Tricky Exam Questions
Biopsychology

Try these questions without using any of your notes, then use your notes to supplement your answers and finally check with the suggested answers in this document.

3 markers

1. Outline the structure and function of the motor cortex. (3 marks)
2. Outline the structure and function of the somatosensory area. (3 marks)
3. Outline the structure and function of the visual area. (3 marks)
4. Outline the structure and function of the auditory area. (3 marks)

4 markers

These questions demand more AO1 knowledge than you would need to include for the concept if it were part of a 16-mark essay. Therefore, the exam board use these types of questions to differentiate between the top achieving students from others.

1. Outline the function of the nervous system. (4 marks)
2. Outline the structure and function of the central nervous system. (4 marks)
3. Outline the structure and function of the peripheral nervous system. (4 marks)
4. Outline the structure and function of the somatic nervous system. (4 marks)
5. Outline the structure and function of the autonomic nervous system. (4 marks)
6. Outline the structure and function of the sensory neurons. (4 marks)
7. Outline the structure and function of the relay neurons. (4 marks)
8. Outline the structure and function of the motor neurons. (4 marks)
9. Outline the process of excitation in synaptic transmission. (4 marks)
10. Outline the process of inhibition in synaptic transmission. (4 marks)
11. Outline the process of summation in synaptic transmission. (4 marks)
12. Identify and outline the function of one neurotransmitter. (4 marks)
13. Outline the function of the endocrine system. (4 marks)
14. Identify and outline the function of one hormone. (4 marks)
15. Identify and outline the function of one gland. (4 marks)
16. Outline the role of adrenaline. (4 marks)

17. Using an example, outline what is meant by localisation of function. (4 marks)
18. Outline the structure and function of Broca's area. (4 marks)
19. Outline the structure and function of Wernicke's area. (4 marks)
20. Outline the structure and function of the language centres. (4 marks)
21. Using an example, outline what is meant by hemispheric lateralisation. (4 marks)
22. Outline a study using split brain patients. (4 marks)
23. Outline the procedure of a study using split brain patients. (4 marks)
24. Outline the findings of a study using split brain patients. (4 marks)
25. Outline what is meant by plasticity of the brain. (4 marks)
26. Outline a study investigating plasticity of the brain. (4 marks)
27. Outline the procedure of a study investigating plasticity of the brain. (4 marks)
28. Outline the findings of study investigating plasticity of the brain. (4 marks)
29. Outline what is meant by functional recovery of the brain after trauma. (4 marks)
30. Outline how fMRIs are used as ways of studying the brain. (4 marks)
31. Outline how EEGs are used as ways of studying the brain. (4 marks)
32. Outline how ERPs are used as ways of studying the brain. (4 marks)
33. Outline how postmortem examinations are used as ways of studying the brain. (4 marks)
34. Outline circadian rhythms. (4 marks)
35. Outline a study investigating circadian rhythms. (4 marks)
36. Outline the procedure of a study investigating circadian rhythms. (4 marks)
37. Outline the findings of a study investigating circadian rhythms. (4 marks)
38. Outline infradian rhythms. (4 marks)
39. Outline a study investigating infradian rhythms. (4 marks)
40. Outline the procedure of a study investigating infradian rhythms. (4 marks)
41. Outline the findings of a study investigating infradian rhythms. (4 marks)
42. Outline ultradian rhythms. (4 marks)
43. Using an example, explain the differences between infradian and ultradian rhythms. (4 marks)
44. Outline the effects of endogenous pacemakers on the sleep/wake cycle. (4 marks)
45. Outline a study investigating the effects of endogenous pacemakers. (4 marks)
46. Outline the procedure of a study investigating the effects of endogenous pacemakers. (4 marks)

47. Outline the findings of a study investigating the effects of endogenous pacemakers. (4 marks)
48. Outline the effects of exogenous zeitgebers on the sleep/wake cycle. (4 marks)
49. Outline a study investigating the effects of exogenous zeitgebers. (4 marks)
50. Outline the procedure of a study investigating the effects of exogenous zeitgebers. (4 marks)
51. Outline the findings of a study investigating the effects of exogenous zeitgebers. (4 marks)

6 markers

1. Outline the process of synaptic transmission. (6 marks)
2. Outline the fight or flight process in humans. (6 marks)

8 markers

1. Discuss the effects of endogenous pacemakers on the sleep/ wake cycle. (8 marks)
2. Discuss the effects of exogenous zeitgebers on the sleep/ wake cycle. (8 marks)

Suggested Answers

1 mark would be awarded per bullet point. Not all bullet points are needed. Answers below are suggested answers only.

