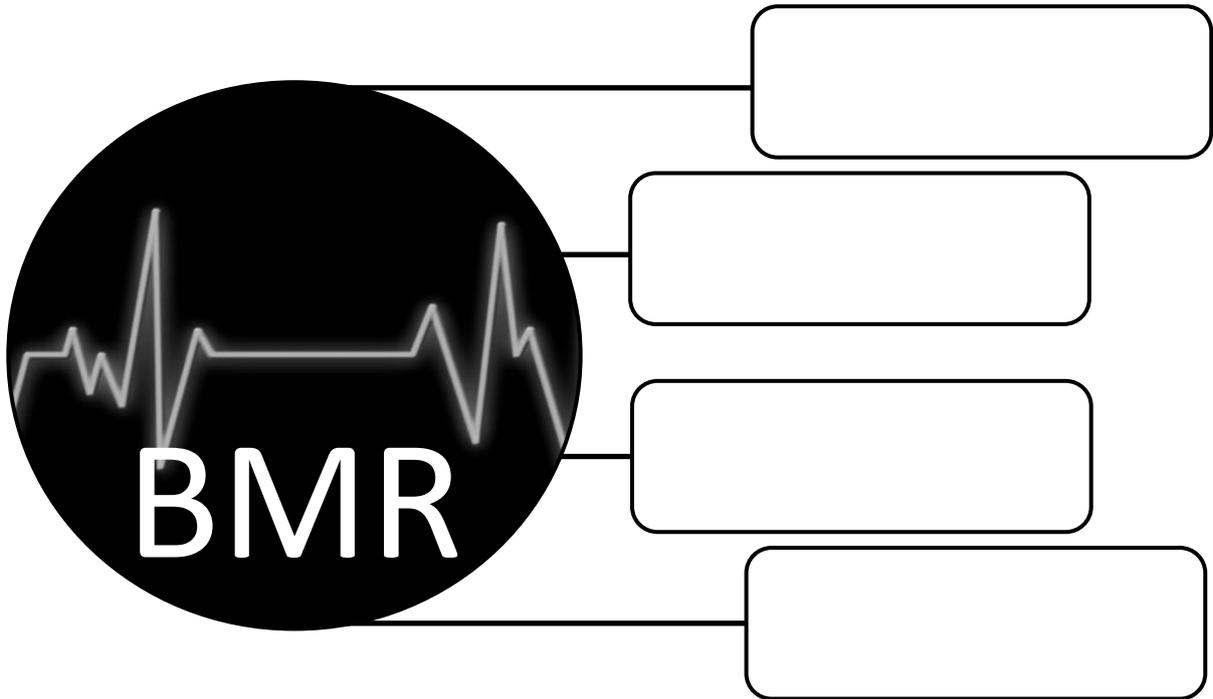


3. Energy balance

1) i) Indicate four factors which affect basal metabolic rate.



ii) Physical activity level (PAL) is the amount of energy needed to conduct all actions – *walking, sleeping, working, running, etc.* Explain how PAL affects energy needs of an individual.

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2) Different macronutrients provide different amounts of energy. Match the nutrients below with the amount of energy they provide in one gram.

Fats	Carbohydrates	Proteins	Alcohol
7 kcal	4 kcal	3.75 kcal	9 kcal

3) 1 kcal equals 4.184 kJ. Calculate how much energy (in joules) will be provided by the following foods.

i) A slice of pizza (480 kcal)

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ii) A banana (120 kcal)

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iii) A cup of milk (105 kcal)

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iv) One bar of chocolate (525 kcal)

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4) i) Complete the diagram to identify four factors that influence an individual's energy needs.

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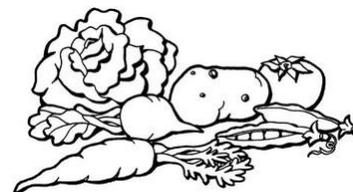
2.

4.

ii) Energy excess can cause a number of health-related conditions and diseases. Name two of them.

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5) Indicate what dietary changes might help maintain healthy body weight throughout life. Use the pictures to help you.



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Exam-style Question

Bread is one of the staple foods in the UK.
Name the **one** nutrient in bread which provides the most energy.

