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final-exam-07e28

#183

2 of 16

Instructions for this Exam:

1. Wireless communication (i.e., cell phones, tablets, etc) and other electronic devices are not permitted. These must be turned OFF and kept in your bag/backpack. You are NOT permitted to retain these devices in your pant or coat pocket, or on your desk.
2. Textbook, lecture and lab materials are not permitted on your desk. Pencil (or other) cases are not permitted on your desk.
3. Drinking and eating are prohibited.
4. Place your Photo ID (Tcard) at the top right corner of your desk for the duration of the exam.
5. The maximum amount of marks for this exam is 80. There are 20 short answer questions that are worth 65 points and 15 multiple choice questions worth 15 points.
6. The number of marks available is indicated in parentheses () at the end of each question.
7. Please adhere to specified sentence limits. One mark will be deducted for each sentence over the specified limit.
8. This exam is double-sided. Only answers written in space below questions will be considered. If necessary, use blank sheets provided for calculations or draft answers.
9. The last page has the multiple choice bubble sheet. Each question has only one correct answer per question
10. The "time remaining" will be announced at 10 minutes and 5 minutes before the end of the exam.
11. You may not leave the exam room during the first hour, or after the 5 minutes remaining announcement.
12. You have 2.5 hours to complete this exam.



Part 1: Short Answer

Only answers written in space below questions will be considered.

If necessary, use blank sheets provided for calculations or draft answers.

1. You have just removed a gel loaded with different samples using SDS-PAGE (sodium dodecyl sulfate – polyacrylamide gel electrophoresis) and realize that your proteins did not resolve into well-defined bands. Specifically, there was poor band resolution. List 2 reasons that explain why this might have happened and a corrective action. (4)

Reason for poor band resolution	Corrective action

2. Where did you place the electrodes on your skin in the EMG lab? (1)
3. What is the advantage of having an autonomic nervous system neuron that exits the spinal cord synapse onto a second neuron before the target cell? (1)