3 markers

1. Motor cortex (3 marks)

- Located in the (posterior) frontal lobe.
- Organised contralaterally, controlling the opposite side of the body.
- Responsible for initiating voluntary movements.

2. Somatosensory area (3 marks)

- Located in the parietal lobe.
- Processes sensory information such as touch, pressure, and temperature.
- Different body areas are mapped to specific regions (somatosensory homunculus).

3. Visual area (3 marks)

- Located in the occipital lobe.
- Processes visual information such as colour, shape, and movement.
- Receives input contralaterally e.g. left visual field → right hemisphere.

4. Auditory area (3 marks)

- Located in the temporal lobe, in the auditory cortex.
- Processes sound information, including pitch and loudness.
- Processes information received by the ears.

4 markers

1. Function of the nervous system (4 marks)

- To communicate messages via neurons and electrical impulses.
- To send messages very quickly (faster acting than the endocrine system).
- To collect and process information from the environment.
- To coordinate responses to external stimuli e.g. reflex actions
- Works together with the endocrine system to control the body's organs and behaviour.

2. Structure & function of the CNS (4 marks)

- Consists of the brain and spinal cord.
- Reflex actions are coordinated in the spinal cord.
- Brain controls complex processes like thinking and emotion.
- Spinal cord relays messages between brain and body.
- Coordinates all voluntary and involuntary responses.

3. Structure & function of the PNS (4 marks)

- Consists of all nerves outside the CNS.
- Divided into the somatic and autonomic systems.
- Transmits information from body to CNS.
- Sends commands from CNS to muscles and organs.

4. Structure & function of the somatic nervous system (4 marks)

- Part of the peripheral nervous system.
- Contains sensory and motor neurons.
- Controls voluntary movement of skeletal muscles.
- Transmits sensory information from receptors to CNS.

5. Structure & function of the autonomic nervous system (4 marks)

- Subdivision of the peripheral nervous system.
- Controls involuntary actions (e.g., heart rate, digestion).
- Has sympathetic and parasympathetic branches.
- Maintains homeostasis and regulates internal organs.

6. Structure & function of sensory neurons (4 marks)

- Have long dendrites and short axons.
- Carry messages from receptors to the CNS.
- Convert external stimuli into electrical impulses.
- Found in the somatic NS only.

7. Structure & function of relay neurons (4 marks)

- Found entirely within the CNS.
- Make up around 90% of all neurons in the human body.
- Have short dendrites and short axons.
- Connect sensory neurons to motor neurons.
- Allow communication within the CNS.

8. Structure & function of motor neurons (4 marks)

- Have short dendrites and long axons.
- Carry messages from CNS to muscles or glands.
- Cause muscles to contract or glands to secrete.
- Found in the somatic and autonomic NS.

9. Process of excitation in synaptic transmission (4 marks)

- When excitatory neurotransmitters (e.g., glutamate) bind to receptors it creates an EPSP.
- This is a positive charge in the postsynaptic neuron.
- Increase likelihood of firing an action potential.
- Make the postsynaptic neuron more likely to fire an action potential.

10. Process of inhibition in synaptic transmission (4 marks)

- When inhibitory neurotransmitters (e.g., GABA) bind to receptors it creates an IPSP.
- This is a negative charge in the postsynaptic neuron.
- Decrease likelihood of the neuron firing.
- Make the postsynaptic neuron less likely to fire an action potential.

11. Process of summation in synaptic transmission (4 marks)

- Summation combines all excitatory and inhibitory inputs.
- If excitatory input outweighs inhibitory, neuron fires.
- If inhibitory input outweighs excitatory, neuron does not fire.
- Determines whether the postsynaptic neuron reaches threshold.

12. Identify and outline the function of one neurotransmitter (4 marks)
(Example: Serotonin)
- Serotonin is an inhibitory neurotransmitter.
- Regulates mood, sleep, and appetite.
- Low levels are linked to depression and aggression.
- Used to pass messages between neurons through neurotransmission.

13. Function of the endocrine system (4 marks)
- Uses glands to release hormones into the bloodstream.
- Regulates processes such as metabolism, growth, and stress.
- Works alongside the nervous system for body control.
- Produces slow but long-lasting responses.

14. Identify and outline the function of one hormone (4 marks)
(Example: Adrenaline)
- Function is to pass messages around the endocrine system.
- Released by the adrenal glands into the blood.
- Increases heart rate and breathing.
- Prepares the body for fight or flight.

15. Identify and outline the function of one gland (4 marks)
(Example: Pituitary gland)
- Known as the "master gland."
- Controls release of hormones from other glands.
- Releases ACTH to trigger stress responses.
- Regulates growth, reproduction, and metabolism.

