

Mastership in Chemical Analysis

Part B Examination

Paper 1

Online

Wednesday 26th April 2023

1000 - 1400

OFFICIAL

Instructions

Answer **four** questions out of the six questions.

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

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

This is an open book examination, and you are allowed access to any resources you feel are appropriate. This includes the use of the internet; however, you are not allowed to communicate with any third parties during 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.

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

Food Analysis/Composition/Labelling

1. (a) Your laboratory is moving to a brand-new purpose-built facility and the staff as well as the equipment are largely the same.

The laboratory is an Official Control Laboratory (OCL) and covers food and animal feed chemical analysis for Official Control purposes. The scope of accreditation covers nutritional analysis, High Performance Liquid Chromatography (HPLC), Gas Chromatography with Mass Spectrometry (GC-MS), elemental techniques, Polymerase Chain Reaction (PCR) based methods and also microbiological examination of foods and waters. There is also a flexible scope of accreditation in place for all of the aforementioned techniques.

Describe the plans that you would put forward to United Kingdom Accreditation Service (UKAS) in order to assure them of the maintenance of your quality system and method accreditation during the transition to your new premises.

Detail all of the factors you would have to consider to minimise the disruption to your accreditation during your move.

12.5 marks

(Question 1 continues on the next page)

OFFICIAL

(b) You have received a sample of prepacked filled potato skins which has caused an alleged reaction to a person who suffers from a milk allergy. The product is described as Plant Based Loaded Potato Skins and the name of the food on the packaging label states, "Potato skins with a topping of non-dairy alternatives to Cheddar and mozzarella and soya based non-dairy alternative to soft cheese with chives". The only emphasised word in the ingredient list is "soya" and the cross-contamination statement present is "May also contain traces of sesame seeds".

Your laboratory does not have specific accreditation for milk proteins, however it does hold accreditation for other allergens. You are required to test this sample in-house as you do not have an approved subcontractor.

A sample from the same batch has been tested by the manufacturer and found the presence of casein at a level of 120mg/kg. There has been a product recall issue as a result of this.

The complaint specimen has been submitted by an inexperienced Trading Standards Officer (TSO) to your lab for testing. Explain your approach to the analysis and the reasoning behind your decision, and assuming your laboratory results are similar to those obtained by the manufacturer, discuss your comments and opinions and any advice you might give to this TSO.

12.5 marks

OFFICIAL

2. (a) “The health of the nation, in particular the rise in obesity has been a concern for a number of years”. Discuss how legislation and guidance has evolved over time in order to educate, inform and enable consumers to make informed healthier food choices. Provide examples where necessary.

15 marks

- (b) A food manufacturer wishes to undertake an in-store promotion of the following prepacked yogurt-coated raisins:

Yogurt Flavoured Coating (54%): [Sugar, Palm Fat, Whey Powder (Milk), Rice Flour, Yogurt Powder (Milk) (5%), Emulsifier (Sunflower Lecithins), Glazing Agent (Shellac, Gum Arabic)], Raisins-dried (46%).

Analytical Results	g/100g
Moisture	8.5
Ash	0.5
Fat	19
Protein	2.0
Dietary Fibre (AOAC)	3.0g

- (i) Calculate the nutrient profile for the product based on the data provided and include in your answer all reasonings behind your calculations.

8 marks

- (ii) What impact does the final score have regarding the promotion of the product being sold at retail?

2 marks

OFFICIAL

3. (a) Green tea from China was found by analysis to contain the following pesticides and levels:

Acetamiprid	0.1 mg/kg
Carbendazim	0.045 mg/kg
Clothianidin	0.021 mg/kg
Imidacloprid	0.13 mg/kg
Thiamethoxam	0.22mg/kg

Assess whether the levels of pesticides are acceptable in your opinion and include in your answer all your reasoning and any assumptions made.

5 marks

- (b) The local port has a new importer who is bringing rice into the UK from China. You have been approached by your local Port Health Authority to undertake some testing with respect to the presence of genetic modification.

Outline the analytical process that you would apply in order to check for compliance and include in your answer any reporting requirements and assumptions made when deciding if the product is compliant.

