

NAME (Last, First) Tiersma, Mark Lab Instructor _____

(PRINT CLEARLY, LAST, then First)

Your participation in the course requires that you follow examination policies.

Instructions: To prevent cheating, **nothing** may be on your desk but a pencil and eraser.

Nothing may be on the empty seats: everything must be under your own seat, and out of sight. This includes:

- Water bottles, drinks, cups
- Phones
- Books and notes
- Hats and jackets
- etc.

All watches must be removed and put away inside backpacks. All cell phones must be turned off AND put inside backpacks.

Keep your exams and answer sheets **flat on your desk**; do not lift them up to your face to read them, as others will be able to see your answers too.

When there are 10 minutes left, stay in your seats until the exam is finished. We will also not answer any questions during the last 10 minutes to avoid disturbing others.

Your SID must be written on your answer sheet **and** bubbled in. Start at the far left. If your SID is only 8 digits, fill the last two spaces in with 00 and bubble in 00 for the last two boxes. Failure to do this may result in a 5 point deduction.

SID (write & bubble in all digits, if your SID is only 8-digits, enter 00 in the last two red boxes)

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5	5	5	5	5	5	5	5	5	5
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7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
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Lab Section Number

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2	2	2
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6	6	6
7	7	7
8	8	8
9	9	9

Please follow the directions on the exam questions sheet. Fill in the entire circle that corresponds to your answer. Use a number 2 pencil. Erase undesired responses completely. Do not cross them out.

This exam is 50 minutes long. When the timer goes off, you must stop working. If you continue to work, we may not accept your exam. This includes filling in your name, SID and answers on the answer sheet; this needs to be done before the timer goes off.

Do not begin until instructed to do so. Each question is worth 2 points unless indicated otherwise. (Version of the exam is always worth 0 points, but very important).

1. Fill in the correct values for the boxes (i), (ii), and (iii) for the following hypothetical microscope:

Objective Magnification	Number of ruler sub divisions that fit into 100 μm (calibrating reticle)	Ruler (μm /sub division)
50X	i) 50	ii)
20X	20	5 μm /div
4X		iii)

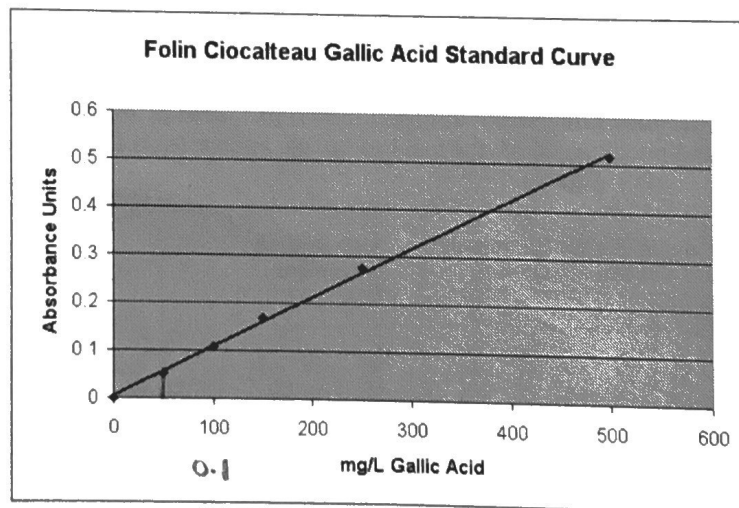
- A. 8, 12.5, 1
 B. 50, 2, 1
 C. 8, 12.5, 1
 D. 50, 2, 25

2. You want to make 16 mls of 0.25% starch from a stock of 4% starch, which of the following dilutions will work? **BUBBLE IN ALL CORRECT ANSWERS.**

- A. Add 8 mls of 4% starch to 8 mls of phosphate buffer. Repeat 3 more dilutions using the same ratio (8 mls of the diluted starch and 8 mls of phosphate buffer).
 B. Add 4 mls of 4% starch to 12 mls of phosphate buffer. Then add 4 mls of the diluted starch to 12 mls of phosphate buffer.
 C. Add 1 ml of 4% starch to 15 mls of phosphate buffer.

3. Below is a standard curve for gallic acid. You are given a sample containing an unknown amount of gallic acid in the same solvent that was used for the standard curve. The absorbance of the solution was 0.05. What was the concentration of gallic acid in the sample? Note the units of the answers.

- A. 5 g/L
 B. 1 g/L
 C. 0.5 g/L
 D. 0.1 g/L
 E. 0.05 g/L
 F. 0.01 g/L



4. You observe a protist at 20X and have properly set the microscope. You then switch from a 20x to a 40x objective. To get the best image, you typically will need to **BUBBLE IN ALL CORRECT ANSWERS.**

- A. Focus the condenser.
 B. Adjust the oculars to your eyes.
 C. Adjust the diopter.
 D. Adjust the focus, using fine focus only.

5. (1 points) Changing the objective from 40x to 10x will _____ the depth of field.

