

## TITLE OF ACTIVITY / UNIT: Nutrition in extreme conditions

Investigar sobre els requeriments nutricionals, fer el balanç energètic en una situació quotidiana i comparar-lo amb el que es necessita en condicions extremes com poden ser les dels navegants de la BWR (en anglès).

<b>DURATION</b>	5 sessions	<b>AREA/S</b>	Ciències Naturals (Biologia)	<b>LEVEL</b>	3r d'ESO
<b>AUTHOR</b>	Maria Casadevall (mcasade8@gmail.com)				
<b>OBJECTIVES</b>	<ol style="list-style-type: none"> <li>Entendre la relació entre la ingesta de calories i les necessitats energètiques de l'organisme.</li> <li>Entendre la necessitat de fer una dieta variada, equilibrada i adequada a l'activitat física.</li> </ol>		<b>CURRICULAR CONTENTS</b>	<ul style="list-style-type: none"> <li>Conceptes: nutrició, caloria, despesa energètica.</li> <li>Anàlisi de la dieta.</li> <li>Malalties provocades per deficiències nutricionals</li> </ul>	

## BASIC COMPETENCES

### Audiovisual, language and communication competence

- Lectura i redacció de diversos textos, ús de la llengua estrangera.

### Visual and artistic competence

### Processing information and digital competence

- Recerca d'informació a Internet.

### Mathematical competence

- Càlculs diversos.

### Learning to learn

- Motivació per aprendre tot allò que no està a l'abast d'una única font d'informació.

### Autonomy and personal initiative

- Els alumnes han de buscar la informació i col·laborar entre ells. El professor hauria de fer de guia.

### Knowledge and interaction with the physical world

- El tema de la nutrició forma part del currículum de ciències naturals a 3r d'ESO

## Social and civic competence

- Col·laboració amb els companys de grup.

## MATERIALS

Els alumnes han de treballar a l'aula, preferentment en grups de 2-3, per tal d'afavorir el treball cooperatiu.

- Han de fer servir l'ordinador i també llapis i paper.
- Fitxa d'activitats "*Nutrition in extreme conditions*" (annex al final)

Com a feina final es poden col·leccionar totes les activitats i enquadernar-les.

NOTA: [Enllaç](#) a la carpeta amb tot el material.

## DEVELOPMENT

Crec que el millor seria passar l'activitat com a tancament de la unitat sobre nutrició i l'aparell digestiu.

- **Sessió 1** – Introduir la feina visualitzant el vídeo i fent un petit debat sobre l'energia que fa funcionar el cos humà. Fer les activitats 2 i 3
- **Sessió 2** – Recerca a Internet per fer l'activitat 4 i començar a preparar l'activitat 5 (llegir un dels articles).
- **Sessió 3** – Fer l'activitat 5
- **Sessió 4** – Activitats 6 i 7
- **Sessió 5** – Tancament de l'activitat

## AVALUATION

Per part del docent, l'avaluació ha de ser mirar la participació en els debats, veure la participació dels alumnes en el treball de grup i valorar la presentació de la feina de manera acurada i puntual.

Per part dels alumnes, fer-los omplir una fitxa d'autoavaluació individual i grupal on hi hagi ítems que valorin la responsabilitat de cada alumne, la implicació i el compliment de la feina.

# Annex

# Nutrition in extreme conditions

Why do we need to eat? Our body is constantly working, even when we sleep. To do that work, our body needs energy that is obtained by the digestion of food in the digestive system. Food also provides the building blocks that our body needs to make different structures and molecules. The energy needs of our body will depend on the type of activity that we do, but also the climate and weather conditions can affect and alter the energy needs of our body.

There are six different types of nutrients: carbohydrates, fats, proteins, vitamins, mineral salts and water. All of them have to be included in our diet and we should know the amount of each one that our body needs if we want to stay healthy.

In this activity you will learn basic concepts about nutrition and food conservation, and you will analyze your diet and that of a high performance athlete, such as the skippers that participate in the BWR.

