

- 1 **Chapter 15**
Genetic Code & Translation
- 2
 - ▶ Beadle & Tatum
 - ▶ Neurospora
 - ▶ Auxotrophs
 - No growth on minimal media
 - ▶ Determine affected pathway
- 3
 - ▶ Adrian Srb & Norman Horowitz
 - ▶ Determined pathway steps
- 4 **One gene one enzyme**
 - ▶ Beadle & Tatum
 - ▶ Genetic crosses & mapping
 - ▶ Mutations of one step map to same location
 - ▶ One gene one enzyme hypothesis
 - ▶ Many enzymes composed of multiple subunits
 - ▶ Modified
 - ▶ One gene, one polypeptide
- 5
 - ▶ Proteins
 - ▶ Enzymes
 - ▶ Structural
 - ▶ Transport
 - ▶ Regulation
 - ▶ Communication
 - ▶ defense
- 6
 - ▶ Amino acids
 - ▶ 20 common
 - ▶ Central carbon
 - ▶ Amino group
 - ▶ Hydrogen atom
 - ▶ Carboxyl group
 - ▶ R group
 - ▶ Joined by peptide bonds
 - ▶ Polypeptide chains
- 7
- 8
- 9 **15.2 Genetic Code**
 - ▶ How many bases encode an amino acid?
 - ▶ Two ($4 \times 4 = 16$)
 - ▶ Not possible
 - ▶ Three ($4 \times 4 \times 4 = 64$)
 - ▶ More than enough for amino acids
- 10
 - ▶ Codons

This is only a guideline topics discussed in-class as well as the assigned pages from the text and supplemental material may also be on the exam.

- ▶ 64 total
- ▶ 3 stop
- ▶ 61 sense codons
 - ▶ 20 aa's
- ▶ Degenerate
 - ▶ Multiple physical states that have equivalent meaning
 - ▶ Most aa's have multiple codons (synonymous)
- ▶ Wobble
 - ▶ Third pair has flexible pairing

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- ▶ Nonoverlapping
- ▶ Reading frame
 - ▶ Initiation codon
 - ▶ AUG
 - ▶ Rarely GUG or UUG
 - ▶ Termination codons
 - ▶ UAA, UAG & UGA
 - Nonsense codons
- ▶ Almost universal

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15.3 AA assembly

- ▶ Ribosome
 - ▶ Attaches to 5 end of mRNA
 - ▶ Moves toward 3
 - ▶ Synthesis begins at amino end of aa new aa's added to carboxyl end

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- ▶ Stages
 - ▶ tRNA charging
 - ▶ Binds aa to tRNA
 - ▶ Initiation
 - ▶ Components assembled at ribosome
 - ▶ Elongation
 - ▶ Aa's added to chain
 - ▶ Termination
 - ▶ Stop codon

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- ▶ tRNA charging
 - ▶ Requires ATP
 - ▶ CCA at 3end
 - ▶ Carboxyl group attaches to adenine nucleotide
- ▶ Specificity
 - ▶ Aminoacyl-tRNA synthetases
 - ▶ One for each aa

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- ▶ Subunits
 - ▶ mRNA
 - ▶ Ribosome units Small & large
 - ▶ Initiation factors (3 proteins)
 - ▶ Initiation tRNA

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- 16
 - ▶ Guanosine triphosphate (GTP)
 - ▶ Bacteria
 - ▶ Consensus sequence
- 17
 - ▶ Eukaryotic
 - ▶ No consensus sequence
 - ▶ Recognizes 5 cap
 - ▶ Scans mRNA until first AUG
 - ▶ More initiation factors
 - ▶ Poly-A tail
 - ▶ interaction with CAP binding proteins
- 18
 - ▶ Elongation
 - ▶ tRNA's are moved through 3 sites
 - ▶ Aminoacyl (A site)
 - ▶ Peptidyl (P site)
 - ▶ Exit (e site)
 - ▶ Elongation factors
 - ▶ EF-Tu & GTP
 - ▶ EF-Ts – regenerates GTP
 - ▶ Peptide bond
 - ▶ between A & P sites
 - ▶ Translocation
 - ▶ Shifts ribosome
 - ▶ EF-G & GTP
- 19
 - ▶ Termination
 - ▶ No tRNA enters A site
 - ▶ Release factors bind to ribosome & stop codon
 - ▶ Uses GTP
 - ▶ release tRNA, mRNA from ribosome
- 20 **overview**
- 21 **Additional properties**
 - ▶ Polyribosomes
 - ▶ mRNA surveillance
 - ▶ Posttranslational modification of proteins
 - ▶ Molecular chaperones
 - ▶ Antibiotics
 - ▶ Bind to specific ribosome's
 - ▶ Tetracycline's, Neomycin, Chloramphenicol, Streptomycin, Erythromycin, Puromycin (cancer)

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