- A. Increase
 B. Decrease
 C. Not change

6. You calibrate your reticle using a nylon mesh slide and find that there are 40 subdivisions in one square of the mesh (100 μm). At the same magnification, you look at an unidentified specimen and measure its length to be 62 subdivisions. What is the actual length of the specimen?

- A. 24.8 μm
- B. 62 μm
- C. 155 μm
- D. 620 μm
- E. 1.55 mm

$$2.5 \cdot 62 =$$

$$\begin{array}{r} 62 \\ 2.5 \\ \hline 31.0 \\ 124.0 \\ \hline 155.0 \end{array}$$

7. A bacterial agar contains the following ingredients in one liter - 10g Bacto-tryptone, 5g yeast extract, 10 g NaCl and 15 g agar. The agar was sterilized and then 1 ml of a 1 mg/ml stock of the antibiotic ampicillin was added. What type of medium is this?

BUBBLE IN ALL CORRECT ANSWERS.

- A. Complex
- B. Defined
- C. Selective
- D. Differential
- E. Permissive

8. (1 point) Bioluminescence in *Vibrio* results from

BUBBLE IN ALL CORRECT ANSWERS.

- A. An increased density of the bacteria
- B. Production of N-acyl homoserine lactone
- C. Decreased activity of luciferase

9. FCCP would affect the movement of which of the following protists or organelles?

- A. *Paramecium*
- B. *Amoeba*
- C. *Volvox*
- D. Chloroplasts in *Nitella*
- E. All of the above
- F. None of the above

10. (1 point) Cytochalasin D inhibits actin polymerization. From what you know about cytoplasmic streaming, how might this drug affect cytoplasmic streaming in *Nitella*?

- A. Speed it up.
- B. Slow it down or stop it.
- C. Have no effect.

11. Which of the following steps would most likely slow down a *Paramecium*.

BUBBLE IN ALL CORRECT ANSWERS.

- A. Grains of sand on the slide
- B. Adding a drop of methocel to your sample
- C. Adding a drop of methylene blue to your sample
- D. Adding a concentrated solution of FCCP

12. *Amoebae*, as seen in lab, are single celled _____ and move using _____.

- A. Prokaryotes, cilia
- B. Eukaryotes, pseudopods
- C. Eukaryotes, cilia
- D. Prokaryotes, pseudopods

13. 0 pts. Mark A as you have version A of the exam.

14. Which of these can be present in both eukaryote and prokaryote cells?

BUBBLE IN ALL CORRECT ANSWERS.

- A. Plasma membrane
- B. Mitochondria
- C. Chloroplasts
- D. Ribosomes
- E. Genes

15. Which of the following movements requires tubulin?

BUBBLE IN ALL CORRECT ANSWERS.

- A. Swimming by *Paramecium*
- B. Swimming by *Volvox*
- C. Pseudopodia extension by *Amoeba*
- D. Ciliary movement by lung airway epithelial cells

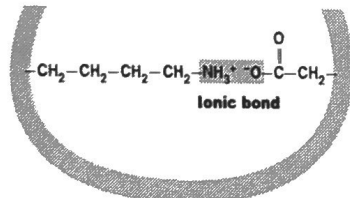
16. In the experiment to determine the K_m of alpha-amylase, a student added DNS to all his reactions and heated them for 7 min at $> 95^\circ\text{C}$. The student correctly prepared the blanks, but then forgot to heat the blanks for 7 minutes at $> 95^\circ\text{C}$. Because of his oversight, the student's O.D. readings using the spectrophotometer and software (as in lab) for his reactions would be

- A. higher than if he had heated the blanks.
- B. lower than if he had heated the blanks
- C. the same as if he had heated the blanks.

blanks = less color = lower absorbance

17. See the ionic bond between the R groups of aspartic acid and lysine in the diagram. The pK_a for the R group of aspartic acid = 4. The pK_a for the R group of lysine = 10. Select the pH that will promote the largest number of ionic bonds between these two groups. ?

- A. pH 4
- B. pH 7
- C. pH 11



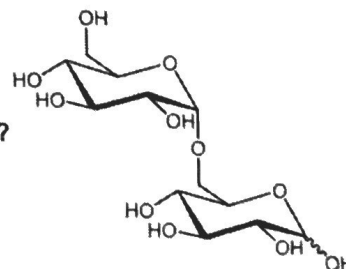
18. Which of the following treatments resulted in decreased enzyme activity during the enzyme lab.

- A. If the enzyme was denatured by high temperature.
- B. If the enzyme was denatured by low temperature.
- C. If the enzyme was denatured by low pH.
- D. If DNS was added to the enzyme before adding starch.
- E. All of the above.
- F. None of the above.

19. (1 point) Below is a diagram of isomaltose.

How many molecules of DNS can react with one molecule of isomaltose?