16. Outline the role of adrenaline (4 marks)
- Released during stress by adrenal medulla into the bloodstream.
- Prepares the body for the fight-or-flight response.
- Increases heart rate to pump blood around the body.
- Diverts blood to muscles for action for fight or flight.

17. Localisation of function (example) (4 marks)
- Theory that different brain areas have specific functions.
- Instead of being holistic, functions are localised.
- Example: Broca's area controls speech production.
- Damage to that area leads to speech deficits.

18. Structure & function of Broca's area (4 marks)
- Located in the left frontal lobe.
- Responsible for speech production.
- Damage causes Broca's aphasia.
- Characterised by speech that is slow, laborious and lacks in fluency.

19. Structure & function of Wernicke's area (4 marks)
- Located in the left temporal lobe.
- Responsible for language comprehension.

- Damage causes Wernicke’s aphasia.
- Characterised by fluent but meaningless speech i.e. word salad.

20. Structure & function of the language centres (4 marks)

- Both lateralised to the left.
- Broca’s area: speech production.
- Wernicke’s area: language comprehension.
- Broca's area: frontal lobe, Wernicke’s area: temporal lobe.

21. Hemispheric lateralisation (example) (4 marks)

- Idea that some functions are specialised to one hemisphere.
- The left hemisphere is dominant for language.
- The right hemisphere specialises in spatial and visual tasks.
- Brain operates contralaterally.

22. Outline a study using split-brain patients (4 marks)

(Example: Sperry)

- Sperry studied patients who had their corpus callosum severed.
- Used tasks presenting information to one visual field.
- Found if a word presented to the RVF, ppt could name it but if LVF could not.
- Found if a word presented to the RVF, ppt could not name it but could select the matching object.
- Accept any other findings

23. Procedure of a split-brain study (4 marks)

- Divided field methodology: Participants fixated on a central point.
- Images/words flashed to one visual field for 1/10 of a second.
- Ppts asked to say what they saw
- Ppts asked to select the matching object
- Ppts asked to select a matching face

24. Findings of a split-brain study (4 marks)

- Info to left visual field couldn’t be named (right hemisphere lacks language).
- Patients could draw objects presented to left visual field.
- Info to right visual field could be named normally.
- Ppts said the gender which was presented to RVF but selected the gender on the LVF.

25. What is meant by brain plasticity? (4 marks)

- The brain’s ability to change and adapt.
- Involves forming new connections between neurons – new neural pathways.
- Involves forming new neurons – neurogenesis.
- Involves deleting connections between neurons – neural pruning.
- Occurs due to learning or experience.
- Reference to Maguire (or other studies) findings

26. Study investigating plasticity (4 marks)

(Example: Maguire)

- Studied 16 London taxi drivers who had completed The Knowledge test

- Used MRI scans to compare their brains to 50 right-handed controls.
- Found increased grey matter in posterior hippocampus.
- Concluded navigation experience changes brain structure.

27. Procedure of a plasticity study (4 marks)
(Maguire)
- Studied 16 London taxi drivers who had completed The Knowledge test
- Used MRI scans to compare their brains to 50 right-handed controls
- Measured volume of hippocampal grey matter.
- Correlated time spent as taxi driver and size of posterior hippocampus.

28. Findings of a plasticity study (4 marks)
(Maguire)
- Taxi drivers had more grey matter in posterior hippocampus.
- Amount correlated with years of experience.
- Suggests learning changes brain structure.
- Demonstrates adult brain plasticity.

29. Functional recovery after trauma (4 marks)
- Brain reforms connections after injury.
- Unaffected areas can take over lost functions – neural reorganisation.
- Neural regeneration – new connections and/ or neurons.
- Activation of dormant synapses.
- Includes axonal sprouting and reformation of blood vessels.
- Involves recruitment of homologous areas in opposite hemisphere.

30. How fMRIs are used to study the brain (4 marks)
- Measure changes in blood oxygenation.
- Show which brain areas are active during tasks.
- Produce detailed 3D images of brain activity.
- Useful for understanding localisation of function.

31. How EEGs are used to study the brain (4 marks)
- Measure electrical activity via electrodes on the scalp.
- Detect patterns such as brain waves.
- Useful for investigating sleep, epilepsy, and abnormalities.
- Provide real-time, high temporal resolution data.

32. How ERPs are used to study the brain (4 marks)
- Are EEG recordings in response to specific stimuli.
- Extracted by averaging EEG data over many trials – statistical averaging techniques
- Show brain's electrical response to sensory, cognitive, or motor events.
- Allow researchers to study processing of specific information.

