

**MARK SCHEME for the October/November 2008 question paper**

**9336/01**

**9336 FOOD STUDIES**

Paper 1 (Theory), maximum raw mark

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1 (a) Ways in which the body uses energy

**basal metabolism** – involuntary processes – which keep the body alive – heartbeat – blood circulation – breathing etc.

**heat energy** – to maintain body temperature – at 98.4°F / 37°C – more energy used in cold conditions –

**physical activity** – varies according to amount of movement – e.g. walking uses less energy than playing football (or any other examples) – upward movement requires most energy – e.g. climbing –

**chemical reactions** – all changes within cells require energy – digestion – metabolism – growth – repair / maintenance of cells etc.

**electrical energy** – nervous impulses – require energy for transmission

12 points

2 points = 1 mark

[6]

(b) Explain the reasons for different individual energy requirements.

(Do not credit method of measuring BMR)

**body size** – women have lower BMR than men – lighter weight – have proportionally more body fat – and less lean tissue –

under-nutrition – reduces lean body mass –

can exist on less energy than is considered adequate –

**age** – children have smaller body size – less heat loss from surface – have lower BMR – average BMR falls with increased age –

**activity of thyroid gland** – secretion of iodine-containing hormones – controls metabolic rate – e.g. thyroxin – overactive thyroid increases BMR –

**thermogenic effect of food** – intake of food stimulates metabolism – metabolic rate increases after a meal – extra energy in form of heat –

**occupation** – sedentary workers require less energy than manual workers –

**activity level** – sportsmen require more energy

**state of body** – energy required to produce new cells – after injury – and for production of new cells during pregnancy –

and for production of milk – during lactation –

**climate** – more energy required in cold temperatures than in hot – to maintain body temperature

**to maintain a constant body weight** – weight differs between individuals –

**to reduce body weight** – energy output must be greater than input – energy obtained from stored body fat –

**function of glands / internal organs** – varies according to health – food intake – etc.

**gender** – men require 10–20% more energy per kg of body weight than women

**personality** – a calm, placid person requires less energy than a nervous person

**amount of sleep** – more hours of sleep reduce energy requirement – any activity requires more energy than sleeping

**stage in life-cycle** – affected by sleep / activity / food intake etc.

24 points

2 points = 1 mark

[12]



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(c) Other factors

- High water content – 70% body – constituent of body cells –
- Temperature control – waster removal – transport of nutrients
- Add colour – e.g. red pepper, green peas
- Add flavour – e.g. – raw and cooked fruits give different flavours
- Variety of textures and shapes – e.g.
- Add bulk – feeling of fullness – useful when controlling kcal intake
- Can be cooked in many ways – e.g.
- Can be preserved in many different ways – jam / pickles / canned / dried
- Thirst quenching because of high water content e.g. melon / orange etc.
- Inexpensive – can be grown at home – buy in bulk and store / freeze
- Large variety available
- Can be imported from other countries
- Low in energy value – valuable in calorie-controlled diet
- Useful snack food – easy to carry – easy to eat – e.g. bananas etc.

20 points

2 points = 1 mark

[10]

3 (a) (i) Structure of monosaccharides

single molecule –  $C_6H_{12}O_6$

Structure of disaccharides

2 molecules of monosaccharide –  $C_{12}H_{22}O_{11}$

1 molecule of water lost in reaction – condensation

Structure of polysaccharides

Long chains of glucose molecules –  $(C_6H_{10}O_5)_n$

Water lost in reaction – condensation –

Can be linear – or branched

More than one type of monosaccharide joined together

(ii) Properties of monosaccharides

Sweet taste – water soluble – foundation for di and polysaccharides

Can be absorbed into bloodstream

Properties of disaccharides

Water soluble – broken down to monosaccharides during digestion

Sucrose very sweet

Properties of polysaccharides

Available carbohydrate can be digested into simple sugars –

then absorbed into the bloodstream after digestion –

Unavailable carbohydrate cannot be digested –

Insoluble in water



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- 4 (a) Discuss the particular dietary needs of adolescents.  
[Only credit nutrients and functions that relate to adolescents]

