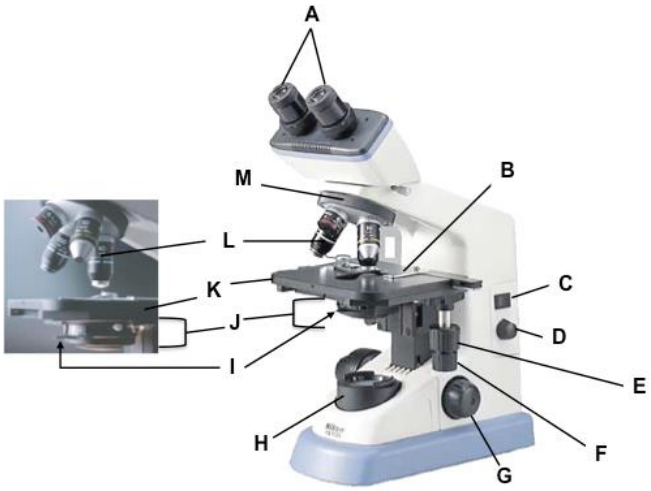
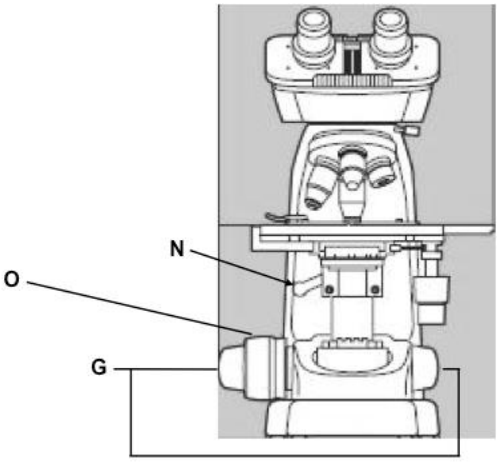
BIOL201 Introductory Biology Lab Exam W2020 /115

The total exam is worth 20% of your final grade and is out of a total of 115 possible marks.

Name: Id:

Question 1: (9 points)





A) You are a lab technician working in a hospital and have received a specimen from a patient who has an unknown bacterial infection. After preparing your slide, you begin your analysis. Your microscope is in the appropriate "ready" position as you would expect, same as we learned in our teaching lab. Place the following letters in the correct order regarding a logical sequence for which you will manipulate them in order to observe your specimen (2) B D G M O

B) Assuming that the microscope is the same brand as the one we use in the lab, and considering you are looking for a bacterium, what total magnification should your microscope be set up at in order to observe as much detail as possible? (1)

C) You perform a Gram Stain on your specimen prior to placing the slide on the microscope. Which of the following would be IMPROVED by using a stain in order to observe your specimen? Explain briefly. You can choose more than one to comment on: (2)

Magnification and/or Resolution and/or Contrast

D) You finally set up your microscope at the above mentioned magnification, observe a round cell, pink in color, and determine that your cell occupies approximately 1/5th length of your field diameter. Assuming that at 40X total magnification your field diameter is 4.5 mm, what would be a logical estimation of the diameter of a single cell (answer in micrometers)? (2)

E) You fill in a report about what has most likely cause the patient's illness and need to confirm the likely type of organism, whether it is bacterial or not, and pertinent characteristics which you can tell based on the staining results. You do not need to comment on the shape of the cell. You should include 2 important pieces of information in your answer. (2)

Question 2 (8 points)

A) You prepare a solution of 5% saline in a beaker. Your lab partner asks you what type of a solution it is regarding tonicity. Will you tell him/her that your solution is hypotonic, hypertonic, or isotonic? Explain why briefly. (2)

B) A piece of dialysis tubing is filled with distilled water. It is made from a porous membrane which can allow molecules of 170 KDa in size to pass through. It is placed in the beaker containing a 5% solution of potassium permanganate (158KDa). Describe what you expect to happen over time (refer to movement of the proper molecules AND the name of the process). (2)

