

## Physiology week 4 – Reflexes VIVAs

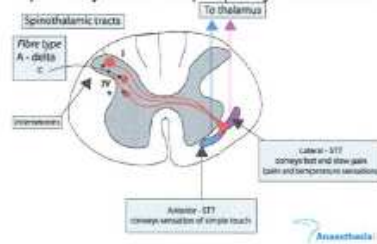
**TOPIC:** Stretch and inverse reflexes **NUMBER: 4**

OPENING QUESTION	PROMPTS	COMMENTS
Can you give an example of a stretch reflex?		
<b>POINTS REQUIRED</b>	1. Knee jerk 2. Ankle jerk	Need 1 example to pass
<b>SECOND QUESTION (if needed)</b>	Describe the elements of the stretch reflex..	
<b>POINTS REQUIRED</b>	1. Sensor from afferent limb (1a fibre from muscle spindle, monosynaptic neurone & excite the motor neurone, so the muscle contract.	Need to say all to pass
<b>THIRD QUESTION (if needed)</b>	What is an inverse stretch reflex?	
<b>POINTS REQUIRED</b>	Following prolonged stretch or muscle contraction, the contracted muscles suddenly relax. Stimulate the Golgi tendon organ , integrator (synapse on motor neurone for stretch and on inhibitory interneuron for inverse stretch), efferent limb (ventral root for both) and effector (extrafusal fibres muscle fibres)	Need definition, sensor, synapse, inhibitory effect.

COMMENTS	[Key items marked with*]	
What is nystagmus ?  <i>Prompt:</i> <i>Are there different types ?</i>	Characteristic jerky movement of the eye seen at start & end of period of rotation *  Different types * - horizontal (eyes move horizontal plane) - vertical (head tipped sidewise in rotation) - rotatory (head tipped forward)  Direction of eye movement is identified by the direction of the quick component.	Definition  Horizontal plus one other
Why does nystagmus occur ?  <i>Prompt:</i> <i>Why do the eyes move ?</i>	Reflex that maintains visual fixation on stationary points while the body rotates, although not initiated by visual impulses.  - When rotation starts, the eyes move slowly in a direction opposite to the direction of rotation, maintaining visual fixation * (vestibulo-ocular reflex VOR). - When the limit of this movement is reached, the eyes quickly snap back to a new fixation point and then again move slowly in the other direction. *	General relationship of eye movements in relation to head movement
How is nystagmus mediated ?	Slow component is initiated by impulses from the labyrinths * Quick component is triggered by a centre in the brain stem. *	

Question 5:  
Ganong pp 139-147

i) Describe the route followed by pain pathways from the periphery to the brain.



ii) What are the characteristics of the different types of pain fibres?

- i) Primary efferent fibres
- naked nerve endings peripherally
  - cell bodies in dorsal root ganglia (or equivalent in cranial nn.)
  - terminate on neurons in dorsal horns (Aδ fibres in laminae I and V, C fibres in laminae I and II)

Axons from dorsal horns travel in **anterolateral system (lateral spinothalamic tract)** to ventricular posterior nuclei (specific sensory relay nuclei of thalamus) and thence to cerebral cortex.

- ii)
- Aδ: Myelinated**  
Large diameter (2-5 microm)  
Fast conduction rates (12-30 m/s)  
Modulate "fast" pain
  - C: Unmyelinated**  
Small diameter (0.4-1.2 microm)  
Slow conduction rates (0.5-2 m/s)  
Modulate "slow" pain

TOPIC: Withdrawal Reflex

OPENING QUESTION	Describe the withdrawal reflex?	COMMENTS
POINTS	Reflex arc consisting of sense organ afferent and efferent nerve and effector	3/5
	Noxious stimulus to skin or sub cut	
	Response of flexor muscle contraction and extensor relaxation	
	Result in withdrawal of limb from stimulus	
	Cross extensor response	
PROMPTS		
SECOND QUESTION	What is meant by the term polysynaptic reflex?	
POINTS	One or more interneurons and interposed between the afferent and efferent neurons	
THIRD QUESTION	What are the effects of a polysynaptic reflex?	1/2
POINTS	Prolonged effect as different time for stimulus to reach effector	
	Reverberation circuit as some interneurons turn back on themselves further prolonging the effect.	
PROMPTS	Prompt if necessary	

COMMENTS

Stretch reflex	Describe the elements that make up a stretch reflex  How do the muscle spindles function?	Uxv/rx of concepts. Sensor (muscle spindle); afferent limb; integrator (synapse on motor neurone); efferent limb; effector (intrafusal fibres)  Parallel intrafusal fibres responds to stretch with different dynamic and static responses.
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Question 5: Withdrawal reflex Ganong pp 135-6	i) Please describe the withdrawal reflex.  Prompt: What happens if a painful stimulus is applied to the left lower limb of a normal person?	dorsal root, then dorsal horn of the spinal cord. • Central integrator consists of <b>polysynaptic</b> connections in the spinal cord. • Efferent limbs are motor nerves to effector muscles on the ipsi- and contralateral sides. • Effectors are muscles of the ipsi- and contralateral sides, which produce flexion and withdrawal of the ipsilateral limb and (crossed) extension of the opposite limb.	
	ii) What are the important characteristics of polysynaptic reflexes?	• The reflex effect becomes stronger and more prolonged the greater the stimulus. Due to: ○ The impulse arriving at effectors at different times due to interneurons. ○ Irradiation of the impulse up and down the spinal cord. ○ Recruitment of motor units. ○ Reverberation of the circuit as some interneurons turn back on themselves. • Above effects result in after-discharge due to continued bombardment of motor neurones by impulses arriving by complicated and circuitous paths.	To pass: Magnified response
	iii) What is meant by the term prepotency of the withdrawal reflex?	• The reflex pre-empts spinal pathways from any other reflex activity occurring at the same time.	