**protein** – HBV – contains all Indispensable Amino Acids (IAAs) –  
for growth spurt – more cells – greater volume of blood –  
hormones for changes within body etc.  
**carbohydrate / starch** – increased activity – energy for growth –  
**fat** – for energy – concentrated source – reduces bulk of food needed –  
too much may aggravate skin disturbances –  
**calcium** – more rapid growth of bones –  
**phosphorus** – with calcium for bone growth  
**vitamin D** – absorption of calcium – prevention of rickets  
**iron** – greater volume of blood – especially for girls – lost during menstruation –  
prevent anaemia –  
**vitamin C** – absorption of iron – clear skin –  
**vitamin A** – clear skin  
**thiamin** – release of energy from carbohydrates – growth –  
**riboflavin** – metabolism of proteins – fatty acids – carbohydrates –  
affects growth rate  
**niacin** – metabolism of proteins – fatty acids – carbohydrates –  
affects growth rate  
**little sugar** – empty calories – link to obesity – tooth decay –  
reduces appetite  
**fruit and vegetables** – water – NSP – clear skin etc.

20 points

2 points = 1 mark

[10]

- (b) Many adolescents have an unbalanced diet. Discuss possible reasons for this.  
snack between meals – or instead of meals – lack of parental supervision –  
availability of junk food – fast food outlets –  
spending money / pocket money available –  
peer pressure – less active – do not use up all kcal taken in –  
eat what given by parents at home – or may not have family meals – food fads –  
weight-reducing diets – miss meals – because of school activities –  
or socialising – overeat at other meals – buy lunch at school –  
food available may be high in fat / kilocalories – may be food stalls / shops nearby  
quick – easy – desire to be thin – anorexia – bulimia – poor self-image –  
influence of advertising – etc.

10 points

2 points = 1 mark

[5]

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(c) Many adolescent girls suffer from anaemia.

(i) Describe and account for the condition.

**ANAEMIA**

reduced number of red blood cells – so reduced amount of oxygen carried – causes lack of energy – tiredness / lethargy – headaches – dizziness –

**CAUSES**

lack of **cobalamin (B12)** – with folic acid – for formation of red blood cells – deficiency causes pernicious anaemia – caused by a failure to absorb vitamin B12

lack of **folic acid** – concerned with formation of red blood cells – protein found in stomach – known as intrinsic factor – must combine with the vitamin before absorption – may occur in vegans –

**iron** deficiency – formation of haemoglobin – red pigment in blood – transports oxygen – from lungs to cells – to oxidise glucose – release energy – only 5 – 20% protein absorbed – depends on form of iron – most readily absorbed as haem iron – ferrous – less readily as non-haem – ferric – must reduce from ferric to ferrous – aided by **vitamin C** – anaemia may be cause by lack of vitamin C –

**phytic acid** – interferes with iron absorption – also **oxalic acid** – and **tannins** – consumption of foods containing these substances reduces absorption –

e.g. phytic acid in wholemeal cereals / pulses

oxalic acid in green vegetables / spinach

tannins in tea

could mention sickle cell anaemia

12 points

2 points = 1 mark

[6]

(ii) Discuss methods for its prevention.

Ensure supplies of:

**folic acid** found in liver – green leafy vegetables – nuts – pulses

**cobalamin** found in liver / kidney – meat – eggs –

added to breakfast cereals – yeast extract

**iron** – (**ferrous**) – red meat – liver – kidney – eggs

(**ferric**) – pulses – green leafy vegetables – cocoa –

whole grain cereal – fortified breakfast cereal –

**vitamin C** – leafy vegetables – citrus fruit – strawberries – tomatoes etc.

must eat foods with iron and vitamin C at same meal –

to aid iron absorption

regular / daily supply of vitamin C needed – cannot be stored in body –

**Do not credit names of nutrients in both (i) and (ii).**

**Allow max. 2 sources of each nutrient identified.**

8 points

2 points = 1 mark

[4]

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5 (a) Discuss the composition and nutritive value of eggs.