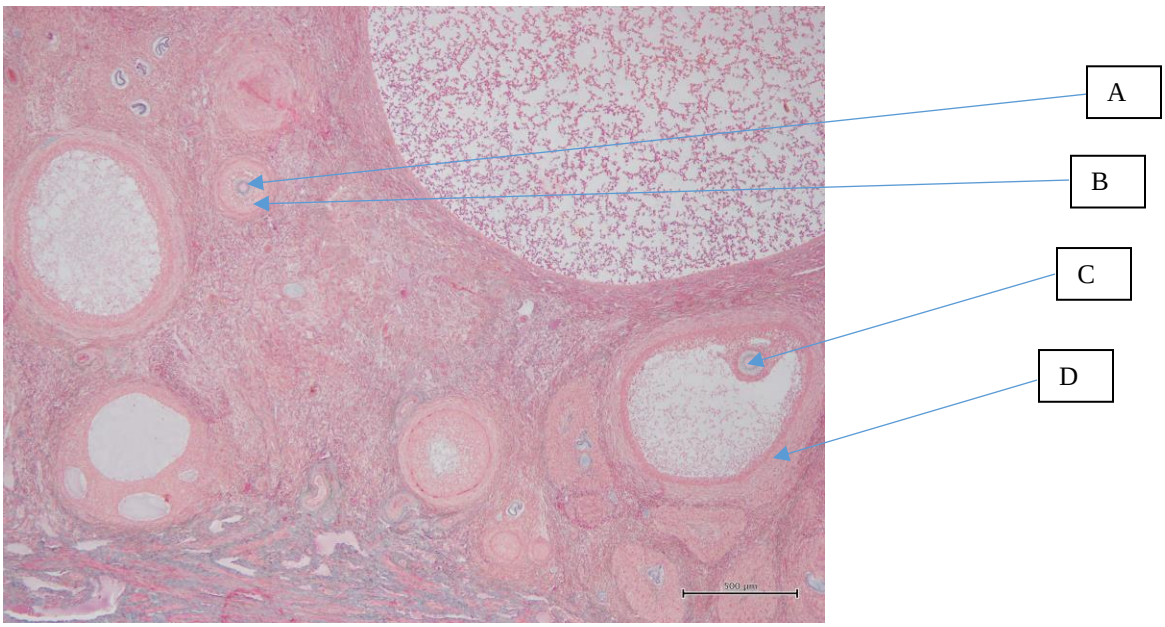
C) You remove this dialysis bag after 1 hour and place it in a solution of 20% methyl orange (327 KDa). Name and describe two process which will occur. In other words, indicate what directions molecules will move in over the next hour and what the name of each of these processes of membrane transport are called (4)

Question 3 (11)

A) Which 3 phases of mitosis are CLEARLY being depicted among the different cells in the tissue sample above? Explain in your own words using proper terminology how you were able to identify them. (3)

B) Is this tissue sample derived from an animal or plant? Explain making reference to ONE of the above three phases, using appropriate terminology. (1)

C) Regarding the other 2 phases being depicted, HOW would each of those phases be different if they were occurring in Meiosis 1 rather than Mitosis? (2)



D) What organ is on display in the slide above? (1)

E) What is the correct term used to name what is being indicated by each of the above letters? For each structure indicate whether the cell at the tip of the pointer is haploid of diploid. (4)

Question 4: (11)

You have been provided with a pea plant which was grown from a local farmer. This specific species produces seeds whose phenotypic characteristics follow the rules of complete dominance. Green seeds and beige seeds as phenotypes follow the rules of complete dominance as do smooth vs wrinkled seeds.

You isolate seeds from a single plant and perform counts

Characteristic	Number of seeds
Green	49
Beige	51
Smooth	23
Wrinkled	77

A) By analyzing the texture of the seeds, do you hypothesize that the wrinkled or smooth seed phenotype of dominant? Which is recessive? (2)

B) Based on your answer, what is the probability of the wrinkled seed being homozygous for texture? (1)

C) Based on your answer, what is the probability of the smooth seed being heterozygous for texture? (1)

D) You grow one smooth seed into a pea plant. Describe a cross that you can perform with the smooth seed plant to confirm your suspicion. Indicate the phenotype and genotype of the plant you would cross each with and what your expected outcome will be based on your initial hypothesis. (3)

E) Can you confidently determine whether green seeds are a dominant phenotype or that beige seeds are a dominant phenotype based on your observations alone? If yes, indicate which is dominant and how you elucidated this. If no, indicate why you cannot determine this. (2)

F) Considering your answer above, describe a possible cross that may have resulted in this plant you are analyzing. Indicate the phenotype and genotype (with reference to the color characteristic only, not texture) of the plants you are describing in your cross (2):

Question 5: (10)

You have been hired by the police department as a forensic specialist who is to help determine which suspects were likely at a crime scene by performing DNA analysis. They have sent you several different specimens of blood samples from different individuals. Unfortunately the usual reagents you use in your tests have all run out and so you need to improvise and use other chemicals as replacements. Trientene is an ion chelator which can remove magnesium from proteins. ALS-1 is a strong detergent which promotes lipids to mix with water.

