

Earth's resources

This resource accompanies the infographic poster **Using Earth's resources** in *Education in Chemistry* which demonstrates global production of materials used for warmth, shelter, food and transport and can be viewed at: rsc.li/4bSMOWV

Learning objectives

- 1 Identify what humans use Earth's resources for.
- 2 Apply your knowledge of key terms to your own experiences.
- 3 Use data to carry out calculations on Earth's resources.

Introduction

Use this resource as a Directed Activity Related to Text (DART) alongside the infographic poster and fact sheet available at the link above.

How to use this resource

- Learners use the infographic poster and/or fact sheet to answer the questions.
- Learners answer the maths questions using data, taken from BP's *Statistical Review of World Energy, 2022 (71st edition)*, relating to the production of oil in 2021.
- You can also use the questions in this resource as a think-pair-share activity.

Scaffolding

There are three versions of the student sheet. The unscaffolded worksheet, indicated by three stars in the header, contains little help and all the calculation questions.

The fully scaffolded and partially scaffolded worksheets both include multiple choice options. The fully scaffolded worksheet does not have the final calculation question, to calculate a percentage, but the partially scaffolded version does, with hints.

The skills involved in answering the calculation questions (addition, multiplication, reading data from a table, calculating a percentage) should be within the capabilities of this age group but the size of the numbers does offer additional challenge.

Answers

1. All are correct. Learners may also have given other answers – most will be correct.

2. Finite resources will **eventually run out**.
Renewable resources will **keep going forever if replaced**.
3. Either mobile phone or toothbrush is correct. Learners may also give answers such as plastic bottles for shampoo etc. Anything made from plastics, metals, oil etc are finite resources.
4. Finite resources will **eventually run out**.
5. Learners may give answers relating to wood (paper), plants (biomass) etc.
6. Renewable resources will **keep going forever if replaced**.
7. Natural products are **formed from plants and animal processes**.
8. Clothes made from polyesters, nylon, plastic water bottles, anything from a man-made product eg. plastic
9. Clothes made from cotton, wool, hemp or bamboo;
bamboo toothbrushes (however the bristles may be plastic).
- 10.

Pros	Cons
Made from renewable* resources	May not be as durable or strong
Will not run out	May need replacing more often
Better for the environment**	

*This may depend on the natural product chosen in Q9. Check that learners have chosen a renewable product. Natural products, including oil and coal, can also be finite.

**Learners may give this as an answer and it may be valid. However, this is a good place to discuss the use of life cycle assessments (LCAs) to assess a product's environmental impact, from raw materials to disposal. It is not always the case that a natural or renewable item is better for the environment when assessed against a wider range of criteria.

Global context: calculations

1. $\text{Ans} = 23,942 + 5909 + 3420 + 13,829 + 28,156 + 7286 + 7335$
 $= 89,877 \times 1000$ (thousands of barrels from table heading)
 $= \mathbf{89,877,000}$ barrels per day in 2021
2. $\text{Ans} = Q1 \times 365 = 89,877,000 \times 365 = \mathbf{32,805,105,000}$ barrels per year in 2021.

This is a good opportunity to ask learners to present this answer in standard form or to a number of significant figures to bring in more maths skills.

3. North America barrels per year = $23,942 \times 1000 \times 365 = 8,738,830,000$
 Total barrels per year (Q2) = $32,805,105,000$
 $\text{Ans} = (8,738,830,000 / 32,805,105,000) \times 100 = \mathbf{26.64\%}$

Alternatively:

North America thousands of barrels per day = 23,492
 Total thousands of barrels per day (Q1) = 89,877
 $\text{Ans} = (23,942/89,877) \times 100 = \mathbf{26.64\%}$

Again, there is an opportunity here for more data handling questions.