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RECOGNISING ACHIEVEMENT

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GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE SCIENCE A

A214/02/RB

Unit 4: Ideas in Context (Higher Tier)

RESOURCE BOOKLET

To be opened on receipt

JUNE 2011

OCE/32655

INSTRUCTIONS TO CANDIDATES

- This booklet contains three articles.
- Take these articles away and read them through carefully.
- Spend some time looking up any technical terms or phrases you do not understand.
- For the examination on **Friday 27 May 2011** you will be given a fresh copy of these articles, together with a question paper.
- You will **not** be able to take your original copy into the examination with you.

INFORMATION FOR CANDIDATES

- This document consists of **8** pages. Any blank pages are indicated.

Are organic foods better for us?

Why do people buy organic food?

Organic food has been a success story. Shops and supermarkets sell organic fruit and vegetables. Total sales of organic food were worth more than £2 billion in 2007 in the UK alone.

There are many reasons why people choose to buy organic food. Some people think it tastes better, is safer and contains more vitamins and minerals. Other people think it is better for the environment or that it is more 'natural'. Some may also think that eating organic food is a way to reduce their intake of pesticide residues.

Is organic food more nutritious?

One reason why many people buy organic food is because they believe that it is more nutritious. However, the balance of current scientific evidence does not support this view.

Nutrient levels in food vary depending on many different factors. These include freshness, storage conditions, crop variety, soil conditions and weather conditions. The available evidence shows that the nutrient levels are similar in food produced by both organic and intensive farming methods. However, organic food is more expensive, and this also affects people's choices. Sales of organic food are likely to fall when people have less money to spend.

Results of an independent study

The Food Standards Agency (FSA) helps to bring about changes in diet that will improve people's health. For this reason the FSA funded an independent study of the levels of nutrients in organic and non-organic food. This 2009 study reviewed evidence published over the past 50 years of the different nutrient levels found in crops from both types of farming. It also looked at the possible health benefits of eating organic food.

The study concluded that in terms of the nutrient content there is no good evidence that organic food is better than non-organic food. The results of this study showed that there is little, if any, nutritional difference between organic and intensively produced food. There was also no evidence of additional health benefits from eating organic food.

For example, evidence shows that there is more phosphorus in organic food. Phosphorus is an important mineral in the diet, but the diet of most people contains enough phosphorus. Acidity is also higher in organic produce, but acidity is about taste and makes no difference at all for health.

Further support

The FSA is not alone in making this assessment. In 2003 the French Food Safety Agency published a review which concluded that there is no difference in terms of food safety and nutrition. Also, in 2007 the Swedish National Food Administration reported that there were no nutritional benefits from organic food.

Pesticides

The FSA report did not look at pesticide residues in food. Farmers using intensive methods spray their crops with pesticides to give good yields at low cost. Before pesticides are approved they are rigorously assessed. This ensures that they do not pose an unacceptable risk to human health and that residues left in food will not be harmful to consumers. Pesticide residues in the food chain are also monitored to check they are within legal and safe limits.

Nevertheless, many people prefer not to have detectable pesticide residues in their food, even if they are not a risk to health. Buying organic food is one way to reduce the chances that your food contains pesticides. Organic food contains fewer pesticide residues because other methods, such as natural predators, are used to control insect pests.

It is also possible to produce intensively grown fruit and vegetables with residue levels as small as those found in organically grown crops. This can be done by carefully controlling the amount of chemical sprayed and adjusting how long before harvesting this is done. Modern pesticides can be sprayed at very low concentrations and they quickly break down into harmless chemicals.

Vitamin C in tomatoes

Scientists measured the amount of vitamin C in tomatoes grown using organic and intensive farming methods. Their results are shown in the table.

	vitamin C content in mg/100 g						
	sample 1	**sample 2**	**sample 3**	**sample 4**	**sample 5**	**sample 6**	**best estimate**
organically grown tomatoes	19.5	19.9	19.6	19.9	19.8	19.5	19.7
intensively grown tomatoes	20.2	20.0	19.8	19.1	19.9	19.7	19.9

These scientists concluded that there is not a real difference between the vitamin C content of the tomatoes grown using organic farming methods and those grown using intensive farming methods.