During extraction of the DNA from your samples you follow the steps described below. Answer the following questions:

A) You start by heating your samples. In your own words, what is the main purpose of heating the samples (use appropriate terminology)? (1)

B) Within the heated solution you place your samples in, what is the purpose of including ALS-1? (1)

C) What are two reasons that you included Trientene? (2)

You now use restriction enzymes in order to digest your DNA samples before running them on a gel. You decide to use the enzyme *BamHI* which makes a cut at each GGATCC sequence. You then proceed to cut the ENTIRE segment of DNA you began with using restriction enzyme BamHI.

5’ GGGGATGGATATTACGCGATGGATCCAGGGTTTAATGCTAATTGGTAGTTTCCGTCGGATCCGGGGGG
CGTCGTCATATAGCTAGTTTGGATCCTTCCTGGGATCTGCCGTACG 3’

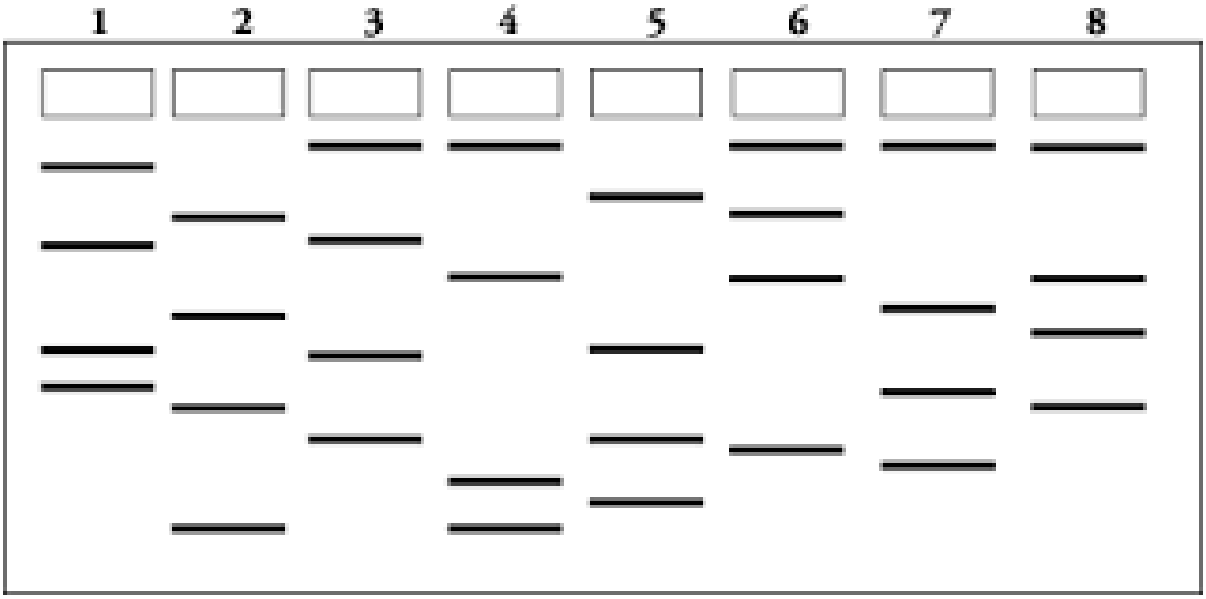
D) How many fragments of DNA will result from this digestion? (1)

E) How many bands will you expect to see on a gel (assuming an extremely good resolution)? (1)

F) You are placing your gel into the electriophoresis apparatus. Will you place the wells on the +ve side of the apparatus or the –ve side of the apparatus? Explain briefly (2)

Finally, you stain and destain your gel and obtain the following results. Lane 1 has the crime scene DNA and lanes

2-8 contain DNA from different suspects.



