



## PTS Reading Week Question Series 2021

### Neuro

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1) A 55-year-old patient is diagnosed with thyroid cancer and then undergoes surgery to respect the tumour. One week after the surgery, his family notes his voice has become more hoarse. Which nerve was most likely damaged during surgery to cause this change in his voice?

- a) Glossopharyngeal nerve
- b) Recurrent laryngeal nerve
- c) Ansa cervicalis
- d) Superior laryngeal nerve
- e) Phrenic nerve

2) A woman has a stab wound to her back, which has completely severed the right side of her spinal cord at the twelfth thoracic vertebra (T12). What typical pattern of symptoms would you expect from a hemi section of the spinal cord?

- a) Ipsilaterally: Weakness, loss of pain and temperature sensation Contralaterally: Loss of touch and proprioception
- b) Ipsilaterally: Loss of pain and temperature sensation Contralaterally: Weakness, loss of touch and proprioception
- c) Ipsilaterally: Weakness, loss of touch and proprioception Contralaterally: Loss of pain and temperature sensation
- d) Contralaterally: Weakness, loss of pain and temperature sensation Ipsilaterally: Loss of touch and proprioception
- e) Bilaterally: Weakness, loss of pain and temperature sensation, loss of touch and proprioception

3) A 56-year-old woman presents to the general practice with a 4-day history of feeling unsteady when walking. She reports tripping over her feet on several occasions over the past few months. She feels this is more of a problem with her left foot. There is dysdiadochokinesis present on the left upper limb. Her gait appears normal. An MRI scan shows a mass present in the left cerebellar hemisphere. The mass is invading the fourth ventricle and there is asymmetry of the cisterna magna suggesting drainage of the fourth ventricle is impaired. Which of the following allows cerebrospinal fluid to flow from the fourth ventricle into the cisterna magna?

- a) Interventricular foramen (foramen of Monroe)
- b) Cerebral aqueduct
- c) Median aperture (foramen of Magendie)
- d) Central canal
- e) Superior sagittal sinus

4) Which of the following does not contribute to the blood brain barrier?

- a) Glycocalyx
- b) Pericytes

- c) A continuous basement membrane (with no fenestrations)
- d) Astrocyte end-feet
- e) Endothelial tight junctions

5) Brock and Gary are battling at the gym when, suddenly, Garry notices that Brock is speaking gibberish. His words, though fluid and well-formed, seem to lack meaning- despite the passion in Brock's face and the expressive flailing of his arms. When Garry tells Brock this, Brock's expression changes to one of confusion, as he does not seem to understand what Garry is saying. Later on, it is found that Brock had had a minor stroke- What area of the brain has this stroke affected?

- a) Precentral Gyrus
- b) Broca's Area
- c) Postcentral Gyrus
- d) Wernicke's Area
- e) Parietal Lobe

6) James is told bluntly that his cancer has blocked a branch of his left Glossopharyngeal Nerve (CNIX). The doctor explains that this has caused a number of effects, including a lack of parasympathetic stimulation of his left parotid gland. Along with the Glossopharyngeal Nerve, what other cranial nerves have autonomic functions?

- a) Olfactory (CNI), Facial (CNVII), and Oculomotor (CNIII)
- b) Vestibulocochlear (CNVIII), Vagus (CNX), and Trigeminal (CNV)
- c) Facial (CNVII), Vestibulocochlear (CNVIII), and Vagus (CNX)
- d) Vagus (CNX), Facial (CNVII), and Oculomotor (CNIII)
- e) Trigeminal (CNV), Vagus (CNX), and Facial (CNVII)

7) Which of the following is a pyramidal tract?

- a) Corticospinal tract
- b) Tectospinal tract
- c) Rubrospinal tract
- d) Vestibulospinal tract
- e) Reticulospinal tract

8) Which of the following regarding chemical synapses is TRUE?

- a) Glutamate is the main inhibitory neurotransmitter in the CNS.
- b) Neuromodulators have fast action.
- c) Dopamine exclusively acts in the basal ganglia.
- d) Inhibitory neurotransmitters hyperpolarize the postsynaptic membrane (i.e. make it more negative)
- e) Nicotine is a neurotransmitter at the neuromuscular junction.

9) Andy is watching a tennis match when he suddenly gets a bit irritated. He has begun to notice that he cannot see the player on the left side of the court, even though he can see the other player fine. On turning his head to the left, he can see the left player, but this is uncomfortable and not ideal for Andy who is trying to enjoy his day off. Later he sees a doctor and it turns out he had a minor stroke. Which part of the visual pathway was most likely affected?

