



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme

June 2003

GCE

Home Economics

Unit HEC6

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Unit 6 Food Science and Technology

Question 1

(a) **COMA recommendations for fats:**

Total fat should not provide more than 35% of dietary energy intake.

Saturated fatty acids should not provide more than 10% of dietary energy intake.

Trans fatty acids should provide no more than 2% of dietary energy intake.

Essential fatty acids (linoleic and linolenic) should provide at least 1 and 0.2 per cent, respectively, of our total dietary energy intake.

Polyunsaturated fatty acids intake should double to about 0.2g per day (1.5g per week).

Reasons for these recommendations:

to reduce incidence of CHD – saturated fatty acids;

to reduce obesity – total fat intake.

5 Marks

(b) (i) **Nutritional role of fats in the diet:**

Provides a concentrated source of energy – 1g = 9kcal. therefore has a high satiety value.

Acts as an insulator, keeping the body warm/prevents heat loss.

Protects delicate organs from physical injury, e.g. kidneys.

Conveys the fat soluble vitamins A,D,E,K.

Provides the essential fatty acids, linoleic and linolenic needed to make hormones to control blood clotting and for the development and function of the brain and retina.

5 Marks

(ii) Label 1 provides more information relating not only to total fat but also to types of fatty acid. Useful when attempting to keep within the COMA guidelines/when trying to reduce one's risk of CHD (saturated fatty acids).

3 Marks

(b) **Properties of fats and uses in food preparation**

Answer should refer to chemical makeup of fats:

composed of carbon, hydrogen and oxygen;

long chains of glycerol and a wide variety of fatty acids;

some fatty acids are saturated others are unsaturated ;

animal fats composed largely of saturated fatty acids and therefore solid at room temperature and a high melting point;

vegetable fats/oils tend to have large amounts of unsaturated fatty acids and are therefore soft/liquid at room temperature and have a lower melting point.

There are a large number of fatty acids making a large number of combinations possible. Results in a great variety of fats and oils for culinary use.

Spreading – fat formulated so that it has a low melting point. Polyunsaturated (hydrogenated vegetable oil) with relatively high levels of unsaturated fatty acids produce a fat which spreads directly from the fridge. Has an acceptable flavour and colour. Butter can be used but it needs to be left at room temperature for some time before it is spreadable.

Aeration – polyunsaturated margarines and butter are suitable for creamed cakes because they are made from a combination of fatty acids with a wide plastic range. These types of fat are able to hold air bubbles, when creamed with sugar, and form a foam. In addition, they extend the shelf life of the cakes and give colour and flavour.

Shortening – in shortcrust pastry (biscuits) a mixture of white fat (lard or vegetable fat plus either hard margarine or butter) is used. The fats coat the flour granules, preventing moisture absorption and inhibiting gluten formation, without melting during the rubbing in process. The result is a short crust and a crumbly texture. The margarine gives colour and flavour.

Frying – oils can reach higher temperatures than fats without breaking down. If the smoke point is low then the fats hydrolyse and produce ‘off’ flavours.

Criteria Bands

1 – 4 marks

Weak answer which will not relate chemical properties of fats to their use in food preparation, but will make vague references to use of named fats, e.g. recommend the use of polyunsaturated margarine in cake making, oil for frying.

5 – 8 marks

Average answer which will recognise some of the chemical properties of fats, e.g. may refer to the use of hard fats, their saturated fatty acid content and function in short crust pastry/high polyunsaturated fatty acid content of oils – high smoke point, will not easily breakdown, therefore suitable for deep frying.

9 – 12 marks

Good answer demonstrating a high level of knowledge and understanding of the relationship between the chemical make up of fats and their uses in food preparation, i.e. spreading, aeration, shortening, frying.

12 Marks

Total 25 Marks

Question 2

- (a) To prevent autolysis, enzymes must be deprived of the conditions required for their development. Yeasts, moulds and bacteria require similar conditions, i.e. moisture, correct pH, warmth (10°C - 60°C), food, oxygen (unless anaerobic), time.

Criteria Bands

1 – 3 marks

Weak answer which identifies some of the conditions required by enzymes and microbes. May be able to show simple understanding of the principles involved in preservation.

3 – 6 marks

Good answer which shows a sound understanding of the principles involved in food preservation. Candidates at the top of this range will be able to list all of the factors and link them to enzymes, yeasts, moulds and bacteria.

6 Marks

- (b) Description of the following methods of preservation:

Cook-chill

Food is cooked and chilled to just above 0°C.

Chilling must take place within one and a half hours of cooking.

The stored at a temperature of between 0°C and 3°C.

Food must be reheated until centre reaches at least 72°C.

A.F.D.

Food is frozen.

Temperature is increased to vaporise the ice.

Which turns into steam.

As it dries out the food.

Modified/controlled atmosphere packaging

The aim is to control the humidity and composition of the atmosphere.

Food is preserved in sealed packs that contain a mixture of :

Oxygen – this helps to retain the colour e.g. meat stays red;

Nitrogen – this reduces the rate of oxidation;

Carbon dioxide – retards the growth of bacteria;

One mark for naming all 3 gases.

The ratio of gases used depends on the food being packaged.

Fresh foods are packed in peak condition.

Replacing the air by 'gas flashing' a combination of the above gases around the food.
The plastic bag/lid is sealed hermetically.

3 X 4 = 12 Marks

(c) Advantages and limitations of each method:

Cook-chill

Can only be kept for a few days.
Must be eaten within 2 hours of reheating.
Can only be reheated once.
Expensive.
Requires little or no preparation/convenient.

A.F.D.

