HSC 205 Examination (2009-2010 Academic Year)

Identify the letter of the choice that best completes the statement or answers the question

(71) Graded potentials (a) are local changes in membrane potential that occur in varying degrees of magnitude (b) serve as short-distance signals (c) serve as long-distance signals (d) Both (a) and (b) (e) Both (a) and (c).

(72) The negative charge established along a nerve cell membrane is due to (a) movement of Na+ into the cell (b) movement of proteins out of the cell (c) higher permeability of K+ relative to Na+. (d) intracellular protein anions (e) Both (c) and (d).

(73) The cells of excitable and nonexcitable tissues share which of the following properties? (a) a threshold potential (b) a resting membrane potential (c) an ability to open the Na^+ gates (d) All of these answers (e) None of these answers.

(74) Which term below best describes an excitable when a resting membrane potential is present? (a) polarized (b) depolarized (c) hyperpolarized (d) repolarized (e) nonpolarized

(75) A threshold potential is (a) the potential achieved when two opposing forces acting upon an ion (concentration and electrical gradients) achieve a state of equilibrium (b) the peak potential achieved during an action potential (c) the point at which there is an explosive increase in Na^+ permeability (d) the potential at which P K^+ increases (e) always a positive potential.

(76) A change in a membrane potential from -70 mV to -60mV is an example of (a) depolarization (b) hyperpolarization (c) polarization (d) repolarization (e) zero potential.

(77) A change in a membrane potential from +30 mV to -70 mV is an example of (a) depolarization (b) hyperpolarization (c) polarization (d) repolarization (e) zero potential.

(78) During the rising phase of the action potential, (a) P K^+ is much greater than P Na^+. (b) P Na^+ is much greater than P K^+. (c) P K^+ is the same as PNa^+. (d) Na^+ efflux occurs. (e) Two of these answers.

(79) At the peak of an action potential, (a) the electrical gradient for K^+ tends to move this ion outward (b) the concentration gradient for K^+ tends to move this ion outward (c) K^+ permeability greatly increases (d) All of these answers. (e) Two of these answers

(80) Which of the following is responsible for the falling phase of an action potential? (a) opening of Na^+ gates (b) Na^+-K^+ pump restoring the ions to their original locations (c) Greatly increased permeability to Na^+ (d) ATP-ase destroying the energy supply that was maintaining the action potential at its peak (e) None of these answers.

(81) The rising phase of the action potential is due to (a) calcium equilibrium (b) potassium efflux (c) potassium influx (d) sodium efflux (e) sodium influx.

(82) The falling phase of the action potential is due to (a) calcium equilibrium (b) potassium efflux (c) potassium influx (d) sodium efflux (e) sodium influx.

(83) When an excitatory neurotransmitter binds to a nicotinic receptor (a) voltage-gated Na^+ channels open (b) voltage-gated K^+ channels open (c) chemically-gated Na^+ channels open (d) voltage-gated Cl- channels open (e) None of these answers.

(84) When chemically-gated Na^+ channels open (a) the membrane hyperpolarizes (b) the membrane repolarizes (c) the membrane depolarizes (d) the membrane becomes more negative (e) the membrane is inhibited.

(85) When a membrane is stimulated due to opening of chemically-gated Na^+ channels (a) an impulse is propagated (b) a graded potential is established (c) an action potential is established (d) the voltage becomes more negative (e) the voltage stays the same.

(86) An action potential develops when: (a) threshold voltage is reached (b) voltage-gated Na^+ channels open and the membrane reaches about -60 millivolts (c) spatial and/or temporal summation of graded potentials occurs to a great enough extent (d) depolarization of the axon occurs (e) All of these answers.

(87) Myelinated axons conduct impulses much faster because: (a) the myelin insulates the axon (b) channels only have to open at the nodes (c) voltage is not lost through along myelinated areas (d) of saltatory conduction (e) All of these answers.

(88) Which of the following is not a graded potential? (a) end-plate potential (b) action potential (c) slow-wave potential (d) receptor potential (e) postsynaptic postential

(89) Which statement regarding graded potentials is false? (a) they are decremental (b) they travel only short distances (c) they are self-propagating (d) they may contribute to the development of an action potential (e) they travel in both directions along the membrane.

