**DRAG AND DROP EXERCISES**

**CHAPTER ONE**

**Figure 1.6. The main components of a typical brain neuron**.

Source: Quassar Jarosz/Wikimedia Commons.

**The following diagram shows a typical brain neuron. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

Dendrites (receivers)

Nucleus

Cell body

Axon (the conducting fibre)

Node of Ranvier

Schwann cells (they make the myelin)

Myelin sheath

Axon terminals (transmitter release)

**Figure 1.26. The limbic system.**

**The following diagram shows a schematic illustration of the limbic system. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped**:

Cingulate gyrus

Septal nuclei

Amygdala

Hippocampus

Parahippocampal gyrus

Mammillary bodies

Hypothalamus

Fornix

**Figure 1.27. The basal ganglia.**

**The following diagram shows a schematic illustration of the basal ganglia. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

Putamen

Globus pallidus (lateral part)

Globus pallidus (medial part)

Caudate nucleus

Thalamus

Subthalamic nucleus

Substantia nigra

**Figure 1.29. The lobes of the cerebral cortex.**

**The following diagram shows the main lobes of the cerebral cortex. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

Frontal lobe

Central sulcus

Parietal lobe

Occipital lobe

Temporal lobe

Lateral fissure

**CHAPTER TWO**

**Figure 2:5.** **Projections from the retina to the cerebral hemispheres**

**The following diagram shows the main pathways from the eyes to the cortex. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

Optic nerve

Optic chiasm

Lateral geniculate nucleus

Visual cortex

**Figure 2:15. The ventral “what” and dorsal “where” streams of visual processing.**

**The following diagram shows a schematic illustration of the cortical visual areas. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

Dorsal stream

Ventral stream

Posterior parietal cortex

V5

Primary visual cortex V1

V2

V4 (on ventral surface)

Inferior temporal cortex

**CHAPTER THREE**

**Figure 3.3. The outer, middle and inner ear.**

**The following diagram shows a schematic illustration of the ear. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

Pinna

Hammer

Anvil

Semicircular canals

Auditory nerve

Cochlea

External auditory canal

Tympanic membrane (eardrum)

Stirrup

Oval window

Round window

**Figure 3.14. The dorsal column medial lemniscus system and anterolateral system.**

**Note to digital: Labels to go at end of pointer lines**

**The following diagram shows a schematic illustration of the ascending pathways conveying peripheral proprioceptive and somatosensory input to the brain. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

First-order neurons

Dorsal root ganglion cells

Substantia gelatinosa

Dorsal column medial lemniscus system

Anterolateral system

Second-order neurons

Medial lemniscus

Spinothalamic tract

Medial lemniscus tract

Ventral posterior thalamus

Third-order neurons

Insular cortex

Somatosensory cortex

Anterior cingulate cortex

**Figure 3.15. The primary and secondary somatosensory areas.**

**Note to digital: part B of the figure should also be included (intact)**

**The following diagram shows a simplified schematic illustration of the cortical somatosensory areas. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

Primary motor cortex

Central sulcus

Primary somatosensory cortex

Posterior parietal cortex

Secondary somatosensory cortex

Lateral fissure

**CHAPTER FOUR**

**Figure 4.7. A simplified scheme showing the main movement areas of the brain.**

**Note to digital: this activity has two parts. Both figure parts (A) and (B) to be included here.**

**The following diagram shows a simplified schematic illustration of the main motor areas of the brain. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

Supplementary motor area

Premotor cortex

Somatosensory cortex

Primary motor cortex

Areas of posterior parietal cortex

Basal ganglia (deep in brain)

Cerebellum

**The following diagram shows a simplified illustration of the main motor regions of the brain. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

Basal Ganglia

Cerebellum

Brainstem

Spinal cord

**Figure 4.11. The location of the basal ganglia (caudate and putamen).**

**Note to digital: This exercise is slightly different to the previous ones. If possible to do, the student is given just two labels and they have a choice of 7 locations in the diagram to place them.**

**Where in the following basal ganglia diagram are the locations of the putamen and caudate nucleus?**

Putamen

Caudate nucleus

**Figure 4.14. The motor areas of the cortex and cerebellum.**

**Note to digital: This exercise has two parts. If possible to do, the student labels the terms and then adds the descriptions.**