33. How post-mortem examinations study the brain (4 marks)
- Analyse the brain after death.
- Often used on individuals with rare disorders.
- Compare brain structure to behaviour before death.

- Allow detailed examination of deeper brain regions.

34. Outline circadian rhythms (4 marks)

- Biological rhythms lasting about 24 hours.
- Example: the sleep–wake cycle.
- Governed by endogenous pacemakers like the SCN.
- Influenced by exogenous zeitgebers like light.

35. Study investigating circadian rhythms (4 marks)

(Example: Siffre)

- Siffre lived in a cave with no natural light for six months.
- Studied impact on sleep–wake cycle.
- Found circadian rhythm extended to 25 hours on average.
- Concluded internal clock runs without external cues.
- External cues (EZs) can influence the rhythm.

36. Procedure of a circadian rhythm study (4 marks)

(Siffre)

- Spent 6 months underground.
- Removed all external cues (no clocks or daylight).
- Measured sleep and wake times.
- Carried out cognitive and physical tests.
- Recorded physiological changes.

37. Findings of a circadian rhythm study (4 marks)

(Siffre)

- Sleep–wake cycle settled around 25 hours.
- Showed circadian rhythms persist without cues.
- But external cues normally reset the clock to 24 hours.
- Demonstrated role of endogenous pacemakers.
- External cues (EZs) can influence the rhythm.

38. Outline infradian rhythms (4 marks)

- Biological rhythms longer than 24 hours.
- Example: the menstrual cycle.
- Controlled by hormones like oestrogen and progesterone. Hypothalamus the EP.
- Can be influenced by external cues (EZs) such as pheromones.

39. Study investigating infradian rhythms (4 marks)

(Example: McClintock)

- Investigated menstrual synchrony in women living together.
- Took samples of 9 women's pheromones.
- Applied them to other 20 women's upper lips.
- Found cycles changed in 68% of sample to become synchronised.

40. Procedure of an infradian rhythm study (4 marks)

(McClintock)

- Collected pheromone samples from 9 women at different cycle stages using a cotton pad under the arm.
- Applied them to 20 participants' upper lips.
- Repeated over several months.
- Measured changes in menstrual cycle length.

41. Findings of an infradian rhythm study (4 marks)
(McClintock)

- Women exposed to pheromones showed cycle changes.
- Cycles shortened when exposed to early-cycle pheromones.
- Cycles lengthened when exposed to late-cycle pheromones.
- Supports the role of external cues (pheromones).

42. Outline ultradian rhythms (4 marks)

- Biological rhythms shorter than 24 hours.
- Example: stages of sleep.
- Include cycles of REM and non-REM sleep. Stage 1 and 2 = light sleep and Stages 3 and 4 = deep sleep.
- Typically repeat every 90 minutes.

43. Difference between infradian and ultradian rhythms (example) (4 marks)

- Infradian rhythms last longer than 24 hours.
- Ultradian rhythms last less than 24 hours.
- Example infradian: menstrual cycle (~28 days).
- Example ultradian: sleep cycle (~90 minutes).

44. Effects of endogenous pacemakers on the sleep/wake cycle (4 marks)

- SCN acts as the internal body clock. Tiny bundle of nerve fibres in the hypothalamus.
- Regulates circadian rhythms like sleep.
- Sends signals to the pineal gland.
- Controls melatonin release, inducing sleepiness.

45. Study investigating effects of endogenous pacemakers (4 marks)
(Example: Ralph)

- Bred mutant hamsters with 20-hour rhythms.
- Transplanted SCN of mutants into rats foetuses.
- Normal hamsters adopted the 20-hour rhythm.
- Then implanted the SCN cells of 24 hour hamsters into the rats and rhythm changed to 24 hours.
- Shows SCN controls circadian timing.

46. Procedure of a study on endogenous pacemakers (4 marks)
(Example: Ralph)

- Mutant hamsters with 20 hour SCNs were identified.
- Their SCNs were surgically removed and transplanted into rat foetuses.
- Behavioural rhythms were monitored.
- Then implanted the SCN cells of 24 hour hamsters into the rats and monitored.

47. Findings of a study on endogenous pacemakers (4 marks)
(Ralph)

- Normal hamsters shifted to 20-hour cycles.
- Rhythm matched the donor SCN.
- Demonstrated SCN drives circadian rhythm.
- Provided strong evidence for biological clock control.

Also accept Siffre or any other relevant study.