(1 mark)

Extension Task

Create a fact file to identify the main sources of energy in a balanced diet. In your fact file you should:

- indicate the nutrients which provide energy in the diet
- identify how much energy they should provide every day (as a percentage)
- list or draw food sources of those nutrients

Use the Extension Task worksheet to help you.

Extension Task worksheet



_____ fact file	_____ fact file
Provides _____ kcal (_____ kJ) in 1 gram	Provides _____ kcal (_____ kJ) in 1 gram
_____ % of energy in a balanced diet should come from it!	_____ % of energy in a balanced diet should come from it!
You can find it in:	You can find it in:
_____ fact file	_____ fact file
Provides _____ kcal (_____ kJ) in 1 gram	Provides _____ kcal (_____ kJ) in 1 gram
_____ % of energy in a balanced diet should come from it!	_____ % of energy in a balanced diet should come from it!
You can find it in:	You can find it in:

3. Energy balance



1) i) Explain what 'BMR' and 'PAL' are.

BMR stands for

It is

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PAL stands for

It is

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ii) Explain how BMR and PAL affect the total energy needs of an individual.

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2) Indicate how much energy is provided by one gram of:

fat

carbohydrate

protein

alcohol

3) 1 kcal equals 4.184 kJ. Using the data in the table below, calculate how much energy (in kcal and kJ) will be provided by each of the meals described on the following page:

wholemeal bread	217 kcal / 100 g	butter	744 kcal / 100 g	sweetcorn	78 kcal / 100 g
tuna	109 kcal / 100 g	olive oil	899 kcal / 100 g	lettuce	11 kcal / 100 g
mozzarella	257 kcal / 100 g	mayonnaise	686 kcal / 100 g	tomato	22 kcal / 100 g

- i) A tuna and sweetcorn sandwich (80 g wholemeal bread, 10 g butter, 50 g tuna, 30 g sweetcorn, 20 g mayonnaise)

<i>Calculation:</i>
Total:kcal;kJ

- ii) A tomato and mozzarella salad (80 g lettuce, 50 g tomato, 50 g mozzarella, 10 g olive oil)

<i>Calculation:</i>
Total:kcal;kJ

- 4) i) Explain how four chosen factors influence an individual's energy requirements.

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- ii) List two symptoms of health conditions or diseases caused by energy deficiency.

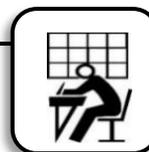
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5) Indicate three factors that can help maintain healthy body weight throughout life, and provide an explanation for your answers.

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2.
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Exam-style Question



Fish and chips is one of the most popular fast foods in the UK.

i) Name one source of energy in fish and chips from the macronutrients given below.

- Protein
- Carbohydrates
- Fats

(3 marks)

ii) Give **one** example of how the energy content of fish and chips could be reduced.

(1 mark)

Extension Task

Write a journal article about the main factors that influence an individual's energy requirements.

In your article, you can refer to one or more of the following factors: sex, life stage, body size, occupation and lifestyle, state of health state, genetics.

