Markscheme

May 2023

Interdisciplinary

On-screen examination

9 pages

Best fit Approach

'The approach used in assessment in the application of assessment criteria is a "best fit" model. The examiner or teacher applying an assessment criterion must choose the achievement level that overall best matches the piece of work being marked. It is not necessary for every detailed aspect of an achievement level to be satisfied for that level to be awarded but it must reflect the balance of student achievement against the markband. For example, if student work matches two of the three requirements within a markband but one is seriously lacking, the student should be awarded for the strands that have been met well, but the mark awarded should be at the lower end of the markband to compensate for what is lacking in one strand. If the level of student work spans multiple markbands, compensation depends on the performance in the higher order skills. It is worth noting that the highest level of any given criterion does not represent perfection'

Note: Before marking, please familiarize yourself with the pre-release material, all sources, the questions and the markscheme.

*These are the command terms used throughout the markscheme.

Command term	Definition
State*	**Give a specific name, value or other brief answer without explanation or calculation.**
Outline*	**Give a brief account or summary.**
Describe*	**Give a detailed account or picture of a situation, event, pattern or process.**
Explain*	**Give a detailed account including reasons or causes.**
Compare and contrast	Give an account of the similarities and differences between two (or more) items or situations, referring to both (all) of them throughout.
Discuss	Offer a considered and balanced review that includes a range of arguments, factors or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence.
Justify	Give valid reasons or evidence to support an answer or conclusion. (See also "Explain".)

SUSTAIN

THE SOLAR CAR

HEAD TO THE LIGHT AND REDUCE THOSE ENDLESS CHARGES

FROM **$178 500**

SUSTAIN YOUR DREAM ROAD TRIP

Cancún
Mérida
Valladolid
Tulum
Campeche
Yucatan Peninsula, Mexico
Escárcega
Chetumal

DISTANCE TRAVELLED 750 MILES/ 1200 KILOMETRES

0 GRAMS CO_2 EMITTED

0 CHARGES

Sustain Solar Car charges twice as fast as a standard electric car.

The average distance travelled is twice as far as a standard electric car.

Average number of charges per 10 000 miles/ 16 000 kilometres:
• Sustain Solar Car: 20*
• Standard electric car: 60

* based on an average of 12 daylight hours of which 6 hours are direct sunlight.

INFINITY & BEYOND

THE HYDROGEN CAR

From **$68 500**

0 emissions

Refuelling time 5 minutes

Average range 300 miles/480 km

5 — Electricity
4
2
H_2
Motor — Electricity — Fuel cell stack — Power generation — Battery
O_2 — Oxygen — Hydrogen — High pressure hydrogen tanks
H_2O
1
3
6
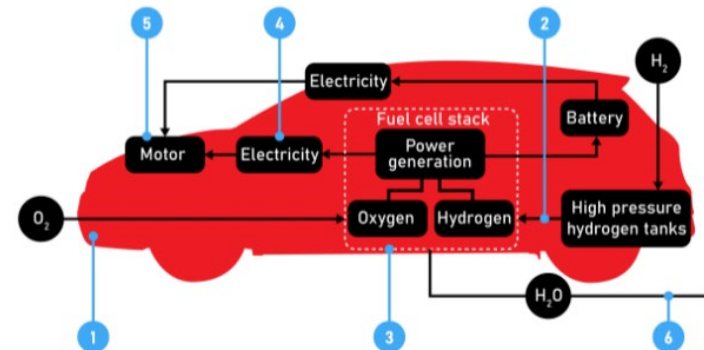
1 Oxygen from the atmosphere enters the car's air vent.

2 Hydrogen is transitioned to the fuel stack.

3 A chemical reaction generates electricity and water.

4 The electricity powers the motor.

5 The motor enables the vehicle to move.

6 The only waste by-product is water.

Question 1

Refer to the two sales brochures in the tabs above. **Compare and contrast** the synthesis of mathematics and science in "The Solar Car" and "The Hydrogen Car" sales brochures. In your answer you must:
- analyse the use of mathematics and science in each brochure
- explain the strengths and weaknesses of each synthesis
- give an evaluative conclusion.

