Name: KEY

Chapter 3 and 4

Microbiology Test Review Tool

Calculating Total Magnification (1 Question)

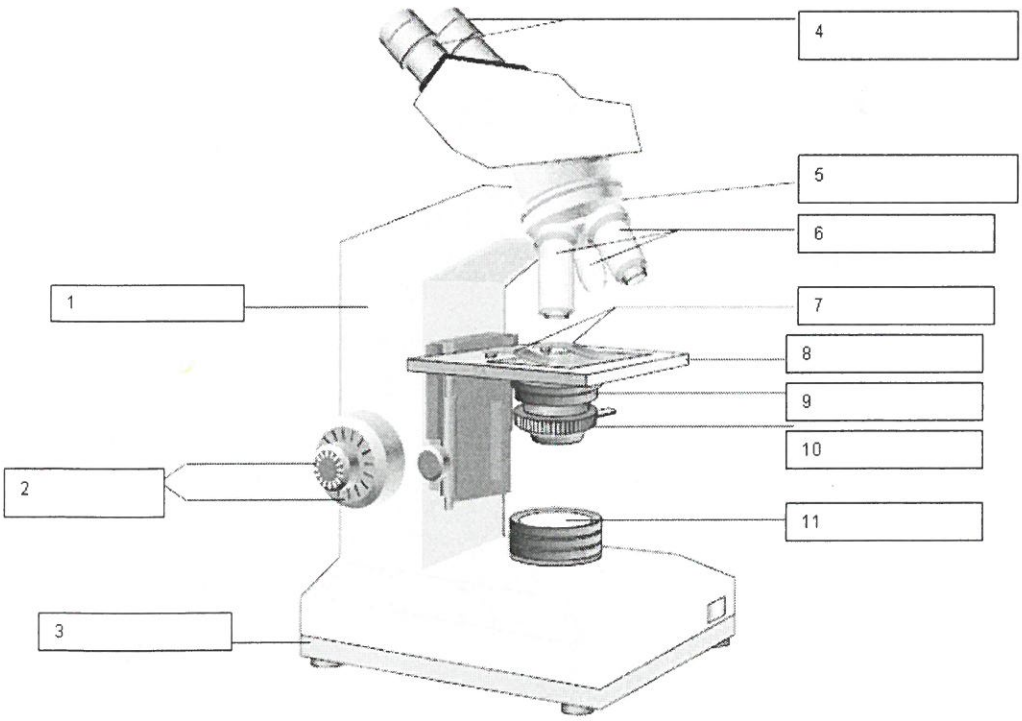
- How do you find the total magnification of a scope?
- Calculate the total magnification of viewing a specimen if the objective lens is:
  - 40X • 10 = 400
  - 100X • 10 = 1,000

Resolution (2 Questions)

	Definition	Ways to Improve
Resolution	The minimum distance at which you can see two points as separate.	1. ↓ wavelength 2. Adjust condenser 3. Use OIL

Types of Microscopes (4 Questions)

1. Light: Label the following parts of a microscope



#	Name of Part
1	Arm
2	course + fine adjustments
3	base
4	eyepieces
5	rotating objectives
6	objectives
7	stage / slide clamps
8	stage
9	diaphragm
10	light source.

2. Electron: (1 Question)

Type of Scope	What is it used for?	Advantages	Disadvantages
1). Scanning	viewing external structures in 3D.	3-D	•Kills organisms
2). Transmission	viewing internal structures	•The best magnification and resolution	•Kills organisms •needs thin slices.

Fixing (1 Question)

	Definition	Methods	Advantages	Disadvantages
Fixing	Attaching microbes to slide	•heat •alcohol	•traps organism in place •preserves organism	•can cause distortion of size / shape.

Morphology (5 Question)

	Bacillus	Coccus	Spirillum
Shape	rod	circle	spiral
Drawing			
Flagella (Yes or No)	yes	no	yes

Negative/Acidic Stains (5 Questions)

Uses	Advantage	Disadvantage
Stains background so bacterial shape (morphology) and size can be accurately observed.	less distortion (no heat fixing) live bacteria	Live bacteria easy to wash off/ remove stain
Examples of negative stains:	Nigrosin / Acid Fuchsin	
How does it work?	The (−) bacterial cell wall repels the dye causing the dye to bind to the background.	

Positive/Basic Stains (3 Questions)

Uses	Advantage	Disadvantage
Stains bacteria so accurate arrangements & groupings can be seen.	• Doesn't wash off • preserved specimen	• Can distort bacteria - due to heat fixing
Examples of positive stains:	Saffranin, Crystal Violet, Methylene Blue, & Malachite Green	
How does it work?	The (-) bacterial cell wall attracts the (+) dye causing it to adhere to and stain the bacteria.	