Methane from the Arctic

Most scientists agree that global warming is due to greenhouse gases, and that the consequences of continued global warming will be severe. Concern about greenhouse gases has focused on carbon dioxide, which has been released in greater and greater amounts over the past two hundred years. However, methane also absorbs infrared radiation, and so contributes to the greenhouse effect. The table shows how the levels of these gases in the atmosphere have changed over the past two hundred years. Water vapour is also a powerful greenhouse gas, but it has been omitted from the table as the water cycle has kept the amount of water vapour in the atmosphere roughly constant since pre-industrial times.

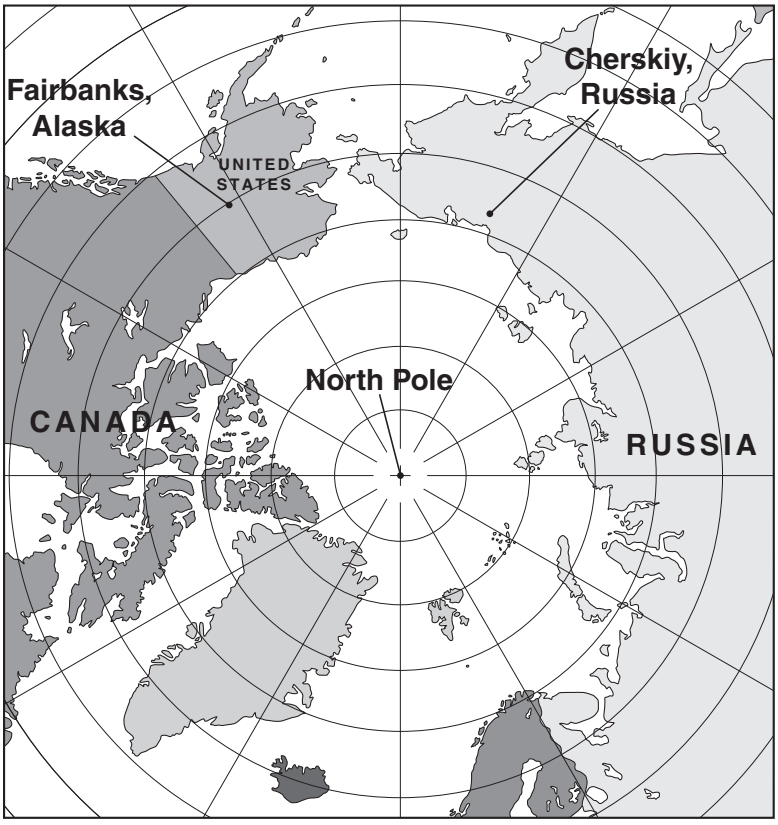
	carbon dioxide	methane
pre-industrial level in ppm (parts per million)	280	0.700
current level in ppm (parts per million)	387	1.745

The carbon dioxide level has gone up by 107 ppm since pre-industrial times, an increase of nearly 40 %. In the same time, however, the amount of methane has gone up by 150 %. Further increases in methane could have a serious effect.

Methane is a much more powerful greenhouse gas than carbon dioxide. Although the methane level is 200 times less than the carbon dioxide level, the current contribution of methane to global warming is estimated to be about one-third that of carbon dioxide. Most methane is produced by bacteria decomposing dead tissues from plants or animals. These bacteria live in places where there is no oxygen, such as the mud at the bottom of stagnant ponds.

