs, reasoning questions, and reaction-writing. It also forms the direct foundation for the extraction and reactivity-series concepts that reappear in Class 11 and 12 Chemistry, so a strong grip on this chapter pays off well beyond this one board exam.

CBSE Exam Weightage

This chapter falls under **Unit I: Chemical Substances – Nature and Behaviour** in the CBSE Class 10 Science board exam syllabus. This unit typically carries around **25 marks (31.25%)** of the 80-mark theory paper, based on CBSE's published unit-wise weightage (Question Paper Design). CBSE sets weightage at the unit level rather than chapter-by-chapter, so the exact share from this specific chapter can vary a little between years and sample papers.

How to Use These Solutions

Don't just read the equations — write out the reactivity series and practice writing balanced equations from memory, since equation-based and reasoning-based questions are where most marks are lost in this chapter. You can download the full chapter directly from our Class 10 Science NCERT book page, or browse every Class 10 subject on our Class 10 hub.

Class 10 Science Chapter 3 – Notes and Extra Questions

Along with these NCERT Solutions, students can also use the Class 10 Science Chapter 3 Extra Questions and Class 10 Science Chapter 3 Revision Notes for quick revision and extra practice.