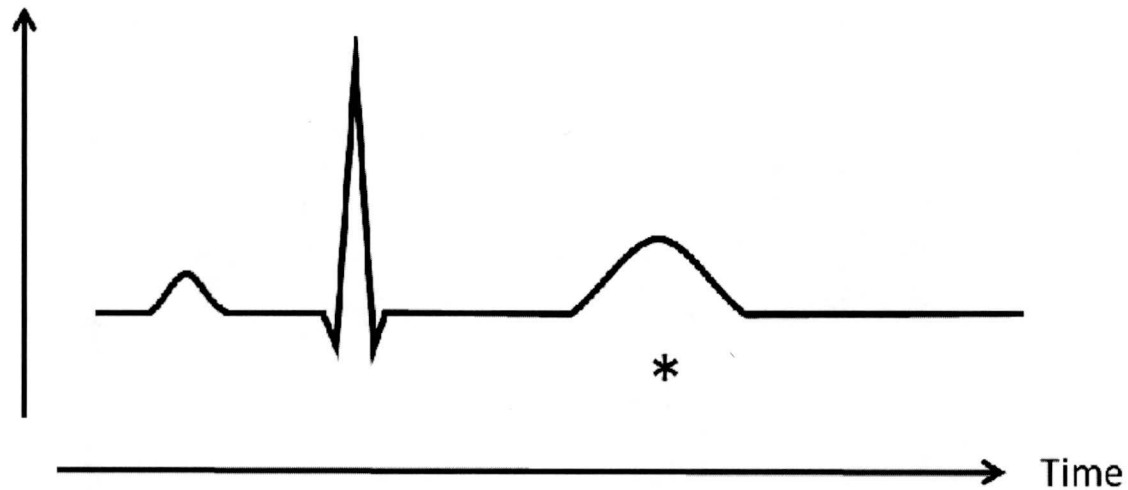
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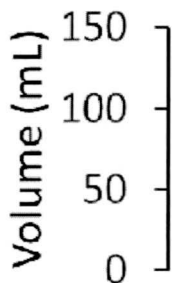
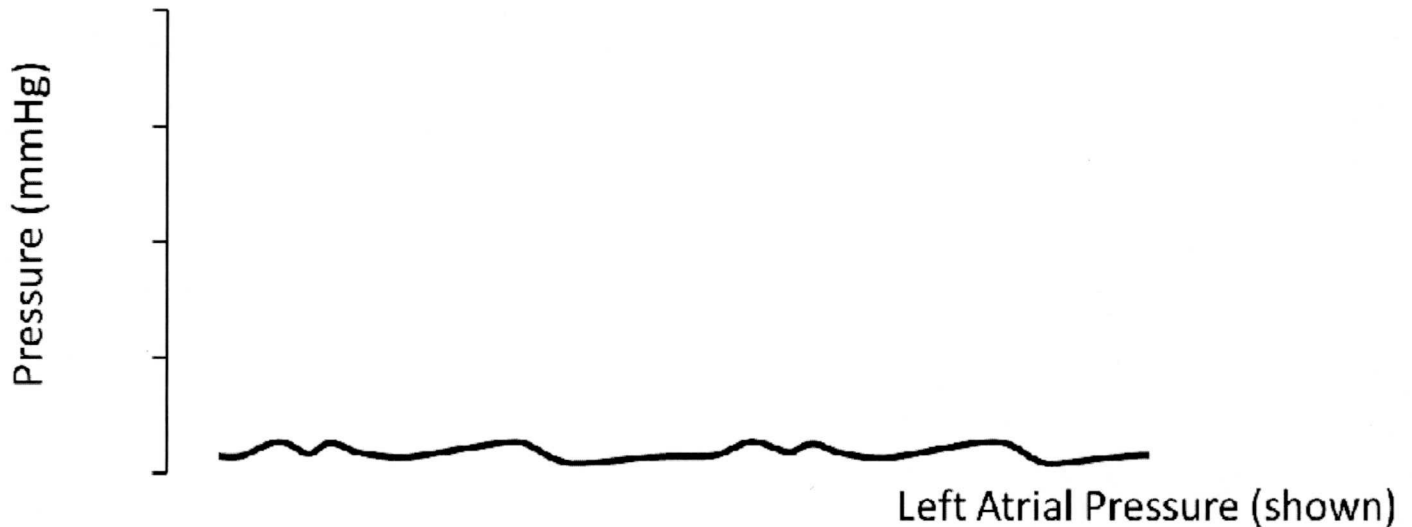
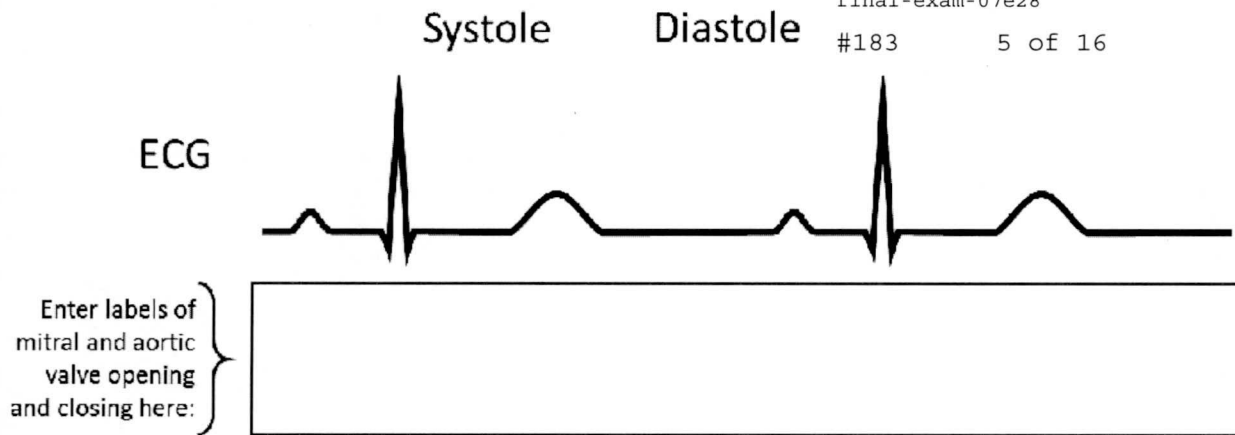
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4 of 16

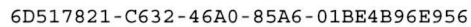
4. Use the figure shown below of the electrocardiogram to answer the following questions: (6)



