

New 2015 Specification

AQA
AS and A-LEVEL

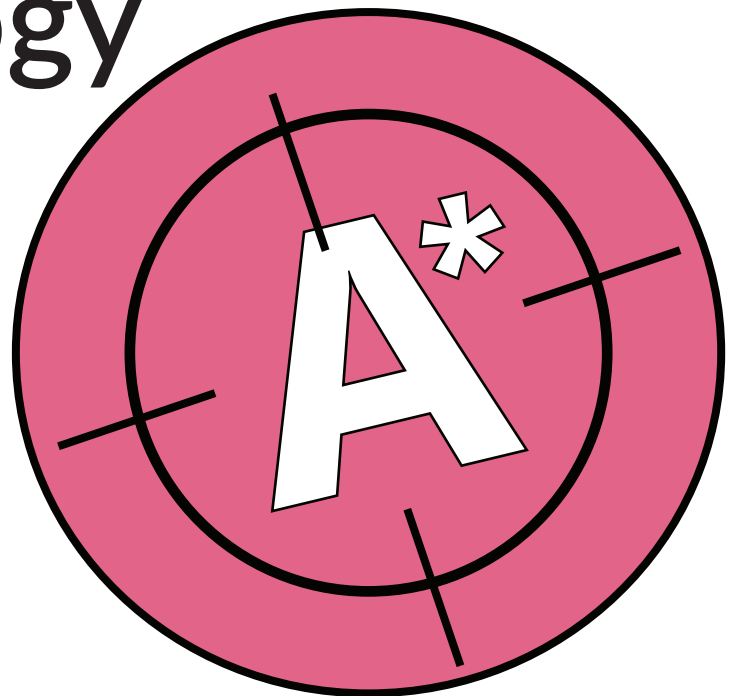
Psychology

BRILLIANT EXAM NOTES

The Complete Study and Revision Book

Biopsychology

*Do brilliantly
in your
psychology exam!*



Nicholas Savva

www.psychologyzone.co.uk

Proven exam
success

Written by
examiners

Concise, detailed and
clearly written topic material

Published by Educationzone Ltd

London N21 3YA United Kingdom

©2018 Educationzone Ltd

All rights reserved. The copyright of all materials in this publication, except where otherwise stated, remains the property of the publisher and the author. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, for whatever purpose, without the written permission of Educationzone Ltd or under licence from the Copyright Licensing Agency Limited, of Saffron House, 6–10 Kirby Street, London, EC1N 8TS.

Nicholas Savva has asserted his moral rights to be identified as the author of this work in accordance with the Copyright, Designs and Patents Act 1988.

Any person who commits any unauthorised act in relation to this publication may be liable for criminal prosecution and civil claims for damages.

British Library Cataloguing in Publication Data:

A catalogue record for this publication is available from the British Library.

For more information:

Visit our website for exam questions and answers, teaching resources, books and much more:

www.psychologyzone.co.uk

Email us for further information:

info@psychologyzone.co.uk

Biopsychology

AQA Specification

Biopsychology

AQA

- The divisions of the nervous system: central and peripheral (somatic and autonomic).
- The structure and function of sensory, relay and motor neurons. The process of synaptic transmission, including reference to neurotransmitters, excitation and inhibition.
- The function of the endocrine system: glands and hormones.
- The fight or flight response including the role of adrenaline.
- Localisation of function in the brain and hemispheric lateralisation: motor, somatosensory, visual, auditory and language centres; Broca's and Wernicke's areas, split brain research. Plasticity and functional recovery of the brain after trauma.
- Ways of studying the brain: scanning techniques, including functional magnetic resonance imaging (fMRI); electroencephalogram (EEGs) and event-related potentials (ERPs); post-mortem examinations.
- Biological rhythms: circadian, infradian and ultradian and the difference between these rhythms. The effect of endogenous pacemakers and exogenous zeitgebers on the sleep/wake cycle.

