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'LCA' stands for 'Life Cycle Assessment'. It looks at every stage in the manufacture, use and disposal of a product.

Look at the example below.

LCA questions	Paper cup	Synthetic polymer cup
What is the raw material?	wood	crude oil
Is the raw material from a sustainable source?	Yes – new trees can be planted.	No – when all the crude oil is used up it will be gone for ever.
What is the effect on the environment of:		
a getting the raw material	Habitats are destroyed when forests are logged but forests can be managed to reduce the damage.	Leaks of crude oil at oil wells harms habitats.
b transporting the raw material	Transport of logs creates air pollution.	Leakage of crude oil from pipelines and tankers causes major damage to wildlife. Ships and lorries produce air pollution.
c the manufacturing process	Harmful chemicals are used to make paper. Leaks of these chemicals can damage health and the environment.	Leaks during the refining of crude oil and making polymers damage health and the environment.
d using the product	Transport of the cups produces air pollution.	Transport of the cups produces air pollution.
e disposal:		
1 landfill	Paper rots in landfill, releasing carbon dioxide and methane.	Most polymers will not rot.
2 incineration	Paper can be burned, releasing carbon dioxide and water vapour.	Polymers can be burned but give off toxic gases, carbon dioxide and water vapour.
3 recycling	Paper can be recycled easily.	Polymers are difficult to recycle.
What are the benefits?	People are employed in the manufacture and distribution of cups. Paper cups are convenient to use. Paper cups do not have to be washed.	People are employed in the manufacture and distribution of cups. Plastic cups are lighter than paper and less likely to leak. Plastic cups do not have to be washed.
How does energy use during the lifetime of the product compare?		
i No recycling	i Paper cups use up about twice as much energy as plastic cups.	
ii With recycling	ii Both materials use about the same amount of energy.	

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Which material comes from a sustainable source?

[1 mark]

paper cup (allow wood) [1]

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Is the manufacture of disposable cups from a) paper or b) synthetic polymers harmful to the environment? Give examples.

[2 marks]

harmful chemicals used to make paper [1]

leaks during the refining of crude oil to make polymers can damage the environment [1]

**TOP TIP :**  
make sure you focus only on the manufacturing here

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State which material is likely to cause most damage to the environment when it is disposed of?

[1 mark]

synthetic polymer cup (allow plastic) [1]

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Which material uses up the most energy in its life cycle? Explain your answer

[2 marks]

(paper/it) uses twice as much energy if not recycled  
and

paper and polymer uses the same if recycled [1]

Paper will use more energy unless all cups are recycled [1]

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Which material should be used for disposable cups? State your choice with your reasons.

[2 marks]

paper

- raw materials from a sustainable source [1]

- disposal is better for the environment [1]

OR

polymer

- uses less energy overall [1]

- lighter than paper and less likely to leak [1]

(Total 8 marks)

End

**WARNING :**  
In this question, it is not the answer that is important, but the justification you give .