3. Energy balance

- 1) ● i) gender/sex, age, height, weight
ii) The higher the PAL, the more energy a person needs. The lower the PAL, the less energy a person needs.
- 1) ■ i) ● BMR – basal metabolic rate – the amount of energy needed to stay alive, e.g. for breathing, maintaining body warmth and heart beat; BMR depends on sex, age, height and weight
● PAL – physical activity level – an indicator of how active a person is during the day; depends on lifestyle, type of work performed, sports, etc.
● BMR multiplied by PAL equals total energy expenditure (TEE) which indicates total energy needs of an individual; TEE is amount of energy necessary to perform all actions and maintain healthy body weight and health
- 2) ●■ Higher ability to provide similar answer to lower-ability worksheet
- 1 g of fat provides 9 kcal of energy
 - 1 g of carbohydrates provides 3.75 kcal of energy
 - 1 g of protein provides 4 kcal of energy
 - 1 g of alcohol provides 7 kcal of energy
- 3) ● i) 2008.32 kJ
ii) 502.08 kJ
iii) 439.32 kJ
iv) 2196.6 kJ
- 3) ■ i) The calories provided should be calculated as follows:
First, calculate how many calories are provided by a portion of each ingredient:
- 80 g wholemeal bread → $80 \text{ g} * 217 \text{ kcal} / 100 \text{ g} = 174 \text{ kcal}$
 - 10 g butter → $10 \text{ g} * 744 \text{ kcal} / 100 \text{ g} = 74 \text{ kcal}$
 - 50 g tuna → $50 \text{ g} * 109 \text{ kcal} / 100 \text{ g} = 54 \text{ kcal}$
 - 30 g sweetcorn → $30 \text{ g} * 78 \text{ kcal} / 100 \text{ g} = 23 \text{ kcal}$
 - 20 g mayonnaise → $20 \text{ g} * 686 \text{ kcal} / 100 \text{ g} = 137 \text{ kcal}$
- Add the calories provided by all ingredients:
- The sandwich would provide $174 + 74 + 54 + 23 + 137 = 462 \text{ kcal}$
- Calculate the equivalent in kilojoules:
- $462 \text{ kcal} * 4.184 = 1933 \text{ kJ}$
- ii) The calories provided should be calculated as follows:
- First, calculate how many calories are provided by a portion of each ingredient:
 - 80 g lettuce → $80 \text{ g} * 11 \text{ kcal} / 100 \text{ g} = 9 \text{ kcal}$
 - 50 g tomato → $50 \text{ g} * 22 \text{ kcal} / 100 \text{ g} = 11 \text{ kcal}$
 - 50 g mozzarella → $50 \text{ g} * 257 \text{ kcal} / 100 \text{ g} = 129 \text{ kcal}$
 - 10 g olive oil → $10 \text{ g} * 899 \text{ kcal} / 100 \text{ g} = 90 \text{ kcal}$
- Add the calories provided by all ingredients:
- The salad would provide $9 + 11 + 129 + 90 = 239 \text{ kcal}$
- Calculate the equivalent in kilojoules:
- $239 \text{ kcal} * 4.184 = 999 \text{ kJ}$
- 4) i) Any four from: (■ also to provide explanation)
- sex – men usually need more energy than women due to higher amounts of muscle tissue
 - life stage / age – children need more energy in relation to body mass than adults or the elderly; also, teenagers need more energy than adults due to growth spurts
 - pregnancy/lactation – a pregnant woman needs more energy to provide for the growing foetus, while a lactating woman need more energy to produce milk
 - body weight/height – tall people usually need more energy than short people; also, heavier people usually need more energy than leaner people due to higher amount of tissue to maintain
 - occupation – people who are very active at work (e.g. builders, physical workers) need more energy than people who work in an office; also, professional sportspeople and athletes need more energy
 - lifestyle – people who have a sedentary lifestyle usually need less energy than those who are physically active
 - genetics – genetic factors may have an influence on one's energy requirements, due to the way different genes are expressed

- ii) ● Any two from:
- overweight/obesity
 - cardiovascular disease
 - hypertension
 - type 2 diabetes
 - joint pains
 - depression
 - or any other suitable example
- ii) ■ Any two from:
- underweight / weight loss
 - tiredness/fatigue
 - fainting and loss of consciousness
 - loss of muscle tissue
 - weakness
 - impaired growth and development
 - lower immunity / falling ill more often and more easily
 - or any other suitable example
- 5) ●■ Higher ability to also provide explanation
- Physical activity helps burn fat tissue, preventing overweight and obesity
 - Drinking sufficient amounts of water gives the feeling of satiety, decreases hunger and helps remove toxins
 - Eating fresh vegetables provides micronutrients and fibre
 - Choosing wholegrain products such as bread, pasta or rice to provide starch and fibre
- Other relevant responses possible.

Exam-style Question

- 1) ● (1 mark)
Starch / complex carbohydrates
- 1) ■ i) (3 marks)
- Protein – fish
 - Carbohydrates – potatoes, breadcrumbs/batter
 - Fats – oil, fish
- ii) (1 mark)
Examples could include:
- dry-fry or shallow-fry the fish instead of deep-frying it
 - roast the chips instead of deep-frying them
 - use a lean type of fish, e.g. cod
 - blanch potatoes before frying (this will prevent them from absorbing too much oil and shorten the cooking time)
- Other suitable answers can be accepted.