Contents

Exam Notes for Biopsychology

EN 1.	The Division of the Nervous System	5
EN 2.	Neurons and Synaptic Transmission	9
EN 3.	The Function of the Endocrine System	13
EN 4.	The Fight or Flight Response	16
EN 5.	Localisation of Function in the Brain	19
EN 6.	Hemispheric Lateralisation and Split-Brain Research	23
EN 7.	Plasticity and Functional Recovery of the Brain	28
EN 8.	Ways of Studying the Brain	32
EN 9.	Biological Rhythms: Circadian Rhythms	36
EN 10.	Biological Rhythms: Infradian Rhythms and Ultradian Rhythms	40
EN 11.	Endogenous Pacemakers and Exogenous Zeitgebers	45

AQA Specification: Biopsychology

- ▶ The divisions of the nervous system: central and peripheral (somatic and autonomic).

◆ Introduction

There are close links between biology and psychology. Biology can influence our behaviour. For example, changes in our brain chemicals influences our moods and emotions (think of serotonin and dopamine). They can also influence our biology. For example, certain stressors in life (e.g. work, deadlines, social relationships) have been shown to influence our immune system. So the term **biopsychology** is concerned with the ways in which biological factors influence our emotions, behaviours and mental processes.

◆ Nervous system

All humans are made up of cells. Neurons are specialist cells that make up the nervous system (nerves). The nervous system is made of trillions of neurons (or nerve cells) whose purpose is to carry messages through neurotransmitters as part of the electrical chemical process. Its two main jobs are: 1) To collect, process and respond to information in the environment; 2) To coordinate the working of different organs and cells in the body. The nervous system is divided into two subsystems: *central nervous system* (CNS) and *peripheral nervous system* (PNS). The CNS comprises the brain and spinal cord. The PNS comprises the nerves outside the brain and spinal cord, which carry sensory information from the arm, legs and body to the brain.

◆ The Central Nervous System (CNS)

As mentioned above, the **brain** and the **spinal cord** make up the **central nervous system (CNS)**. The nerves that come off the CNS make up the *peripheral nervous system*. This is connected to all our body parts such as our internal organs, muscles and glands. The CNS does not have any direct communication with the outside world. It is the PNS that conveys the information about the outside world to and from the CNS. The spinal cord is vital as this is the pathway in which the processing and transfer of information takes place via neurons. The main job of the CNS is to process the information and regulate physiological processes – to ensure that life is maintained!

The brain

Is divided into four main areas:

- **Cerebrum**: the largest part, which is responsible for many functions such as speech production and processing visual images.
- **Cerebellum**: the part that controls motor skills and balance.
- **Diencephalon**: the part that contains the **thalamus** which acts as a relay station for nerve impulses coming from the senses. and the **hypothalamus** which is responsible for regulation of body temperature amongst other things. The hypothalamus also triggers hormones to be released from the pituitary gland.
- **Brain Stem**: the part that regulates functions essential for life such as heart beat, swallowing and breathing.

The spinal cord

- **Relays information** between the brain and the rest of the body.
- Is connected to different parts of the body by **spinal nerves** which connect to specific **muscles** and **glands**.
- Contains circuits of nerves that perform **simple reflexes** without direct involvement of the brain, such as pulling your hand away from a hot plate.

◆ Peripheral Nervous System (PNS)

Nerves that come off from the central nervous system are called the **Peripheral Nervous System (PNS)**. The PNS can be further divided into two sections: the **somatic nervous system** and the **autonomic nervous system**.