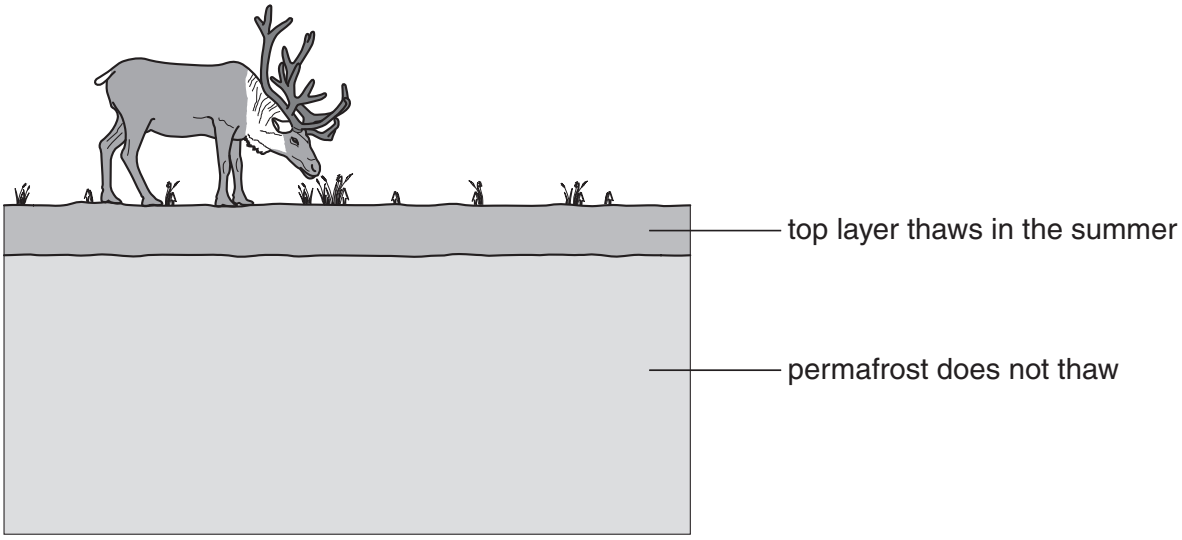
Bubbling lakes

Recently, scientists have discovered an alarming new source of methane in the frozen north of the Arctic. Investigating bubbles coming out of lakes at Fairbanks in Alaska, Professor Katey Walter of the University of Alaska found that large quantities of methane were being released from the ground underneath. Field work by other scientists in Cherskiy in northern Russia produced similar results.



Thawing permafrost

The top few centimetres of the ground in the Arctic thaws in the summer. Beneath this, the ground is frozen all the time. This is the **permafrost** (permanently frozen ground). Permafrost contains dead plant and animal matter that has been locked in cold storage for thousands of years.



section through Arctic soil

As the climate warms, the melting snow and glaciers are producing more and more lakes. The water at the bottom of these lakes melts the permafrost, allowing microorganisms to break down the dead matter into methane.

Threat or opportunity?

As global warming continues, the problem of methane being released from the Arctic permafrost becomes more serious. The more thawing there is, the more lakes will be formed. These lakes will warm up the permafrost underneath them and release methane. This will increase global warming further.

One method suggested to deal with the methane is to collect it and burn it. Although this produces carbon dioxide, the carbon dioxide is far less powerful as a greenhouse gas than methane. Burning the methane can generate energy for the local inhabitants too, although there are problems with supplying this methane to a thinly-spread population in such a harsh environment.

Another possible method is to prevent the permafrost from thawing by introducing massive herds of plant-eating animals to the region. These animals will remove the insulating layer of snow when foraging for food. This allows the cold winter temperatures to penetrate deeper into the ground and keep the permafrost frozen. This is what used to happen when mammoths, which are now extinct, roamed around the Arctic. The animals suggested for this are moose, reindeer and horses. This is currently being tried out in a village in northern Russia.

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Original text taken from:

Katherine Harmon, Heart-Lung Machine May Not Be the Culprit in Post-Op "Pump Head" Syndrome, Scientific American, 6 August 2009, © 2009 Scientific American, a Division of Nature America, Inc.

www.scientificamerican.com/article.cfm?id=disease-may-cause-pumphead