

# IGCSE Biology Workbook

## 14. Coordination and Response

### Part A: The Nervous System

The stuff you need to know in this chapter:

#### 14.1 COORDINATION AND RESPONSE

*Core:*

- Describe a nerve impulse as an electrical signal that passes along nerve cells called neurones
- Describe the human nervous system in terms of:
  - the central nervous system consisting of brain and spinal cord
  - the peripheral nervous system
  - coordination and regulation of body functions
- Identify motor (effector), relay (connector) and sensory neurones from diagrams
- Describe a simple reflex arc in terms of receptor, sensory neurone, relay neurone, motor neurones and effector
- Describe a reflex action as a means of automatically and rapidly integrating and coordinating stimuli with the responses of effectors (muscles and glands)
- Define a synapse as a junction between two neurones

*Extended:*

- Distinguish between voluntary and involuntary actions
- Describe the structure of a synapse, including the presence of neurotransmitter containing vesicles, the synaptic cleft and neurotransmitter receptor molecules
- Describe how an impulse triggers the release of a neurotransmitter from vesicles into the synaptic gap and how the neurotransmitter diffuses across to bind with receptor molecules, in the membrane of the neurone after the synaptic gap, causing the impulse to continue
- State that in a reflex arc the synapses ensure that impulses travel in one direction only
- State that many drugs, e.g. heroin act upon synapses

#### 14.2 SENSE ORGANS

*Core*

- Define sense organs as groups of receptor cells responding to specific stimuli: light, sound, touch, temperature and chemicals
- Identify the structures of the eye, limited to cornea, iris, pupil, lens, retina, optic nerve and blind spot
- Describe the function of each part of the eye, limited to:
  - cornea – refracts light
  - iris – controls how much light enters pupil
  - lens – focuses light onto retina
  - retina – contains light receptors, some sensitive to light of different colours
  - optic nerve – carries impulses to the brain
- Explain the pupil reflex in terms of light intensity and pupil diameter only

*Extended*

- Explain the pupil reflex in terms of light intensity and antagonistic action of circular and radial muscles in the iris
- Explain accommodation to view near and distant objects in terms of the contraction and relaxation of the ciliary muscles, tension in the suspensory ligaments, shape of the lens and refraction of light
- State the distribution of rods and cones in the retina of a human
- Outline the function of rods and cones, limited to greater sensitivity of rods for night vision and three different kinds of cones absorbing light of different colours for colour vision
- Identify the position of the fovea

(CIE, 2014)

**Ref:**

- CIE: Cambridge International Examination (2014) *0610 IGCSE Biology Syllabus Guide* [Online]

## 14.1.1 COORDINATION AND RESPONSE

What are nerve impulses?

The central nervous system in humans consists of the brain, spinal cord and what else?

What is the function of the central nervous system?

Draw a labeled diagram of a motor neurone, a sensory neurone and a relay neurone.

For the following example, state the sensor and effector

Example	Sensor(s)	Effector(s)
Touching something cold and moving your hand away		
Seeing a bright light and closing your eyes		
Hearing a crash and turning your head to find where it came from		
Hearing a One Direction song and pressing the "mute" button		

Describe, with examples, the difference between voluntary and involuntary actions.

What is a reflex action?

Draw a flow diagram to represent a reflex arc

Give 2 examples of when a reflex action may occur

### 14.1.2 SYNAPSES

What is a synapse?

Draw a labeled diagram of a synapse

Describe how a signal is transmitted across a synapse

Explain how a recreational drug such as heroin can effect nerve impulses

## 14.2 SENSE ORGANS

Define "sense organ"

Draw a labeled diagram of the eye including the retina, cornea, pupil, lens, iris, blind spot, optic nerve and fovea.

State the function of the following parts of the eye:

Structure	Function
Cornea	
Lens	
Iris	
Retina	
Optic Nerve	

Explain how the dilation (getting larger) and constriction (getting smaller) of the pupil is controlled. Use a diagram to help.

**MINI TASK:**

1. Look at a distant object, perhaps on the other side of the classroom, or outside of the window. Focus on it for 30 seconds.
2. Put your finger about 10cm in from your face and focus on it for 30 seconds.

*Which was easier (less uncomfortable)?*

*Do your eye muscles work harder to see distant or near objects?*

Fill in the blanks below explaining how the eye accommodates viewing of near and distant objects. Use the words below to help.

*retina/cornea/iris/thicker/thinner/relax/contract/loosens/tightens*

When objects are near, the lens needs to be \_\_\_\_\_. The ciliary muscles \_\_\_\_\_ which \_\_\_\_\_ the suspensory ligaments. The more thick lens (more convex) enables light to focus correctly on the \_\_\_\_\_. When objects are far, the lens needs to be \_\_\_\_\_. The ciliary muscles \_\_\_\_\_ which \_\_\_\_\_ the suspensory ligaments. The less thick (less convex) lens enables light to focus correctly on the \_\_\_\_\_.

**Compare and contrast rod and cone cells (a table might help)**



**State the function of the fovea. Include reference to cone cells in your answer.**