The Somatic Nervous System

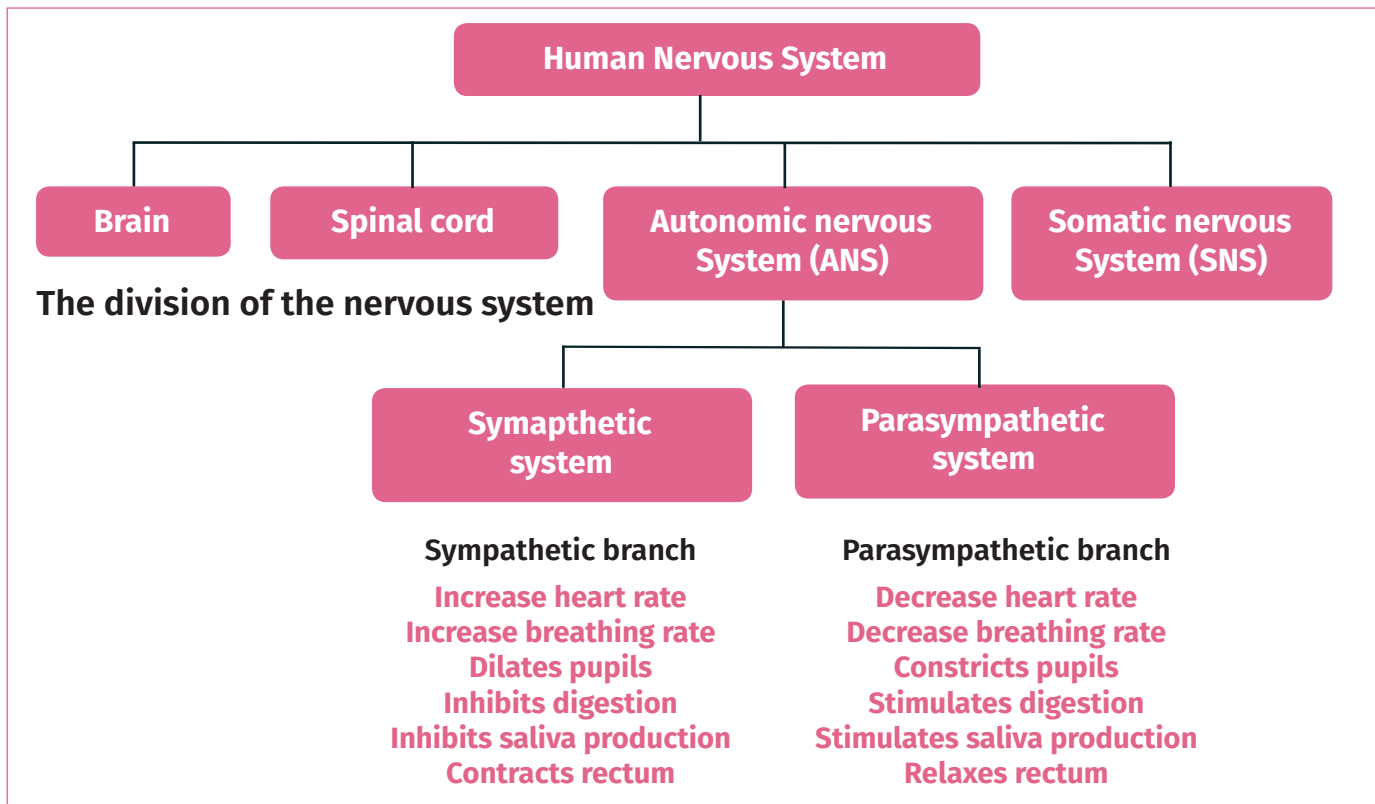
The Somatic Nervous System (SNS) has two main nervous pathways: *sensory and motor*. Their main job is to transmit sensory information, such as auditory information from the ears and visual information, from the eyes, and relay this information to the CNS—via the spinal cord to the brain. The Somatic Nervous System also relays motor neuron messages from the CNS to our skeletal muscles to make them react and move: facial muscles, walking, running, and so on. So in a nutshell, the SNS:

- is under our conscious control whereas the ANS (below) is involuntary – not under our control.
- is made up of nerves coming from the **brain** and from the **spinal cord**.
- contains both **sensory** and **motor** neurons.
- **Sensory neurons** relay messages **to** the CNS
- **Motor neurons** relay messages **from** the CNS.