- 4a. Writing on the figure above: Label all of the waves with the standard letters that describe each major deflection. Draw and label the interval or segment that best describes the time when the ventricles are contracting and emptying. (3; half mark for each response)
- 4b. Referencing the figure above, what is the cause of the deflection that lies above the asterisk (*) and why is it a positive deflection? (2)
- 4c. Which interval or segment best describes the slower conduction velocity encountered by the atrioventricular node? (**Do not** label this on the diagram above) (1)



5. Use the figure above to answer the following questions. (7)
- 5a. Draw vertical lines that correspond to the opening and closing of the Mitral and Aortic valves. You must correctly label each line in the space provided with the proper valve action for full marks. Also provide correct labels to the intervals where there is isovolumic relaxation and contraction (3; half mark for each response)
- 5b. The middle panel, where the y-axis labeled "Pressure" is located, shows the pressure changes in the left atrium. You must draw the following: 1) the normal changes in left ventricular pressure, 2) the corresponding changes in aortic pressure, and 3) the appropriate y-axis labels. (3)
- 5c. On the bottom panel, where the y-axis labeled "Volume" is located, you must draw the correct left ventricular volume changes that match the waveforms that you have already drawn. (1)

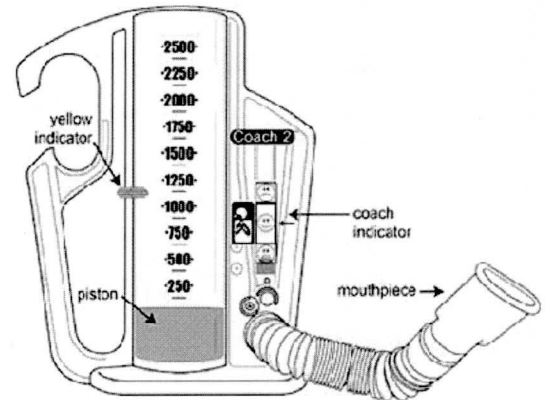


#183 6 of 16

6. In two sentences or less, why would atrial fibrillation become especially problematic for a person during periods strenuous exercise? (2)
7. Considering a standard baroreceptor response to low blood pressure: In two sentences or less, describe how the autonomic nervous system responds to restore mean arterial blood pressure to normal. (3)
8. In two sentences or less, how would a person with idiopathic pulmonary fibrosis potentially describe their symptoms? What is the most likely reason they may say this and what structural changes likely have occurred? (3)



9. The device shown on the right was demonstrated in class. Considering normal use of the device, what lung volume or capacity would the device be most likely to measure? (1)



- 9a. Describe the pattern of breathing (in terms of inspiration and expiration) that defines this volume or capacity. (1)

- 9b. If a person with asthma were to use this device, what might be different compared to a normal healthy person? (1)

