

Lithium-ion rechargeable batteries – answers

Education in Chemistry

January 2020

rsc.li/2P6AWqQ

Chemistry of lithium-ion batteries

- 01.1** Lithium can produce a high voltage in cells.
Lithium has a low density so can help produce portable equipment.
- 01.2** The reactions in the cell stop because one of the reactants runs out.
- 01.3** The reactions in the cell are reversible.
When the cell is recharged the reverse reaction occurs.
- 01.4** Any one from:
- Metal/metal compounds are reused.
 - Supplies are not depleted.
 - The cell can be reused.
 - No landfill problems.
 - Less mining.
 - Less energy to extract metals.
 - Less waste.
- 01.5** A battery is made from two or more cells are connected together in series.
- 01.6** $\text{Li} \rightarrow \text{Li}^+ + \text{e}^-$
- 01.7** Sodium loses an electron more easily.
Sodium's outer electron in energy level further from nucleus.
Sodium's out electron less strongly attracted by nucleus.
- 01.8** The water could react with the lithium metal.

Life cycle assessment for lithium ion batteries.

02

- Mining could damage the landscape.
- Mining could displace indigenous populations.
- Processing lithium could use up water needed by population.
- Energy usage in mining process.

03.1

- In reuse the batteries could be used in second-use applications, eg in community storing of electricity generated by solar or wind power.
- In reuse the battery is still working as a battery.
- In recycling the battery is dismantled and the components are separated.
- The different components are then used again.

03.2

- Many old batteries are kept by owners or thrown away and end up in landfill.
- There are many different components in the batteries that are hard to separate.
- The batteries have many different designs.

03.3

- Legislation could mean the batteries have the same design.
- This would make it easier to recycle.

03.4

- To prevent resources being wasted.
- Lithium may run out.
- Batteries can cause pollution problems if disposed in landfill.
- Less energy and water to extract metals.