Biology AQA Topic 5 Homeostasis and Response Mark Scheme

Q1. The human body maintains a constant internal environment.

(a) What is the term for this process?

- **Homeostasis** (1)

(b) Give one reason why it is important to maintain body temperature.
Any one from:

- So enzymes can work efficiently / prevent enzymes denaturing (1)
- Maintain optimal temperature for cell processes / metabolic reactions (1)

[Total: 3 marks]

Q2. Body temperature is regulated by the thermoregulatory centre in the brain.

(a) Describe how the body responds when it becomes too hot.
Any two from:

- Sweating increases (1)
- Vasodilation – blood vessels widen to increase heat loss (1)
- Hairs lie flat (1)

(b) Describe how the body responds when it becomes too cold.
Any two from:

- Shivering – muscles contract to generate heat (1)
- Vasoconstriction – blood vessels narrow to reduce heat loss (1)
- Hairs stand up to trap air (1)

[Total: 4 marks]

Q3. The nervous system allows us to react to our surroundings.

(a) Name the three main parts of a coordination response.

- **Receptor** (1)
- **Coordinator / CNS (brain or spinal cord)** (1)
- **Effector (muscle or gland)** (1)

[Total: 3 marks]

Q4. Reflex actions are automatic and rapid.

(a) Describe one example of a reflex action.
Any one suitable example:

- Pulling hand away from a hot object (1)
- Blinking when something comes close to your eyes (1)
- Sneezing when dust enters nose (1)
  Must include stimulus and response.

(b) Why are reflex actions important?

- Protect the body from harm / prevent injury (1)

[Total: 2 marks]

Q5. Hormones are chemical messengers.

(a) Where are hormones produced?

- **Glands** (accept "endocrine glands") (1)

(b) Name one organ that is affected by adrenaline.
Any one from:

- Heart (1)

- Lungs (1)
- Liver (1)

[Total: 2 marks]

Q6. The endocrine system controls many body functions.

(a) State one difference between the nervous system and the endocrine system.
Any one pair of contrasting points:

- Nervous system uses electrical impulses; endocrine uses hormones (1)
- Nervous is faster; endocrine is slower (1)
- Nervous has short-term effects; endocrine has longer-lasting effects (1)

[Total: 2 marks]

Q7. Blood glucose concentration is controlled by the pancreas.

(a) Name the hormone that lowers blood glucose levels.

- **Insulin** (1)

(b) How does this hormone work?
Any two from:

- Causes glucose to move from blood into cells (1)
- Glucose is converted to glycogen (1)
- Glycogen is stored in liver/muscles (1)

[Total: 3 marks]

Q8. Diabetes affects the control of blood glucose.

(a) What is the difference between Type 1 and Type 2 diabetes?

- Type 1: body does not produce insulin (1)
- Type 2: body's cells do not respond to insulin (1)

[Total: 2 marks]

Q9. Hormones control the menstrual cycle.

(a) Name the hormone that stimulates the release of an egg.

- **LH / Luteinising hormone** (1)

(b) Name the gland that produces FSH.

- **Pituitary gland** (1)

[Total: 2 marks]

Q10. Contraceptives help prevent pregnancy.

(a) State one type of hormonal contraceptive.
Any one from:

- Contraceptive pill (1)
- Contraceptive implant (1)
- Contraceptive injection / patch (1)

(b) Suggest one non-hormonal method of contraception.
Any one from:

- Condom (1)
- Diaphragm / cap (1)
- Intrauterine device (non-hormonal coil) (1)

[Total: 2 marks]

Q11. Fertility treatment involves hormones.

(a) Name one hormone used in fertility treatment.

- FSH or LH (1)

(b) Suggest one ethical concern of fertility treatment.
Any one from:

- Multiple births / risk to mother or babies (1)
- Unused embryos / embryo selection / religious or moral concerns (1)

[Total: 2 marks]

Q12. The structure of a nerve cell helps its function.