- A. 1
- B. 2
- C. 3
- D. 4



20. As you raise the enzyme concentration for a given reaction, the V_{max} will _____ and the K_m will _____.

- A. Remain the same; remain the same
- ~~B.~~ Remain the same; increase
- ~~C.~~ Remain the same; decrease
- ~~D.~~ Increase; remain the same
- E. Increase; increase
- ~~F.~~ Increase; decrease
- ~~G.~~ Decrease; remain the same
- ~~H.~~ Decrease; increase
- ~~I.~~ Decrease; decrease

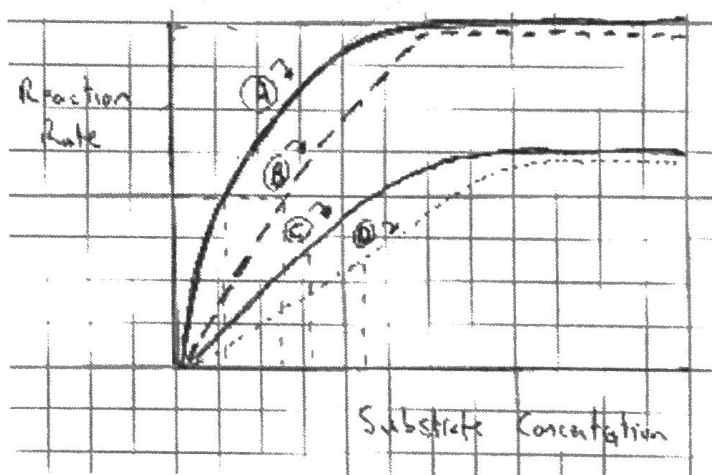
21. (1 point) Heating the DNS- alpha amylase solution ensures that

- A. the alpha amylase reaction with starch is complete.
- B. the alpha amylase is no longer active.
- C. the DNS- alpha amylase reaction is driven to completion.
- D. None of the above.

22. Below is a figure showing the reaction rates for four enzymes- labeled A- D (from top down).

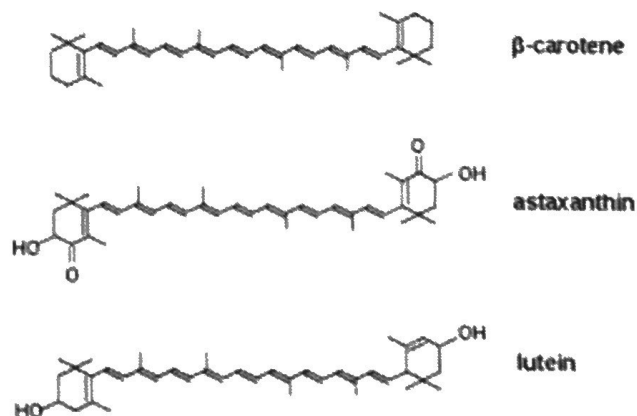
Which enzyme has the LOWEST affinity for the substrate?

- A.
- B.
- C.
- D.



23. You carry out a paper chromatography experiment using solutions and paper identical to those used in the biology 1A lab. The crude extract contains three types of carotenoids as shown below. Order the molecules based on their R_f value from HIGH to LOW.

	HIGHEST R_f		LOWEST R_f
A.	beta-carotene	astaxanthin	lutein
B.	beta-carotene	lutein	astaxanthin
C.	astaxanthin	lutein	beta-carotene
D.	astaxanthin	beta-carotene	lutein
E.	lutein	beta-carotene	astaxanthin
F.	lutein	astaxanthin	beta-carotene



EXAM CONTINUES

24. A thylakoid preparation was placed in a weakly acidic solution so that all compartments are at pH 6. The thylakoids were then placed in solution of pH 7. NO light was present during these manipulations. You immediately check for the following. Which would you expect to occur? Remember this is in the dark!

- A. The splitting of water
- B. Electron transport
- C. The synthesis of ATP
- D. CO₂ fixation
- E. All of the above would occur.
- F. None of the above would occur.

25. _____ blocks the transfer of electrons from _____ to plastoquinone.

- A. DCPIP, PSI
- B. DCPIP, PSII
- C. DCMU, PSI
- D. DCMU, PSII

26. Oligomycin is a drug that blocks the flow of protons through ATP synthase. If you monitored the production of O₂ from a chloroplast preparation in the light lab, what effect would you expect upon the addition of oligomycin?

- A. It would increase the rate of O₂ production.
- B. It would decrease the rate of O₂ production.
- C. It would have no effect on the rate of O₂ production.

27. (1 point) Energy is transferred during electron transport by

- A. Fluorescence
- B. Resonance energy transfer
- C. Redox reactions

28. Which if any of the following statements is TRUE?

BUBBLE IN ALL CORRECT ANSWERS.

- A. During non-cyclic (linear) photosynthesis photosystem I reduces NADP⁺ via ferredoxin.
- B. The light reactions of photosystem II result in the splitting of water into protons, electrons and oxygen.
- C. Methylamine uncouples electron transport from photophosphorylation by opening ion channels for the passage of protons in the thylakoid membranes.
- D. The Calvin Benson cycle, which takes place in the stroma, uses ATP and NADPH generated by the light reactions.

29. The action spectrum of a plant is shown below. Of the following wavelengths, which is most effective at driving photosynthesis?

- A. 400 NM
- B. 450 NM
- C. 500 NM
- D. 550 NM
- E. 600 NM