**The following illustration shows the main motor areas of the cortex. In part A, drag and drop the boxes to label its anatomical parts. In part B, drag and drop the boxes to provide a description of their function.**

**(A)**

**Boxes to be dragged and dropped:**

Supplementary motor area

Primary motor cortex

Primary somatosensory cortex

Posterior parietal cortex

Cerebellum

Prefrontal cortex

Premotor cortex

**(B)**

**Boxes to be dragged and dropped (once part A is completed):**

Body information such as limb positions

Body part locations

Modulation / smoothing

Movement execution

Uses information about body and world to select movement and target

Visual and auditory information

Motor sequences

Begins programming movement

**CHAPTER FIVE**

**Figure 5.2. The digestive system.**

**The following diagram shows the digestive system.** **Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

Esophagus

Liver

Stomach

Gallbladder

Duodenum

Pancreas

Large intestine

Small intestine

Rectum

Anal canal

**Figure 5.8. The dual-centre set-point model of feeding.**

**The following shows a flow chart describing the main stages in the dual-centre set-point model of feeding. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

Information signalling food intake

Ventromedial hypothalamus ‘turned on’

Lateral hypothalamus ‘turned on’

Information signalling declining nutrient availability

**Table 5.1. Summary of feeding signals involved in huger and satiety.**

**The following shows a table summarising the main signals used to monitor feeding behaviour. Drag and drop the boxes to label its parts under the heading ‘Signal Source’**

**Boxes to be dragged and dropped:**

Detected by liver as nutrients in blood are depleted

Low level detected by glucose receptors in the brain

Peptide released by stomach during fasting

Stretch receptors in stomach detext increased volume from food

Stomach and intestine release peptides that aid digestion, signal brain of nutrient’s presence

Released by intestines

Released by fat cells

Released by Pancreas

Released by neurons from the lateral hypothalamus

**CHAPTER SIX**

**Figure 6.1. Comparison of sympathetic activity during emotional arousal with parasympathetic activity during relaxation.**

**The following exercise requires you to label the correct function to the organ involved in autonomic nervous activity. Drag and drop the boxes to label the organ.**

**Boxes to be dragged and dropped:**

|  |  |
| --- | --- |
| Sympathetic | Parasympathetic |
| Pupils dilated, dry; far vision | Pupils constricted, moist; near vision |
| Dry | Salivating |
| Goose bumps | No goose bumps |
| Sweaty | Dry |
| Passages dilated | Passages constricted |
| Increased rate | decreased rate |
| Supply maximum to muscles | Supply maximum to internal organs |
| Increased activity | Decreased activity |
| Inhibited | Stimulated |

**Figure 6:7. Structures of the Limbic system.**

**The following is a schematic diagram of the limbic system. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

Cingulate gyrus

Fornix

Hypothalamus

Mammillary body

Parahippocampal gyrus

Hippocampus

Amygdala

Septal nuclei

**Figure 6:11. The amygdala projections to areas of the brain responsible for coordinating fear responses.**

**The following diagram shows some of the fear-related behaviours regulated by the amygdala. Attach the correct function to the anatomical target.**

**Boxes to be dragged and dropped:**

Tachycardia, galvanic skin responses, paleness, pupil dilation, blood pressure elevation

Ulcers, urination, defaecation, bradycardia

Panting, respiratory disease

Behavioural and EEG arousal, increased vigilance, increased attention

Increased startle

Freezing, conflict test, CER, social interaction, hypoalgesia

Facial expression of fear

Corticosteroid release

**CHAPTER SEVEN**

**Figures 7:8 and 7:9. The effects of brain stem lesioning on sleep.**

**The following 3 figures shows the effects of lesioning various parts of the brainstem on EEG sleep patterns. Drop and drag the lesion box and then do the same with the type of sleep pattern that would be expected to occur following the lesion.**

**Boxes to be dragged and dropped:**

EEG showing continuous slow-wave sleep

EEG showing normal cycles of sleep and wakefulness

EEG showing continuous slow-wave sleep

Complete cut of upper brainstem

Complete cut of caudal brainstem

A cut confined to the reticular formation

**Figures 7:12. Brain mechanisms of sleep.**

**The following diagram shows some of the major brain areas involved in sleep. Drag and drop the appropriate box which fits the diagram.**