- a) Right optic tract
- b) Left inferior optic radiation.
- c) Optic chiasm
- d) Right optic nerve
- e) Left optic tract.

10) Which of the following best describes the function of gamma motor neurons?

- a) Innervate extrafusal fibres to contribute to the force generated by muscle contraction.
- b) Relay information from the muscle spindle into the spinal cord.
- c) Innervates all muscle fibres in a motor unit.
- d) Cause contraction.
- e) Keeps intrafusal muscle fibres taut during muscle contraction.

11) You are trying to make a baby giggle, so you decide to do your classic “googly eyes” trick, which involves moving both your eyes so that they are looking inwards, towards the nose. The baby does not laugh, but more importantly: What are the two main ocular muscles you are using to do this manoeuvre, and what nerves supply these?

- a) Left superior oblique (Trochlear - CNIV) and right medial rectus (Oculomotor - CNIII)
- b) Left medial rectus and right medial rectus (Oculomotor - CNIII)
- c) Left medial rectus (Oculomotor - CNIII) and right lateral rectus (Abducens – CNVI)
- d) Left inferior oblique and right inferior oblique (Oculomotor – CNIII)
- e) Left medial rectus and right medial rectus (Abducens – CNVI)

12) Jerry is a 32-year-old man who was discharged 2 days ago from hospital, after sustaining an injury to his head. Observations and imaging were all normal. Since then, he has noticed difficulty in going downstairs. He says that he cannot see where he is going and becomes very unsteady. His husband also told him that he has started to tilt his head to the left, which Jerry was unaware of.

On examination, his visual acuity is 6/6 but he has difficulty looking down and out with his left eye, no other abnormality is revealed. What is the most likely diagnosis?

- a) Abducens nerve palsy
- b) Extraocular muscle impingement
- c) Myasthenia gravis

- d) Oculomotor nerve palsy
- e) Trochlear nerve palsy

13) A 67-year-old woman with metastatic cancer presents with a peculiar set of symptoms. Imaging of the head shows an obstructive right-sided mass on the base of the skull. A diagnosis of Jugular Foramen Syndrome (Vernet's Syndrome) is made. Which signs and symptoms would best fit with this diagnosis?

- a) Voice hoarseness, tongue deviation to the right, and total right-sided blindness
- b) Loss of sensation from right-posterior 1/3 of tongue, voice hoarseness, and a partial loss of the gag-reflex.
- c) Weakness lifting the right shoulder, tongue deviation to the right, and a partial loss of the gag-reflex.
- d) Loss of taste-sensation from right-anterior 2/3 of tongue, tongue deviation to the right, and loss of gag-reflex.
- e) Loss of taste-sensation from right-anterior 2/3 of tongue, loss of right-sided hearing, and nystagmus.

14) A "Nissl body" is comprised of which of the following organelles?

- a) Mitochondria
- b) Neuropil
- c) Rough endoplasmic reticulum
- d) Ribosomes
- e) Nucleus

15) When considering mental health from a public health point of view, there are many individual level interventions. These include medications, psychological therapies, and couples therapy. Which of the following is another individual level intervention?

- a) Cognitive behavioural therapy
- b) Focussing on early identification.
- c) Developing social skills for young people
- d) Opportunities for physical activity for the elderly
- e) Integrating specialist services through collaborative and stepped care.

16) Which of the following is NOT a function of astrocytes:

- a) Guide developing neurons during development.
- b) Resident macrophage of the CNS
- c) Take up Glutamate leaking from synapses for recycling.
- d) Metabolic support (providing glucose and removing ammonia from neurons).
- e) Regulate neurovascular coupling.

17) You have just switched on the stove so you can cook some pasta for your pesto. You are a little tipsy so you accidentally stumble and place your hand on the stove. How does the pain and temperature sensation travel from your hand to the cerebral cortex?

- a) 1st-order neurones -> 2nd-order neurones -> Decussation -> Anterior Spinothalamic Tract -> 3rd-order neurones in the Thalamus -> Cerebral Cortex.
- b) 1st-order neurones -> 2nd order neurones -> Lateral Spinothalamic Tract -> Decussation -> 3rd order neurones in the Thalamus -> Cerebral Cortex.
- c) 1st-order neurones -> 2nd order neurones -> Decussation -> Lateral Spinothalamic Tract -> 3rd order neurones in the Thalamus -> Cerebral Cortex.
- d) 1st-order neurones -> Decussation -> 2nd order neurones -> Lateral Spinothalamic Tract -> 3rd order neurones in the Thalamus -> Cerebral Cortex.
- e) 1st-order neurones -> 2nd order neurones -> Anterior Spinothalamic Tract -> Decussation -> 3rd order neurones in the Cerebellum -> Cerebral Cortex.

