

Section 1

Nerves and Muscles

- 1 With reference to the action potential:
 - a) decreasing the external Na^+ concentration increases the size of the action potential
 - b) decreasing the external K^+ concentration decreases the resting membrane potential
 - c) increasing the external Na^+ concentration decreases the resting membrane potential
 - d) decreasing the external K^+ concentration has little effect on the resting membrane potential
 - e) none of the above are true

- 2 In the Erlanger and Gasser classification of nerve fibres:
 - a) C fibres have the fastest conduction velocity
 - b) $A\gamma$ fibres are responsible for touch and pressure
 - c) C fibres are most susceptible to local anaesthetics
 - d) $A\alpha$ fibres have the fastest conduction velocity and the longest absolute refractory period
 - e) A fibres are most susceptible to hypoxia

- 3 Regarding neurotrophins:
 - a) NGF and BDNF share the same receptor
 - b) the structure of the β subunit of NGF resembles that of insulin
 - c) CNTF is necessary for the growth and maintenance of sympathetic neurons
 - d) disruption of GDNF by gene knockout causes a marked loss of cutaneous mechanoreceptors
 - e) none of the above are true

- 4 Regarding cardiac muscle:
 - a) cardiac muscle has high ATPase activity
 - b) only the α MHC isoform is found in the atria
 - c) resting membrane potential is about -70mV
 - d) force of contraction is mediated by catecholamines acting via β^1 -adrenergic receptors
 - e) mutations of the human ether-a-go-go gene causes minks to shake their legs uncontrollably

- 5 Which of the following does not decrease smooth muscle membrane potential?
- acetylcholine
 - stretch
 - cold
 - noradrenaline
 - parasympathetic stimulation
- 6 In regard to plasma volume:
- it contributes to 10% of body weight
 - can easily be measured by radioisotope chromium
 - if the plasma volume is known, the blood volume can be calculated by multiplying $100 - \text{HCT} / 100$
 - measured by injecting Evans blue
 - the average plasma volume is 500ml
- 7 Which of the following is FALSE?
- the ECF represents 20% of body weight
 - the blood volume represents 8% of the body weight
 - the 2/3 of the body water is in ICF
 - 18% of the body weight is protein
 - the transcellular fluids contribute to 5% of the body weight
- 8 Which of the following is FALSE?
- diffusion depends on concentration gradient of the solutes
 - osmotic pressure of a solution is inversely related to the volume of the solution
 - when 5% dextrose is infused, it becomes hypotonic to the plasma in the body
 - osmolality is defined as osmotically active particles in 1L of solution
 - osmolality is defined as a number of osmotically active particles in 1kg of solvent
- 9 Regarding cell membrane, which of the following is FALSE?
- the diameter of the cell membrane is about 7.5nm
 - 50% of the cell membrane is made up of proteins
 - the main lipids of the cell membrane are phospholipids
 - the hydrophilic ends of the lipid molecules are faced towards the interior of the cell membrane
 - the proteins in the cell membrane function as carriers, ion channels, enzymes and receptors

- 10 Regarding mitochondria, which of the following is TRUE?
- a) 99% of mitochondrial proteins are products of mitochondrial DNA
 - b) the outer membrane of the mitochondria is folded to form cristae
 - c) the space between the outer and inner mitochondrial space is called matrix space
 - d) it is the sperm which contributes to the formation of mitochondria in the zygote
 - e) the synthesis of ATP in the mitochondria is triggered by diffusion of H^+ from matrix to intracristal space
- 11 Which is FALSE?
- a) fast fibres have small number of mitochondria
 - b) fast fibres are called white muscles
 - c) the glycolic processes are more important in energy supply in fast fibres
 - d) slow fibres are also called red fibres
 - e) fast fibres have more extensive blood supply than slow fibres
- 12 Smooth muscles differ from skeletal muscle by:
- a) not having actin/myosin
 - b) not having striated appearance
 - c) not using ATP for contraction
 - d) not using Ca^{2+} for contraction
 - e) not having sarcoplasmic reticulum
- 13 Which of the following is absent in smooth muscle?
- a) tropomyosin
 - b) actin
 - c) myosin
 - d) troponin
 - e) mitochondria
- 14 The highest number of voltage gated Na^+ channels are found in:
- a) initial segment of axon
 - b) nodes of Ranvier
 - c) cell body
 - d) terminal buttons
 - e) myeline sheath
- 15 Which of the following nerve fibres is most susceptible to hypoxia?
- a) group B
 - b) group C
 - c) group A – α
 - d) dorsal root
 - e) somatic motor

