6.5 Nerves, hormones and homeostasis – *summary of mark schemes*

6.5.1	State that the nervous system consists of the central nervous system (CNS) and peripheral nerves, and is composed of cells called neurons that can carry rapid electrical impulses. Mark Scheme A. the nervous system is divided into the central nervous system / CNS (brain and spinal cord) and the peripheral nerve system / PNS (nerves); B. CNS consisting of brain and spinal cord; C. PNS consisting of motor and sensory nerves; D. sensory neurons carry impulses to the CNS; E. motor neurons carry impulses from the CNS;
6.5.2	Draw and label a diagram of the structure of a motor neuron. Mark Scheme A. cell body - complete with nucleus and dendrites; B. axon - shown longer than the longest dendrite, with the membrane drawn as a continuous line; C. myelin sheath - surrounding the axon, showing nodes of Ranvier; D. motor end plates - not covered by myelin sheath and ending in a button / dot;
6.5.6	Explain the principles of synaptic transmission. Mark Scheme A. nerve impulse travels to end of presynaptic neuron; B. triggers influx of Ca2+; C. causes synaptic vesicles to fuse with membrane; D. release neurotransmitter molecules into synaptic cleft; E. (neurotransmitter) crosses / diffuses across channel; F. (neurotransmitter) binds to receptors on next / postsynaptic neuron; G. causes ion channels to open on neuron; H. eg Na+ diffuse into postsynaptic neuron; I. can inhibit / excite; J. by hyperpolarizing / depolarizing; K. neurotransmitter degraded; L. Ca2+ pumped back into the synaptic cleft; M. acetylcholine / GABA / dopamine / serotonin / other examples of neurotransmitter;
6.5.8	State that homeostasis involves maintaining the internal environment between limits, including blood pH, carbon dioxide concentration, blood glucose concentration, body temperature and water balance. Mark Scheme A. homeostasis is the maintenance of a constant level of the internal environment; B. within narrow limits; C. involves negative feedback;
6.5.9	Explain that homeostasis involves monitoring levels of variables and correcting changes in levels by negative feedback mechanisms. Mark Scheme A. change in environment is sensed / detected; B. response to bring the system back to normal state / set point / within limits; C. when the normal state reached, the response is stopped; D. this prevents over reaction; E. internal environment fluctuates around norm / small fluctuations; F. a rise in level would feedback to decrease production; G. as levels drop to low this would feedback to increase production; H. eg blood glucose concentration / body temperature;

6.5.10	Explain the control of body temperature, including the transfer of heat in blood, and the roles of the hypothalamus, sweat glands, skin arterioles and shivering. Mark Scheme A. temperature regulated by negative feedback; B. thermoreceptors detect temperature change; C. thermoregulatory centre (hypothalamus) in brain; warming the body actions: D. metabolic rate increases; E. increased activity; F. shivering to produce waste heat; G. no release of sweat; H. vasoconstriction of skin arterioles; I. blood flow from extremities is reduced / blood flow to internal organs is increased; J. leading to retention of heat; K. heat is transferred in blood; L. behaviours including increased motion / huddling / reduction of exposed surfaces; cooling the body actions: M. vasodilation of skin arterioles; N. leading to loss of heat by radiation; O. sweating accompanied by evaporative cooling; P. reduction of activity / relaxation of muscles; Q. loss of heat by radiation;
6.5.11	Explain the control of blood glucose concentration, including the roles of glucagon, insulin and α and β cells in the pancreatic islets. Mark Scheme A. homeostasis maintains the internal blood glucose levels between narrow limits (70–110 mg glucose 100 cm–3); B. blood glucose regulation is an example of negative feedback; C. pancreatic cells monitor blood glucose; D. islets in pancreas monitor blood glucose levels; E. insulin / glucagon is a hormone; F. low glucose level induces production of glucagon; G. alpha-cells of pancreatic islet produce glucagon; H. glucagon stimulates the liver to break glycogen into glucose; I. glucagon leads to increase in blood glucose; J. absorption of glucose from digestive tract causes glucose levels to rise (after meals); K. high level of blood glucose induces production of insulin; L. beta-cells of pancreatic islet produce insulin; M. insulin stimulates uptake of glucose into muscles / adipose tissue and liver cells; N. glucose stored in the form of glycogen (in muscle / liver); O. storage lowers blood glucose levels; P. homeostatic monitoring of blood glucose levels is constantly happening; Q. skipping meals can cause blood glucose levels to drop; R. in diabetes mellitus blood insulin low / target cells insensitive; S. adrenaline leads to increased blood glucose level