The Autonomic Nervous System

The Autonomic Nervous System (ANS). The main job of this system is to transmit and receive information in order to **regulate internal body organs** and **glands** e.g. the beating of the heart, the digestion of food, the breathing of the lungs, body temperature, and so on. It is called autonomic (automatic) because we have no control over it—it happens involuntarily. The ANS can be further divided into two sections: the **sympathetic nervous system** which **increases** bodily activity (such as heart rate or breathing) and the **parasympathetic nervous system** which conserves the body's natural activity level by **decreasing** activity or maintaining it. So in a nutshell, the ANS:

- regulates **involuntary** actions of body organs and glands such as the heart.
- contains purely **motor neurons** (pathways).
- is divided into two parts: the sympathetic and parasympathetic systems. These work on the same organs but have opposite effects. One increases the activity, the other decreases the activity.
 - The *sympathetic* nervous system (SNS) responds to a *perceived* threat or danger. It produces physiological changes that prepare the body for fight or flight (the alarm response – see Exam Notes 4).
 - The *parasympathetic* nervous system (PNS) restores normal physiological functioning when the threat has passed. It slows the heart rate, decreases blood pressure, stimulates the digestive system and stores energy for future use.



Practice exam questions

1. Name and briefly explain two division of the human nervous system. **[2 marks]**
2. Identify and outline two divisions of peripheral nervous systems. **[3 marks]**
3. Give one difference between the autonomic nervous system and the somatic nervous system. **[1 mark]**
4. Identify the two components of the peripheral nervous system, and explain two differences in their organisation and/or functions. **[3 marks]**
5. Which two of the statements below about the nervous system of the human body are correct? **[2 marks]**

Tick only two boxes only.

- A** the fight or flight response occurs when the parasympathetic division controls functioning.
- B** the central nervous system consists of the brain and spinal cord.
- C** sensory, relay and motor neurons are all controlled by the somatic nervous system.
- D** sensory neurons carry messages from the central nervous system.
- E** the somatic nervous system controls voluntary movements.

6. Complete the following sentence. Shade one box only.

The somatic nervous system

- A comprises of two sub-systems.
- B connects the central nervous system and the senses.
- C consists of the brain and spinal cord.
- D controls involuntary responses.

AQA Specification: Biopsychology

- ▶ The structure and function of sensory, relay and motor neurons. The process of synaptic transmission, including neurotransmitters, excitation and inhibition.

◆ Introduction

The nervous system is made up of **neurons**. These are specialist cells that carry electrical impulses. Their function is to receive information and transmit this to the brain, as well as to other neurons throughout the body. There are thought to be around 100 billion neurons in the brain and one billion neurons in the spinal cord.

◆ The structure and function of the neuron

Neurons are responsible for everything we do—our thoughts, memories, emotions, physical sensations and the coordination of all the physical functions of the body. The nervous system (including the brain) has three main types of neurons: *sensory neurons*, *relay neurons* and *motor neurons*, and they perform different functions:

Function

- **Sensory neurons** (the 'sensing' neurons) respond to stimulation from our five senses, i.e. vision, smell, taste, touch and hearing. These neurons are located in the peripheral nervous system (PNS) and are found all over the body. They receive information from the sensory receptors (e.g. in the skin, tongue and eyes) and convert this information into electrical impulses. When these reach our brain, they are translated into sensations such as pain, sight or heat. Not all sensory information travels to the brain, however. Some neurons terminate in the spinal cord. This allows reflex action to occur quickly without the delay of sending impulses to the brain. So *sensory neurons carry signals towards the CNS (spinal cord and brain)*.
- **Motor neurons** (the 'moving' neurons) are located in the central nervous system (CNS), from the brain stem nerves to the muscles of the face and head, and from the spinal cord nerves to the muscles and glands. Motor neurons help both glands and muscles to functions. E.g. they make muscles contract and keep the heart beating. So *motor neurons carrying information away from the CNS*
- **Relay neurons** (the 'connecting' neurons) connect motor neurons and sensory neurons, allowing them to communicate by passing signals to one another, that is, they transmit messages from one neuron to another neuron. They can also receive signals from other *relay neurons*. All the neurons in the CNS are relay neurons. In fact, most relay neurons are found in the CNS. These sensory neurons help the brain to process information from the environment.