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Q43

In the context of electric vehicle batteries, consider the following elements: I. Cobalt II. Graphite III. Lithium IV. Nickel How many of the above usually make up battery cathodes? (a) Only one (b) Only two (c) Only three (d) All the four Official key: C.

UPSC Civil Services Prelims 2025 · General Studies · 2 marks · Current Affairs and GK
Current events, government schemes, miscellaneous GK - Prelims GS Paper I.

Explanation

(a)

Only one. Cobalt, lithium and nickel all appear in common cathode families; the official count is not one.

(b)

Only two. That under-counts the cathode set.

(c) Official key

Only three. Cobalt, lithium and nickel are cathode metals in everyday Li-ion cells. Graphite is the usual anode, so it is the one that drops.

(d)

All four. Graphite is not a cathode material in standard Li-ion cells.

Summary

Official Set A key is (c) only three. In lithium-ion cells the cathode is a lithium metal oxide or phosphate. Cobalt (LCO, NMC), nickel (NMC, NCA) and lithium itself are cathode ingredients. Graphite is the standard anode. LFP has no cobalt or nickel, but the paper still keys three of the four names as the usual cathode set and leaves graphite out. (a)(b) under-count; (d) wrongly keeps graphite.

Related possible facts

These can be asked in a future Prelims paper.

Lithium cobalt oxide (LCO)

LiCoO₂ cathode. Common in phones and laptops. Cobalt plus lithium.

NMC cathode

Nickel-manganese-cobalt with lithium. Widely used in EVs.

Lithium iron phosphate (LFP)

LiFePO₄ cathode. No nickel, no cobalt. Growing share of EV packs.

Graphite anode

The usual negative electrode in Li-ion cells. Lithium ions intercalate here on charge.

Solid-state battery

Replaces the liquid electrolyte. Cathode chemistry is still a separate design choice.

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