(a) Describe how the shape of a nerve cell is adapted for its function.
Any two from:

- Long axon to carry impulses over long distances (1)
- Branched endings (dendrites) to connect to other neurons (1)
- Myelin sheath to insulate and speed up impulse (1)

[Total: 2 marks]

Q13. Control systems in the body use receptors and effectors.

(a) What is the function of a receptor?

- Detects changes in the environment / detects stimuli (1)

(b) Give one example of an effector in the human body.
Any one from:

- Muscle (1)
- Gland (1)

[Total: 2 marks]

Q14. The eye adjusts to light and dark conditions.

(a) What part of the eye controls the amount of light entering?

- **Iris** (1)

(b) Describe how the eye reacts to bright light.

- Pupil becomes smaller / constricts (1)
- Circular muscles in the iris contract (1)

[Total: 3 marks]

Q15. Scientists test hormone levels in the blood.

(a) Suggest one reason for measuring hormone levels.
Any one from:

- To diagnose a condition (e.g. diabetes, thyroid problem) (1)
- To monitor fertility / menstrual cycle (1)
- To check for hormonal imbalances (1)

(b) Describe how hormone levels can be tested.
Any two from:

- Take a blood sample (1)
- Use a machine / chemical test to analyse hormone levels (1)
- Compare with normal range / doctor's assessment (1)

[Total: 3 marks]

Q16. The brain controls complex behaviours.

(a) Name the part of the brain responsible for memory.

- **Cerebrum** (accept "cerebral cortex") (1)

(b) How can scientists study the brain?
Any two from:

- MRI scans (1)
- Studying patients with brain damage (1)
- Electrical stimulation of brain areas (1)

[Total: 3 marks]

Q17. The kidneys maintain water balance.

(a) What is the name of the hormone that controls water levels?

- **ADH (antidiuretic hormone)** (1)

(b) Explain what happens when the body is dehydrated.

- More ADH is released (1)
- Kidneys reabsorb more water / less water lost in urine (1)

[Total: 3 marks]

Q18. Plant roots respond to gravity.

(a) What is the name of this response?

- **Gravitropism / geotropism** (1)

(b) Name the plant hormone involved.

- **Auxin** (1)

[Total: 2 marks]

Q19. Auxins control plant growth.

(a) Describe one effect of auxins on plant shoots.

- Auxins cause shoots to bend towards light / grow longer on shaded side (1)
- Causes cell elongation (1)

(b) Suggest one commercial use of auxins.
Any one from:

- Rooting powder (1)
- Weed killer / selective herbicide (1)
- Promoting fruit growth (1)

[Total: 3 marks]

Q20. Hormones can be used to delay or trigger processes in the body.

(a) Give one example of a medical use of hormones.
Any one from:

- Insulin for diabetes (1)
- Contraceptive pill (1)
- Fertility treatment (1)
- HRT (hormone replacement therapy) (1)

(b) Explain why hormones are only needed in small quantities.

- Hormones are very powerful (1)
- They trigger responses / effects even at low concentrations (1)

[Total: 3 marks]

Q21. The nervous system transmits signals rapidly.

(a) Describe how information is passed across a synapse.

- Electrical impulse reaches the end of neurone (1)
- Chemical (neurotransmitter) released and diffuses across the synapse (1)

(b) Why is transmission across synapses slower than in neurones?

- Diffusion of chemicals is slower than electrical impulses (1)
- Impulse must be converted to chemical signal and back (1)

[Total: 4 marks]

Q22. Hormonal and nervous responses differ in speed and duration.

(a) Compare the speed and duration of hormonal and nervous responses.

- Nervous: faster, short-lasting (1)
- Hormonal: slower, longer-lasting (1)

(b) Give one reason why hormonal responses are useful for long-term changes.

- They regulate processes like growth, metabolism, or reproduction (1)

[Total: 3 marks]

Q23. FSH and LH are hormones involved in fertility.

(a) Describe the roles of FSH and LH in the menstrual cycle.