G) What will you tell the police regarding who was most likely at the crime scene? Explain briefly. (2)

Question 6 (13)

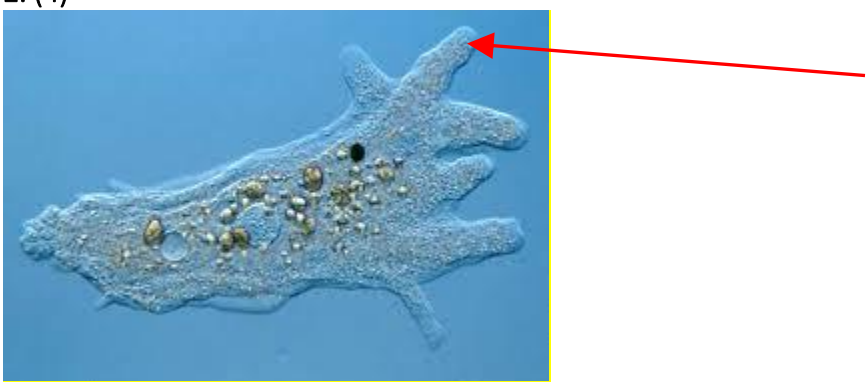
1. (3)

a) What is the full term used to describe this organism's mode of nutrition?

b) What domain does this organism belong to?

c) What is the particularly unique feature of this organism which is distinct compared to closely related organisms of the same group or kingdom?

2. (4)

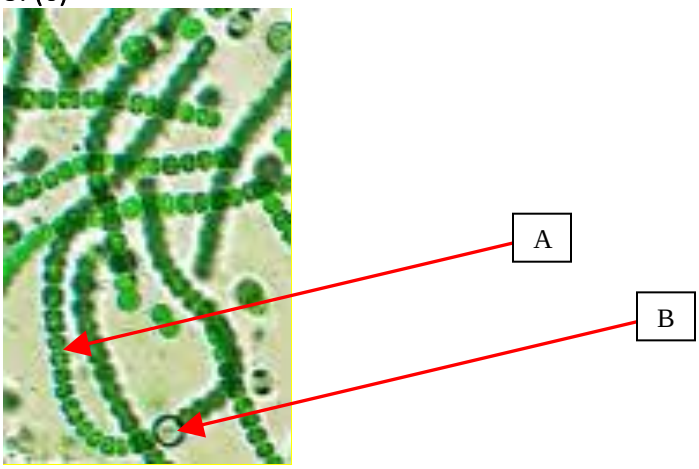


a) What domain does this organism belong to?

b) What is the mode of nutrition that characterizes this organism?

c) Name 2 functions of the structure indicated by the pointer:

3. (6)



a) Are the individual organisms seen here unicellular or multicellular?

b) What domain does this organism belong to?

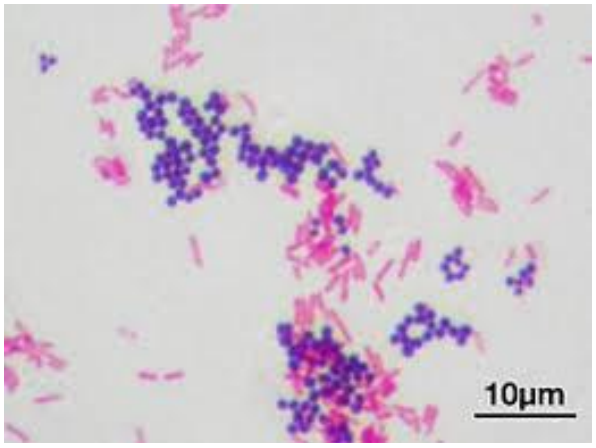
c) What is the mode of nutrition that characterizes this organism?

d) What is the function of the cell labelled “A”?

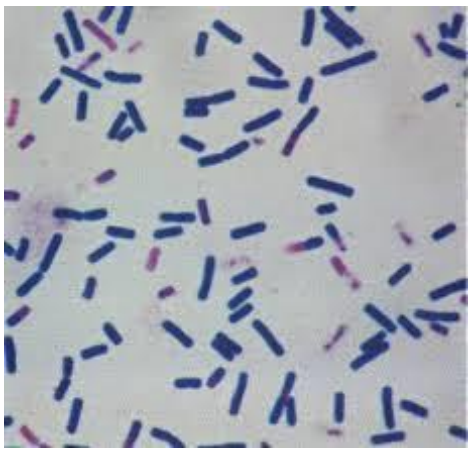
e) What is the name of the cell labelled “B”?

f) What is the function of the cell labelled “B”?