8 marks

- (c) A Bladderwrack (Whole Thallus) food supplement sample was found by analysis using Microwave Acid digestion followed by Inductively Coupled Plasma Mass Spectrometry to contain an arsenic content of 58 mg/kg. The instruction on the product was to “take one capsule daily” and the average capsule contents weight was determined to be 0.5881g.

Assess compliance and include in your answer all rationale behind your opinion.

6 marks

- (d) The level of Ochratoxin A in prepacked soya chunks for use as a meat alternative was found by analysis using Liquid Chromatography to be 26.8µg/kg.

Assess compliance and include in your answer all rationale behind your opinion using the following analytical information:

Recovery 90.2%

Uncertainty 25.9%

6 marks

OFFICIAL

4. (a) The following analytical results were obtained for a formal sample of:

“BEEF SAUSAGE”

Ingredients: Beef (65%), Heart/Offal, Water, Rusk, Salt, Spices.

Moisture: 69.2 per cent
Fat: 14.4 per cent
Nitrogen: 1.62 per cent
Ash: 1.52 per cent
Hydroxyproline: 0.52 per cent

Assess compliance of the declared beef content, showing all calculations and explain all assumptions and numerical factors used in your decision.

10 marks

- (b) Analysis was performed on the following prepacked product:

“Lean Beef Steak Mince 5% Fat”

Possessing the declarations:

Fat 4.5g per 100g (as sold)

Protein 20.8g per 100g (as sold)

Typical percentage fat content under 5%

Typical percentage collagen/meat protein ratio under 12%

The following results were obtained:

Fat 6.7 g/100g

Nitrogen 3.42 g/100g

Protein 21.4 g/100g

Hydroxyproline 0.35 g/100g

Assess compliance and explain all rationale behind your decision.

7 marks

(Question 4 continues on the next page)

OFFICIAL

(c) A trainee MChemA candidate in your laboratory has found the following product label and a set of results on page 1 of a paper printed report (as below) but cannot find the interpretation sheet(s) relating to the report. As the sole qualified public analyst in the laboratory, comprehensively advise the trainee as to what the interpretative observations/opinions would have been on the missing page(s).

Virgin Olive Oil

Olive oil obtained directly from olives solely by mechanical means.

Ambient Dry Storage. Avoid exposure to direct sunlight.

Best Before End: May 2023

Imported by: Premium Importers Ltd, Unit 66, YD12 6JU.

70cl

Analytical Results

Free Fatty Acid content (as Oleic Acid)	1.1 g/100g
Peroxide Value	1.5 meq O ₂ /kg
K 232nm	4.25
K 268nm	2.86
Delta-K	0.39
Fatty Acid Methyl Ester C24:0	0.16 % wt
Fatty Acid Methyl Ester C22:0	0.51 % wt
Fatty Acid Methyl Ester C20:1	0.14 % wt
Fatty Acid Methyl Ester C20:0	0.27 % wt
Fatty Acid Methyl Ester C18:3	0.15 % wt
Fatty Acid Methyl Ester C14:0	0.08 % wt

8 marks

OFFICIAL

OFFICIAL

5. (a) You have been approached by an Environmental Health Officer (EHO) regarding a complaint they have received relating to a consumer who has suffered an allergic reaction following consumption of a meal served at a restaurant. The EHO has sought your advice regarding formally obtaining a follow-up sample of the same meal choice at the restaurant.

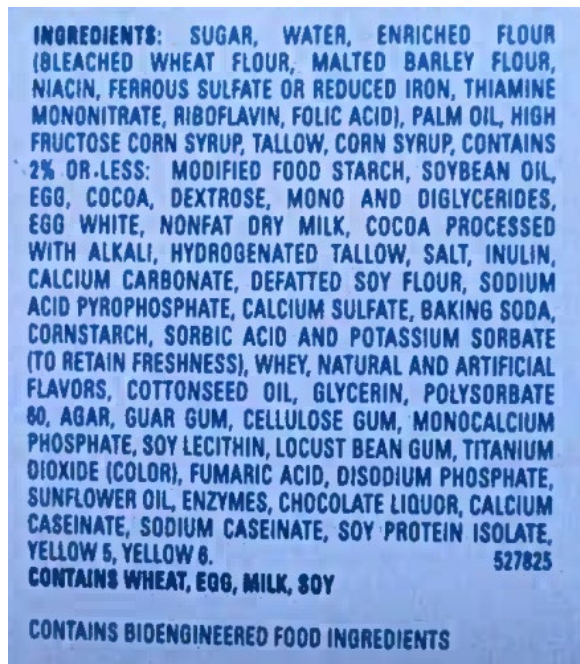
What sampling advice would you give to the officer and how would this advice impact on the analysis and subsequent interpretation of results?