- FSH stimulates egg maturation and oestrogen production (1)
- LH triggers ovulation / release of egg (1)
- LH also stimulates progesterone production (1)

[Total: 3 marks]

Q24. IVF treatment uses hormone therapy.

(a) Explain how hormones are used during IVF.

- FSH given to stimulate egg maturation (1)
- LH triggers ovulation / release of eggs (1)
- Hormones increase the number of mature eggs for collection (1)

(b) Suggest one ethical issue linked to IVF.
Any one from:

- Embryo selection / disposal of unused embryos (1)
- Expensive and may not be successful (1)

[Total: 4 marks]

Q25. Diabetes is a condition related to blood glucose regulation.

(a) Explain the differences in treatment between type 1 and type 2 diabetes.

- Type 1: treated with insulin injections (1)
- Type 2: treated with diet and exercise (1)
- Type 2 may also require medication to improve insulin response (1)

[Total: 3 marks]

Q26. The body regulates blood glucose concentration.

(a) Explain the role of glucagon when blood glucose levels fall.

- Glucagon is released by pancreas (1)

- Causes liver to convert glycogen into glucose (1)
- Glucose is released into the blood (1)

[Total: 3 marks]

Q27. Kidney failure can be treated using dialysis or transplantation.

(a) Describe how dialysis works.

- Blood is removed and passed through dialysis machine (1)
- Dialysis fluid has correct concentrations of substances (1)
- Waste substances (e.g. urea) diffuse out of the blood (1)

(b) State one advantage and one disadvantage of kidney transplants.
Advantage: normal lifestyle / no regular dialysis (1)
Disadvantage: risk of rejection / need for immunosuppressants (1)

[Total: 5 marks]

Q28. The brain has several important regions.

(a) Describe the function of the cerebral cortex.

- Responsible for consciousness, intelligence, memory, and language (1)
- Controls voluntary actions (1)

(b) Explain one risk of studying the brain using electrical stimulation.

- May damage the brain / affect other functions (1)

[Total: 3 marks]

Q29. The iris controls the amount of light entering the eye.

(a) Explain how the iris responds to dim light.

- Pupil dilates (gets bigger) (1)
- Radial muscles contract, circular muscles relax (1)

(b) Why is this response important?

- Allows more light in so vision is improved in low light (1)

[Total: 3 marks]

Q30. Homeostasis includes control of water balance.

(a) Explain how ADH affects the kidney tubules.

- Increases permeability of tubules (1)
- More water reabsorbed back into the blood (1)

(b) What would happen to urine output if ADH production stopped?

- Large volume of dilute urine produced (1)

[Total: 3 marks]

Q31. Plant growth can be affected by light and gravity.

(a) Describe how auxin is distributed in a plant shoot exposed to light from one side.

- Auxin moves to the shaded side of the shoot (1)
- Higher auxin concentration on shaded side (1)

(b) Explain the effect this has on the direction of growth.

- Cells on shaded side elongate more (1)
- Shoot bends towards the light (1)

[Total: 4 marks]

Q32. Negative feedback maintains stable internal conditions.

(a) Define negative feedback.

- A response that counteracts a change (1)
- To bring internal conditions back to normal / set point (1)

(b) Give one example of negative feedback in the body.
Any one from:

- Blood glucose regulation (1)
- Body temperature control (1)
- Water balance / ADH control (1)

[Total: 3 marks]

Q33. Blood glucose regulation is an example of homeostasis.

(a) Describe what happens when blood glucose levels rise after eating.

- Insulin released from pancreas (1)
- Glucose converted to glycogen (1)
- Stored in liver and muscle cells (1)

[Total: 3 marks]

Q34. Hormones play a key role in the menstrual cycle.

(a) Explain how progesterone prevents the release of an egg.

- Inhibits the release of FSH and LH (1)
- Prevents egg maturation and ovulation (1)

(b) What would happen if progesterone levels remain high throughout the cycle?

- No ovulation / egg not released (1)

[Total: 3 marks]

Q35. Thermoregulation is controlled by the hypothalamus.

(a) Explain how sweating helps reduce body temperature.