## Activity 1 – Introduction

Watch the following video (<https://www.box.com/s/hwyrotk73jy0ld3hdrpu>) and discuss within your group about different types of energy that you can identify, how is energy transformed, how do the skippers get energy from, and how do they spend it.

## Activity 2 – Basic concepts

Surf the web and look for information about nutrition and digestion. Then, define the following concepts using your own words: **nutrition, digestion, absorption, energy, nutrient, calories.**

## Activity 3 – Nutrients

Look for information on the 6 types of nutrients and fill in a table like the one below.

Nutrient	Building blocks	Functions

As you may know now, all of us, as well as other living organisms, need to transform food into chemical energy to keep us alive and to perform all our activities. If you think about all the food that you eat in a day and the food sailors may need to go on a race around the world, that may last up to three months, you probably realize that they will have to carry a lot of weight inside their ships.

And this will force them to decrease their speed while sailing. How can this problem be solved? Let's learn something about food preservation techniques.

## Activity 4 – Food preservation

Food preservation is not a modern process, but it started a long time ago, even the romans used such techniques to keep their food, since they did not have refrigerators.

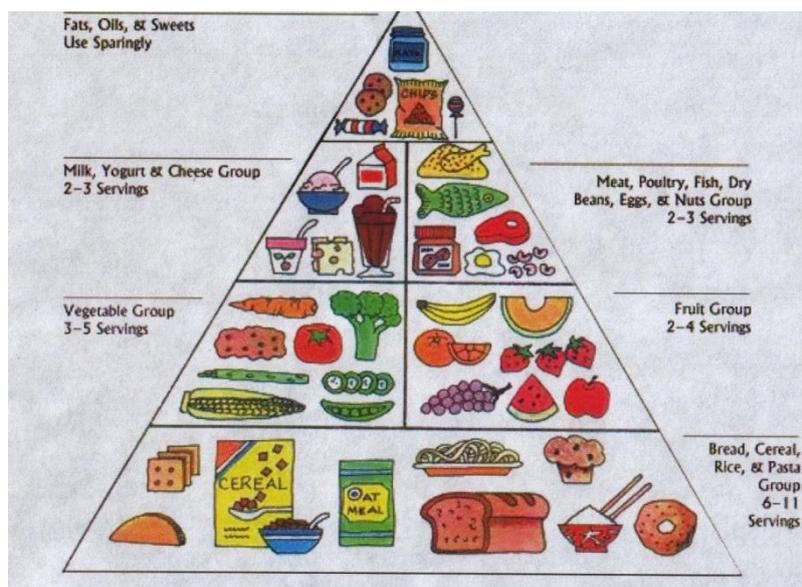
- Do some research in the internet and find information about the different ways that we can preserve food, from the oldest and easiest to the most modern techniques used today.
- Write a short description of each preservation method, including the main principle of conservation and how it is done.

## Activity 5 – Diets

Now that we know a little bit more about energy, nutrients, food and preservation techniques, let's focus on our diets.

- Think about the word diet and discuss with your classmates the different meanings that this word may have. Do you know what a balanced diet is? How can you have a balanced diet? Do all of us need to have the same type of diet?

We can use a food pyramid, like the one below, to know the types of food that we should eat in large amounts and the ones that we should have in small amounts.



You can find more information on the [Food Guide Pyramid](#) booklet.

There are different types of calorie charts. Some tell us the calorie requirements according to the sex, age and activity, like Chart 1, others help us to calculate the amount of energy that we need to do different activities, like Chart 2, and food calorie charts help us design balanced meals (<http://www.calorie-charts.net/>)

