**ITEM NO. 12**

**DISCOVERIES AND INVENTIONS**

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| --- | --- | --- |
| Reading Literacy | Them: SCIENCE | Classes: IX  Time: 30 minutes  Total credit: 8 |
| Description of Item   |  |  | | --- | --- | | ✓ | Text | | ✓ | Image | |  | Table | |  | Graph | |  | Map | |  | Poem | | Learning Outcome: Reasoning and Knowledge | |

**UNIT: INVENTION AND DICOVERIES**



JOHN B GOODENOUGH, M STANLEY WHITTINGHAM AND AKIRA YOSHINO WON THE CHEMISTRY NOBEL PRIZE 2019. PHOTO: NOBEL MEDIA

An American physicist, a British-American chemist and a Japanese chemist on October 9, 2019, won the Nobel Prize in Chemistry 2019 “for the development of lithium-ion batteries”, according to the Royal Swedish Academy of Sciences. John B Goodenough from the University of Texas at Austin at United States, M Stanley Whittingham from Binghamton University, State University of New York in the US and Akira Yoshino from Asahi Kasei Corporation, Tokyo, Japan ochMeijo University, Nagoya in Japan “created a rechargeable world”, read the statement on the website. Goodenough, 97, is the oldest-ever to win the prestigious prize.

The “lightweight, rechargeable and powerful battery” today powers everything from mobile phones to laptops and electric vehicles. The batteries have also contributed towards a fossil fuel-free world by storing significant amounts of energy from renewable sources, such as solar and wind power” and have paved the way for “the development of long-range electric cars”.

Whittingham began research on methods to build fossil fuel-free energy technologies during the oil-crisis in the 1970s. He discovered an extremely energy-rich material and created an innovative cathode in a lithium battery, with just over two volts.

Using cobalt oxide with intercalated lithium ions, Goodenough produced more powerful batteries with four volts in 1980.

Yoshino, in 1985, created the first commercially viable lithium-ion battery, using petroleum coke — a carbon material — that, like the cathode’s cobalt oxide, can intercalate lithium-ions, the statement said.

The lithium-ion batteries are based upon lithium-ions flowing back and forth between the anode and cathode.

“Lithium-ion batteries have revolutionised our lives since it entered the market in 1991. They have laid the foundation of a wireless, fossil fuel-free society, and are of the greatest benefit to humankind” the statement noted.

Read the above text and answer the questions:

Q.1. Nobel prize for Chemistry in 2019 was given for?

a) Mobile battery

b) Development of Lithium Ion Batteries

c) Ionic Composition

d) Discovery ofLithium

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| FRAMEWORK | CHARECTERISTICS |
| SITUATION/SCENARIO/CONTEXT | Educational |
| TEXT FORMAT | Continuous |
| TEXT TYPE | Exposition |
| COGNITIVE PROCESS | Locate and Retrieve |
| ITEM FORMAT | Simple MCQ |
| PROFICIENCY LEVEL | 1b |

Q.2.What have the three Nobel Laureatescreated?

a) Lightweight, rechargeable and powerful battery

b) Renewable source of energy

c) Batteries to run Bullet Train

d) Mobile networks to charge Batteries

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| FRAMEWORK | CHARECTERISTICS |
| SITUATION/SCENARIO/CONTEXT | Educational |
| TEXT FORMAT | Continuous |
| TEXT TYPE | Exposition |
| COGNITIVE PROCESS | Locate and retrieve |
| ITEM FORMAT | Complex MCQ |
| PROFICIENCY LEVEL | 1b |

Q.3. How does Lithium Ion Batteries work?

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| FRAMEWORK | CHARECTERISTICS |
| SITUATION/SCENARIO/CONTEXT | Educational |
| TEXT FORMAT | Continuous |
| TEXT TYPE | Exposition |
| COGNITIVE PROCESS | Locate &retrieve |
| ITEM FORMAT | Closed constructed response |
| PROFICIENCY LEVEL | 1 a |

Q.4.“Lithium-ion batteries have revolutionized our lives since it entered the market in 1991. They have laid the foundation of a wireless, fossil fuel-free society, and are of the greatest benefit to humankind”. Justify the statement with clear explanations. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| FRAMEWORK | CHARECTERISTICS |
| SITUATION/SCENARIO/CONTEXT | Educational |
| TEXT FORMAT | Continuous |
| TEXT TYPE | Exposition |
| COGNITIVE PROCESS | Evaluate and Reflect |
| ITEM FORMAT | Open constructed response |
| PROFICIENCY LEVEL | ~~4~~2 |

**Scoring and credits**

Q.1.

Full Credit: option (b)

No Credit: any other options

Q.2.

Full Credit: option (a)

No Credit:-any other options

Q.3.

Full Credit: They are based upon lithium –ions flowing back and forth between the anode &cathode.

No Credit: any other responses

Q.4.

FULL CREDIT: 2responses: These batteries can change everything in the world .

: Contribute towards fossil fuel –free world by storing significant amounts of energy from renewable sources .

PARTIAL CREDIT: Any onepoint

NO CREDIT:any other responses