11 marks

- b) Imported foodstuffs reportedly make up 46% of the food consumed in the United Kingdom. However, for those foods imported from outside of Europe the safety and legality are often called into question.

With respect to each of the four products below, discuss the legality and potential safety concerns with respect to the declared ingredients.

- (i) Individual iced lemon sponge cakes, having the following ingredients listing:



5 marks

(Question 5 continues on the next page)

OFFICIAL

(ii) Sugar free flavoured coffee whitener having the following ingredients listing:

Hydrogenated vegetable oil (coconut and/ palm kernel and/ or soybean), Corn syrup solids, Sodium Caseinate (A Milk derivative), And less than 2% of Mono- and Diglycerides, Dipotassium Phosphate, Natural and Artificial Flavor, Salt, Sodium Aluminosilicate, Sucralose, Acesulfame Potassium (Non- nutritive sweetener), Yeast Extract. Contains: A Milk derivative

3 marks

(iii) Red coloured confectionery having the following ingredients:

Sugar, corn syrup, acacia (gum arabic), artificial flavor, confectioner's glaze shellac), carnauba wax, red 40, cornstarch, white mineral oil

3 marks

(iv) Cinnamon flavoured breakfast cereal having the following ingredients list:

Whole Grain Wheat, Sugar, Rice Flour, Canola and/or Sunflower Oil, Fructose, Maltodextrin, Dextrose, Salt, Cinnamon, Trisodium Phosphate, Soy Lecithin, Caramel Color. BHT Added to Preserve Freshness. Vitamins and Minerals: Calcium Carbonate, Vitamin C (sodium ascorbate), Iron and Zinc (mineral nutrients), A B Vitamin (niacinamide), Vitamin B6 (pyridoxine hydrochloride), Vitamin B1 (thiamin mononitrate), Vitamin A (palmitate), Vitamin B2 (riboflavin), A B Vitamin (folic acid), Vitamin B12, Vitamin D3.

3 marks

OFFICIAL

6. (a) A Trading Standards officer (TSO) as home authority for the food business operator has been passed the following analytical report from another Local Authority and is asking your advice as to its interpretation and how to deal with it.

HERITAGE QUALITY PRODUCTS

Natural Greek Style Yogurt

Ingredients: Whole MILK, CREAM, Skimmed MILK POWDER, salt, yogurt culture. Allergens in BOLD

Analysis results:

Benzoic Acid	11 mg/kg
Sorbic Acid	62 mg/kg
Protein	3.9 g/100g

Discuss including all rationale, your interpretation of the report as well as what advice, with reasoning, you would give to the TSO in order to approach the food business operator.

10 marks

(b) Trading Standards officers can find analytical terms used in reporting analytical values, such as measurement uncertainty, difficult to understand and/or confusing at times.

Discuss, with examples, the different terms that are commonly used and explain how you would convey or address these terms in order to make it easier for TSOs to understand.

8 marks

(Question 6 continues on the next page)

OFFICIAL

(c) A local start-up food producer has asked their Trading Standards Department to advise on the following product regarding what is required in order to ensure a marketable legislative compliant product. As the appointed public analyst by that local authority, construct a reply with full rationale to the Trading Standards Department who have asked you for your help in relation to the following intended label:

British Butter Blended with Vegetable Oil

	Per 100g
Energy	2302kJ/559kcal
Fat	60.9g
Of which saturates	23.6g
Carbohydrate	1.5g
Of which sugars	0.2g
Fibre	0.5g
Protein	0.2g
Salt	1.0g

4 marks

(d) A sample labelled as “Natural Strawberry Extra Jam” gave the following results on analysis:

Soluble Solids: 61%

Fruit Content: 35%

With regard to the above information, does the sample comply with legislative requirements in your opinion?

3 marks

END OF PAPER

OFFICIAL