**Boxes to be dragged and dropped:**

Adenosine

Thalamus

Ventrolateral preoptic area

Tuberomammillary nucleus

PPT/LDT

Raphe nuclei

Magnocellular nucleus

Locus coeruleus

Pons

Preoptic area

Basal forebrain area

**CHAPTER EIGHT**

**Figure 8:4. Flowchart showing how the hypothalamic-pituitary axis influences the activity of the testes and ovaries.**

**The following is a flowchart showing how the hypothalamic-pituitary axis regulates the activity of sex-related hormones on the testes and ovaries. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

|  |  |
| --- | --- |
| 1. Male | 1. Female |
| Hypothalamus | Hypothalamus |
| Anterior pituitary | Anterior pituitary |
| Testes | Ovaries |
| Seminiferous tubules produce sperm luteum | Development of follicle and corpus |
| Leydig cells produce testosterone |  |

**Figure 8:5. The menstrual cycle.**

**The following two diagrams shows the phases of the menstrual cycle and its hormonal regulation.** **Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

**(first figure)**

Follicular phase

Ovulation

Luteal phase

Luteinising hormone

Follicle-stimulating hormone

**(second figure)**

Follicular phase

Ovulation

Luteal phase

Oestrogen

Progesterone

**CHAPTER NINE**

**Figure 9:7a. How long-term potentiation is examined.**

**The following is a highly simplified diagram of how long term potential may be examined in the hippocampus. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

Stimulate axons in perforant path

Record from dentate gyrus

Schaffer collaterals

Field CA1

Field CA3

Entorhinal cortex

Dentate gyrus

**Figure 9:8. The participation of glutamate receptors in LTP.**

**The following figures shows two stages of glutamatic receptor (AMPA and NMDA) involvement in long term potentiation. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped.**

**(a)**

Glutamate molecule attached to receptor

Magnesium ion blocking channel

AMPA receptor

NA+ enters

NMDA receptor

(Nothing enters usually)

**(b)**

Displaced magnesium molecule

AMPA receptor

NMDA receptor

Much NA+ enters

NA+ and CA++ enter

**Figure 9:15. The Papez and Yakovlev circuits.**

**The following is a flow chart illustrating the Papez and Yakovlev circuits in the brain. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

Association cortex

Hippocampus

Mammillary bodies

Anterior thalamus

Cingulate cortex

Amygdala

Dorsomedial thalamus

Orbitofrontal cortex.

**CHAPTER TEN**

**Figure 10:4. Language –related areas of the cortex.**

**The following figure is an illustration of the main cortical areas involved in language. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped**

Motor cortex

Angular gyrus

Primary visual cortex

Wernicke’s area

Lateral fissure

Broca’s area

**Figure 10:5. The Wernicke-Geschwind model of language.**

**The following is a schematic illustration showing the main areas of the brain involved in language comprehension and production. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped**

Motor cortex

Arcuate fasciculus

Angular gyrus

Primary visual cortex

Wernicke’s area

Primary auditory cortex

Facial motor area

Broca’s area

Written input

Spoken input

**Figure 10:9. The presentation of visual stimuli to individual hemispheres in split-brain subjects.**

**The following figure shows how stimuli can be presented individually to each cerebral hemisphere. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

Spoon

Fork

Receives input from right visual field

Receives input from the left visual field

**CHAPTER ELEVEN**

**Figure 11:7. The time-lag from presynaptic uptake blockade to postsynaptic receptor down regulation**

**The following illustration explains some of the changes that take place to receptors and neurotransmitter release following tricyclic antidepressant treatment. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped**

1. With continual stimulation, autoreceptors become down-regulated and/or less sensitive
2. More noradrenaline is released into the synaptic gap
3. With increased stimulation, noradrenergic beta receptors become down-regulated and/or less sensitive

Note: While inhibition of amine uptake occurs almost immediately the down regulation of beta receptors may take several weeks to occur

**Figure 11:9a and b. The forebrain’s noradrenergic and serotonergic systems**

**The following two figures show the brain’s noradrenergic and serotonergic systems respectively. Drag and drop the boxes to label their parts.**

**Boxes to be dragged and dropped:**

1. **The noradrenergic system**

Neocortex

Thalamus

Cerebellum

To Spinal cord

Locus coeruleus

Temporal lobe

Hypothalamus

1. **The serotonergic system**

Neocortex

Basal ganglia

Thalamus

Cerebellum

To Spinal cord

Raphe nuclei

Temporal lobe

Hypothalamus

**Figure 11:13. The Carlsson and Lindqvist theory of how chlorpromazine and haloperidol produce their pharmacological effects**