(90) Because of the presence of both activation and inactivation gates, voltage-gated Na+ channels can (a) be closed but capable of opening

(b) activated (c) closed and not capable of opening (d) All of these answers (e) None of these answers.

(91) Which protein(s) is/are responsible for development of the resting membrane potential? (a) leak channels (b) gated channels (c) pumps (d) Both (a) and (b) above (e) Both (a) and (c) above.

(92) The membrane is more permeable to K^+ than to Na^+ (a) at resting potential (b) during the rising phase of an action potential (c) during the falling phase of an action potential (d) Both (a) and (b) (e) Both (a) and (c).

(93) A recording electrode is placed into a nerve cell to measure the membrane potential at a particular point. When the physiologist glances at the recording and sees that the membrane at that instant has a potential of +15 mV, she knows that the portion of the membrane being recorded is (a) in the normal resting state (b) in the reversal phase of an action potential when the inside of the cell becomes more positive than the outside (c) more permeable to Ca^{2+} than normal (d) in the after hyperpolarization phase of an action potential (e) Two of these answers.

(94) Conduction by local current flow (a) occurs in unmyelinated fibers (b) is faster than propagation of an action potential in myelinated fibers because myelin acts as an insulator to slow down the impulse (c) involves current flowing locally between the active and adjacent inactive areas, thereby bringing the inactive areas to threshold so that they too become active (i.e., have an action potential) (d) Both (a) and (c) above (e) All of these answers.

(95) Saltatory conduction (a) occurs in unmyelinated nerve fibers (b) is slower than conduction by local current flow because the myelin acts as an insulator to slow the impulse down (c) involves the impulse jumping from one node of Ranvier to the adjacent node (d) refers to the action potential spreading from one Schwann cell to the adjacent Schwann cell (e) More than one of these answers.

(96) Which of the following statements concerning propagation of action potentials is incorrect? (a) saltatory conduction occurs in myelinated nerve fibers (b) during conduction by local current flow, there is a flow of current between the active and adjacent inactive area of the cell membrane, thereby decreasing the potential in the inactive area to threshold (c) the action potential jumps from one Schwann cell to the adjacent Schwann cell in a myelinated fiber (d) saltatory conduction is faster than conduction by local current flow (e) conduction by local current flow is the method of propagation in unmyelinated fibers.

(97) Which of the following nerve fibers will have the highest conduction velocity? (a) an unmyelinated nerve fiber with conduction velocity = 0.35 m/sec (b) an unmyelinated nerve fiber smaller than nerve fiber a. (c) a myelinated nerve fiber the same size as nerve fiber a. (d) a myelinated fiber larger than nerve fiber a. (e) it is impossible to determine with the information provided.

(98) Select the incorrect statement about the action potential. (a) it has an all-or-none characteristic. (b) it has a refractory period. (c) it is triggered by depolarization to threshold. (d) it occurs along a plasma membrane (e) it speeds up transmission by summation.

(99) Permeability of which ion is affected by a positive feedback mechanism once threshold is reached? (a) sodium (b) potassium (c) calcium (d) chloride (e) protein.

(100) During the peak of the action potential which ion has the greatest permeability? (a) sodium (b) potassium (c) calcium (d) chloride (e) protein.

(101) If a neuron were experimentally stimulated at both ends simultaneously, (a) the action potentials would pass in the middle and travel to the opposite ends (b) the action potentials would meet in the middle and then be propagated back to their starting positions (c) the action potentials would stop as they met in the middle (d) the strongest action potential would override the weaker action potential (e) summation would occur when the action potentials met in the middle, resulting in a larger action potential.

(102) Which of the following statements concerning the absolute refractory period is inaccurate? (a) the absolute refractory period refers to the period of time during which another action potential cannot be initiated in a patch of membrane that has just undergone an action potential, no matter how strong the stimulus. (b) the absolute refractory period corresponds to the time period during which the Na^+ gates are first opened and then closed and inactivated (c) immediately following the absolute refractory period, the patch of nerve fiber membrane that has just under- gone an action potential can be restimulated only by a stronger stimulus than is usually necessary (d) the absolute refractory period occurs during the after hyperpolarization phase of the action potential (e) the absolute and relative refractory periods assure the unidirectional spread of the action potential down the nerve fiber away from the initial site of activation.