A



B

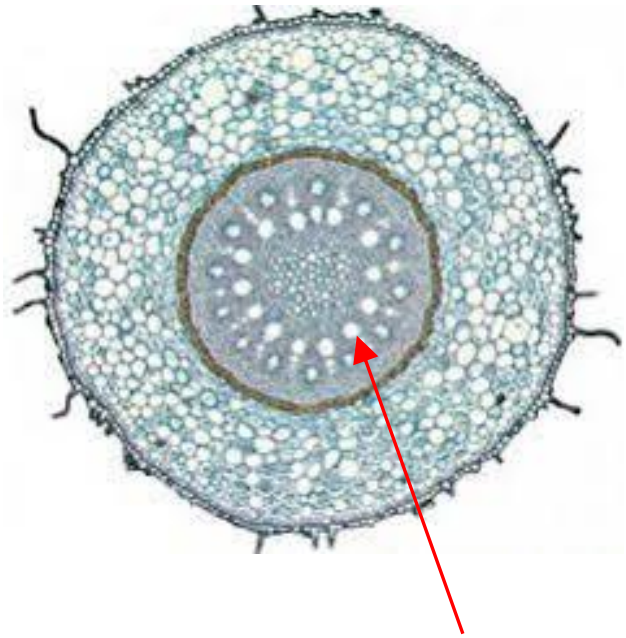


4. Fill in the following table with reference to the Gram positive bacteria in the two above microscope fields of view: (2)

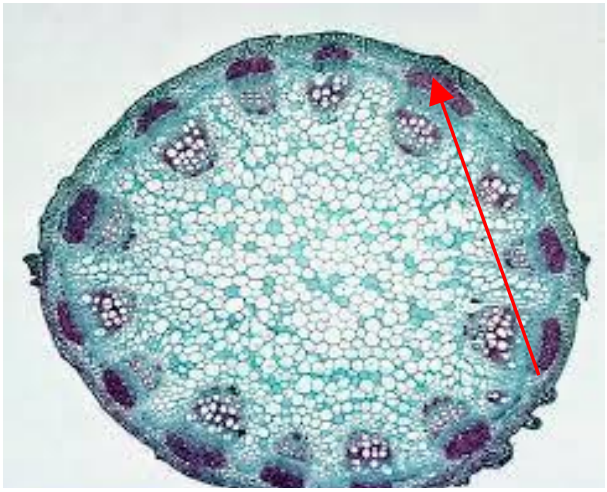
Microscope	Shape	Arrangement
A		
B		

Question 7 (16)

A



B



1. Fill in the following chart: (8)

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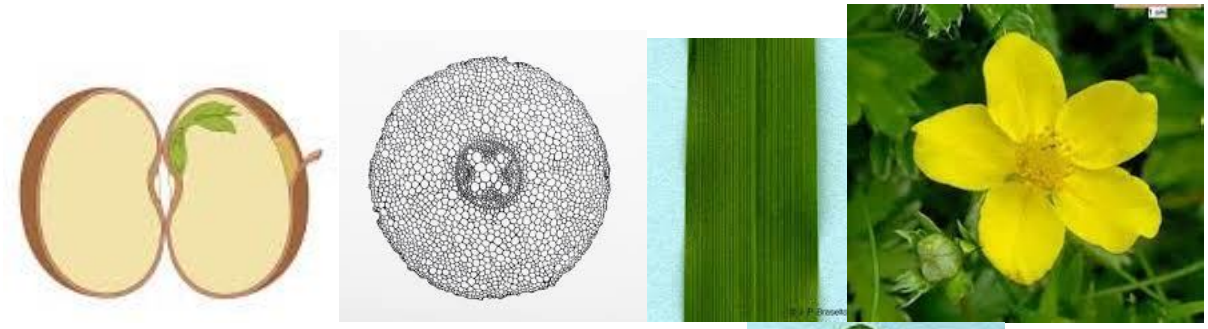
Specimen	Which of the 4 main categories of plants is this specimen derived from?	What part of the plant is this a cross-section of?	Is this specimen from a monocot or dicot plant?	What specific type of tissue is labelled with the arrow?
A				
B				

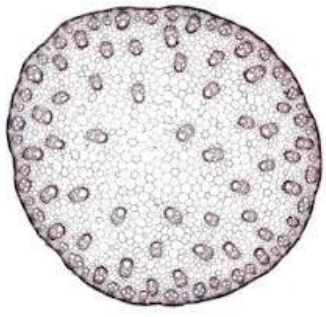
2. Parts of 2 different plants have been shuffled around in the below images. Match the seed, tissue sample, leaf, and flower that go together by indicating all 4 letters in the appropriate box.