Composition

11% shell – mainly calcium carbonate – unavailable to body – protects egg from damage – and bacteria – porous – 58% white – thick and viscous around yolk – thinner and more transparent nearest shell – protein – water – trace of riboflavin – 31% yolk – anchored to shell by chalazae – hold yolk centrally – carotene gives yolk its colour – depends on food eaten by hen – less water than egg white – more protein – fat – in small droplets – oil-in-water emulsion – lecithin – cholesterol in fat – iron – sulphur – chlorine / magnesium / sodium / potassium – vitamin A – vitamin D – vitamin E – vitamin K –

Nutritive value

HBV protein – contains all IAAs – colloidal solution – albumin – in white – vitellin – in yolk – growth – repair – maintenance – energy – enzymes / hormones / antibodies etc. fat – saturated – cholesterol – link to CHD – energy – insulation – protection etc. iron – formation of haemoglobin – prevent anaemia – transport of oxygen – energy – vitamin A – fat soluble – mucous membranes – skin – visual purple etc. vitamin D – fat soluble – absorption of calcium – bones and teeth etc. riboflavin – release of energy from carbohydrate / protein / fat – growth etc.

20 points to cover both areas without repetition

2 points = 1 mark

[10]

(b) Identify and explain the changes that take place in eggs during storage.

air space increases in size – due to loss of water through porous shell – and replacement by air – water passes from white to yolk – due to osmotic pressure exerted by yolk – yolk enlarges – membrane surrounding it weakens – thick white becomes thinner – pH of both white and yolk increases – due to loss of carbon dioxide through shell – solution of carbon dioxide in water is a weak acid – loss of CO<sub>2</sub> increases alkalinity after some time bacterial spoilage occurs – enter egg through porous shell – hydrogen sulphide produced – by bacterial breakdown of protein – bad smell – when cracked and placed on a plate will spread more when older – flatter – because thick white has become thinner / more watery -

10 points                      2 points = 1 mark

[5]

(c) Describe and explain the effect of heat on eggs.

protein coagulates – egg white at about 60°C – becomes opaque – forms a gel – yolk proteins at about 66°C – yolk thickens – solidifies at 70 C rate increases by presence of salts – and acid – e.g. salt and vinegar - added to water for poaching eggs – to bring about rapid coagulation – iron sulphide formed – may cause a black ring around yolk of hard-boiled egg – sulphur from amino acids in egg white – iron from yolk – happens more in stale eggs – reduce discoloration by placing in cold water after cooking – small loss of thiamin and riboflavin – prolonged boiling causes egg white to become tough – and rubbery – yolk becomes dry – and powdery – hard boiled eggs may be difficult to digest

10 points                      2 points = 1 mark

[5]

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(d) Discuss and give examples of the following uses of eggs:

(i) **emulsification:**

e.g. mayonnaise – rich cakes –

egg yolk contains lecithin – an emulsifying agent –  
allows oil and water to combine – in a stable mixture –  
molecules of the emulsifier (egg) surround droplets of dispersed liquid –  
egg surrounds oil – lowers surface tension between the two liquids –  
enabling them to combine – stabilisers are long chain molecules –  
e.g. protein in egg – which form a network in the continuous phase –  
i.e. the liquid / vinegar in mayonnaise – which separates the droplets of oil –  
known as the disperse phase – and prevents coalescence  
credit excellent drawing

1 point for example + at least 2 other points

(ii) **foam formation.**

e.g. meringue – soufflé – mousse – sponge cakes – bread

formed when gas is dispersed through a liquid – honeycomb mesh is formed –  
globular protein in egg white – unfolds – and stretches – when whisked –  
protein molecules bond with each other – forming a network –  
air bubbles surrounded by egg white film – and are trapped – beating creates heat –  
to slightly coagulate the protein – and stabilise the foam – mixture becomes stiff –  
opaque – white – and glossy – foams used to aerate mixtures –  
fresh eggs foam best – presence of fat – e.g. on beater – or broken egg yolk –  
reduces volume of foam – acid improves stability – e.g. cream of tartar in meringue –  
when heated foam coagulates – giving a solid foam – as in bread

1 point for example + at least 2 other points

10 points

2 points = 1 mark

[5]

6 (a) Give advice, with reasons, on the choice of fat, flour and sugar for rich cakes.