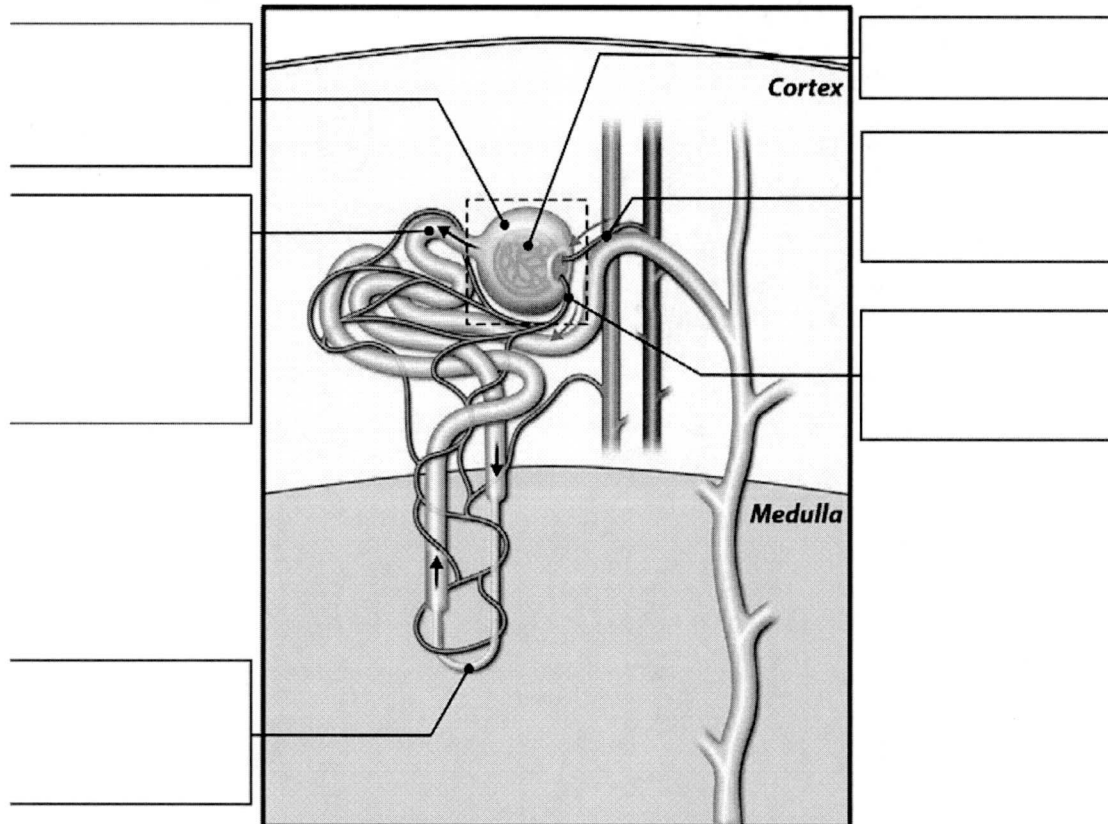
10. The device shown on the right was demonstrated in class. Considering normal use of the device, what lung volume or capacity would the device be most likely to measure? (1)



- 10a. If a person with asthma were to use this device, how would the lung volume or capacity it measures change for this person compared to a normal, healthy person? Describe the reason for this change. (2)



11. Enter the correct labels for the structures listed below. (3; half mark for each response)



12. What are 3 features of the glomerular capillary bed that are significantly different compared to normal capillary beds in other organs? (3)

Feature 1) _____

Feature 2) _____

Feature 3) _____

13. In the nephron, the two capillary beds in series allows for a sequence of events to occur. In the correct order, what three things must occur to excrete urine? (2)

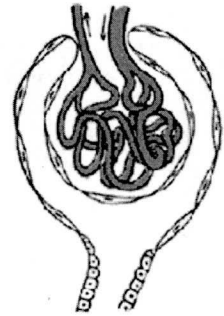
1) _____

2) _____

3) _____



14. Shown to the right is a drawing of the glomerulus. In one sentence, what would happen to the glomerular filtration rate if only the efferent arteriole experiences vasodilation and why? (2)



15. Name the structures in the small intestine and describe, in one sentence or less, why the small intestine is so long? (2)
16. During the cephalic phase of digestion, what processes start to occur in the stomach before the presence of food is detected? (2)



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final-exam-07e28

#183

10 of 16

17. As eating occurs during the gastric phase, the swallowing of food is separated into three distinct phases. Name the three phases and, in one sentence or less, describe what happens. (6; half mark for each response)