Plant 1: The 4 corresponding letters are: (2)

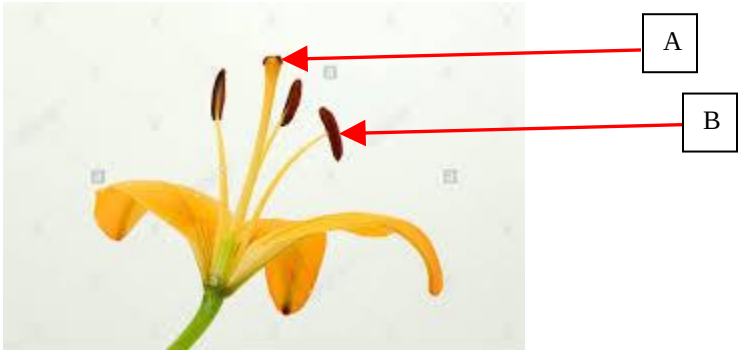
Plant 2: The 4 corresponding letters are: (2)

A **B** **C** **D**





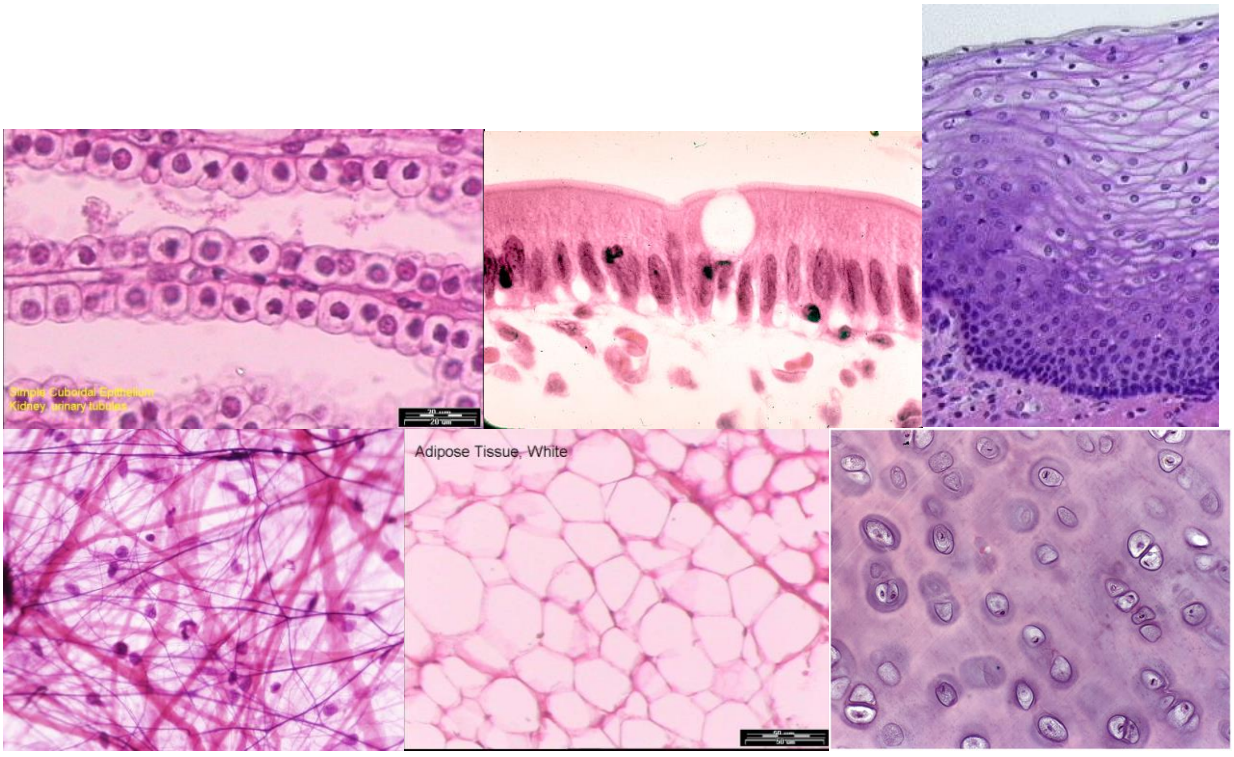
E **F** **G** **H**



3. Answer the following questions regarding the picture above.
A) What is the name of the structure labelled A?
B) What is its function?
C) What is the name of the structure labelled B?
D) What is its function?

