McGill University
Physiology 210 – Mammalian physiology II
Midterm Examination – Version 1
Thursday February 28th, 2013

Type A Questions: Choose the answer that is the best and darken the appropriate circle

1. Which of the following is NOT a step in hormonal signaling?
    a) Synthesis of the hormone by endocrine cells (or neurons in case of neurohormones)
    b) Transport of the hormone or neurohormone to target site by the blood stream
    c) Detection of the hormone or neurohormone by a specific receptor protein on the target cells
    d) A change in cellular metabolism triggered by the hormone-receptor interaction
    e) None of the above

2. Thyroid hormone
    a) Induces PTH release via paracrine signaling with the parathyroids
    b) Is an iodinated metabolite of the amino acid tyrosine
    c) Stunts growth in a hyperthyroid state
    d) Functions primarily through a G protein-coupled membrane receptor
    e) None of the above

3. Cushing's disease
    a) Arises entirely from loss of glucocorticoid secretion
    b) Is characterized by low circulating Na^+ concentrations and low blood volume
    c) Is characterized by low blood glucose during fasting
    d) Is almost always primary in nature because it arises from adrenal atrophy
    e) None of the above

4. FXR:
    a) Is highly expressed in adipose tissue
    b) Stimulates differentiation of adipose tissue leading to weight gain
    c) Is a target of TZD drugs used in treatment of type II diabetes
    d) Acts to suppress CYP7A expression as part of a negative feedback loop in bile acid metabolism
    e) All of the above

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5. Which of the following statements is true about atrial fibrillation?
   a) The start-up of the arrhythmia is due to premature ventricular contraction
   b) There is the re-entrant motion of multiple action potentials wavefronts in the atrial muscle
   c) The cardiac output is very much reduced from normal
   d) There is no evidence of atrial activity visible on the electrocardiogram
   e) The start-up of the arrhythmia is due to a premature atrial contraction that originates in an ectopic focus situated in the pulmonary arteries

6. In a patient with a stenosis of the aortic valve, one might expect to hear a murmur
   a) Just before the first heart-sound
   b) Between the first and second heart-sounds
   c) Just after the second heart sound
   d) During atrial systole
   e) Just before the P-wave is seen on the ECG

7. Which statement is true about measuring the arterial blood pressure (BP)?
   a) One is at the systolic BP when one first starts to hear the heart-sounds
   b) In the oscillometric method, the oscillations in the pressure in the cuff cease before the cuff pressure falls to the diastolic BP
   c) The direct method of measuring BP is no longer used
   d) One can calculate the pulse pressure by adding together the diastolic BP and the systolic BP
   e) One is at the diastolic BP when one ceases to hear the Korotkoff sounds

8. Increased activity in the sympathetic system will cause
   a) A decreased heart rate
   b) A decrease in the contractility of ventricular muscle
   c) An increase in the amount of acetylcholine released at the synapse of the sympathetic pre-ganglionic axon with the ganglion cell
   d) An increase in the amount of acetylcholine binding to muscarinic receptors in sympathetic ganglion cells
   e) An increase in the amount of acetylcholine binding to muscarinic receptors on sinus node cells

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9. With a fall in blood pressure, the reflex changes that will be provoked include:
   a) Activation of the parasympathetic nervous system by the baroreceptor reflex
   b) A decreased level of plasma epinephrine concentration
   c) A decreased production of urine
   d) A decreased plasma angiotensin I concentration
   e) A decreased plasma aldosterone concentration

10. During heavy aerobic exercise in an individual of average weight, the cardiac output rises to 25 L, the O_2 content of the arterial blood stays at its resting value and the O_2 of mixed venous blood falls to 5mL per 100mL blood. During this exercise period, the consumption of oxygen by the body, with respect to the resting value, will be multiplied by a factor of:
   a) 10
   b) 15
   c) 20
   d) 25
   e) 30

11. Physiological distension at the level of the
   a) distal portion of the esophagus, will generate primary esophageal peristaltic waves
   b) proximal stomach, will generate strong local peristaltic waves
   c) distal stomach, will generate local receptive relaxation
   d) duodenum, will inhibit gastric antral peristaltic activity
   e) distal ileum, will tighten the sphincter separating the small intestine from the colon

12. Which one of the following statements regarding the CTZ is **INCORRECT**?
   a) It is located in the medulla oblongata
   b) It lies outside the blood/brain barrier
   c) Its intactness is NOT required for psychogenic vomiting to take place
   d) Its intactness is NOT required for vomiting in response to chemical irritation of the gastrointestinal tract
   e) It continues to bring about vomiting in response to toxins in the blood stream, even if the Vomiting Centre has been destroyed

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13. Segmenting contractions
    a) In the stomach, are responsible for the conversion of a solid meal into chyme
    b) In the duodenum, have a lower maximum frequency than in the distal ileum
    c) Throughout the small intestine promote mixing of contents with digestive secretions, but don't play a role in the propulsion of chime towards the colon
    d) In the small intestine, are seen more commonly than peristaltic contractions, after the intake of a meal
    e) Are never seen in the colon in the normal individual

14. The Enterogastrone Hormonal Complex,
    a) includes the hormone Gastrin
    b) is released from the gastric mucosa in response to the presence of fat
    c) is released in response to the activation of the enterogastric reflex
    d) exerts an effect on gastric activity which is opposite to that resulting from the activation of the enterogastric reflex
    e) inhibits both gastric emptying and gastric secretion