(12 marks)

Note: Responses must refer to the brochures use of mathematics and science, not the cars themselves. If a response only compares the cars, then students score 0 for the first two strands. The conclusion can still gain marks.

Note: Responses should not be two separate lists about each brochure or discuss each brochure separately. The command term is Compare and Contrast and responses must therefore refer to similarities and differences of the brochures together. If there is no comparison or contrast for the first two strands, highest band available for this strand is 1-3

Note: To be valid, examples must reference an element of the brochures.

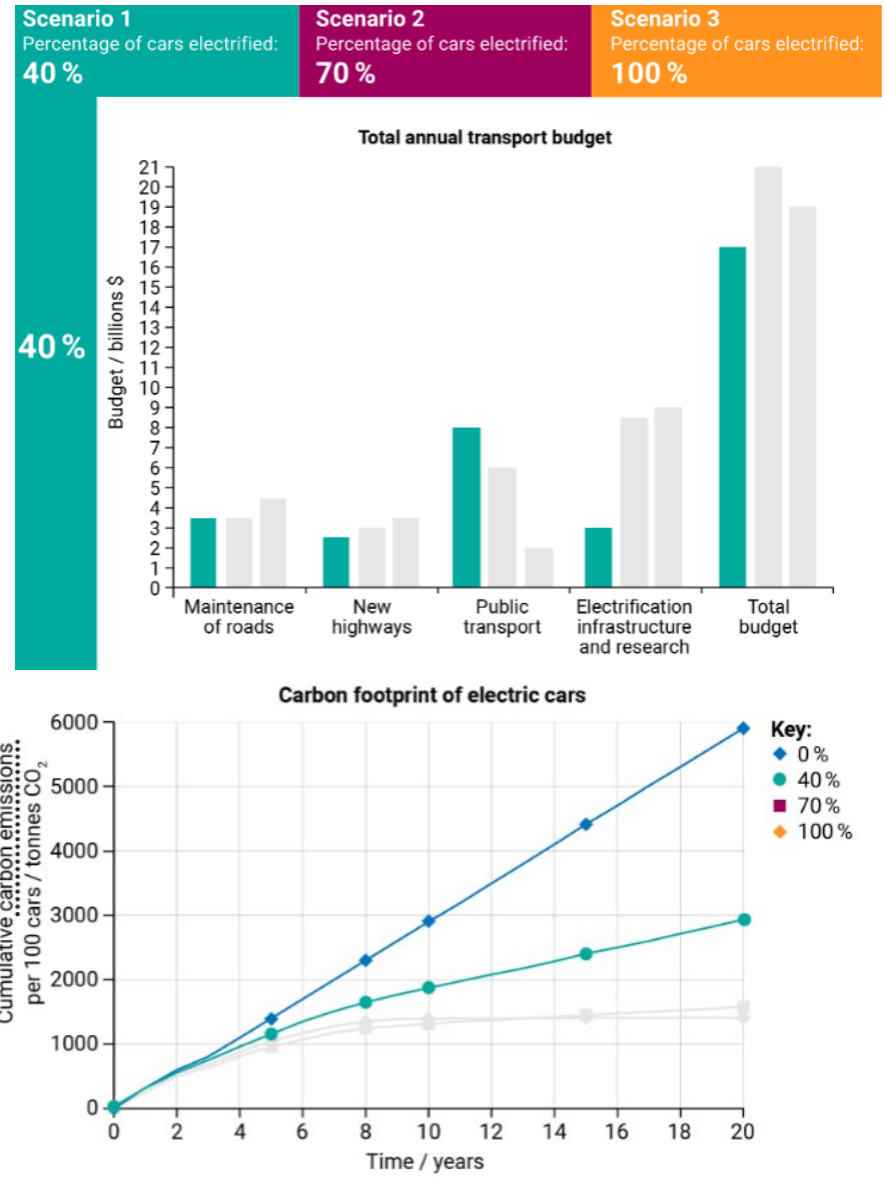| Marks	Descriptor
0	The student does not achieve a standard described by any of the descriptors given below.
1-3	The student: ● **states** how each brochure uses mathematics and science ● **states** a strength and weakness of each syntheses
4-6	The student **directly** compares and contrasts each brochure by: ● **outlining** how each brochure uses mathematics and science ● **outlining** the strengths and weaknesses of the syntheses ● **attempting** a conclusion
7-9	The student **directly** compares and contrasts each brochure by: ● **describing** how each brochure uses mathematics and science ● **describing** the strengths and weaknesses of the syntheses ● giving a conclusion
10-12	The student **directly** compares and contrasts each brochure by: ● **explaining** how each brochure uses mathematics and science ● **explaining** the strengths and weaknesses of the syntheses ● giving an **evaluative** conclusion

Question 2

You are a government official working for the department of transport. Your department is overseeing the transition to electric cars over a 10-year period.

