

BIOS 312 Review Sheet Lecture Test 2

Chapter 7: Microbial Molecular Biology

- Structure of DNA, RNA, supercoiling, DNA packaging, DNA gyrase
- DNA replication, enzymes involved, replication fork, proof-reading
- Transcription: RNA polymerase, subunits, sigma-factors
- Transcriptional start and stop signals, promoters, terminator structures
- Translation: ribosomes, t-RNA, aminoacyl-t-RNA synthetases, initiation, elongation, termination
- Translational start and stop signals
- Shine-Dalgarno sequence, start codon, stop codon, N-formyl-methionine
- Genetic code, universal, exceptions, degenerate
- Operon structure in prokaryotes, open reading frames
- Protein folding - chaperones, protein secretion

Chapter 8: Regulation of Gene Expression

- Regulation of enzyme activity, feedback inhibition, allostery, posttranslational modification
- Regulation of enzyme synthesis – gene expression
- Enzyme induction in catabolic operons
- Enzyme repression in biosynthetic operons
- Negative control in the *lac* operon: *lac* repressor, inducer
- Positive control in the *lac* operon: CAP, cyclic-AMP
- Regulon
- DNA-binding proteins, helix-turn-helix motif, zinc fingers, leucine zippers
- Alternative sigma factors
- Two-component systems
- Quorum sensing

Chapter 10: Bacterial Genetics

- Horizontal gene transfer
- Homologous recombination (RecA protein)
- Transformation, competence, natural, artificial
- Transduction (specialized, general)
- Conjugation
- Plasmids (F-factor, R-factor)
- Chromosome mobilization (Hfr strains, resulting circular maps)
- *IS elements*, *transposons*, *integrons*
- *Transposon mutagenesis*

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Chapter 20: Microbial Growth Control

- Sterilization, sterile
- Bacteriocidal, bacteriostatic
- Physical methods: heat, decimal reduction time, autoclave, endospores, pasteurization
- Radiation, UV, X-rays
- Filtration
- Osmotic pressure, desiccation, cold
- MIC, agar diffusion method – Kirby-Bauer Test
- Disinfectant, antiseptic, asepsis
- Alcohols, phenols, detergents, oxidizing agents, halogens
- Heavy metals, aldehydes, ethylene oxide, ozone, organic acids

- **Antibiotics**
- Selective toxicity; broad and narrow spectrum
- Growth factor analogs: sulfa - drugs
- Targets: cell wall, cell membrane, nucleic acid synthesis (DNA gyrase), protein synthesis
- Penicillin, cephalosporins, beta-lactam ring
- Kanamycin and streptomycin – aminoglycosides: protein synthesis
- Tetracycline: protein biosynthesis
- Quinolones – DNA gyrase (nalidixic acid, norfloxacin, novobiocin)
- Macrolides - erythromycin
- Antifungal drugs: membranes
- Zyvox: oxazolidinone

- **Resistance Mechanisms – how can bacteria fight the antibiotic?**
- Lack of target
- Alteration of target
- Inhibit uptake - impermeability
- Efflux systems
- Enzymatic alteration of antibiotic

How can antibiotic resistances spread so fast and widely?

- Mutation and Selection, short generation time of bacteria
- R-plasmids, transposons
- Selection due to human use

- Antifungal Drugs – ergosterol as target
- Antiviral drugs – nucleoside analogs

• **Microbe Hunters!**