Phase 1: _____

Phase 2: _____

Phase 3: _____

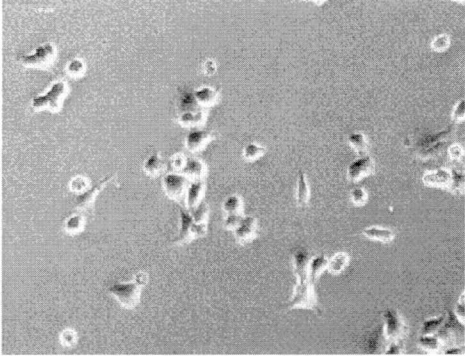
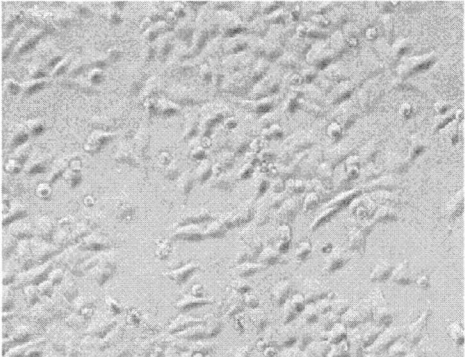
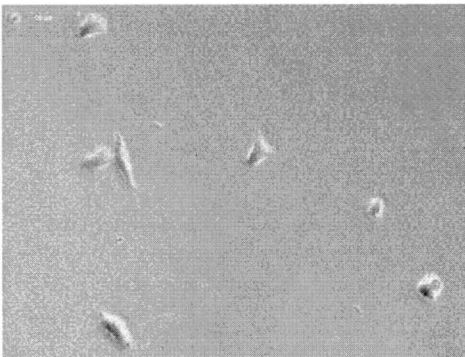
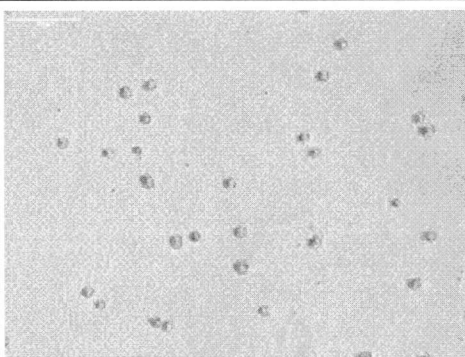
18. Based on the 5 most common types of leukocytes, list each in the correct column. Indicate, in brackets, whether the leukocyte is best identified as: [innate] or [adaptive]. (5)

Granulocytes	Agranulocytes

19. What are the four physical signs of inflammation? (2; half mark for each response)



20. You analyzed three different cell types in the microscopy lab. In each row, provide a short answer or check the best description of the state of the cells in each picture. (5)

a) What type of cell is this? _____	
	<input type="checkbox"/> Low confluence <input type="checkbox"/> Normal confluence <input type="checkbox"/> High confluence <input type="checkbox"/> Dead
	<input type="checkbox"/> Low confluence <input type="checkbox"/> Normal confluence <input type="checkbox"/> High confluence <input type="checkbox"/> Dead
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Part 2: Multiple Choice

Each question is worth 1 point

Each question has only one answer (i.e., a, b, c, d, or e)

Answers must be filled out on bubble sheet on last page

1. In the Teaching Lab you used a centrifuge to separate suspensions in liquids. What should you do when using the centrifuge to ensure safe operation?
 - (a) Leave the rotor lid to the centrifuge unsecured
 - (b) Open the lid while the centrifuge is running
 - (c) Always use multiple sample tubes at the same time
 - (d) Use the centrifuge on any surface, even if it is not level
 - (e) Put sample tubes in without checking if lid is closed
2. Choose the best answer for the question: why do feed-forward systems exist in the human body?
 - (a) Feed-forward systems anticipate changes in physiological systems.
 - (b) Some systems are very insensitive to change and a feed-forward system helps them to respond best.
 - (c) All feed-forward systems are positive feedback loops.
 - (d) All feed-forward systems are negative feedback loops.
 - (e) Feed-forward systems do not exist in the body.
3. Choose which statement is **false**.
 - (a) The CNS contains cell bodies that give rise to cranial nerves.
 - (b) The CNS is composed of the brain and spinal cord.
 - (c) Afferents travel up the spinal cord to the CNS.
 - (d) Efferents originate in the spinal cord and go out into the body.
 - (e) Dorsal root ganglia are part of the CNS.
4. Tonic receptors are _____.
 - (a) Rapidly adapting
 - (b) Slowly adapting
 - (c) Have a receptor potential "off" response
 - (d) Have a high action potential frequency caused by the initial stimulus
 - (e) What a Pacinian corpuscle is
5. Where is the pre-ganglionic neuronal cell body for a sympathetic neuron located?
 - (a) All levels of the spinal cord within the dorsal horn
 - (b) The cranial nerve nuclei in the brain stem
 - (c) Levels T1 through L2 of the spinal cord
 - (d) The sacral vertebrae
 - (e) The sympathetic chain ganglia