18) Regarding neuronal transmission and physiology, which of the following statements is false?

- a) Most CNS neurons transmit via saltatory conduction.
- b) There is a low concentration of Na<sup>+</sup> channels in the myelinated region of myelinated neurons.
- c) By increasing cross section and myelination and neuron, you decrease speed of conduction.
- d) It is possible to stimulate another action potential during the relative refractory period.
- e) The resting potential of neurons ranges between -40 and -90mV.

19) Mental health is a major public health sector in the UK, with 1 in 6 adults bearing a neurotic disorder. Which of the following is the most common mental health condition?

- a) Generalised anxiety disorder
- b) Obsessive compulsive disorder
- c) Post-traumatic stress disorder
- d) Depression
- e) Schizophrenia

20) What is the name of sinus highlighted in green?



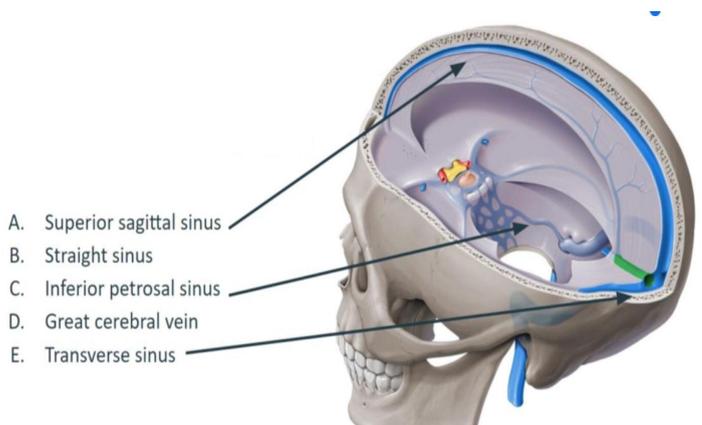
- a) Superior petrosal sinus
- b) Straight sinus
- c) Inferior petrosal sinus
- d) Great cerebral vein
- e) Transverse sinus

## Answers and Explanations

1) B	Recurrent Laryngeal
2) C	<ul style="list-style-type: none"> <li>• Ipsilaterally: Weakness, loss of touch and proprioception</li> <li>• Contralaterally: Loss of pain and temperature sensation</li> </ul>
3) C	Median Aperture (foramen of Magendie)
4) A	a glycocalyx is something biofilm-forming bacteria secrete (do not worry if you did not know this, the question was hopefully deducible by process of elimination).
5) D	Wernicke's Area-Brock is presenting with Wernicke's Aphasia- General loss of understanding of written and spoken speech. This is often accompanied with non-meaningful fluent speech. The patient is often unaware that they are talking nonsense.
6) D	<p>Vagus (CNX), Glossopharyngeal (IX), Facial (CNVII), and Oculomotor (CNIII) all have autonomic functions - Remember "1973".</p> <ul style="list-style-type: none"> <li>• -Vagus: Cardiac, GI, and vascular autonomic effects.</li> <li>• -Glossopharyngeal: Parotid Gland and Optic ganglion.</li> <li>• -Facial: Other salivary glands, lacrimal gland, and more.</li> <li>• -Oculomotor: Autonomic Eye Movements, including pupil dilation.</li> </ul>
7) A	corticospinal tract
8) D	<p>By making the membrane more negative, the post-synaptic neuron will require more excitatory/depolarising neurotransmitter to allow more Na<sup>+</sup> influx to push the membrane potential to the threshold potential, and generate an action potential.</p> <p>a) GABA is the main inhibitory neurotransmitter in the CNS.</p>

