

Q1. This is part of an article about food additives.

THE PERIL OF FOOD ADDITIVES

Some orange drinks contain the additives E102 (Tartrazine), E104 (Quinoline Yellow) and E110 (Sunset Yellow). These three coloured additives are thought to cause hyperactivity in children.

(a) State **two** reasons that a manufacturer might give to justify the use of these additives.

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2

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(2)

(b) Some scientists asked 4000 twelve-year-old children to help them investigate if there is a link between these three coloured additives and hyperactivity.

How would the scientists use these 4000 children to investigate if there is a link between these three coloured additives and hyperactivity in children?

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(4)

(c) A manufacturer used an independent scientist to show that their orange drink did not contain these three coloured additives.

(i) Suggest why the manufacturer would use a scientist who was independent instead of using their own scientist.

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(1)

- (ii) The scientist had samples of E102, E104 and E110 and the orange drink. The scientist used paper chromatography for the test.

Describe how the scientist could use the results to show if the orange drink contained any of these three coloured additives.

You may include a diagram of the paper chromatography results.

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(2)
(Total 9 marks)

Q2. Thermosoftening polymers can be used to make plastic bottles and food packaging.

- (a) The reaction to produce polymers uses a catalyst.

Why does the catalyst work for a long time before it needs replacing ?

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(1)

- (b) Thermosoftening polymers would **not** be suitable for packaging very hot food.

Explain why in terms of their properties and structure.

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(2)

(c) Compounds from food packaging must not contaminate the food.

Food can be tested for contamination using gas chromatography linked to mass spectroscopy (GC-MS).

(i) Gas chromatography can separate substances in a mixture of compounds.

Describe how, as fully as you can.

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(3)

(ii) What information does the molecular ion peak give about the molecule?

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(1)

(Total 7 marks)

Q3. Spacecraft have been to the planets Venus and Mars. The spacecraft have sent back information about the atmosphere of each planet.



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(a) The main gas in the atmosphere of Mars is carbon dioxide.

Explain why, in terms of structure, carbon dioxide is a gas, even at low temperatures.

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(3)

(b) Gas chromatography linked to a mass spectrometer (GC-MS) is used to identify substances found on Mars.

(i) What is the purpose of gas chromatography?

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(1)

(ii) What information do the molecular ion peaks from the mass spectrometer give about the substances?

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(1)

(c) The atmosphere on Venus contains droplets of sulfuric acid solution.

(i) Suggest a pH value for sulfuric acid solution.

pH =

(1)

(ii) Name the ion which makes sulfuric acid solution acidic.

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(1)

(d) The atmosphere of Venus contains the isotopes ${}^2_1\text{H}$ and ${}^1_1\text{H}$

Describe the similarities and the differences in the isotopes ${}^2_1\text{H}$ and ${}^1_1\text{H}$

You should refer to the sub-atomic particles in each isotope.

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(3)

(Total 10 marks)