- Sweat evaporates from skin surface (1)
- Takes heat energy away from the body (1)

(b) Suggest one disadvantage of excessive sweating.
Any one from:

- Dehydration (1)
- Loss of salts / minerals (1)

[Total: 3 marks]

Q36. Receptors and effectors are involved in control systems.

(a) Define the term 'effector' and give one example.

- Muscle or gland that carries out a response (1)
- Example: muscle contracts / gland secretes hormone (1)

[Total: 2 marks]

Q37. Scientists use MRI scans to study brain structure.

(a) Suggest one advantage and one limitation of using MRI.
Advantage: non-invasive / detailed images (1)
Limitation: expensive / can't show brain activity directly (1)

[Total: 2 marks]

Q38. Body temperature regulation is an example of negative feedback.

(a) Describe what happens when body temperature falls below normal.

- Thermoregulatory centre detects change (1)
- Vasoconstriction reduces heat loss (1)
- Muscles shiver to generate heat (1)

[Total: 3 marks]

Q39. Contraceptive pills contain hormones.

(a) Explain how contraceptive pills prevent pregnancy.

- Contain oestrogen and/or progesterone (1)
- Inhibit FSH and LH (1)
- Prevent ovulation / egg release (1)

[Total: 3 marks]

Q40. Plants show phototropism and gravitropism.

(a) Compare phototropism and gravitropism in shoots and roots.

- Shoots: positive phototropism, negative gravitropism (1)
- Roots: negative phototropism, positive gravitropism (1)
- Due to unequal auxin distribution (1)

[Total: 3 marks]

Q41. Kidney dialysis can be life-saving.

(a) Explain why dialysis fluid must contain the same concentration of useful substances as blood.

- So useful substances (e.g. glucose, ions) don't diffuse out (1)
- Only waste products like urea are removed (1)

[Total: 2 marks]

Q42. Blood glucose must be kept within narrow limits.

(a) Suggest what might happen if blood glucose remains high for a long time.
Any two from:

- Damage to organs (e.g. kidneys, eyes) (1)
- Risk of heart disease / stroke / nerve damage (1)
- Increased risk of infection (1)

[Total: 2 marks]

Q43. Auxins are plant hormones used commercially.

(a) Describe how auxins are used in agriculture.

- Used as rooting powder to promote root growth (1)
- Used as weed killers / selective herbicides (1)

[Total: 2 marks]

Q44. Thermoregulation helps keep enzymes working efficiently.

(a) Explain why enzymes stop working properly if body temperature is too high.

- Enzymes denature / active site changes shape (1)
- Substrate no longer fits / reaction slows down (1)

[Total: 2 marks]

Q45. The pancreas has an important role in homeostasis.

(a) Explain how insulin and glucagon work together to regulate blood sugar levels.

- Insulin lowers blood glucose by converting glucose to glycogen (1)
- Glucagon increases blood glucose by converting glycogen to glucose (1)
- Maintain stable blood sugar levels (1)

[Total: 3 marks]

Q46. Synthetic ADH and Kidney Function

(a) Explain how ADH affects the concentration of urine.

- ADH increases permeability of kidney tubules (1)
- More water is reabsorbed into the bloodstream (1)
- Produces a smaller volume of more concentrated urine (1)

(b) Why might synthetic ADH help people with diabetes insipidus?

- They produce insufficient or no ADH naturally (1)
- Synthetic ADH reduces water loss and helps maintain hydration (1)

[Total: 5 marks]

Q47. Contraceptive Hormones and Ovulation

(a) Describe the role of LH in the menstrual cycle.

- LH triggers ovulation / release of the egg (1)
- Stimulates the release of progesterone (1)

(b) Explain how contraceptive hormones prevent pregnancy.

- Oestrogen inhibits FSH, preventing egg maturation (1)
- Progesterone inhibits LH, preventing ovulation (1)
- Also thickens cervical mucus to block sperm (1)

[Total: 5 marks]

Q48. Phototropism in Genetically Modified Plants

(a) What is meant by a positive phototropism?