	<ul style="list-style-type: none"> <li>b) Neuromodulators are neurotransmitters which have longer lasting and more diffuse effects (Dopamine, Serotonin)</li> <li>c) Dopamine also acts in other parts of the CNS and parts of the PNS</li> <li>d)</li> <li>e) Acetylcholine used at NMJ, nicotinic receptors are the first synapse in both divisions of the autonomic nervous system (PNS and SNS)</li> </ul>
<b>9) A</b>	Right Optic Tract -This means that the information from the right side of the retina in both eyes, and the left visual field of both eyes, cannot reach the occipital cortex. This is also known as Left homogenous hemianopia.
<b>10) E</b>	<p>We need alpha gamma coactivation to keep the intrafusal fibres taught, so when they are stretched, the muscle spindle can detect stretch straight away. Difficult to explain, but good Youtube videos if you search “alpha gamma coactivation muscle spindles”.</p> <ul style="list-style-type: none"> <li>a) This was alpha motor neurons.</li> <li>b) This was type 1a/2 afferent nerves.</li> <li>c) Also alpha motor neurons</li> <li>d) Technically correct, but E is the best description.</li> </ul> <p>The diagram illustrates the process of alpha-gamma coactivation in a muscle spindle. It is divided into three stages from left to right:</p> <ul style="list-style-type: none"> <li><b>Resting State:</b> Shows extrafusal fibers (top) and intrafusal fibers (bottom) within a muscle spindle. An alpha motor neuron axon is shown entering the spindle, with its axon terminals near the intrafusal fibers. A gamma motor neuron is also shown with its axon terminals near the intrafusal fibers.</li> <li><b>Activated Alpha:</b> Shows the extrafusal fibers contracted (shorter and thicker). The alpha motor neuron is active, indicated by an arrow pointing to its axon terminals.</li> <li><b>Activated Alpha and Gamma:</b> Shows both extrafusal and intrafusal fibers contracted. Both the alpha and gamma motor neurons are active, indicated by arrows pointing to their axon terminals. This coactivation maintains the tension of the intrafusal fibers despite the contraction of the extrafusal fibers.</li> </ul>
<b>11) B</b>	Left medial rectus and right medial rectus (Oculomotor - CNIII)
<b>12) E</b>	Trochlear Nerve Palsy
<b>13) B</b>	Loss of sensation from right posterior 1/3 of tongue, voice hoarseness, and partial loss of gag reflex.

	<p>This is looking at the nerves which pass through the jugular foramen: The Glossopharyngeal (IX), the Vagus (X), and the Spinal Accessory Nerve (XI).</p> <p>There are symptoms in the other answers which correspond to other nerves:</p> <ul style="list-style-type: none"> <li>● Optic Nerve (II): Total right-sided blindness.</li> <li>● Facial Nerve (VII): Loss of taste-sensation from right anterior 2/3 of tongue.</li> <li>● Vestibulocochlear (VIII): Loss of right-sided hearing and nystagmus.</li> <li>● Glossopharyngeal (IX): Loss of afferent gag reflex and loss of sensation to posterior 1/3 of tongue.</li> <li>● Vagus (X): Loss of efferent gag reflex and voice hoarseness,</li> <li>● Spinal Accessory Nerve (XI): Weakness/Loss of function of sternocleidomastoid and trapezius muscles - Weakness lifting shoulder.</li> <li>● Hypoglossal Nerve (XII): Loss of motor function of tongue: Deviation of tongue to side of lesion (right).</li> </ul>
<b>14) C</b>	<p>these are granules seen on histology, and the rough endoplasmic reticulum in neurons is required for the synthesis of peptide neurotransmitters. Neuropil is the “stuff” in between the neuron cell bodies.</p>
<b>15) A</b>	<p>CBT is recommended by NICE guidelines for anxiety and depression, and is an individual level. The rest of the options are either community level (B, C, D) or service organisation level (E).</p>
<b>16) B</b>	<p>This is a function of microglia. Microglia also perform synaptic pruning.</p> <p>Astrocytes are the most common glial cell in the CNS, and are heterogeneous in morphology and function. They perform A, C, D, E (neurovascular coupling is where blood vessels near more active neurons vasodilate to meet metabolic demand), among other functions such as regulating the blood brain barrier.</p>
<b>17) C</b>	<p>1st order neurones -&gt; 2nd order neurones -&gt; Decussation -&gt; Lateral Spinothalamic Tract -&gt; 3rd order neurones in the Thalamus -&gt; Cerebral Cortex.</p> <ul style="list-style-type: none"> <li>● Anterior Spinothalamic Tract carries crude touch, not pain and temperature.</li> </ul>

	<ul style="list-style-type: none"> <li>Decussation happens in the 2nd -order neurone a few levels above the spinal root.</li> </ul>
<b>18) C</b>	C would have been true if it said, "increase the speed of conduction". This question tests exam technique and the importance of double reading the question.
<b>19) D</b>	Depression is the most common mental health issue, with levels increasing by 18% between 2005 and 2015. Rates are more prevalent in women.
<b>20) B</b>	 <p>A. Superior sagittal sinus  B. Straight sinus  C. Inferior petrosal sinus  D. Great cerebral vein  E. Transverse sinus</p>

We hope you have found these questions useful. Please fill out our feedback form so we can improve;

<https://docs.google.com/forms/d/e/1FAIpQLSfp6LVdcxvKezwk4rib9MDCiNjd9uOH6XxSEe1fe4zz-6AIQ/viewform?vc=0&c=0&w=1&flr=0>