

## Unit 3- Frequency

**Frequency** is the expression of repetition. It refers to events that occur more often than once and less often than always. Frequency is, of course, related to measurement and consequently you will meet certain expressions already seen in Unit 1 for a second time. This function can be expressed by:

- lexical items (particularly adverbs),
- grammatical structures (particularly word formation),
- certain fixed adverbial phrases.

### Self evaluation – entry test

■ Fill in the blanks using appropriate expressions. The first two letters of the answer are printed.

Example:

The batteries must be recharged **tw** ..... a month. (two times)

→ The batteries must be recharged **twice** a month.

1. Under stress, the heart **be** ..... faster. (*pulsates*)
2. Over the past 100,000 years, the polar ice sheets have advanced or retreated depending on periodic **sw** ..... in the climate. (*variations, oscillations*)
3. The famous 19<sup>th</sup> century millionaire, Carnegie, emigrated to the US from Scotland and began work in a factory for \$1.20 **pe** ..... week. (*each*)
4. There will be a **re** ..... of epidemics as soon as natural immunisation dies out. (*they will happen again, repeated incidence*)
5. The Ebola virus produces a mortality **ra** ..... which can be as high as 88% in human beings. (*a measure of frequency*)
6. Over the past 300 years, the average height of Europeans has increased **st** ..... . (*regularly*)
7. The world population is growing fast. A new child is born **ev** ..... 60 seconds. (*each minute*)
8. The **se** ..... of earthquakes that struck Missouri in 1811 were among the most powerful ever experienced in the United States. (*succession, repeated incidents*)
9. It is estimated that the **ho** ..... flow of water of the Amazon river is between 12,000 and 44,000 million litres. (*every 60 minutes*)
10. The strength of a steel alloy depends on the **ra** ..... of iron to carbon. (*mathematical relationship of proportion*)

## Text: bats versus butterflies

### ➤ Insert the following words in the gaps:

RATE • ECHOES • PERIODICALLY • WAVES • RANGE • PER • SERIES (1-7)  
RANDOM • FREQUENCIES • USUALLY • WAVELENGTH • DAILY • PROPORTION • PULSES  
• PATTERN (8-15)

It is well known that bats use a sonar system to navigate, that is to say, that they emit sound (1) ..... which are reflected back as ..... . It is this that enables them to locate objects and food. These waves are emitted ..... and are in the 20-50 kilohertz ..... . As the bat gets nearer to its target, the ..... increases, finally reaching several hundred emissions ..... second.

- The ability to navigate acoustically has several advantages for bats. It means that they can fly by night when the temperature is lower which reduces the danger of dehydration. This is critical for bats because of their enormous skin area. It also means that they are free from attack from predators and above all, it means that there is less competition for food.

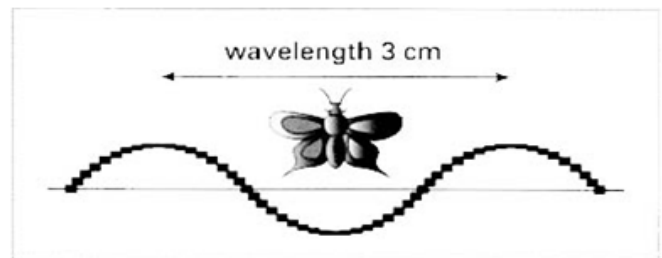


However, faced with such a predator some lepidoptera have undergone a ..... of genetic mutations, developing more sensitive hearing organs which enable them to detect the acoustic (8) ..... used by bats. They can consequently take evasive action and survive.

But nature, as Darwin pointed out, is not static and the race between the predators and their victims does not stop there. Jens Rydell of the University of Aberdeen and Raphael Arlettaz of the University of Lausanne have shown that a certain European bat, "Tadarida teniotis" searches for its prey using much lower ..... than those ..... used by other bats. They are so low (between 11 and 12 kHz) that insects are incapable of detecting them. This development in echolocation has, however, an evolutionary cost. The 12 kHz frequency corresponds to a ..... of 3 cm; consequently, objects which are smaller than the wavelength are not detected.

Rydell and Arlettaz concluded that the feeding ..... of "Tadarida teniotis" would therefore be different from that of other bats and their diet would not include insects with a wing span smaller than 3 cm, except for ..... catches, as these would be too small to detect.

Rydell and Arlettaz carried out an experimental study to check this hypothesis. Over a period of 3 weeks, they made a ..... examination of samples of bat droppings<sup>1</sup> found in caves in Sisteron in south-eastern France. The findings confirmed the hypothesis. Rydell and Arlettaz found the ..... of large insects was significantly higher, ranging from 68.3 to 86.8% of the total diet.



### COMPETITION RUNNING: 800 METRES

- I- Replace the underlined words by synonyms, antonyms or by explanation.
- II- Find out what AT running is.

#### ■ Notes

- The importance of aerobic running is crucial to 800 m training. Aerobic running involves continued, **non-stop** activity at a steady and relatively slow speed. The necessary oxygen is provided by the respiratory and cardiovascular system and virtually no lactate acid should build up in the muscles. The heart rate should be approximately 60-75% of maximum, seldom exceeding 130-145 **beats** per minute. As aerobic capacity improves, running speeds will be gradually increased. Training should be carried out **daily**.



© CRSU / Lyon et Grenoble

- To avoid monotony, the pattern of track training must be varied. A set of runs over different distances, followed by short recuperation periods, enables the body to **rebuild** its forces.
- Aerobic threshold training (AT) should be carried out no more than **once a week** at the beginning of the period, and **twice a week** when the season begins.
- Hill sessions are exercises designed to develop power. They consist of short, low speed, up-hill runs on slopes with gradients of no more than 1 in 6.
- Work in the gymnasium is scheduled every second day. Exercises will range from weight-lifting to exercises designed to improve body posture, arm swing and to strengthen muscles in the back and abdomen. Relaxation of foot muscles can be obtained by walking barefoot in sand or on grass.

■ **ADJECTIVES** – *Supply the missing words.*

6. Gases consist of molecules that are in fast ..... motion.
7. Glaciers are formed by a ..... process of sublimation and recrystallisation.
8. The ..... climate during the Pleistocene period was responsible for the extinction of many species.
9. The "Spirit of St Louis" made the first ..... transatlantic flight in 1927.
10. Pulsars emit short ..... bursts of radiation about once per second.

■ **NOUNS**

11. The depth of the sea can be measured by echo-sounding techniques consisting of acoustic .....
12. Coconuts grow on trees in ..... of 10 or 20.
13. Its high strength-to-weight ..... makes aluminium useful in the construction of aircraft.
14. The fermented liquid which contains between 7 and 12% ethanol is concentrated to 95% by a ..... of distillations.
15. Antibiotics came into use in the 1950s and have totally changed the ..... of disease and death.

■ **VERBS**

16. The electric current from standard generators ..... in direction.
17. The radio beam ..... more strongly in this part of the moon which suggests that there may be underground ice.
18. The speed at which the pendulum ..... depends on its length.
19. At this stage, the organism ..... itself and combines several genes producing immunoglobulins.
20. Yellow fever is a disease that never ..... ; one attack provides immunity for life.

- a. recurrent
- b. fluctuating
- c. periodic
- d. random
- e. non-stop

- f. pattern
- g. series
- h. clusters
- i. pulses
- j. ratio

- k. echoes
- l. swings
- m. recurs
- n. reorganises
- o. alternates