1: If the Nernst equation explains the membrane voltage required to balance ion concentration forces, why do we need the Goldman-Hodgkin-Katz (GHK) equation?

(a) The GHK is necessary when there is an imbalance due to kidney failure or some other pathological condition.

(b) The Nernst equation can only be used at during an action potential while the GHK can only be used during $V_{rest}$.

(c) The GHK takes into account the simultaneous contributions of multiple ions, for example, when both gated and non-gated channels are open.

(d) The Nernst equation is concerned with ion permeability whereas the GHK also takes into account ion concentration forces.

2: Graded potentials...

(a) are always depolarizations.

(b) are always hyperpolarizations.

(c) may be hyperpolarizations or depolarizations.

(d) are hyperpolarizations in the peripheral nervous system and depolarizations in the central nervous system.

(e) are the same as action potentials, only with inverted polarity.

3: The limit to the amount of depolarization during the action potential is set by...

(a) the time constant for calcium channels.

(b) the amount of neurotransmitter released.

(c) the potassium equilibrium potential (voltage)

(d) the sodium equilibrium potential (voltage)

(e) the sodium channel density.
4: A typical axon refractory period is 1.0 millisecond. This limits the rate of action potentials in the axon to:

(a) 10 per second
(b) 50 per second
(c) 500 per second
(d) 2000 per second 4000 per second

5: Increasing the diameter of an axon changes action potential conduction velocity...

(a) in both vertebrates and invertebrates.
(b) only in vertebrates.
(c) only in invertebrates.
(d) only if there is no myelin.

6: Positive feedback during the action potential is due to...

(a) reabsorption of neurotransmitter
(b) regenerative calcium entry
(c) accommodation flux
(d) voltage-sensitive channels
(e) threshold inactivation

7: In an axon the major factor slowing the internal spread of positivity is...

(a) the time constant for calcium channels to open
(b) membrane capacitance
(c) the presence of myelin
(d) migration of synaptic vesicles
8: Neurotransmitter molecules move across the synaptic cleft by...
   (a) active transport  
   (b) charge gradient  
   (c) simple diffusion  
   (d) calcium influx  
   (e) axonal transport

9: Neurotransmitters are typically...
   (a) lipids  
   (b) large proteins  
   (c) carbohydrates  
   (d) a, b, and c  
   (e) none of the above

10: In vertebrate eyes, light has to pass through four neuron cell layers before reaching the photoreceptors.
   (a) True  
   (b) False

11: In a retina adapted for low-light conditions, you would expect...
   (a) mostly all cones and very few rods  
   (b) equal or higher acuity compared with a similar retina adapted for bright-light conditions  
   (c) photoreceptor cells with high concentrations retino-carotine  
   (d) a tapetum  
   (e) a carbacholized vitreous humour
12: Which of the following statements about hormones is true?

(a) Hormones tend to be elaborate speciality compounds produced in large quantities, stored in paracrine glands, and released as necessary.

(b) Most hormones are specific for a particular target tissue and it is rare for different tissues to have receptors for the same hormone.

(c) Typically hormones are made by one or a few simple chemical substitutions from a common metabolite.

(d) Hormones are found only in vertebrates, and the sex steroids found only in mammals.

(e) With the exception of a few compounds secreted from bismuth glands, hormones bind to trans-membrane protein receptors which in turn activate G-proteins.

13: What is the difference between a pheromone and a hormone?

(a) Hormones are found only in vertebrates and pheromones are found only in invertebrates.

(b) Pheromones are signals transmitted via a portal blood system.

(c) Hormones are secreted by ducted glands while pheromones are secreted by ductless glands.

(d) Pheromones are broadcast via an external medium while hormones are blood-transported.

14: What are releasing hormones?

(a) any hormone that binds to a neuron

(b) hormones that have target cells in the gonads

(c) hormones that bind to target cells involved in triggering fixed action patterns

(d) a special class of pituitary hormones that stimulates production of other hormones
15: What is the fate of daughter cells from a primary spermatocyte?
   (a) three of four become polar bodies and one becomes a sperm cell
   (b) two become sperm cells and the other two degenerate
   (c) all four become sperm cells
   (d) just before ejaculation the four daughter cells go through a mitotic division to form eight sperm cells
   (e) the nuclei of each pair of daughter cells fuse to form standard polyploid sperm cells

16: The gonadotropins FSH and LH are found in...
   (a) males only
   (b) females only
   (c) males and females
   (d) males and females, but only during early embryonic development
   (e) vegetarians only

17: If fertilization does not take place, the luteal phase ends...
   (a) when the follicle ruptures
   (b) due to insufficient levels of chorionic gonadotropin
   (c) if progesterone level is too high
   (d) at the morula stage
   (e) because of programmed cerebellar estrogen secretion
18: In humans, fertilization typically takes place in the...

(a) uterus
(b) ovary
(c) endometrium
(d) oviducts
(e) seminiferous tubules