Gram Staining (14 Questions)

1. Steps of Gram Stain (8 Questions)

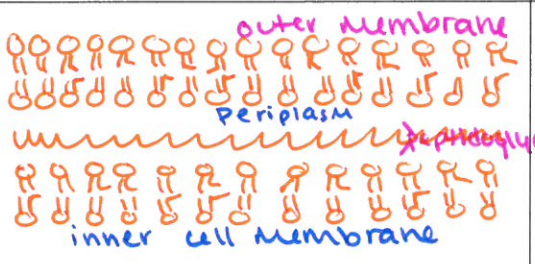
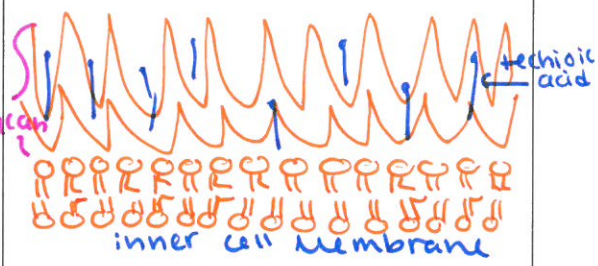
	Substance Used	Purpose	Appearance of Gram Positive	Appearance of Gram Negative
Step One	Crystal Violet	Intial stain: stains all bacteria purple	purple	purple
Step Two	Iodine	Mordant: creates CVI complex that causes GP cells to remain purple.	purple	purple
Step Three	Ethyl Alcohol	Decolorizes: dehydrates cell wall washing crystal violet out of GN cells.	purple	clear
Step Four	Saffranin	Counterstain: stains clear GN bacteria so they are more easily observed.	purple	pink/red

2. Advantages/Disadvantages (1 Question)

	Uses	Advantages	Disadvantages
Gram Staining	• Helps differentiate between bacteria with different cell walls.	Used to guide perscription of antibiotics and decrease resistance.	• only useful for bacteria • young cultures are required. • decolorizing time is critical • heat can degrade cell walls.

Gram Staining Continued (14 Questions)

3. Cell Wall Structure (5 Questions)

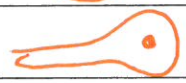
	Gram Negative	Gram Positive
Drawing of cell wall structure (Label all components)		
Amount of peptidoglycan	little	lots
Osmotic Protection (Yes/No)	no	yes
Endotoxins (Yes/No)	yes	no
Penicillin Resistance (Yes/No)	yes	no

Exceptions to Normal Cell Wall Structure: (1 Question)

1. Why don't archaea cell walls react to gram staining? They do not have cell walls or peptideglycan (they have pseudomuerin)

Prokaryote Cell Internal Characteristics (21 Questions)

1. Endospores (6 Questions)
   A. What is an endospore? A resistant, dormant, resting structural remenant of bacteria designed to protect microbes in adverse conditions.
   B. When do cells produce endospores?
   Hardship
   C. What category of bacteria possesses endospores? GP
   D. When would you want to perform an endospore stain?
   If clear spots are seen.
   E. What technique must be employed to stain endospores? Endospore stain → Heat.
   F. Endospore Locations

Possible Locations	Description of Location	Drawing
Free	outside cell	
Terminal	at the end of the cell	
Subterminal	almost at end	
Central	In the center	
Central, Swollen	center	
Terminal, Swollen	end	

2. Plasma Membrane: (8 Questions)

Passive Transport Definition:	Passive Transport Types	Types of molecules moved
	1. Diffusion	small molecules /elements
	2. Osmosis	water
	3. Facilitated Diffusion	Larger molecules through protein channels

Types of Solution	Direction of water movement	Cell Response
Hypotonic	Into cells	swells
Hypertonic	out of cells	shrinks
Isotonic	In & out of cells	balance

3. Chromatophores (1 Question)
   A. What are chromatophores? photosynthetic structures (sunlight → food)

4. Nuclear Area (2 Questions)
   A. Where do you find genetic information in a bacterial cell? nucleoid

   B. Is there a nucleus?
      i. Why/Why not? no, no membrane bound organelles are found.

5. Plasmids (2 Questions)
   A. What are plasmids? extrachromosomal DNA

   B. Uses: Antibiotic resistance, toxin production, resistance to toxic metals, Biotech (use as a vector for production of insulin, vaccines, etc).

6. Ribosomes (1 Question)
   A. Type found in prokaryotes
      70S (Eukaryote 80S)

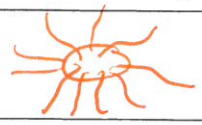
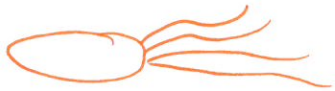
7. Inclusions (1 Question)
   A. Function: Reserve deposits

Inhibition of Bacterial Growth: (2 Questions)

1. How do you best inhibit bacterial growth on agar? place bacteria in Hypertonic environments → plasmolysis

2. What substance showed higher inhibitive tendencies?
   a. Why? NaCl → plasmolysis

Flagella Types: (3 Questions)

Types of Flagella	Description	Drawing
Peritrichous	Bacteria with surfaces covered in flagella	
Monotrichous	Bacteria with one flagella	
Lophotrichous	Bacteria with a group of flagella on one end	
Amphitrichous	Bacteria with flagella on opposite ends.	

Cell Structures: (6 Questions)

Cell Structure	Function in Cell
Flagella	Movement
Axial Filaments	Movement
Fimbrae	Adherence
Pilli	DNA (plasmid) Transfer
Capsule	Adherence, Prevent Phagocytosis

Eukaryotes (1 Question)

1. What structures are unique to eukaryotic cells? nucleus + membrane bound organelles.

2. Describe the origin of organelles such as chloroplasts and mitochondria using evidence.

Endosumbiotic Theory

ribosomes - 70S

plasmid DNA - extrachromosomal

binary fission

- mitochondria + chloroplasts are prokaryotic cells once ingested by eukaryotic cells and then harnessed to perform cellular tasks (mitochondria → producing energy, chloroplasts → produce food).