Causes little damage to the food.
Flavour and colour remain authentic.
No shrinkage as with other methods of drying.
Nutritional profile is retained.

} Sublimation

Preserves the food longer than other drying methods.
Rehydrates well.
Expensive.
Needs to be handled with care as A.F.D. food crumbles easily.

Modified/controlled atmosphere packaging

Food looks, tastes and smells the same as fresh food.
Consumer can see the food.
No loss of nutrients.
Once opened must be refrigerated.

Criteria Bands

1 – 3 marks

Simplistic response which only discusses the advantages and limitations of two of the processes. Limited discussion.

3 – 7 marks

More detailed response which addresses the three processes. At the higher end of this band, two will have been dealt with in detail with brief reference to the third process.

7 Marks

Total 25 Marks

Question 3

(a) **Immediate consequences:**

Where fizzy drinks have a high sugar content, dental caries can result. The acid content will cause corrosion of the enamel, even if the drinks are of the low sugar/diet variety. Fizzy drinks with their CO₂ content

contribute to a bloated feeling, and can reduce the interest of the consumer in foods/drinks which contain a variety of nutrients. They may contribute to obesity. Fizzy drinks containing artificial sweeteners may cause allergic reactions such as hyperactivity.

Long term consequences:

Late onset diabetes. Low intake of calcium may have detrimental effects on bone mass leading to osteoporosis.

Deficiency of fat soluble vitamins A and D possible.

Poor eating habits established.

Criteria Bands

1 – 3 marks

Weak answer will mention some factors without recognising their implications, or may concentrate on either immediate or long term factors.

4 – 7 marks

Average answer will recognise some of the health implications, both intermediate and long term.

8 – 10 marks

Good answer will recognise all the health implications both intermediate and long term, and will differentiate between diet and fizzy drinks and compare them with milk.

10 Marks

- (b) The answer should refer to the product which has the highest NSP and starch and the lowest sodium, total fat, saturated fat and sugar.

Criteria Bands

1 – 3 marks

Weak answer. Candidate chooses one product and shows a minimal understanding of the healthy eating guidelines in relation to the product.

4 – 7 marks

Average answer which attempts to discuss the relative merits of two products and draws a conclusion relating to most of the healthy eating guidelines.

Alternatively candidates discuss one product in detail, relating it mostly to the healthy eating guidelines.

8 – 10 marks

Good answer, discusses intelligently the relative merits of the two products which ‘best fit’ the healthy eating guidelines, demonstrating a high level of knowledge and understanding.

Alternatively candidates discuss intelligently the product which is the ‘best fit’ for healthy eating guidelines, demonstrating a high level of knowledge and understanding.

10 Marks

- (c) Fruit and vegetables have a lower sugar content than sugary snacks and contain intrinsic sugars which are less damaging to teeth.
High NSP – reduces risk of constipation, bowel disease.
Provides a range of vitamins and minerals/or ‘empty calories’ (energy snacks)
Has a higher satiety value.
Anti-oxidant properties.
Contain complete carbohydrates.

5 Marks

Total 25 Marks

Question 4

- (a) **At risk groups and reasons why**
Ascorbic acid – a deficiency is rare but some elderly men may be at risk – not eating enough fruit and vegetables/infrequent shopping (‘old’ products).
Housebound.
Teenagers who eat mainly fast foods.
Iron – women of child bearing age, particularly if menstruation is heavy.
Children – fast rate of growth and therefore of volume of blood.
Vegans – solely dependent on non-haem iron which is not absorbed efficiently.

5 Marks

- (b) **Functions and main sources of ascorbic acid**
The formation of connective tissue.
Promotes iron absorption making non-haem more available.
Has antioxidant properties – mops up free radicals.
Fruits (especially citrus) and green leafy vegetables, fruit juices and potatoes.

Function and main sources of iron

To make haemoglobin which carries O₂ for the production of energy.
To make myoglobin which hold O₂ in readiness for muscular work.
Red meat, liver, kidney, some breakfast cereals, fortified bread, green leafy vegetables, dried fruit, pulses.

10 Marks

Mark scheme should accommodate both detailed responses about some of the functions and less detailed responses which address all of the functions.

(c) **Ways in which vitamin C may be lost during:**

storage – readily oxidised by heat and light, therefore should be stored in a cool dark place, e.g. salad drawer;

preparation – prepare just before required. Once cut oxidase is released.

No soaking as the vitamin is water soluble.

Tear leaves of leafy vegetables to avoid disruption to the cell and subsequent loss of the vitamin.

Use acids, e.g. orange juice in fruit salad, vinaigrette dressing in green salad, to prevent loss of the vitamin by oxidation;

cooking – avoid cooking in a copper pan. This metal speeds up the rate of oxidation;

Use the minimum amount of water – water soluble.

Use boiling water – the high temperature denatures oxidase.

Cook quickly – oxidation is increased by prolonged cooking.

Never add bicarbonate of soda – alkalis increase the rate of oxidation.

Criteria Bands

1 – 3 marks

Weak answer which addresses ascorbic acid in a simplistic way, e.g. water soluble without fully understanding the care required during preparation and cooking. Identifies at least **two** ways in which the vitamin can be lost.

4 – 7 marks

Average answer which shows some understanding of the instability of ascorbic acid. Identifies at least **two** ways in which the vitamin is lost and suggests at least **two** ways of reducing this loss. May use appropriate scientific term, e.g. oxidation, oxidase.

7 – 10 marks

Good answer which demonstrates a detailed knowledge and understanding of the instability of ascorbic acid. High level responses will use appropriate scientific terms and will address the effect on the vitamin of storage, preparation and cooking.

10 Marks

Total 25 Marks

Paper Total 50 Marks Maximum