6. Which of the following are not physiological properties of skeletal muscle?
- (a) Excitability
 - (b) Extensibility
 - (c) Contractility
 - (d) Elasticity
 - (e) Activation by hormones
7. Which of the following is an example of an extrinsic skeletal muscle property?
- (a) An increase in tension development in a muscle undergoing exercise
 - (b) The number of fibers within a muscle
 - (c) The length of a muscle fiber
 - (d) An increase in speed of contraction in muscles that are longer
 - (e) A change in muscle vascularization
8. Choose which statement is **false**.
- (a) Cardiac muscle is a type of skeletal muscle.
 - (b) Cardiac muscle cells are electrically coupled.
 - (c) The normal contraction of cardiac muscle starts in the ventricle.
 - (d) Sinoatrial node cells induce contraction of the cardiac muscle.
 - (e) Cardiac muscle contains myosin and actin elements.
9. Giving veins the same compliance as arteries might _____.
- (a) Decrease the pressure within the venous system
 - (b) Decrease pressure within the arterial system
 - (c) Result in lower venous return
 - (d) Decrease the volume of blood within veins
 - (e) Increase the number of elastic arteries
10. Normally, what is the clearance for glucose?
- (a) About half the GFR
 - (b) Close to zero
 - (c) Equal to the clearance for creatinine, about 70 L/hr
 - (d) Greater than the clearance for insulin
 - (e) The GFR, about 7.5 L/hr
11. What happens when the diaphragm contracts?
- (a) Air enters the alveoli
 - (b) Intrapulmonary (alveolar) pressure increases
 - (c) Intrapleural pressure increases
 - (d) Pulmonary arterioles constrict
 - (e) Air exits the alveoli



12. It is 4:58 PM on April 11th and you are sprinting up the stairs of SF in order to your hand in your Final Report and Notebook before a deadline. You get to the instructor's office just in time and saved yourself and your team from impending doom. Due to the strenuous exercise of running from the EngSci Common room to instructor's office, you find that you are breathing very heavily and deeply. What is the most likely change in your resting tidal volume?
- (a) Your tidal volume increased to include some of your inspiratory reserve volume
 - (b) Your tidal volume increased to include some of your expiratory reserve volume
 - (c) Your tidal volume increased to include some of your residual volume
 - (d) Your tidal volume increased to include some of your inspiratory reserve volume and some of your expiratory reserve volume
 - (e) Your tidal volume increased to match your vital capacity
13. Dwight K. Schrute, of Schrute farms, brought some of his homegrown beets to the Dunder Mifflin Paper Company staff picnic. Everyone seems to enjoy eating the beet salad, until his boss Michael Scott comes storming out of the porta-potty, screaming "DWIGHT! YOUR BEETS TURNED MY PEE RED! I'M GOING TO DIE!!!" While his coworkers, Jim and Pam (who's pee is not red or pink), calm Michael down, Dwight decides to do some detective work. He discovers that a harmless condition called beeturia causes *some* people's urine to become red or pink after consuming betanin, a red colourant that is naturally found in beets. Which of the following mechanisms are most likely responsible for causing this "problem" in Michael Scott?
- (a) Betanin is filtered by the glomerulus but not reabsorbed or secreted
 - (b) Betanin is filtered by the glomerulus, completely reabsorbed, and not secreted
 - (c) Betanin is filtered by the glomerulus and only partially reabsorbed
 - (d) Betanin is filtered and secreted but not reabsorbed
 - (e) Betanin is not filtered by the glomerulus
14. Compare the functioning of the gastric pit to the mucosal layer in the stomach.
- (a) The gastric pit secretes acid and enzymes, the mucosal layer provides smooth muscle contraction.
 - (b) The gastric pit absorbs food; the mucosal layer secretes enzymes.
 - (c) Both the gastric pit and mucosal layers absorb food.
 - (d) The gastric pit secretes acid and enzymes, the mucosal layer provides protection to the stomach surface.
 - (e) Both the gastric pit and mucosal layers secrete acid.
15. Who invented and built the first artificial kidney?
- (a) Santiago Ramón y Cajal
 - (b) William Harvey
 - (c) Willem Kolff
 - (d) John Scott Haldane
 - (e) Walter Cannon

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final-exam-07e28

#183

15 of 16



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