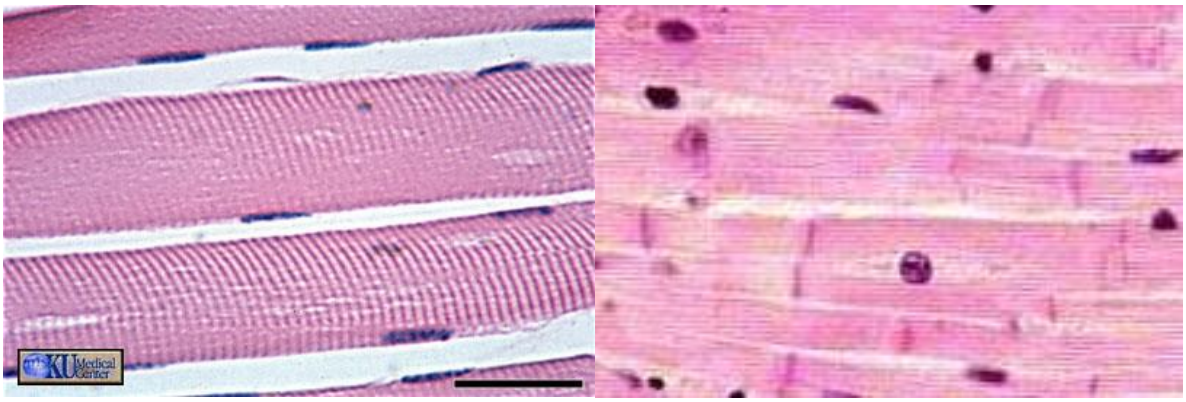
Question 8 (16)

A **B** **C**



D **E** **F**

1. Give the full name of each of the above tissues. Indicate 2 visible diagnostic features (characteristics which allowed you to make your decision). (12)



A B

2. Give the full name of each of the above tissues. Indicate 2 visible diagnostic features (characteristics which allowed you to make your decision). (4)

Question 9 (10)

1.

A) What phylum does this organism belong to?
B) What type of symmetry does this organism exhibit?
C) How would you best describe this organism's nervous system?
D) How would you best describe this organism's digestive system?
E) What type of body cavity does this organism have?

2.

A) What phylum does this organism belong to?
B) What type of symmetry does this organism exhibit?
C) How would you best describe this organism's nervous system?
D) What type of digestion characterizes this organism?
E) When sexual, does this organism demonstrate internal or external fertilization?

3.

A) What phylum does this organism belong to?
B) How would you describe this organism's excretory system?
C) How would you best describe this organism's nervous system?
D) How would you best describe this organism's digestive system?
E) How would you best describe this organism's circulatory system?

4.

A) What phylum does this organism belong to?
B) How would you describe this organism's excretory system?
C) How would you best describe this organism's respiratory system?
D) How would you best describe this organism's digestive system?
E) How would you best describe this organism's circulatory system?

Question 10: (10)

1.

A) How many ventricles does this organism's heart contain?
B) How would you best describe this organism's mechanism of fertilization?
C) What term best describes how this organism regulates its body temperature?
D) How does this adult organism exchange gases with its environment?

2.

A) Is this organism viviparous, oviparous or ovoviviparous?
B) Does this organism contain a single opening for its digestive/excretory systems?
C) Does this organism contain a urinary bladder?
D) How many ventricles does this organism's heart contain?
E) What term best describes how this organism regulates its body temperature?

3.

A) How many atria does this organism's heart contain?
B) How would you best describe this organism's mechanism of fertilization?
C) What term best describes how this organism regulates its body temperature?
D) How does this adult organism exchange gases with its environment?
E) What other class contains organisms who all have a similar skeleton to this organism?

4.

A) How many chambers does this organism's heart contain?
B) How would you best describe this organism's mechanism of fertilization?
C) What term best describes how this organism regulates its body temperature?
D) How does this adult organism exchange gases with its environment?
E) Regarding a characteristic of reproduction, how does this organism differ from birds?