**Flour**

soft flour – with low gluten content – for a short – tender crumb –  
self-raising flour – contains correct amount of raising agent –  
raising agent is evenly mixed –  
if plain flour used – must have baking powder – in correct proportion –  
white flour – gives a better rise –  
brown flour – for colour – flavour – NSP – but poorer rise etc.

**Fat**

butter – for flavour – and colour – but can be expensive –  
more difficult to cream – not suitable for vegans  
soft – margarine – for colour – creams easily – traps air well –  
cheaper than butter – suitable for vegans if based on vegetable oil etc.

**Sugar**

Caster sugar – small / fine grains – dissolves easily during creaming –  
to give an even colour – traps air more easily during creaming –  
granulated sugar – cheaper – can be ground into caster sugar –  
soft brown sugar – for flavour – and colour – more difficult to cream etc.  
At least 4 points from each area

18 points

2 points = 1 mark

[9]

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(b) Name and explain the action of each of the raising agents in rich cakes.

**Air**

incorporated during sieving  
trapped within mixture – expands on heating – pushes mixture upwards – causing mixture to rise

**Steam**

produced from liquids in mixture – e.g. egg  
heat of oven changes water to steam – 1600 x greater than volume of water – increases volume of mixture – steam escapes – replaced by air –

**Carbon dioxide**

Produced from action between bicarbonate of soda – and an acid – usually cream of tartar – in baking powder – on presence of heat – and moisture – quick reaction – leaves a colourless – and tasteless residue – gas expands on heating – pushes up mixture – before shape is set –

3 named gases 3 x 1 point

At least 1 other fact about each gas 3 x 1 point

6 other points from any area (without repetition)

12 points

2 points = 1 mark

[6]

(c) Identify and explain the methods of heat transferred involved when the cake is baked.

**Convection**

occurs in liquids – and gases – in oven – and within cake – molecules expand when heated – become less dense – and rise – cooler – less dense molecules sink – to take their place – convection currents set up – process in continuous –

**Conduction**

occurs in solids – heat transferred from one molecule to the next – by contact – dense materials are better conductors of heat than less dense – metals are good conductors – metal oven shelves are heated by convection – transfer heat to cake tin – then to contents of tin – passes through food by conduction – contact between molecules of mixture

2 named methods 2 x 1 point

At least 1 other fact about each method 2 x 1 point

8 points

2 points = 1 mark

[4]

(d) Describe, with reasons, how to pack and freeze a decorated cake.

open freeze – to avoid damage to decoration

pack in rigid box – to prevent squashing

should be airtight – waterproof – not damaged by cold temperature –

e.g. polythene / Tupperware

label – name – date – portions – ‘best before’ date

freezer on fast freeze – to reach temperature of  $-25^{\circ}\text{C}$  – before freezing –

to avoid damage to cell walls of fruit – which may have been used to decorate –

structure would collapse on thawing – juice would run out –

after fast freezing store cake at  $-18^{\circ}\text{C}$  –

6 points to cover both areas

2 points = 1 mark

[3]

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- (e) Discuss reasons why some people choose to buy cakes instead of making them at home. buying saves time – may have work outside home / other commitments – saves effort – fuel – may not have an oven – only have a microwave oven – not suitable for baking cakes – may not have appropriate cake tin – or equipment for mixing – and decorating – may need it for a special occasion – need a cake which looks good – may not have skills to make – or decorate – may not be confident – especially if required for people other than family – saves buying a range of ingredients – could be cheaper if ingredients left over – avoids waste of additional ingredients – sure that results are good – consistent product – can see before buying etc.