15. On the basis of your knowledge of the mechanism of gastric emptying of liquid meals and that of solid meals, which of the following would you expect following complete destruction of the vagal innervations to the stomach
    a) Accelerated emptying of solids; accelerated emptying of liquids
    b) Delayed emptying of solids, accelerated emptying of liquids
    c) Delayed emptying of solids, delayed emptying of liquids
    d) Accelerated emptying of solids, delayed emptying of liquids
    e) Delayed emptying of solids; no change in emptying of liquids

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Type B Questions: Darken the appropriate circle as follows

1. if a,b and c are good
2. if a and c are good
3. if b and d are good
4. if only d is good
5. if all or none of the above are good

16. Prolactin inhibitory hormone:
    a) Is produced primarily by the corpus luteum to prevent milk production prior to delivery
    b) Is another name for dopamine
    c) Targets primarily the hypothalamus
    d) Release is inhibited by suckling

17. In Grave's disease:
    a) A toxic goiter may be present
    b) The negative feedback loop is broken because of the lack of thyroid hormone
    c) Basal metabolic rate is increased
    d) Treatment involves administration of iodine to counteract deficiency

18. Estrogen signaling:
    a) Can inhibit LH release at moderate concentrations during the menstrual cycle
    b) Is produced by the corpus luteum
    c) Acts in concert with progesterone to stimulate endometrial development prior to implementation
    d) Is not of physiological significance in males

19. All polypeptides hormones:
    a) Are encoded by a gene
    b) Are converted to glycoproteins by glycosylation
    c) Are initially synthesized as preprohormones
    d) Are secreted by the pituitary

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20. Cell A has a membrane area that is twice that of cell B, and a membrane that is half as thick. The O_2 concentration just inside the membrane is the same for the two cells, as is the O_2 concentration just outside the membrane of the two cells. One would expect:

a) The flux of oxygen in cell A to be double that in cell B
b) The flow of oxygen in cell A to be twice that it cell B
c) The concentration gradient in cell A to be double that in cell B
d) The concentration gradient in cell A to be half that in cell B

21. If one wished to quadruple the flow through a vessel, than one could:

a) Halve the length of the vessel
b) Double the radius of the vessel
c) Halve the viscosity of the blood going through the vessel
d) Halve the radius of the vessel

22. Which of the following statements is/are true about the electrical activity in the heart?

a) The upstroke of the action potential in a cell in one of the bundle branches occurs during the QRS-complex
b) Atrial repolarization occurs during the P-wave
c) The direction of activation of ventricular muscle is from its epicardial surface to its endocardial surface
d) Local circuit currents are flowing somewhere in the heart during the entire time between the end of the P-wave and the start of the QRS-complex

23. Which of the following event is/are part of the normal process of excitation-contraction signaling?

a) The entry of K^+ into the cell through potassium channels
b) The release of Ca^{++} from stores within gap junctions
c) The binding of Ca^{++} to ryanodine receptors lying in the mitochondrial membrane
d) The binding of Ca^{++} to troponin

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24. A patient has an end-diastolic volume of 150 mL, a stroke volume of 100 mL and a cardiac output of 6L/min. You conclude that

a) the total peripheral resistance is 3 mm Hg mL^{-1} min
b) the ejection fraction is 0.67 (67%)
c) the cardiac output is abnormally low
d) the end-systolic volume is 50 mL

25. A pheochromocytoma is a tumour of the adrenal gland that can secrete abnormally large amounts of epinephrine into the circulation. Neglecting any cardiovascular reflexes, which of the following might one expect to see in the patient as a direct effect?

a) An increased heart rate
b) An increased amount of binding of epinephrine to alpha-adrenergic receptors
c) An increase in the contractility of cardiac muscle
d) An increased stroke volume

26. **CORRECT** statements regarding the parasympathetic innervation of the GIT include the following one(s)

a) It originates in the medulla oblongata
b) It reaches the wall of the GIT as postganglionic fibres
c) Its preganglionic fibres release Ach which binds to receptors of excitatory or inhibitory enteric neurons
d) It does not play an important role in the regulation of the cephalic phase of GIT secretions

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2. if a and c are good
3. if b and d are good
4. if only d is good
5. if all or none of the above are good

27. In the stomach, the BER is not detectable:

Question was cancelled

28. The cephalic phase of gastric juice secretion,

a) is associated with the release of both HCl and Intrinsic Factor

b) is associated with the release of some gastrin, during both the psychic and gustatory phases

c) is associated with an increase in both gastric blood flow and an increase in the pH of gastric venous blood

d) can no longer take place after the sympathetic innervations to the stomach has been destroyed

29. Which one(s) of the following statements comparing/contrasting the UES and the LES is/are **CORRECT**?

a) The entire UES consists of striated muscle, but only part of the LES is striated

b) The UES is located entirely in the thoracic cavity, but the LES is located entirely in the abdominal cavity

c) The normally closed state of both the UES and the LES results from the intense myogenically determined resting tone of the local musculature

d) Neither the UES nor the LES will relax completely in response to the administration of a physiological dose of atropine

30. In humans, the salivary glands

a) Secrete a fluid which has an osmolarity of over 300 mOsm, at all rates of secretion

b) Secrete a large volume of fluid in response to the intravenous administration of secretin

c) Secrete a fluid which has a pH in the strongly alkaline range, at all rates of secretion

d) Secrete a fluid containing an enzyme capable of digesting polysaccharides to the level of disaccharides

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