(103) The refractory period (a) prevents action potentials from spreading forward and backward (b) refers to the time period during which a portion of the membrane that has just undergone an action potential cannot undergo another action potential in response to normal triggering events because the channels opened during the action potential have not been restored to their "closed but capable of opening" conformation (c) places an upper limit on the frequency with which a neuron can conduct action potentials (d) Two of these answers (e) All of these answers.

(104) The period of time following an action potential during which a membrane cannot be restimulated no matter how strong the stimulus (a) is known as the absolute refractory period (b) occurs during the time after the Na^+ gates have opened until they are restored to their "closed

but capable of opening" conformation (c) prevents the action potential from spreading back over the part of the membrane where the impulse has just passed (d) Two of these (e) All of these answers.

(105) The relative refractory period occurs after the action potential is complete because of the (a) lingering inactivation of the voltage-gated Na+ channels (b) slowness of the voltage-gated channels (c) the sodium-potassium pump (d) Both (a) and (b). (e) Both (b) and (c).

(106) The trigger zone of a neuron (a) precedes the axon (b) is located in the hillock (c) contains voltage gated channels (d) Both (a) and (b) above (e) All of these answers.

(107) Temporal summation takes place when (a) two EPSPs from the same presynaptic input occur so closely together in time that they add together or sum (b) an EPSP and an IPSP occur simultaneously in time and cancel each other out (c) two EPSPs that occur simultaneously from different presynaptic inputs add together or sum (d) action potentials occurring in two presynaptic inputs simultaneously converge upon the postsynaptic cell, initiating two different action potentials in the postsynaptic cell (e) None of these answers.

(108) Spatial summation occurs in a postsynaptic neuron (a) when several EPSPs from a single presynaptic input sum to reach threshold (b) when EPSPs from several presynaptic inputs sum to reach threshold (c) upon simultaneous interaction of an EPSP and an IPSP (d) when several IPSPs from a single presynaptic input sum to hyperpolarize the membrane (e) None of these answers.

(109) At an excitatory synapse, an action potential in the (a) postsynaptic neuron depolarizes the presynaptic cell membrane (b) presynaptic neuron increases the permeability of the subsynaptic membrane of the postsynaptic cell to both Na^+ and K^+. (c) presynaptic neuron increases the permeability of the subsynaptic membrane of the postsynaptic cell to K^+ only (d) Both (a) and (b) above (e) Both (a) and (c) above.

(110) At an excitatory synapse (a) there is increased permeability of the subsynaptic membrane to both Na^+ and K^+. (b) a small hyperpolarization occurs (c) an action potential in the presynaptic neuron always causes an action potential in the postsynaptic neuron (d) Two of these answers are correct (e) All of these answers.

(112) An IPSP is (a) produced by increased Na^+ permeability and K^+ permeability. (b) produced by increased K^+ permeability or increased Cl^- permeability (c) a hyperpolarization of the postsynaptic cell. (d) Both (a) and (c). (e) Both (b) and (c).

(113) Which statement regarding neural integration is incorrect? (a) inhibitory synapses cause postsynaptic hyperpolarization (b) an inhibitory synapse may may result in postsynaptic sodium channel opening (c) inhibitory synpase may result in increased postsynaptic potassium efflux (d) an excitatory synapse causes depolarization of postsynaptic membranes (e) an excitatory synapse increases sodium permeability.

(114) Sequence the following events correctly
1- neurotransmitter diffuses across cleft.
2- calcium induces exocytosis of neurotransmitter.
3- permeability of postsynaptic membrane altered
4- ion channels open.
5- neurotransmitter binds to receptor on chemically-gated channel.

(a) *1, 2, 3, 5, 4* (b) *1, 4, 3, 2, 5* (c) *2, 1, 5, 4, 3* (d) *3, 1, 4, 5, 2* (e) *5, 4, 3, 1, 2*

(115) Which channel type is sensitive to serotonin? (a) voltage-gated (b) chemically-gated (c) mechanically-gated (d) acustically-gated (e) None of these answers.

(116) Which of the following statements concerning neuronal inhibition is incorrect? (a) with presynaptic inhibition, another neuron selectively excites an inhibitory presynaptic input. (b) an IPSP depresses information fed into the cell from any excitatory presynaptic input. (c) all of the axon terminals of an inhibitory neuron will release inhibitory transmitter. (d) when presynaptic inhibition takes place, there is no change in postsynaptic membrane potential. (e) an IPSP moves the potential of the postsynaptic neuron farther from threshold.