**The following diagram gives an account of the Carlsson-Lindqvist explanation of how antipsychotic drugs such as chlorpromazine and haloperidol produce their pharmacological effects. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped:**

1. Chlorpromazine ‘blocks’ dopamine receptors
2. In response to postsynaptic receptor blockage the neuron releases more dopamine
3. Enhanced release of neurotransmitter leads to increased level of metabolites

**CHAPTER TWELVE**

**Figure 12:2. The medial forebrain bundle**

**The following shows the anatomical projections of the medial forebrain bundle in the rat brain. Drag and drop the boxes to label its parts.**

**Boxes to be dragged and dropped**

Olfactory bulb

Frontal cortex

Cortex

Hippocampus

Midbrain

Ventral tegmental area

Locus coeruleus

Substantia nigra

Combined areas of lateral hypothalamus and medial forebrain bundle

Ventromedial hypothalamus

Anterior hypothalamus

Medial preoptic area

Nucleus accumbens

Caudate and putamen

**Figure 12.3. The mesolimbocortical dopamine system**

**The following is a simplified illustration of the mesolimbic dopamine pathway. Drag and drop the boxes to label its regions.**

**Boxes to be dragged and dropped:**

Nucleus accumbens

Medial forebrain bundle

Ventral tegmental area

**Figure 12.5. Brain areas involved in wanting and liking**

**The following is a schematic illustration of the brain regions involved in drug-related ‘wanting’ and ‘liking’. Drag and drop the boxes to label the parts.**

**Boxes to be dropped and dragged:**

Nucleus accumbens

Striatum

Dopamine pathway

Brainstem

Ventral tegmental area

Amygdala

Ventral pallidum

Prefrontal cortex

**CHAPTER THIRTEEN**

**Figure 13:4. How cholinesterase inhibitors work**

**The following figure shows how cholinesterase inhibitors can increase the levels of acetylcholine in the synapse. Drag and drop the boxes to label the parts.**

**Boxes to be dragged and dropped:**

Choline acetyltransferase (CA) converts acetyl coenzyme A and choline into acetylcholine

Acetylcholine is released into the synapse

Acetylcholinesterase (AChE) breaks down acetylcholine into choline and acetate

Cholinesterase inhibitors such as Tacrine inhibits AChE. This slows the breakdown of acetylcholine resulting in more of this neurotransmitter in the synapse

**Table 13.1. Known genes for Alzheimer’s Disease**

**The following table shows some of the genes known to be implicated in early-onset Alzheimer’s disease. Drag and drop the boxes to label the parts.**

**To be dragged and dropped:**

21 45-66 <0.1

14 28-62 1-2

1 40-85 <0.1

19 >60 >50

**CHAPTER FOURTEEN**

**Figure 14.2. The effects of crossing true-breeding pea plants with smooth and wrinkled seeds.**

**If you breed true breeding (homozygous) pea plants where the tall plants are dominant over the dwarf plants, what would happen in the second (F2) generation? Choose two of the following:**

50% Dwarf

50% Tall

¾ Tall

¼ Dwarf

¼ Tall

¾ Dwarf

**Figure 14:5. Organisms are made up of cells, each of which contains an identical set of genes.**

**The following figure shows some of the different levels of organisation that characterise complex organisms. Drag and drop the boxes to label the parts.**

**Boxes to be dragged and dropped:**

Chromosomes

Genes

A human body is made up of trillions of cells, each with an identical set of genes

Each cell nucleus contains an identical set of chromosomes, in which are found pairs

Each pair of chromosomes contains one chromosome inherited from each parent

Each chromosome contains one long DNA molecule. Genes are segments of that DNA.

**Figure 14:8. Transcription (to RNA) and translation (to proteins)**

**The following figure shows some of the steps involved in protein synthesis. Drag and drop the boxes to label the parts.**

**Boxes to be dragged and dropped:**

Inside the nucleus a mRNA copy of the gene is created

Nuclear membrane

Transcription

Nucleus

Nuclear pore

DNA

mRNA

Translation

Ribosome

Amino acids connect via the ribosomes forming the protein encoded by the mRNA