1.12 Product life-cycle assessment: 30-minute Pack

AQA 8552 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions.

1 A community workshop is choosing between two fictional portable display stands for the same 10-year service need. Stand A has a 12-point production impact, 2 points for transport and 2 points for end-of-life treatment; it lasts 5 years and cannot be repaired. Stand B has a 20-point production impact, 2 points for transport and 2 points for end-of-life treatment; it lasts 10 years and can be repaired, but no repair is needed in the stated period. Assume one whole stand is required at a time, identical replacement stands are available, and all points are invented teaching assumptions, not measurements. Recommend one stand by calculating the supplied total for 10 years, then justify your decision and state one limitation of this comparison. [6 marks]

(Total for Question 1 is 6 marks)

2 A fictional life-cycle study records energy used while a lamp is switched on in a home. Name the life-cycle stage represented. [1 mark]

(Total for Question 2 is 1 mark)

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3 Two fictional phone stands do the same job. Stand A has 24 invented impact points per stand and lasts 4 years. Stand B has 30 invented impact points per stand and lasts 10 years. Assume each stand meets the need throughout its stated life and ignore partial stands. Calculate each stand's impact points per service year and identify the lower rate. Values are teaching assumptions, not measured factors. [3 marks]

(Total for Question 3 is 3 marks)

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4 A fictional school has a usable desk organiser that needs a repair. A repair kit has 4 invented impact points and extends its service by 12 years. A new organiser has 18 invented impact points and lasts 12 years. Assume both meet the same need for 12 years, no other impacts change, and all values are fictional teaching assumptions, not measurements. Compare the supplied points for repair and reuse with replacement, then state which is lower and by how much. [3 marks]

(Total for Question 4 is 3 marks)

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5 A fictional kettle is designed with a replaceable switch. The switch fails after 3 years, while the kettle body is expected to last 8 years. The switch replacement kit is assigned 2 invented impact points and a new kettle 20 invented points. Assume repair adds 5 years of service, the replacement kettle lasts 8 years, and other stage impacts are outside this comparison. Explain one life-cycle advantage of repair and support it with a numerical comparison for a 8-year service need. These are teaching assumptions, not measurements. [4 marks]

(Total for Question 5 is 4 marks)

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6 A fictional delivery crate is used for 5 trips. A reusable crate has 9 invented impact points to make and 1 point per trip to clean and return. A single-use crate has 3 points to make per trip and no other impacts in this simplified dataset. Assume both protect the same goods for each trip and that all values are fictional teaching data, not measured factors. Calculate each option's total for 5 trips and recommend the lower supplied total. [4 marks]

(Total for Question 6 is 4 marks)

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7 Two fictional wall clocks provide the same function for a 12-year period. Clock A needs 2 clocks at 16 invented points each because each lasts 6 years. Clock B needs 3 clocks at 9 invented points each because each lasts 4 years. Assume replacements are available exactly when needed and use whole clocks only. Calculate each option's total for 12 years and compare. The points are invented teaching assumptions, not measured emission factors. [4 marks]

(Total for Question 7 is 4 marks)

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Mark scheme · 1.12 Product life-cycle assessment: 30-minute Pack

Question 1

A needs 10 / 5 = 2 stands during the period	**M1**
A total per stand is 12 + 2 + 2 = 16 points, giving 2 x 16 = 32 points	**A1**
B needs one stand lasting 10 years	**M1**
B total = 20 + 2 + 2 = 24 points	**A1**
Recommends B on supplied totals, which are 8 points lower, and links the choice to meeting the full 10-year service with no replacement	**B1**
States a relevant limitation, such as omitted use impacts, uncertain life/reliability, real transport/end-of-life routes or that fictional points are not measured environmental evidence	**B1**

Answer: A requires two stands: each totals 12 + 2 + 2 = 16 points, so 2 x 16 = 32 points. B requires one stand and totals 20 + 2 + 2 = 24 points. I recommend B for the stated 10-year need: it is 8 points lower on these supplied totals and avoids a replacement. The comparison omits use impacts and relies on fictional values, so it is not a measured environmental assessment.

Question 2

Use/in-service stage	**B1**

Answer: The use stage.

Question 3

Calculates A: 24 / 4	**M1**
A = 6 points per service year	**A1**
Calculates B = 30 / 10 = 3 points per service year and identifies B as lower	**A1**

Answer: A: 24 / 4 = 6 points per service year. B: 30 / 10 = 3 points per service year. B has the lower rate.

Question 4

Identifies repair and reuse total as 4 points for 12 years of service	**B1**
Identifies replacement total as 18 points for 12 years of service	**B1**
Calculates 18 - 4 = 14 and states repair and reuse is lower by 14 points under the assumptions	**A1**

Answer: Repair and reuse: 4 points. Replacement: 18 points. Repair is lower by 18 - 4 = 14 points for the same 12-year service.

Question 5

Identifies replacing a failed switch as repair that keeps the usable kettle body in service	**B1**
Uses the stated 2-point repair-kit value and 20-point whole-kettle value	**B1**
Compares supplied totals: repair kit 2 points versus replacement kettle 20 points for the stated 8-year need	**B1**
Concludes repair is lower by 18 points on this limited comparison, subject to stated assumptions/boundary	**B1**

Answer: Replacing the switch keeps the usable body in service. On the stated comparison, the repair kit is 2 points and a new kettle is 20 points, so repair is lower by 18 points for the 8-year need. This conclusion covers only the supplied values and assumes the repair succeeds.

Question 6

Reusable: 9 + (5 x 1)	**M1**
Reusable total = 14 points	**A1**
Single-use: 5 x 3	**M1**
Single-use total = 15 points; recommends reusable as lower by 1 point for these 5 trips	**A1**

Answer: Reusable: 9 + (5 x 1) = 14 points. Single-use: 5 x 3 = 15 points. The reusable crate is lower by 1 point for five trips in this simplified dataset.

Question 7

A requires 12 / 6 = 2 clocks	**M1**
A total = 2 x 16 = 32 points	**A1**
B requires 12 / 4 = 3 clocks	**M1**
B total = 3 x 9 = 27 points, lower by 5 points	**A1**

Answer: A: 12 / 6 = 2 clocks; 2 x 16 = 32 points. B: 12 / 4 = 3 clocks; 3 x 9 = 27 points. B is lower by 5 points over 12 years.

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