Estimated Calorie Requirements (in Kilocalories) for Each Gender and Age Group at Three Levels of Physical Activity*					
Gender	Age (years)	Activity Level <sup>b,c,d</sup>			
		Sedentary <sup>a</sup>	Moderately Active <sup>e</sup>	Active <sup>f</sup>	
Child	2-3	1,000	1,000-1,400 <sup>e</sup>	1,000-1,400 <sup>e</sup>	
	Female	4-8	1,200	1,400-1,600	1,400-1,800
		9-13	1,600	1,600-2,000	1,800-2,200
		14-18	1,800	2,000	2,400
		19-30	2,000	2,000-2,200	2,400
Male	31-50	1,800	2,000	2,200	
	51+	1,600	1,800	2,000-2,200	
	4-8	1,400	1,400-1,600	1,600-2,000	
	9-13	1,800	1,800-2,200	2,000-2,600	
	14-18	2,200	2,400-2,800	2,800-3,200	
	19-30	2,400	2,600-2,800	3,000	
	31-50	2,200	2,400-2,600	2,800-3,000	
	51+	2,000	2,200-2,400	2,400-2,800	

Source: HHS/USDA Dietary Guidelines for Americans, 2005

Chart 1 – Calorie needs depending on sex, age and activity

Calorie-Burning Chart for Various Activities			
Approximate calories burned, per hour, by a 150-pound woman			
Exercise	Calories/hour	Exercise	Calories/hour
Sleeping	55	Water Aerobics	400+
Eating	85	Skating/blading	420+
Sewing	85	Dancing, aerobic	420+
Knitting	85	Aerobics	450+
Sitting	85	Bicycling, moderate	450+
Standing	100	Jogging, 5mph	500+
Driving	110	Gardening, digging	500+
Office Work	140	Swimming, active	500+
Housework, moderate	60+	Cross country ski machine	500+
Golf, with trolley	180	Hiking	500+
Golf, without trolley	240	Step Aerobics	550+
Gardening, planting	250	Rowing	550+
Dancing, ballroom	260	Power Walking	600+
Walking, 3mph	280+	Cycling, studio	650
Table Tennis	290+	Squash	650+
Gardening, hoeing etc.	350+	Skipping with rope	700+
Tennis	350+	Running	700+

Chart 2 – Calorie chart for various activities

# THE COMPLETE GUIDE TO CALORIES

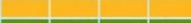
Calories are how we measure the energy that our body uses for fuel. They power our bodies' vital processes (like breathing, pumping blood, and even sleeping). This means we're constantly burning calories (yes, even when sleeping).

## Calories Measure Food Energy

The amount of calories in our food reflect the amount of energy that food provides our bodies. Calories come from macronutrients, a.k.a. carbohydrates, protein, and fat.



**THIS IS HOW MANY CALORIES ARE IN 1 gram OF EACH MACRONUTRIENT:**

CARBOHYDRATE		4 cal/g
PROTEIN		4 cal/g
FAT		9 cal/g

\* Alcohol provides 7 calories per gram, but is not considered a macronutrient because we don't need it for survival.

### How Healthy Adults Should Consume Calories



**Protein 10-25%**  
**Carbohydrates 45-65%**  
**Fats 20-35%**

CARBS	PROTEIN	FATS
<b>WHY WE NEED THEM</b> Carbs are the body's main source of fuel and are easily used by the body for energy.	<b>WHY WE NEED THEM</b> Protein is essential for growth, tissue repair, immune function, preserving lean muscle, and producing essential hormones and enzymes.	<b>WHY WE NEED THEM</b> Fats are essential in cell, nerve tissue, and hormone production. Fats are also essential for absorbing fat-soluble vitamins like vitamins A, D, E, K, and carotenoids.
<b>HOW THEY'RE USED</b> Carbs break down into glucose, which is used for energy. They're also stored in muscles and liver for later use and are important for the central nervous system, kidneys, brain, muscles, and intestinal health.	<b>HOW THEY'RE USED</b> The body uses protein for energy when carbs aren't available.	<b>HOW THEY'RE USED</b> Fats are the most concentrated source of energy. If fats consumed aren't burned as energy or used to build body tissues, they're stored in the body's fat cells for later use.
<b>WHERE TO FIND THEM</b> Grains, fruits, milk and yogurt.	<b>WHERE TO FIND THEM</b> Meat, poultry, fish, cheese, milk, nuts, and legumes.	<b>WHERE TO FIND THEM</b> Unsaturated fats such as olive oil, avocado, nuts, fatty fish (like salmon) and canola oil.