6 points

2 points = 1 mark

[3]

7 (a) (i) caramelisation:

action of heat – on sugar – more readily in absence of water – sweet – brown substance – a mixture of carbohydrate-like compounds – molecular structure changes – due to removal of water e.g. surface of baked cakes, toffee, fudge etc.

6 points – to include 1 example

2 points = 1 mark

[3]

(ii) dextrinisation:

action of heat – on starch – dextrans polymerise – shorter chains of glucose units – stage between starch and glucose – in hydrolysis of starch forming brown-coloured compounds – sweet taste – e.g. toast, bread crust etc.

6 points – to include 1 example

2 points = 1 mark

[3]

(iii) enzymic browning:

when cut cells of fruit / vegetables – are exposed to air – enzymes in cells – oxidised – colourless compounds – become brown coloured compounds – only in raw fruit / vegetables – enzymes destroyed by heat – e.g. apples, potatoes etc.

6 points – to include 1 example

2 points = 1 mark

[3]

(iv) grilling:

colour change from red to brown – above 65°C – pigment myoglobin – changes to hemichrome – fat browns on surface – protein coagulates – further heating denatures – browns e.g. steak, bacon, salmon etc.

6 points – to include 1 example

2 points = 1 mark

[3]

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(v) Maillard reaction.

chemical reaction – between free amino group – in protein – and carboxyl group – of a reducing sugar – e.g. glucose – brown-coloured compounds formed – can cause discoloration during storage – e.g. dried milk, condensed milk e.g. bread crusts, roast meat, fried potatoes, cakes etc.

6 points – to include 1 example

2 points = 1 mark

[3]

(b) Discuss the use of natural and artificial colourings.

Give examples to illustrate your answer.

make food attractive – stimulate appetite – colourful food looks fresh – herbs – e.g. parsley, mint, chives etc. spices – e.g. turmeric, curry, ginger etc. fruit syrup – jam – cocoa – coffee – lemon / orange rind etc. may add nutrients as well as colour – may replace colours lost during processing – e.g. green in peas – manufacturers will sell more of a product if colour replaced – addition of colours controlled by food regulations – natural additives may be used – but not natural in the food product – e.g. caramel in gravy browning – some natural colouring extracted from plants – e.g. chlorophyll – carotene – may be used to give margarine a yellow colour – 15 permitted artificial colours – azo dyes also used – e.g. tartrazine – in confectionery, fruit juices etc. cochineal from beetle – vegetarians need to know E number – E numbers indicate that additives have been tested and approved by EU – Some dyes produce colour expected by consumer – consistent product – e.g. Brown FK (Brown For Kippers) – not approved by EU – possible health risk – long-term effects not known – may cause allergies – hyperactivity in children – not known whether stored in body – must use smallest amount possible to give desired effect – E numbers used instead of names – to help consumers identify – because names are complex – but most people do not take note of labels – etc.

20 points

2 points = 1 mark

[10]

8 (a) Discuss the factors which influence individual food choice.

**Economic circumstances**

amount of money available to spend on food – poorer people have to spend a higher proportion of their income on food – need to budget – less choice if less money food is a status symbol for rich people – smoked salmon, caviar etc. high expenditure does not always mean nutritional meals – cheaper foods can be very nutritious – milk, cheese, eggs etc. can choose cheaper sources of HBV protein – protein complementation – locally-grown vegetables often cheaper – can grow own produce – can keep chickens for family consumption etc. – nutritious diet need not be expensive – food in season – special offers etc. poor people may receive government help – free school meals – food aid – poverty limits choice of food – e.g. elderly – unemployed etc.

