ROYAL SOCIETY OF CHEMISTRY

Mastership in Chemical Analysis

Part B Examination

Paper 2

Burlington House

25th April 2024

1000 – 1400

Plus 10 minutes reading time

Instructions

You must answer **three** out of the four questions from section 1 and answer **one** of two questions from section 2. **Four** questions in total.

The answers to each question must be returned at the end of the examination. Please also provide any question notes you have prepared which could demonstrate you thinking.

Please read through the questions carefully. You are advised to take approximately equal time on each question.

This is a partially open book examination. You will be allowed access to legislation only. You will not be allowed to communicate with third parties during the examination or freely search online for information. You can use any resources on the following two websites only, for the UK (Legislation.gov.uk) and EU (https://eur-lex.europa.eu/homepage.html?locale=en) legislation. You will be required at the end of the examination to show your internet history covering the duration of the examination.

Where appropriate, please reference the relevant resources used for each question.

The marks allocated to each question are given.

Unless otherwise stated, references to Statutes in England include the equivalent alternatives for Scotland, Wales, and Northern Ireland. Where appropriate specify which Statutes you are using.

Unless otherwise stated, any reference to Statutes includes the EU regulations that they enforce.

Food (Section 1)

Question 1

(a) Some foods have been described as “Risky Foods” due to the way they are prepared/cooked or the inherent bacteria they contain. One such food that has been under scrutiny in the last few years is “Beef Burgers that are less than thoroughly cooked” (LTTC).

Detail the risks associated with this type of food and the systems/procedures that a food business operator should put in place to control all hazards identified, including the microbiological risks, to an acceptable level.

Discuss any legal requirements relevant to the production and restaurant service of LTTC Beef Burgers and any testing that may be required to verify the controls.

(15 marks)

(b) Discuss the application and limitations of DNA analysis in determining the microbiological safety of foods. Include examples in your answer.

(10 marks)

Question 2

(a) Discuss the principles of Hazard Analysis and Critical Control Point (HACCP) and include examples in your answer.

(10 marks)

(b) The majority of prepacked foods are required to be marked with an appropriate durability indicator.

Discuss the different approaches available to determine the shelf life of food products. Include in your answer, with examples, the different parameters that need to be considered.

(15 marks)

Question 3

(a) What strategies have been implemented in the UK in the last ten years to detect and prevent food fraud? Give your opinions as to whether the best approach is being taken and what other measures could be put in place to improve the situation.

(12 marks)

(b) Food recalls remain high in the UK. Discuss how food allergens can be managed in the UK retail supply chain, including any problems and weaknesses and how these can be addressed/minimised.

(13 marks)

Question 4

(a) Surface and Ground water is treated in a plant to produce potable drinking water for human consumption. Outline in a schematic diagram the various stages in a typical water treatment plant and explain what is involved and the purpose of each stage.

(15 marks)

(b) The quality of drinking water can be assessed over a wide range of criteria. Within this context, outline the analysis and the subsequent interpretation of EACH of the following:

(i) Trihalomethanes (THMs)

(ii) Pesticides

(3 marks each = 6 marks)

(c) For EACH of the two following scenarios involving potable water, suggest possible causes and, where possible, a means of rectifying the problem:

(i) An environmental health officer keeps trying to take a sample of water from a care home following repeated complaints that the water is cloudy. However, the sample she takes is no longer cloudy once she has returned to her office.

(ii) A library owned by a local authority has had its water supply system disinfected following the appearance of mould coming from one of the taps but after several days, the problem has reappeared.

(2 marks each = 4 marks)

Agriculture (Section 2)

Question 5

(a) What is the major source of EACH of the following contaminants in animal feed? What are their effects on animals and their implications for the food chain?

(i) Vinyl thiooxazolidone

(ii) Melamine

(iii) Dioxins & dioxin-like PCBs

(iv) Fumonisins

(v) Arsenic

(3 marks each = 15 marks)

(b) What role do EACH of the following nutrients have in plant growth and what is a typical symptom of their deficiency?

(i) Boron

(ii) Copper

(iii) Phosphorus

(iv) Calcium

(v) Chloride

(2 marks each = 10 marks)

Question 6

(a) A manufacturer of pet foods wants to expand his manufacturing into the production of raw pet foods which would be for retail sale.

Detail the systems he would have to put in place to ensure the final product meets the legislation in terms of composition and safety as well as meeting the labelling requirements. Include in your answer examples of different types of raw pet food products that may require different standards.

(15 marks)

(b) For EACH of the following, decide as to whether there is a 'significant' or 'insignificant' microbiological hazard and include your reasoning for your answer.

(i) Listeria monocytogenes in a semi-moist pet food (14-60% moisture)

(ii) Salmonella in a wet pet food (≥60% moisture)

(iii) Enterobacteriaceae in a wet pet food (≥60% moisture)

(iv) Staphylococcus aureus in a wet pet food (≥60% moisture)

(v) Salmonella in a dry pet food (≤14% moisture)

(2 marks each = 10 marks)

END OF PAPER