(117) Two adjacent presynaptic knobs, one from neuron A, the other from neuron B, synapse on a third neuron C. The two presynaptic knobs simultaneously release transmitter, as a result of which an action potential is initiated in neuron C. This is an example of (a) temporal summation. (b) spatial summation (c) convergence (d) Both (a) and (c) above (e) Both (b) and (c) above.

(118) The nucleus of a neuron is housed in the (a) axon (b) axon hillock. (c) cell body. (d) collaterals. (e) dendrites.

(119) Select the normal direction for the movement of an action potential along part of a neuron. (a) axon hillock to cell body (b) axon terminals to collateral axon (c) axon to dendrites (d) cell body to receptor (e) dendrites to cell body.

(120) With presynaptic inhibition, (a) an IPSP occurs on the postsynaptic cell. (b) all excitatory information being fed into the cell is depressed. (c) the release of excitatory transmitter from a specific presynaptic excitatory input is depressed. (d) More than one of these answers (e) None of these answers

(121) Assume a hypothetical postsynaptic neuron has three presynaptic inputs-X, Y, and Z. When presynaptic neuron X and Y are stimulated simultaneously, the postsynaptic neuron reaches threshold and undergoes an action potential, yet when presynaptic neuron X and Z are stimulated simultaneously, there is no change in potential of the post- synaptic neuron. What can you tell about presynaptic neurons Y and Z? (a) presynaptic neurons Y and Z are both excitatory (b) presynaptic neurons Y and Z are both inhibitory (c) presynaptic neuron Y is excitatory, and presynaptic neuron Z is inhibitory (d) presynaptic neuron Y is inhibitory, and presynaptic neuron Z is excitatory (e) there is too little information provided to determine what type of neurons Y and Z might be

(122) In convergence, (a) thousands of synapses from many different presynaptic cells end upon a single postsynaptic cell (b) the axon of a nerve cell branches so that the activity in one neuron influences many other cells (c) the dendrites all converge upon the cell body (d) All of these answers (e) None of these answers

(123) In divergence, (a) thousands of synapses from many presynaptic neurons end upon a single postsynaptic cell (b) the dendrites diverge from the cell body to contact as many presynaptic neurons as possible (c) the action potential initiated in the axon diminishes as it diverges into the axon terminals (d) the axon of a nerve cell branches to synapse with many other cells so that activity in one neuron influences the excitability of many other cells (e) None of the above.

(124) Select the incorrect description of the graded potential. (a) it can be depolarized (b) it can be hyperpolarized (c) it can be summated (d) it has a refractory period (e) it occurs in specialized membrane regions

(125) The nodes of Ranvier are (a) action potential recordings (b) breaks in the myelin covering (c) lipid paths (d) spaces between neurons (e) specialized cells

(126) Neuromodulators (a) bind to receptors at nonsynaptic sites (b) do not contribute directly to EPSP formation (c) do not contribute directly to IPSP formation (d) may influence neurotransmitter production. (e) All of these answers.

(127) Presynaptic facilitation results from (a) alteration of calcium permeability (b) continued EPSP generations (c) neuromodulator effects (d) increased neurotransmitter production (e) None of these answers.

(128) Drugs may influence synaptic transmission by (a) altering the formation of neurotransmitters (b) blocking neurotransmitter reuptake (c) blocking receptors (d) blocking channels (e) All these answers.

(129) Select the last step for synaptic signaling when the action potential arrives at the axon terminal of a presynaptic neuron. (a) a neurotransmitter is released by exocytosis. (b) calcium flows in the synaptic knob (c) the neurotrasnmitter combines with protein receptor sites on the subsynaptic membrane (d) the permeability is altered in a postsynaptic neuron (e) None of these answers.

(130) Select the first step for synaptic signaling when the action potential arrives at the axon terminal of a presynaptic neuron. (a) a neurotransmitter is released by exocytosis (b) calcium flows in the synaptic knob (c) the neurotransmitter combines with protein receptor sites on the subsynaptic membrane (d) the permeability is altered in a postsynaptic neuron (e) the neurotransmitter is synthesized.

(131) Select the neuropeptide. (a) acetylcholine (b) dopamine (c) epinephrine (d) glucagon (e) glycine

(132) Neuropeptides (a) are sometimes cosecreted along with classical neurotransmitters (b) are synthesized in the cytosol of the axon terminal (c) act at the subsynaptic membrane of the postsynaptic neuron (d) Both (a) and (b) above. (e) All of these answers.