48. Effects of exogenous zeitgebers on the sleep/wake cycle (4 marks)

- External cues help regulate biological rhythms.
- Light resets the SCN daily.
- Social cues (mealtimes) also influence timing.
- Entrain the rhythms.
- Details of any study to support EZs e.g. Campbell and Murphy

49. Study investigating exogenous zeitgebers (4 marks)
(Example: Campbell & Murphy)

- Investigated light as a zeitgeber.
- Shone light on backs of participants' knees.
- Circadian rhythms shifted up to 3 hours.
- Shows light can influence rhythms without eyes.

50. Procedure of a zeitgeber study (4 marks)
(Campbell & Murphy)

- 15 participants slept in a lab.
- Light pads applied to backs of knees.
- Light exposure occurred during the night.
- Measured changes in sleep–wake cycle.

51. Findings of a zeitgeber study (4 marks)

- Participants' sleep–wake cycles shifted by up to 3 hours.
- Light exposure to the knees affected circadian timing.
- Demonstrated that light can act as a zeitgeber even without retinal input.
- Supports the role of external cues in regulating biological rhythms.

6 markers

1. Outline the process of synaptic transmission (6 marks)

- An electrical impulse (action potential) travels down the presynaptic neuron.
- The impulse triggers vesicles to release neurotransmitters into the synaptic cleft.
- Neurotransmitters diffuse across the synaptic gap.
- They bind to receptor sites on the postsynaptic neuron. This causes either excitation or inhibition, changing the neuron's charge.
- If threshold is reached, the postsynaptic neuron fires a new action potential.
- Then the neurotransmitter is goes through reuptake or is metabolised.

2. Outline the fight or flight process in humans (6 marks)

- A stressor is detected and the amygdala alerts the hypothalamus.
- The sympothomedullary pathway is activated.
- The hypothalamus activates the sympathetic nervous system.
- The adrenal medulla releases adrenaline into the bloodstream.
- Adrenaline increases heart rate, blood pressure, and breathing.
- Blood is diverted to muscles for rapid physical action.
- The parasympathetic nervous system later restores the body to normal.

8 markers

1. Discuss the effects of endogenous pacemakers on the sleep/wake cycle (8 marks)

AO1 (3 marks)

- Endogenous pacemakers are internal biological clocks, the main one being the suprachiasmatic nucleus (SCN) in the hypothalamus.
- The SCN regulates the sleep/wake cycle by sending signals to the pineal gland to release melatonin, which induces sleepiness.
- The SCN maintains a roughly 24-hour circadian rhythm even without external cues, showing it is the primary controller of sleep timing.

AO3 (5 marks)

- Supporting evidence: Ralph (mutant hamster study) shows that transplanting an abnormal SCN causes animals to adopt a new sleep/wake cycle, demonstrating the SCN's control.
- Supporting human evidence: Siffre's cave studies showed that without external cues, his sleep/wake cycle remained regular (though slightly longer), supporting the idea of an internal pacemaker. Miles – case study of blind man who had to take stimulants.
- Criticism – animals: Much research comes from animals, which limits generalisability because human circadian rhythms are influenced by culture, cognition, and social factors.
- Interactionist approach: Endogenous pacemakers do not act alone; they interact with exogenous zeitgebers, so it may be reductionist to consider them in isolation.
- Individual differences: People show natural variations (e.g., "larks" and "owls"), suggesting the SCN alone cannot explain differences in sleep patterns.

2. Discuss the effects of exogenous zeitgebers on the sleep/wake cycle (8 marks)

AO1 (3 marks)

- Exogenous zeitgebers are **external cues**, such as **light** and **social routines**, which help regulate the sleep/wake cycle.
- Light resets the SCN in a process called **entrainment**, keeping the circadian rhythm aligned with the environment.
- Social cues (mealtimes, social interactions) also help keep the sleep/wake cycle in sync, especially in infants whose SCN is not fully developed.

AO3 (5 marks)

- **Supporting evidence:** Campbell and Murphy showed that shining light on the back of participants' knees shifted their sleep/wake cycle, demonstrating that light can influence the internal clock indirectly.
- **Practical application:** Understanding zeitgebers helps reduce jet lag and improve shift-work adjustment through controlled light exposure and structured routines.
- **Criticism – methodological issues:** Campbell & Murphy's study may lack control, as even tiny amounts of normal light could have influenced results.
- **Criticism – overemphasis on light:** Blind people with no light perception still maintain fairly normal circadian rhythms, suggesting zeitgebers may not be as influential as believed. Case study of blind man (Miles).
- **Interactionist approach:** Like pacemakers, zeitgebers do not act alone; entrainment depends on both internal and external systems working together.