

Name _____

Biology 331, Spring 2006 - Lab Exam
Multiple Choice, 2 pts. each. Please circle answer.

1) Mannitol-Salt Media is

- a. selective and differential for Gram Positives
- b. selective and differential for Gram Negatives
- c. selective for Gram Positives but not differential
- d. selective for Gram Negatives but not differential
- e. not selective or differential

2) Aseptic techniques include all EXCEPT

- a. thoroughly flaming the wire end of a loop
- b. setting test tube caps on the table facing up while transferring samples
- c. flaming the lips of all test tubes and flasks between transferring samples
- d. using bleach solutions to sterilize benchtops
- e. none - all of the above are true

3) Which of the following statements about Gram Staining is TRUE?

- a. the treatment order is - safranin, iodine, ethanol, crystal violet
- b. following crystal violet treatment, all bacteria appear purple
- c. the most crucial and differential step of the procedure is the iodine treatment
- d. Gram Positive bacteria appear pink/red
- e. Too thick smear preparations of Gram Negative bacteria can erroneously appear pink/red

4) Match the nitrogen-fixing microbe with its correct strategy for controlling oxygen.

- a. Rhizobium and heterocysts
- b. Azotobacter and leghemoglobin
- c. Methanogens and super-fast metabolic reactions that use oxygen quickly
- d. Anoxygenic phototrophs and living where there is no oxygen
- e. Anabaena and combining oxygen with hydrogen to form water quickly

5) In the nitrate reduction tube

- a. denitrification was indicated by red color formation following the addition of A/B
- b. ammonia was indicated by a black color formation following zinc
- c. ammonia was indicated by no change following A/B and zinc
- d. nitrite was indicated by the formation of a bubble
- e. nitrite was indicated by a red color formation following zinc

6) The ammonia flasks were designed to enrich for

- a. Azotobacter
- b. Rhizobium
- c. Nitrosomonas
- d. Pseudomonas
- e. Enteric Proteobacteria

7) In terms of creating anoxic environments, we used

- a. media-filled sealed bottles
- b. sealed glove-box apparatus
- c. special media that contained oxygen-binding compounds
- d. soft-agar shake-tubes
- e. anaerobic jars with catalysts and H₂/CO₂ gas generating systems

8) Which of the following statements about phototrophs we studied is FALSE?

- a. anoxygenic phototroph enrichments did not fluoresce
- b. Anabaena is a filamentous phototroph
- c. the starting inoculum we used for enrichments was poor soil outside the building
- d. chlorophylls and bacteriochlorophylls are hydrophobic, requiring organic solvent extraction

e. the spectrophotometer graph you obtained showed absorbance vs. wavelength

9) Streptomyces

- a. are Fungi
- b. can be sub-classified based on spore-producing structures
- c. all make antibiotics
- d. consume monomeric carbon and energy sources
- e. all of the above

10) Examples of industrially important Bacillus products include all EXCEPT

- a. amylases for making high fructose corn syrup
- b. base-tolerant lipases and proteases for detergents
- c. antibiotics
- d. enzymes for making alcohol from simple sugars
- e. acid-tolerant food additives with digestive enzymes

11) Fermentation reactions

- a. are what make vinegar if certain bacteria are present
- b. involves something other than oxygen at the end of the electron transport chain
- c. only produces alcohol
- d. is only performed by prokaryotes
- e. occurs during log phase

12) Which of the following statements about antibiotics you tested is TRUE?

- a. tetracycline was the first antibiotic discovered, by Fleming in the 1929
- b. ampicillin is a semi-synthetic, more broad spectrum derivative of penicillin
- c. polymyxin B is an antibiotic made by Streptomycin
- d. tetracycline affects the cell wall
- e. polymyxin B is a broad spectrum antibiotic that affects the ribosome

13) As described in lecture, beer involves all EXCEPT

- a. malting, the activation of amylases from barley
- b. adding variable levels of hops, done exclusively to impart flavor
- c. mashing, the conversion of starch to glucose
- d. pitching S. cerevisiae to produce ales
- e. pitching S. carbergensis to produce lagers

14) Pseudomonas

- a. are Gram Positives
- b. cause diarrhea
- c. are the only major prokaryote that ferments alcohol
- d. only metabolize simple monomeric sugars
- e. are important industrial pollution indicators and bioremediators

15) Campylobacter jejuni

- a. is a lactose negative Enteric that could have grown on MacConkey plates
- b. is a spirilla that is only carried and transmitted by human feces
- c. uniquely causes a high fever about 1 week after ingestion
- d. produces a secreted toxin that shuts down eukaryotic ribosomes
- e. is mostly associated with diarrhea in developing/third world nations