(133) Tetanus toxin (a) combines with glycine receptors, thus blocking the action of this inhibitory neurotransmitter (b) destroys dopamine in the region of the brain involved in controlling complex movements (c) prevents the release of gamma-aminobutyric acid from presynaptic inputs terminating on neurons that supply skeletal muscles (d) promotes presynaptic facilitation (e) causes retrograde flow in axon

(134) Assume a hypothetical postsynaptic neuron has three presynaptic inputs: X, Y and Z. Also assume that presynaptic neuron Z is excitatory. If presynaptic neuron X is stimulated, the postsynaptic cell membrane becomes slightly hyperpolarized. What kind of a synapse is involved between presynaptic neuron X and the postsynaptic neuron? (a) excitatory synapse. (b) inhibitory synapse (c) it could be either an excitatory or an inhibitory synapse (d) collateral axoaxonic (e) insufficient information is given to know what kind of synapse is involved.

(134) Assume a hypothetical postsynaptic neuron has three presynaptic inputs: X, Y and Z. Also assume that presynaptic neuron Z is excitatory. What permeability changes would you expect to occur at the postsynaptic neuron when presynaptic neuron X is stimulated? (Remember that the postsynaptic neuron becomes hyperpolarized by presynaptic neuron X.) (a) increased P Na^+ and P K^+ (b) increased P K^+ or P Cl- (c) increased P A- (d) increased P Ca^{2+} (e) insufficient information is provided to know what permeability change would be expected.

(135) Assume a hypothetical postsynaptic neuron has three presynaptic inputs: X, Y and Z. Also assume that presynaptic neuron Z is excitatory. If presynaptic neuron Y is stimulated, the postsynaptic cell membrane becomes slightly depolarized. What kind of synapse is involved between presynaptic neuron Y and the postsynaptic neuron? (a) excitatory synapse. (b) inhibitory synapse (c) it could be either an excitatory or an inhibitory synapse (d) axosomatic (e) insufficient information is given to know what kind of synapse is involved.

(136) Assume a hypothetical postsynaptic neuron has three presynaptic inputs: X, Y and Z. Also assume that presynaptic neuron Z is

excitatory. What permeability changes would you expect to occur at the postsynaptic neuron when presynaptic neuron Y is stimulated? (Remember that the postsynaptic neuron becomes depolarized by presynaptic neuron Y.) (a) increased P Na^+ and P K^+ (b) increased P K^+ or P Cl- (c) increased P A- (d) increased P Ca^{2+} (e) Insufficient information is provided to know what permeability change would be expected.

(137) Assume a hypothetical postsynaptic neuron has three presynaptic inputs: X, Y and Z. Also assume that presynaptic neuron Z is excitatory. If presynaptic neurons Y and "Z" are stimulated simultaneously, what change would you expect to occur in the postsynaptic neuron? (a) a single EPSP. (b) a single IPSP. (c) temporal summation of EPSPs. (d) spatial summation of EPSPs. (e) an IPSP and EPSP would cancel each other out so there would be essentially no change in potential in the postsynaptic neuron.

(138) Assume a hypothetical postsynaptic neuron has three presynaptic inputs: X, Y and Z. Also assume that presynaptic neuron Z is excitatory. If presynaptic neurons X and "Z" are stimulated simultaneously, what change would you expect to occur in the postsynaptic neuron? (a) a single EPSP (b) a single IPSP (c) temporal summation of EPSPs (d) spatial summation of EPSPs (e) an IPSP and EPSP would cancel each other out, so there would be essentially no change in potential in the postsynaptic neuron.

(139) If presynaptic neuron Z is repeatedly stimulated very rapidly, what change would you expect to occur in the postsynaptic neuron? (a) a single EPSP (b) a single IPSP (c) temporal summation of EPSPs (d) spatial summation of EPSPs (e) An IPSP and EPSP would cancel each other out, so there would be essentially no change in potential in the postsynaptic neuron.

(140) Which of the following is not a type of a muscle fibre? (a) smooth muscle (b) rough muscle (c) striated muscle (d) cardiac muscle (e) none of the above.

END: GOOD LUCK: DR. VERLA AND DR. SALAH