

## LENScience Senior Biology Seminar Series

# Circadian Rhythms: Keeping Time

### Pre-seminar Questions and Discussion

#### Pre-seminar School Discussion

This seminar looks at the concept of biological clocks and the genetic basis for these clocks. During this year you have learnt about how animal and plant behaviour is often linked to information from the biotic and abiotic environment. In particular you have studied how biological clocks control the rhythmic behaviour of plants and animals.

Biological clocks evolved to coordinate the activities of living things with the geophysical cycles occurring in the world around us. Scientists have long been fascinated by how biological clocks work and their genetic basis. This seminar looks at the biological clock in humans and some recent research on the effect of general anaesthetics on the functioning of the clock.



*Use your knowledge of Y12 and 13 Biology and the information in the seminar paper to discuss the following questions.*

1. The biological rhythms that we observe in plants and animals are linked to geophysical rhythms of the earth. Define the terms **circadian** and **circannual** and describe the geophysical cycles that these rhythms are linked to.
2. True biological rhythms are said to be endogenous. Explain the difference between **exogenous** and **endogenous** rhythms.
3. A rhythm has a period. Define what is meant by the period of a rhythm.
4. Explain the role of environmental cues in biological rhythms.
5. Explain why animals like bees and godwits **must** have a biological clock in order to navigate.
6. Circadian and circannual rhythms are found in almost all organisms. Explain why they are important to the survival of the organism.



## Vocabulary

Actogram  
Biological Clock  
Chronobiology  
Circadian  
Circannual

Crepuscular  
Critical Day Length  
Diurnal  
Endogenous  
Entrainment

Exogenous  
Free Running Period  
Geo-physical  
Nocturnal  
Phase Shift

Rhythm  
Sun Compass  
Suprachiasmatic Nuclei  
Time zone  
Zeitgeber

### Level 3 Achievement Standards linking to this seminar:

AS 90715 Describe the role of DNA in relation to gene expression

AS 90716 Describe animal behaviour and plant responses in relation to environmental factors

AS 90718 Describe applications of biotechnological techniques



### Key Concepts from the curriculum that link to this seminar:

Below are selected objectives from the Y13 Biology programme that link to this seminar. THESE ARE NOT A FULL LIST OF THE CONCEPTS COVERED IN YOUR COURSE. You should review these concepts before the seminar.

#### Nature of Science

- Develop an understanding of the relationship between investigations and scientific theories and models
- Understand that scientists connect their new ideas to current and historical scientific knowledge

#### Plant and Animal Responses to the Environment

*Please remember these are only the objectives linking to this seminar—refer to your unit hand out at school for a full list*

- Describe why living things have a requirement for timing
- Describe timing mechanisms
- Describe daily, tidal, lunar and annual rhythms
- Describe examples of biological timing in relation to environmental factors
- Recognise endogenous rhythms are entrained by environmental cues
- Interpret actogram diagrams and calculate free-running periods
- Analyse and interpret information to explain examples or patterns in animal behaviour or plant responses.



#### Molecular Genetics

*Please remember these are only the objectives linking to this seminar—refer to your unit hand out at school for a full list*

- Describe DNA in terms of structure and function
- Describe the process of protein synthesis and the role of DNA in the production of proteins
- Describe the role of DNA in gene expression and the determination of phenotype