

**GCSE Chemistry A (Gateway Science)**

**J248/02 C4-C6 and C7 Foundation (Foundation Tier)**

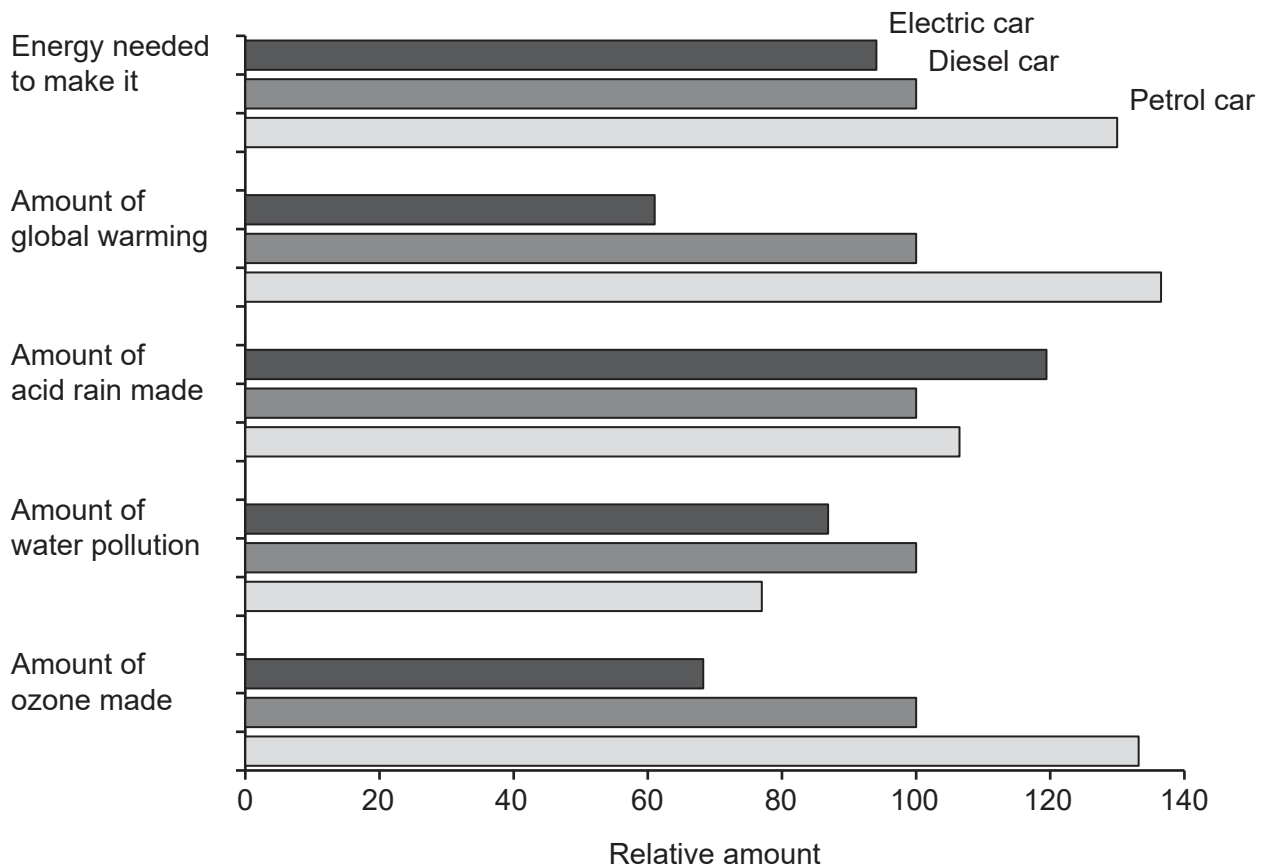
**Question Set 21**

1 This question is about life-cycle assessment.

- (a) A car company is developing three new cars:
- A petrol car
  - A diesel car
  - An electric car.

They do a life-cycle assessment of each car.

Look at the information about the life-cycle assessment of each car.



The company decides to manufacture and sell the electric car.

Explain why they make this choice.

Use the information from the life-cycle assessment to help you.

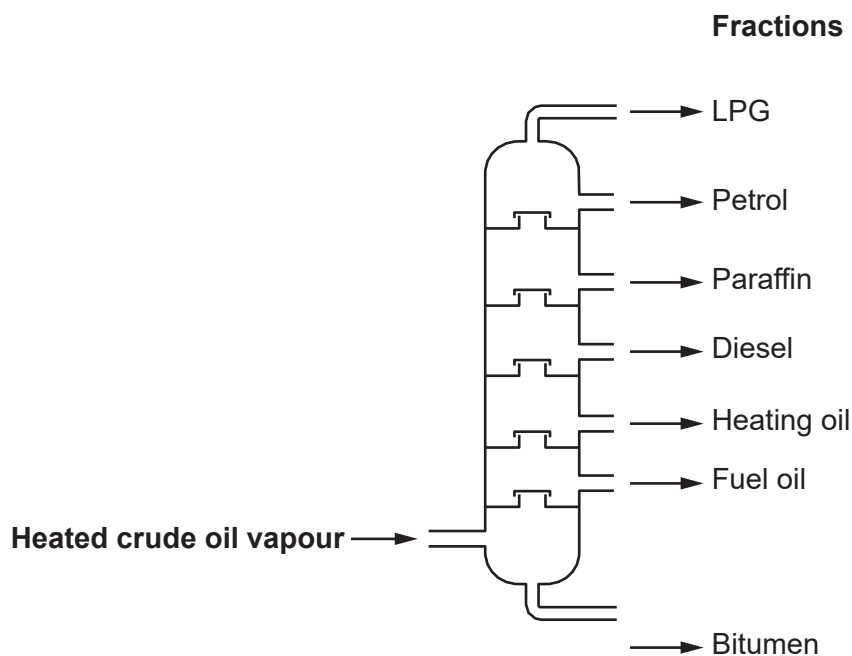
[3]

- Because it requires the least energy to make the electric cars meaning lower cost.
- The electric cars have the least global warming effect.
- It causes the least ozone production

(b) The fuels for the petrol and diesel cars are made from crude oil.

Crude oil is separated into different parts by **fractional distillation**.

The diagram shows a fractionating column.



Explain why crude oil **vapour** can be separated by fractional distillation.

[3]

- Tall column with condensers coming off at different heights
- Column is heated at the bottom thus the bottom is hot while top is cool
- Crude oil vapour with highest boiling points condense at the bottom whilst lowest boiling points condense at the top.

(c) The table shows the boiling points of molecules present in different crude oil fractions.

Molecule	Boiling point (°C)
A	-2
B	125
C	216
D	502

Which molecule, **A**, **B**, **C** or **D**, is in the **LPG** fraction?

Explain your decision.

[2]

*A, because the molecule with the lowest boiling point condense at the very top, LPG fraction*

(d) Car manufacturers are developing cars that are powered by hydrogen/oxygen fuel cells.

The table shows some information about a 200 km journey using an electric car and a car using a fuel cell.

Feature	Electric	Fuel cell
Refuelling time (minutes)	360	4
Cost of refuelling (£)	3.20	4.20
CO <sub>2</sub> emitted (kg)	48	36
Mass of car (kg)	1550	1200

Evaluate the **advantages** and **disadvantages** of using a car powered by a fuel cell, rather than an electric car for the 200 km journey. [3]

*Advantages: - has shorter refuelling time  
- emits less CO<sub>2</sub>  
- car is lighter*

*Disadvantages: - more expensive*

**Total Marks for Question Set 21: 11**

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