2.5 Regulation of temperature	Describe the regulation of normal body temperature.  How is fever generated?	<b>Hypothalamus</b> controls range, circadian and ovulatory variations. Posterior responds to cold, anterior to heat. <b>Heat production:</b> activity, feeding, adrenaline drive, thyroid activity; shivering, vasoconstriction. <b>Heat losses:</b> conduction, radiation, convection, vaporisation; sweating, vasodilation, increased respiration.  Pyrogens etc 'reset the thermostat' Cytokines are endogenous pyrogens
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	[Key items marked with*]	Final Exam
What are the thermoregulatory responses to cold ?	Autonomic, Somatic, Endocrine and Behavioural Response to Cold: Increase heat production <b>Shivering</b> Hunger Increased voluntary activity Increased secretion Adrenaline and NA Decrease heat loss <b>Cutaneous vasoconstriction</b> Curling up Horripilation (pilo erection)	Shivering  Cutaneous vasoconstriction
What are the thermoregulatory responses to heat ?	Response to Heat: Increase heat loss Cutaneous vasodilation Sweating Increased respiration Decrease heat production Anorexia Apathy and inertia	Any 2 from list
Where are these responses regulated?	Reflex response to cold controlled in post hypothalamus Reflex response to heat controlled in ant hypothalamus  Afferents come from sensory receptors in skin, deep tissue, spinal cord, extrahypothalamic parts of brain and hypothalamus itself.	Hypothalamus

Question 4: Temperature regulation Ganong 251-5	i) How does the body generate heat?  ii) How does the body lose heat?  iii) What is the thermo-regulatory response to cold?	a) Heat production: <b>basal metabolic processes, muscular activity, food intake</b>  b) Heat loss: conduction, convection and <b>radiation</b> (70%), <b>sweat vaporisation</b> (27%), respiration (2%), urine and defaecation (1%)  i. <b>Increased heat production</b> such as shivering, muscular activity, hunger (eating), hormonal increase in adrenalin/ NA. <b>Decreased heat loss</b> with cutaneous vasoconstriction, curling up, horripilation (goose pimples – erection of hairs to ii. Decrease conduction/convection.	Cor
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TOPIC: Reticular activating system \_\_\_\_\_ NUMBER: \_\_\_\_\_

OPENING QUESTION	PROMPTS	COMMENTS
<p>What is the function of the reticular activating system?</p> <p><b>POINTS REQUIRED</b></p> <p>1. The RAS is <b>one</b> of the many networks found in the reticular formation. [NB they are not the same thing- common mistake!] Centres within the RF regulate respiratory, cardiovascular, vegetative and endocrine functions. <b>But the RAS is all about waking you up! I.E. increased consciousness, alert state, heightened sensory perception</b></p>		<p>Essential:</p> <p>1. increased consciousness</p> <p>2. differentiate the RAS from RF.</p>
<p>2. Non-specific activation from any modality- i.e. its neurons are activated equally well by different stimuli. Interestingly, can also be activated by certain cortical activities eg really concentrating on an idea will wake up RAS &amp; abolish alpha waves just like a sensory impulse, therefore there must be anatomical fibres that lead back down from the cortex to the RAS.</p>		
<p>3. Sends signals mostly to the thalamus. [MCQ: specifically the thalamus' midline &amp; intralaminar nuclei.] From there, signals are sent to the neocortex.</p>		
<p>4. Increases purposeful cortical electrical activity [&amp; decreases the electrical 'noise' of randomly firing neurons in the non-aroused/asleep state]. This can be seen on EEG as 'desynchronisation': when RAS wakes up the cortex [or when the patient is asked to concentrate on something], the EEG changes from synchronised 'sleeping/resting' alpha waves to 'alpha block' or 'desynchronisation'.</p>		
<p>6. Unsurprisingly, <b>General anaesthetic agents</b> exert their greatest effect on the RAS.</p>		
<p><b>SECOND QUESTION</b></p> <p>Describe its location and structure.</p>	<p>What are its connections?</p>	<p>NB be sure to differentiate between the RAS &amp; the reticular formation.</p>

<b>POINTS REQUIRED</b>	1 Complex polysynaptic network that sends its fibres to the thalamus and cortex.	Where is the RAS located?	Essential
	2 The cell bodies of the RAS are found in the mid ventral portion of medulla + midbrain, along with the rest of the <b>reticular network</b> , which is a jumble of <b>different networks</b> yoked together, really: 'the old core of the brain'.		
	3 Converging sensory fibres from long tracts and cranial nerves [and even from cortex; see point 2 in question 1]		

TOPIC: Reticular activating system \_\_\_\_\_ NUMBER: \_\_\_\_\_

OPENING QUESTION		PROMPTS	COMMENTS
POINTS REQUIRED	What is the function of the reticular activating system?		
	1 Centres within network regulate respiratory, cardiovascular, vegetative and endocrine functions		
	2 Non-specific activation from any modality		
	3 Sends signals mostly to the thalamus		
	4 Increases cortical electrical activity		
	5 Increased consciousness, alert state, heightened sensory perception		Essential
SECOND QUESTION	Describe its location and structure.	What are its connections?	
POINTS REQUIRED	1 Complex polysynaptic network	Where is the RAS located?	Essential
	2 Mid ventral portion of medulla + midbrain		
	3 Converging sensory fibres from long tracts and cranial nerves		