Exam 4 study guide

Sleep 1

What does it mean for a pattern of behavior to have an endogenous circadian rhythm? What influence do zeitgebers have on these cycles? Give an example of how behavior can be disrupted in their absence.

What brain area is necessary for the generation of endogenous cycles? In what specific way does it receive input? Describe the cycles of two proteins and one hormone associated with biological clock regulation.

Differentiate between sleep and coma. Define the stages of sleep. What dos the slowing of brain waves as sleep progresses indicate? How is REM sleep paradoxical?

Behavioral Cycles

- Endogenous rhythms: internally generated signals that prepare behaviors that occur on a cycle
- Circannual (annually): migration, hibernation (animals)
- Circadian (Daily): sleep, eating

Zeitgebers: stimuli that typically cycle with our rhythms (light outside, temperature outside, etc). Can be interrupted by visual impairments and lifestyle changes like overseas flying and night jobs

Biological Clocks

Superchiasmatic nucleus (SCN): Portion of the hypothalamus just above the optic Chiasm

- SCN receives info directly via optic nerve, which is why light is the primary zeitgeber in humans
- Retinal ganglion cells containing photopigment melanopsin compose this portion of the optic nerve (Optic nerve (with melanopsin)→ SCN)

Genetics of Bio Clocks

- Fluctuation of 2 genetically expressed proteins over the day promotes sleep/ wakefulness
- Feedback cycle between mRNA and protein production takes 24 hours
- Proteins also broken down due to light
- SCN controls the pineal gland which releases melatonin that is produced at night to promote sleepiness

Characterizations of Sleep

- Inactivity

- Minimal response to stimuli
- Slowed brain activity
- Cycles back into wakefulness in a reasonable amount of time

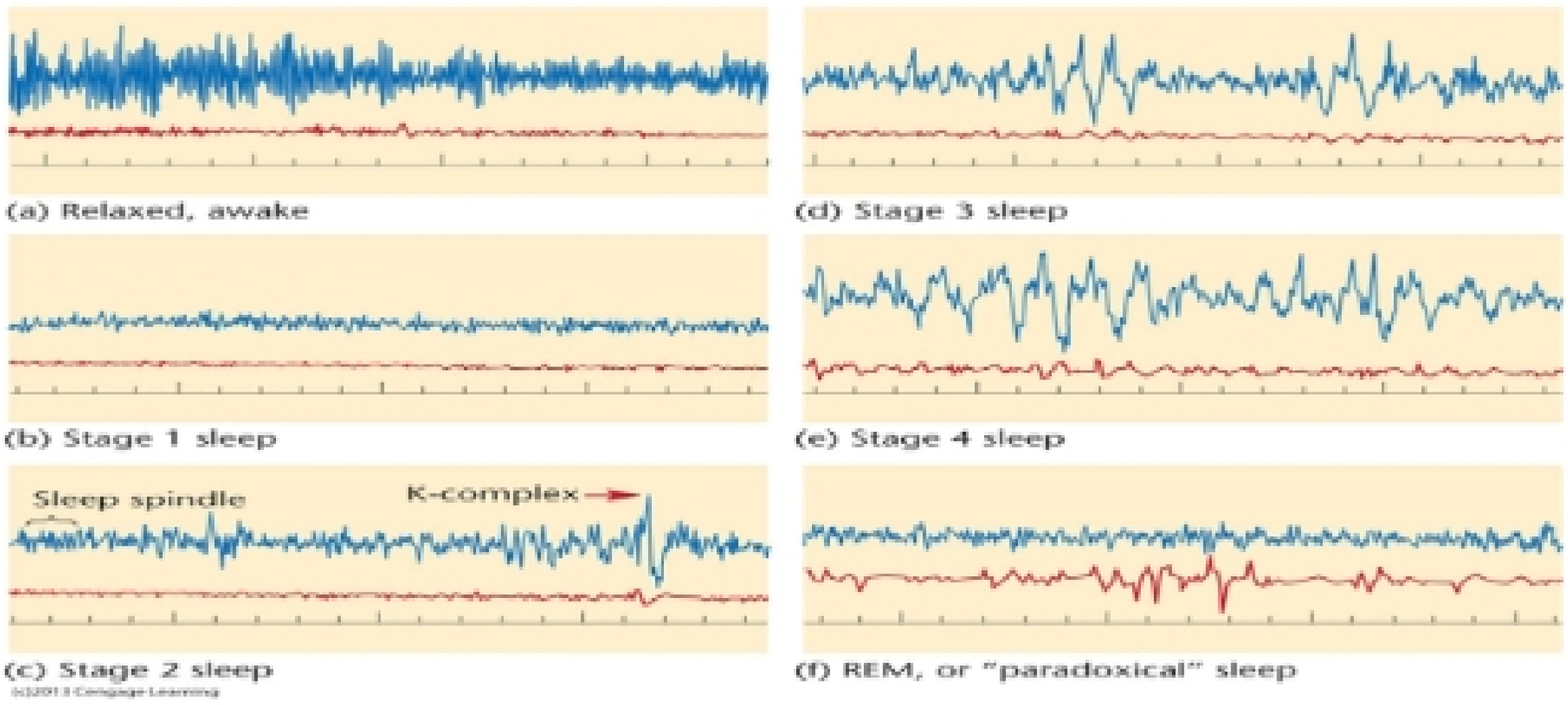
What Sleep Isnt

- Vegetative State: alternation of sleep and arousal, but arousal and brain activity is limited
- Coma: little brain activity coupled with barely any responsiveness to stimuli
- Brain Death: No brain activity, no response to stimuli

Stages Of Sleep

Sleep and arousal defined by their associated patterns of brain activity

- Wakefulness: steady, relatively high frequency of **alpha waves**
- Stage 1: irregular waves with lower amplitude
- Stage 2: emergence of Sleep Spindles and k-complexes
- Slow Wave (stages 3-4): lower frequency waves



REM Sleep

- Brain activity similar to stage 1
- Muscles completely relaxed to point of paralysis, although autonomic functioning increases
- Some facial twitching and eye movement in humans
- Often associated with vivid reaming, but not necessary for REM sleep

Sleep 2

List the areas of the brain involved in arousal and wakefulness and the neurotransmitters that they signal with. What is the main neurotransmitter that maintains sleep?

How can a practitioner diagnose insomnia? What is lack of sleep associated with? Describe two conditions that are caused by interrupted sleep.

What functions might sleep play? What about dreaming?

Brain structures implicated in sleep/ arousal

Reticular formation: projection of neurons from medulla that ascend to the forebrain or descend to spinal cord

- Pontomesencephalon: nuclei in pons that generate spontaneous activity as well as receive info from senses; these messages are distributed to the cortex to promote wakefulness
- Uses acetylcholine and glutamate as NTs

Locus Coeruleus: nuclei in pons that projects widely through cortex

- Signal in response to meaningful events, especially those associated with emotion
- Increase wakefulness and strengthens storage of recent memories
- Uses norepinephrine as NT

Hypothalamic Pathways

- Histaminergic: active during arousal and alertness
- Orexigenic/ Hypocretinergic: necessary for staying awake, but not for waking up

Basal Forebrain pathways: Controlled by hypothalamus

- Acetylcholinergic: increase attention and shift from non-REM to REM sleep
- GABAergic: decrease alertness through inhibition of cortex and thalamus

Dorsal Raphe: nuclei in pons that project widely through the cortex

- Transition out of REM sleep
- Uses serotonin as NT