The total budget for transport is $20 billion. If the project costs more than $20 billion, the extra budget funds will be taken from the budget for the environment.

The interactive media below shows the projected outcomes for three transition scenarios: 40 %, 70 % or 100 % electric vehicles.

Scenario 1 Percentage of cars electrified: 40 %	Scenario 2 Percentage of cars electrified: 70 %	Scenario 3 Percentage of cars electrified: 100 %

Total annual transport budget

40 %

Carbon footprint of electric cars

40 %

Key:
- 0 %
- 40 %
- 70 %
- 100 %

Stability of electricity supply

40 %

Key:
- 0 %
- 40 %
- 70 %
- 100 %

You need to prepare a proposal justifying which scenario is best.
By applying your knowledge of science and mathematics, **justify** which scenario is best.
In your answer you must include:
- evidence supporting your choice using mathematical **and** scientific reasoning
- a response to the evidence against your choice using mathematical **and** scientific reasoning
- an evaluative conclusion.

(12 marks)

Note: Do not credit any scientific information that is not from the examination or PRM.

Note: Mathematical calculations are not required and are therefore to be ignored. Credit is to be awarded for demonstrating and understanding of mathemtical concepts.

Marks	Descriptor
0	The student does not achieve a standard described by any of the descriptors given below.
1-3	The student justifies by: • **stating** evidence using mathematical **or** scientific reasoning • **stating** a counter argument using mathematical **or** scientific reasoning
4-6	The student justifies by: • **outlining** evidence for their choice using mathematical **or** scientific reasoning • **outlining** a counter argument using mathematical **or** scientific reasoning • attempting a conclusion
7-9	The student justifies by: • **describing** their choice using mathematical **and** scientific reasoning • **describing** a counter argument using mathematical **or** scientific reasoning • providing a conclusion or • **Describing** their choice using mathematical **or** scientific reasoning • **describing** a counter argument using mathematical **and** scientific reasoning • providing a conclusion
10-12	The student fully justifies by: • **explaining** their choice using mathematical **and** scientific reasoning • **explaining** a counter argument using mathematical **and** scientific reasoning • providing an **evaluative** conclusion

Question 3

> **Self-employed delivery driver**
>
> I drive my delivery truck in the city every day, all day long. Now the government is telling me I have to pay higher taxes if I don't switch over to an electric truck. I barely make enough money to pay for groceries for my family, and now I'm expected to pay double the price for a new electric truck. We live in an apartment with no way of charging an electric vehicle. There are some charging stations in my city, but the nearest one is an hour away from my home. Even if I were to take the truck to that charging station every day, it would still take 8 hours to fully charge the vehicle.

Using your new interdisciplinary understanding, **discuss** the challenges and related solutions that electric vehicles present for the
self-employed delivery driver in reference 5.
In your answer you must:
- explain **two** challenges
- explain solutions to address **both** challenges
- include evidence from the pre-release material to support your arguments.
  (12 marks)

Note: best fit each strand separately and then best fit all three strands.

Note: Please familiarise with yourself with the pre-release Material

Note: Reference to the delivery driver does not gain credit for the third strand as reference to the pre-release material

Marks	Descriptor
0	The student does not achieve a standard described by any of the descriptors given below.
1-3	The student discusses by: • **stating** two challenges • **stating** two solutions
4-6	The student discusses by: • **outlining** two challenges • **outlining** two solutions • attempting to use evidence from the pre-release material.
7-9	The student discusses by: • **describing** two challenges • **describing** two solutions • using evidence from the pre-release material.
10-12	The student fully discusses by: • **explaining** two challenges • **explaining** two solutions • using relevant evidence from the pre-release material.