## Not All Calories are CREATED EQUAL

In terms of the energy they deliver, all calories are equal. However, the body uses each macronutrient differently. The right amount of calories from each source is very important to ensure the body can function properly.

Every person requires a different amount of calories per day.

### How To Determine Your Daily Calorie Intake



**STEP 1**  
**Find Your Basic Metabolic Rate**  
 Women:  $655 + (4.35 \times \text{weight (lbs.)}) + (4.7 \times \text{height (in.)}) - (4.7 \times \text{age (yrs.)})$   
 Men:  $66 + (6.23 \times \text{weight (lbs.)}) + (12.7 \times \text{height (in.)}) - (6.8 \times \text{age (yrs.)})$

**STEP 2**  
**Determine Your Activity Level**  
 Sedentary (Little to no exercise): 1.2  
 Lightly Active (Light Exercise 1-3 days/week): 1.375  
 Moderately Active (Moderate Exercise 3-5 days/week): 1.55  
 Very Active (Hard Exercise 6-7 days/week): 1.725  
 Extra Active (Very Hard Exercise and Physical Job 7 days/week): 1.9

**STEP 3**  
**BMR x Activity Level = Calorie Intake**  
 Number of calories one should consume daily to maintain current weight

### What about losing or gaining weight?



When choosing what to eat and drink, it's important to get the right mix — enough nutrients, but not too many calories.



To maintain weight, calories in (what you consume) must equal calories out (what you burn on a daily basis through normal body functions and daily activity/exercise).



When you burn more calories than you consume, you lose weight. When you consume more calories than you burn, you gain weight. The general rule is consuming ~7,350 calories per week is equal to 1 lb. of body fat gained or lost.

## WEIGHT CONTROL COMES DOWN TO HOW MUCH ENERGY YOUR BODY USES

If we take in more energy than we use, the rest gets stored as fat. If we burn more energy than we consume, our body relies on energy stores (like fat) to make up the deficit. Basically, it's all about balance.

- Using all this information and other that you may find in the internet, find your base metabolic rate (BMR), determine your activity level and calculate your daily calorie intake (this is the amount of energy that you need to keep up with all your activity and stay healthy)
- Then, using the food pyramid and a food calorie chart prepare all the meals for one day, taking into account the proportion of each nutrient to have a healthy, varied and balanced diet.

Let's get back to the skippers that you have seen in the video at the beginning of the activity. To survive in such extreme conditions of cold temperatures, heavy tasks, and not much rest, they need to increase the amount of energy that they intake up to 4000 kcal/day. Can you prepare their menu?

- Read the articles "Nutrition in extreme conditions" and "Performance nutrition in cold climates" to learn more about the effects of exercising in cold weather and high humidity.
- Prepare a daily menu for the skippers, but be careful. You have to keep in mind that the food has to contain a lot of energy, but it has to be varied and healthy, and it cannot be too heavy. Justify your choices.

Can you include all types of food in the menu? Remember that, even though they are in the sea, they need to have fresh vegetables and fruit. Do you know why?

### Activity 6 – Nutritional deficiencies

As you have seen our body has a basic calorie requirement, but it also needs essential nutrients that come from our diet. Diets lacking essential nutrients lead to health problems.

Deficiency in essential nutrients, such as vitamins, was one of the most important problems among sailors in the XVIII<sup>th</sup> century. **Scurvy** was at one time common among sailors, pirates and others aboard ships at sea longer than perishable fruits and vegetables could be stored (subsisting instead only on cured and salted meats and dried grains) and by soldiers similarly deprived of these foods for extended periods.

- What is the difference between malnutrition and undernutrition?
- Find out what type of other nutritional deficiencies sailors had besides scurvy and fill in a table like the one below:

Disease	Nutrient lacking	Symptoms	Treatment

### Activity 7 – Conclusion

You have worked very hard through all these activities and you have learned a lot about nutrition. As a conclusion, write a paragraph with all your suggestions to the skippers to keep healthy during a long race such as the Barcelona World Race, in which sailors have to travel along 25000 nautical miles during 3 months approximately.

Compare and contrast your conclusion with the other groups in the class.