16. Salmonella

- a. is a lactose positive Enteric that could have grown on MacConkey plates
- b. is represented by less than 10 major strains
- c. relies heavily on changing its pili and flagella to confuse your defenses
- d. is only carried and transmitted by human feces

e. produces a secreted toxin that converts ATP to cAMP, releasing salt and water

17. Shigella

- a. is a spirilla that is only carried and transmitted by human feces
- b. was used by Rajneesh cult members in what remains the largest bioterrorist event on US soil
- c. affects nearly half of victim households because of its profuse diarrhea and low infectious dose
- d. is genetically almost identical to Salmonella
- e. produces a secreted toxin that converts ATP to cAMP, releasing salt and water

18. Enterohemorrhagic E. coli

- a. is only associated with ground beef transmission
- b. typically produces up to 20 bloody bowel movements a day in its victims
- c. LPS causes massive inflammation and autoimmune complications
- d. produces a secreted toxin that has the same action as the Shigella or Shiga toxin
- e. causes the most cases of bacterial diarrhea in the US

19) 6 pts. Name and explain 2 ways to enumerate bacteria using the following table.

Name/Describe Method	Advantage	Disadvantage

20) 2 pts. each. Mixed Vocabulary

STATIONARY PHASE

DAPI

ANTIBIOTIC

BT TOXIN

HUS

21) 6 pts. ALL OR NOTHING. You mix 1 gram chicken 100 ml water and, from this mixture, perform SIX 10-fold dilutions (#1-6, in descending dilution). You plate 0.1 ml from each, observing the following data:

Tube/Plate 1: too many to count

Tube/Plate 4: too many to count

Tube/Plate 2: too many to count

Tube/Plate 5: 142

Tube/Plate 3: too many to count

Tube/Plate 6: none

Question: How many bacteria were in the original sample. Show all math. You are advised to draw pictures.

22) 6 pts. ALL OR NOTHING. Using a hemocytometer, you obtain the following counts by counting 3 grids. The grid size is a 0.005 cm square that is 0.002 cm thick:

Grid 1 = 245

Grid 2 = 218

Grid 3 = 256

Question: How many cells were in the original sample, expressed as cells/ml. Show all math.

23) 9 pts. True/False - Nitrogen Cycle

____ Your final Rhizobium colonies were actively fixing nitrogen.

____ Both the Rhizobium and Azotobacter media contained high levels of sugar to promote capsule formation.

- ___ The source for your Rhizobium inoculation was soil.
- ___ Two different microbes are required to convert ammonia into nitrate.
- ___ Nitrate reducers were the only example of a lithotrophic nitrogen transformation that we studied.
- ___ Beijerinck's historic late-1800's nitrogen enrichment was the first isolation of Nitrobacter.
- ___ Disinfectants, not considered tissue-safe, generally sterilized the nodules better than antiseptics.
- ___ Nitrogenase is found in only the prokaryotic domains of life.
- ___ Nitrogenase is a high-fidelity enzyme that only breaks down the triple bond in N₂ gas.

24) 7 pts. During the phototroph enrichment lab, the class - as a whole - obtained only 1 group of phototrophs. Name this group and provide FOUR specific lines of evidence that you used to support this argument and partially identify your enrichment.

PHOTOTROPH GROUP - be as descriptive as possible

Evidence 1

Evidence 2

Evidence 3

Evidence 4

25) 8 pts. Describe 4 ways you assessed your fermentation, making sure to briefly explain how you carried each out and why.

Method 1

Method 2

Method 3

Method 4

26) 6 pts. ALL OR NOTHING. Using the following chart and the provided data, solve your unknown:

Data Observations: (in no particular order)

WHO AM I?

- Golden layer after addition of Kovacs
- Black after stabbing golden tube
- Bubble in Durham tube of red tube
- Blue after streaking green plate
- Light/white after streaking purple plate

	Sulfur	Indole	Lactose	Glucose-Gas	Citrate
<u>Escherichia coli</u>	-	+	+	+	-
<u>Citrobacter freundii</u>	+	-	+	+	+
<u>Citrobacter intermedius</u>	-	+	+	+	+
<u>Salmonella typhimurium</u>	+	-	-	+	+
<u>Klebsiella pneumoniae</u>	-	-	+	+	+
<u>Proteus mirabilis</u>	+	-	-	+	var
<u>Proteus vulgaris</u>	+	+	-	+	var

27) 6 pts. Draw a simple flow chart that explains how you plated and then sorted for river Coliform Enterics, Non-Coliform Enterics, and Pseudomonads. Explain/identify/name specific features that distinguish each.