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SPECA

GCSE Combined Science (AQA Trilogy) · Chemistry

Using Resources · Mark Scheme

For use with the Tiered Worksheet. Marking points are indicative, not exhaustive: award equivalent correct answers.

Section A: Foundation (Q1 to 14)

1) Development that meets the needs of the current generation (1) without compromising the ability of future generations to meet their own needs (1) [2]

2) Any one reasonable example, e.g. synthetic fertilisers replacing manure, farmed fish replacing wild-caught fish, synthetic dyes replacing natural dyes (1) [1]

3) A finite resource is one that will eventually run out / isn't replaced at a usable rate (e.g. crude oil, metal ores) (1); a renewable resource can be replaced/replenished at the rate it's used (e.g. wood from sustainably managed forests, wind) (1) [2]

4) Water that is safe to drink (1), having sufficiently low levels of dissolved salts and microbes (1) [2]

5) It still contains dissolved substances, it is not a single pure element or compound (1) [1]

6) Choose an appropriate source (1); pass it through filter beds (1); sterilise it, e.g. using chlorine, ozone, or ultraviolet light (1) [3]

7) Desalination is used when fresh water supplies are limited (1); by distillation or by a membrane process such as reverse osmosis (1) [2]

8) Untreated waste water can contain harmful microbes and organic matter (and, for industrial waste water, harmful chemicals) that would pollute and damage the environment if released untreated (1); treatment removes these before release (1) [2]

9) Screening and grit removal (1); sedimentation, producing sludge and effluent (1); anaerobic digestion of the sludge (1); aerobic biological treatment of the effluent (1) [4]

10) Evaluating a product's environmental impact (1) across raw material extraction/processing, manufacture/packaging, use, and end-of-life disposal, including transport at each stage (1) [2]

11) Water, resource, energy, and waste use can be reasonably objectively quantified (1); but assigning numerical values to pollution effects requires value judgements, so the overall assessment isn't purely objective (1) [2]

12) Reusing avoids the energy/resources needed to crush and remelt the glass into a new product (accept any valid resource/energy-saving reason) (1) [1]

13) Metals are melted down (1) and recast/reformed into new products; the separation needed depends on the material and what the final product requires (1) [2]

14) A selective/abbreviated LCA can be used to support a predetermined conclusion (1); ignoring the use and disposal stages could hide a genuinely large environmental impact at those stages, making the product look more sustainable than it really is (1) [2]

Section B: Higher (Q15 to 20)

15) These methods are used for scarce, low-grade ores (e.g. copper) (1), avoiding the environmental impact of traditional large-scale mining (1) [2]

16) Plants absorb metal compounds from the soil/ore (1); the plants are harvested and burned, leaving metal-compound-containing ash (1) [2]

17) Bacteria are used to produce a leachate solution (1) containing metal compounds, from low-grade ore (1) [2]

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18) Phytomining uses plants (harvested and burned for ash); bioleaching uses bacteria (producing a leachate solution): any correct distinction (1) [1]

19) Displacement using a more reactive metal (e.g. scrap iron), OR electrolysis (1); either correctly named method (1) [2]

20) Advantage: e.g. avoids the environmental damage of large-scale mining / can extract metal from ore too low-grade for traditional mining (1); disadvantage: e.g. can be a slower process / lower yield than traditional mining (1) [2]

Total: 28 marks (Section A) + 11 marks (Section B) = 39 marks

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