- Growth of a plant towards light (1)
- Increases exposure to light for photosynthesis (1)

(b) How does auxin distribution cause phototropism in shoots?

- Auxin accumulates on the shaded side of the shoot (1)
- Stimulates cell elongation on that side (1)
- Shoot bends toward the light (1)

[Total: 5 marks]

Q49. Thyroxine and Metabolic Disorders

(a) Name the gland that produces thyroxine.

- Thyroid gland (1)

(b) One effect of thyroxine on the body:

- Increases metabolic rate (1)
- Affects growth and development / heart rate / body temperature (1)

[Total: 3 marks]

Q50. Comparing Insulin and Glucagon

(a)

- Insulin lowers blood glucose (1)
- By converting glucose to glycogen in the liver (1)
- Glucagon raises blood glucose (1)
- By converting glycogen to glucose in the liver (1)

[Total: 4 marks]

Q51. Plant Hormones in Practice

(a) One example of gibberellin use:

- Stimulates seed germination (1)
- Promotes stem elongation or flowering (1)

(b) One commercial use of ethene:

- Ripening of fruit (e.g. bananas, tomatoes) (1)

[Total: 3 marks]

Q52. Hormonal Coordination in Menstrual Cycle

(a) Explain how FSH and LH are involved.

- FSH stimulates egg maturation (1)
- FSH also stimulates oestrogen production (1)
- LH triggers ovulation / release of the egg (1)

(b) How is progesterone used in contraceptive pills?

- Inhibits LH and FSH to prevent ovulation (1)

- Thickens cervical mucus to block sperm entry (1)

[Total: 5 marks]

Q53. Studying Brain Function

(a) Name one method:

- MRI scan / electrical stimulation / studying brain damage (1)

(b) One risk of brain surgery:

- Could damage healthy brain tissue (1)
- May lead to loss of function or infection (1)

[Total: 3 marks]

Q54. Artificial Pancreas Systems

(a) What is negative feedback?

- A system that counteracts a change (1)
- To maintain stable internal conditions (1)

(b) Why might artificial pancreas be better than injections?

- Automatically monitors and adjusts insulin levels (1)
- Maintains tighter glucose control (1)
- Reduces risk of hypo/hyperglycemia (1)

[Total: 5 marks]

Q55. Phototropism and Agriculture

(a) Role of auxin in phototropism:

- Auxin accumulates on the shaded side of shoot (1)
- Stimulates cell elongation, causing bending toward light (1)

(b) Agricultural use:

- Optimise plant orientation for light exposure (1)
- Improve crop yield or control growth direction (1)

[Total: 4 marks]

Q56. Brain Structure and Study

(a) Function of medulla:

- Controls unconscious activities (e.g. breathing, heartbeat) (1)

(b) One way scientists study the brain:

- Use MRI scans to examine structure (1)
- Electrical stimulation to observe response (1)

[Total: 3 marks]

Q57. Focusing on a Near Object

(a)

- Ciliary muscles contract (1)
- Suspensory ligaments loosen (1)
- Lens becomes thicker/more curved to refract more light (1)

[Total: 3 marks]

Q58. Hormones in Metabolism

(a) One role of adrenaline:

- Increases heart rate / prepares body for "fight or flight" (1)

(b) How thyroxine affects metabolism:

- Increases rate of respiration (1)
- Increases energy release and oxygen use (1)

[Total: 3 marks]

Q59. Blood Glucose After a Meal

(a)

- Blood glucose rises after eating (1)
- Pancreas releases insulin (1)
- Glucose converted to glycogen and stored in liver/muscles (1)

[Total: 3 marks]

Q60. Hormone Fertility Treatments – Benefits and Risks

(a) Benefits:

- Helps couples conceive (1)
- Can overcome hormone imbalances (1)
- Allows use of IVF and egg harvesting (1)

Risks:

- May cause multiple births (1)
- Expensive and not always successful (1)
- Emotional/physical stress from hormone use or IVF (1)

[Total: 6 marks]