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### Availability of food

Depends on where person lives – different foods available in different countries – little choice in developing countries – local staple food with little variation – depends on climate – and type of land – disasters such as drought etc may not favour rearing animals or growing certain crops – country may not have money for food imports – no variety from foods from other countries – no money for expensive agricultural developments – wealthy countries can afford to import food not available locally e.g. UK imports bananas, citrus fruit, coffee, tea etc. – wealthier countries have benefited from technological developments – e.g. new methods of preserving – and storing food – unknown in the past – increased availability of dried, canned and frozen foods – food in season – creation of new foods – TVP, instant desserts etc.

### Nutritional knowledge

Choice may be affected by its nutritional value – cheaper HBV protein etc. – nutritional knowledge depends on education – differs between countries – nutrition may not be taught to everyone in school – knowledge varied – packaging may provide nutritional information – people may be more aware – well publicised dangers of excess fat, sugar, salt – increase in diabetes, obesity, CHD in more affluent countries – publicity campaigns in media – to increase awareness – and knowledge – need to know functions of food – and sources of nutrients – choice must be wise or health will be affected etc.

### Marketing methods

Choice affected by how foods are sold – convenience of stores / stalls – consider hygienic conditions – and quality of food in local shops – markets and supermarkets offer wide choice – shopper must discriminate – manufacturers must produce food people want to buy – market research to find out consumer preferences – new products tested in certain areas – to judge consumer appeal – portion size – attractiveness of packaging – price – competition between stores – special offers – loss leaders etc. – advertising in newspapers and on TV – once inside shop will buy other products – methods of displaying goods – positioning – impulse buys near pay point – some advertisements appeal to children – sweets, McDonald's etc. – peer pressure – may feature nutritional information in adverts – breakfast cereals – role as educators etc.

### Cultural and social habits

choose food liked by families – conditioning – vegetarian families – children will follow – may absorb our families attitudes towards foods – likes / dislikes – may be used to provide comfort, satisfaction, stress relief – may be a status symbol – certain brands of chocolate etc. – family patterns influenced by country and culture – each culture has its own foods – religious beliefs – cow sacred to Hindus – Jews must have animals slaughtered in a particular way – Roman Catholics will not eat meat on Fridays – dishes associated with festivals – Christmas cake, turkey for Thanksgiving – certain foods are symbolic of the occasion – wedding cake – lifestyle influences choice – meals can be special occasions to share – or snacks served at parties – to make people relax –

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**Environment**

may be determined by availability of low-priced local food –  
rice is staple in China – potatoes important in UK –  
people migrate and take beliefs and eating habits with them –  
most cities have a variety of types of food / restaurants –  
more mothers employed outside the home – convenience foods –  
more demand for snack food – may not be good for health –  
more people live alone – may snack or buy ready-to-eat food –  
high levels of fat – sugar – salt –  
increase in CHD – obesity – diabetes – tooth decay – hypertension etc.  
climate – hot food in cold weather etc. –

**Physiological and psychological attributes**

eating satisfies hunger –  
influenced by colour – flavour – texture – aroma of food –  
judge food by appearance – food is comforting – habit e.g. cinema –  
smell of bread may entice us to buy etc.  
effect of media – reducing diets  
state of health – diabetics will look at sugar content etc  
40 points                      2 points = 1 mark

[20]

**(b) Explain how the information on food labels can help the consumer to make appropriate food choices.**

labels identify product – is it what is needed for recipe?  
brand – well-known – reliable – quality of product consistent –  
weight – can calculate unit cost – is it too expensive –  
can compare cost of different sized packages – brands –  
country of origin – may wish to avoid for political reasons –  
or perhaps a food scare – BSE in British beef –  
can check ingredients – may avoid certain E numbers – allergies –  
position of ingredients on list – large amount in neat beginning of list –  
e.g. fat / sugar / salt –  
dates – can determine shelf life – can food be used in time ? –  
can food be stored? – saves time shopping on another occasion –  
nutritional information – kcal value per portion – for dieters –  
amount of fat / salt / sugar – for special diets –  
saturated fats for those with CHD etc.

10 points                      2 points = 1 mark

[5]