- 16 Which of the following is most susceptible to pressure?
- group A – motor
 - group C
 - group B
 - pre ganglionic-autonomic
 - muscle spindle fibres
- 17 Regarding nerve action potential, which is TRUE?
- normal resting membrane potential is -40mV
 - initial rapid depolarisation is due to rapid influx of Ca^{2+} via fast channels
 - during depolarisation, Na^+ permeability is greater than K^+ permeability
 - hyperpolarisation is due to continuous opening of Na^+ channels
 - plateau is formed by slow Ca^{2+} channels
- 18 Which is FALSE regarding secondary active transport?
- it always transports substances in one direction
 - energy required is obtained by Na^+/K^+ ATPase pump
 - a good example is Na^+ / glucose co-transport
 - Na^+ / Ca^{2+} antiport is an example of secondary active transport
 - secondary active transport occurs in renal tubules
- 19 Which is TRUE?
- steroids act via cAMP
 - insulin acts via IP_3
 - EGF+ erythropoietin act via cAMP
 - thyroid hormones act via G proteins
 - retinoic acid act via intracellular receptor → transcription of genes
- 20 Na^+ / K^+ ATPase pump – which is FALSE?
- it is electrogenic in nature
 - it is important in maintaining cell volume
 - plays a major role in secondary active transport
 - it is the main factor which determine the resting membrane potential
 - it is an example of primary active transport
- 21 Regarding serotonin:
- the highest concentration is in the brain
 - formed by hydroxylation and decarboxylation of tyrosine
 - catabolised by COMT
 - some receptors are ion channels
 - mediates smooth muscle relaxation

- 22 GABA:
- a) decreases Cl^- conductance
 - b) is broken down by glutamate decarboxylase (GA????)
 - c) there are five receptor subtypes
 - d) benzodiazepines bind to the β subunit of the GABA receptor
 - e) is involved in 20% of CNS synapses
- 23 Which is NOT present in high concentrations, at the active zone of synapses?
- a) syntaxin
 - b) catecholamine vesicles
 - c) neuropeptide vesicles
 - d) synaptobrevin
 - e) calcium channels
- 24 Which is not a ligand-gated ion channel?
- a) nicotinic receptor
 - b) GABA_A receptor
 - c) glycine receptor
 - d) NMDA receptor
 - e) 5-HT_1 receptor
- 25 Which drug is NOT involved in facilitating Cl^- conductance?
- a) benzodiazepines
 - b) progesterone
 - c) oestrogen
 - d) barbiturates
 - e) alcohol
- 26 Regarding skeletal muscle:
- a) isotonic contraction does no work
 - b) calcium is released from troponin during contraction
 - c) the resting membrane potential is -70mV
 - d) treppe occurs in skeletal muscle only
 - e) white muscle has short twitch durations
- 27 Regarding cardiac muscle:
- a) gap junctions provide high resistance bridges
 - b) T system of tubules located at A-I junctions
 - c) calcium binds to calmodulin
 - d) tetany is not possible due to the latch bridge mechanism
 - e) $\uparrow\text{cAMP}$ leads to \uparrow force of contraction

- 28 Regarding smooth muscle:
- tropomyosin is absent
 - the resting membrane potential is -90mV
 - there is a highly developed sarcoplasmic reticulum
 - there are no spike potentials
 - dense bodies are attached to the cell membrane
- 29 Regarding synapses:
- large vesicles contain ACh
 - Na⁺ influx triggers fusion / exocytosis of vesicles
 - 1 PSP can be produced by closing K channels
 - the synaptic cleft is 100-150nm
 - neurotransmitters migrate down the axon by fast axoplasmic transport
- 30 Regarding acetylcholine:
- it is oxidised to choline and acetate by acetylcholinesterase
 - nicotinic receptors are blocked by atropine
 - it is the main excitatory transmitter in the spinal cord
 - it is secreted by the adrenal medulla
 - tetanus blocks its release at the NMJ
- 31 Regarding synaptic structure / function:
- small clear vesicles in the presynaptic tunnel contain catecholamines
 - tetanus toxin causes spastic paralysis by blocking release of ACh at NMJ
 - chemical mediators located in ????? of presynaptic fibres contain one-way conduction of impulses
 - the EPSP is an all-or-none response
 - An I-PSP can be produced by localised increase in membrane permeability to Cl⁻
- 32 Transmitters – all are true EXCEPT:
- angiotensin II is a neurotransmitter of the polypeptidillars
 - glutamate is an inhibitory amino acid
 - glucagons is found in hypothalamus and retina
 - vasopressin is found in posterior pituitary, medulla, spinal cord
 - serotonin is an amine
 - NO and CO may be transmitters – CNS
- 33 Neurotransmitters:
- atropine blocks effect of acetylcholine at ????? receptor
 - reaction between active acetate and choline is catalysed by acetylcholinesterase
 - nicotinic cholinergic receptors are serpentine receptors
 - the rate limiting step in synthesis of NOVA is ??????(concession) of tyrosine to dopa
 - MAO_A is found in nerve endings and platelets

Nerves and Muscles

Section 1 – Answers

- | | |
|----|---|
| 1 | E |
| 2 | C |
| 3 | B |
| 4 | D |
| 5 | D |
| 6 | D |
| 7 | E |
| 8 | D |
| 9 | D |
| 10 | E |
| 11 | E |
| 12 | B |
| 13 | D |
| 14 | A |
| 15 | A |
| 16 | A |
| 17 | C |
| 18 | A |
| 19 | E |
| 20 | D |
| 21 | D |
| 22 | E |
| 23 | C |
| 24 | E |
| 25 | C |
| 26 | E |
| 27 | E |
| 28 | E |
| 29 | E |
| 30 | E |
| 31 | C |
| 32 | B |
| 33 | D |