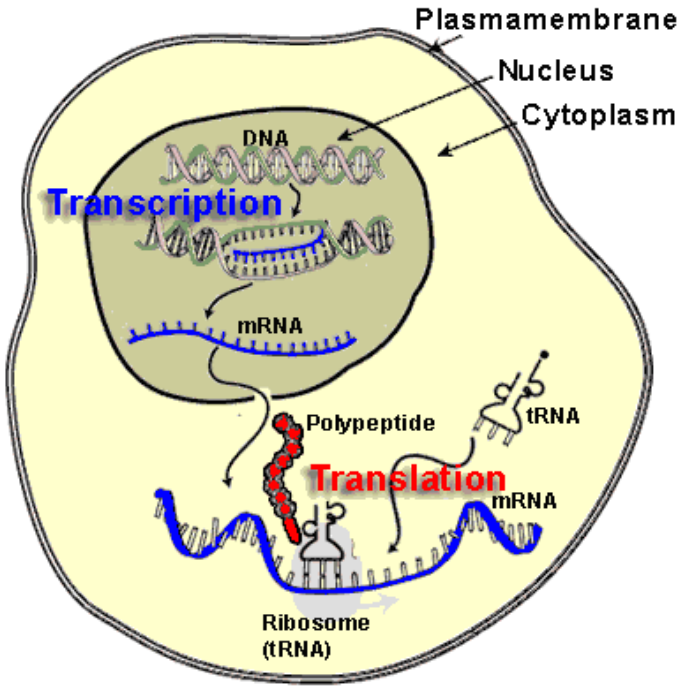
Test 1

1. Which of the following is correct statement for the selective transport of molecules through the nuclear pores primarily?: export of RNAs from the nucleus and transport of proteins into the nucleus
   1.16
2. Heterochromatin consists of which of the following?: condensed, transcriptionally inactive chromatin
   1.54

3. Which of the following is not part of the nucleosome core particle?: Histone H1
   1.45 & 1.48

4. Synthesis of different proteins from the same gene is due to which of the following?: alternative splicing
   1.39

5. Which of the following does not take place in the nucleus?: translation
   1.8



6. Which region of DNA contains the coding information for a protein in eukaryotes?: exons
   1.36

7. The nuclear lamina is built of proteins called which of the following?: lamins
   1.17

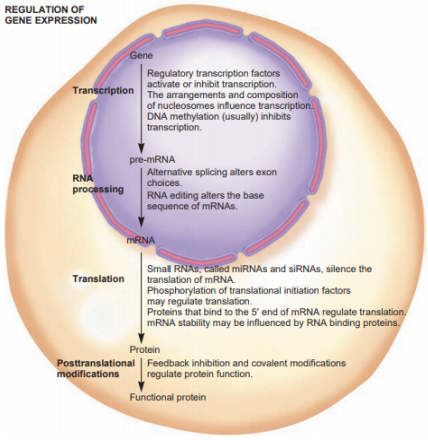
8. Which of the following are (is) assembled in the nucleolus?: ribosomal subunits
   1.8

9. Euchromatin consists of which of the following?: decondensed, transcriptionally active chromatin
   1.20

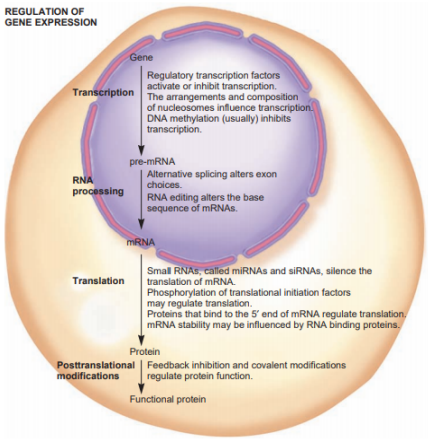
10. The major pathway for molecules to pass into and out of the nucleus is through which of the following?: nuclear pore complexes
    1.11

Test 2

1. Antisense RNA binds to the mRNA and prevents translation. This is gene regulation on which level?: translational
   Since RNA only occurs in the translation stage, regulating translation must occur at the translational level
   2.7

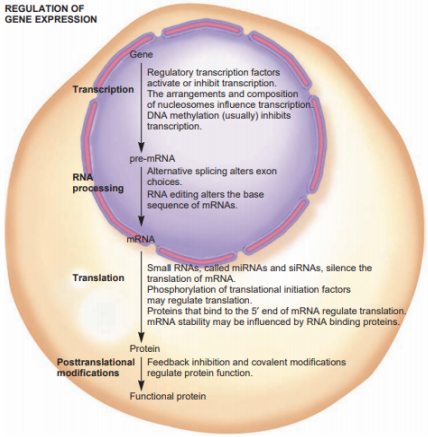


2. The ncRNA HOTAIR recruits histone-modifying complexes and alters chromatin structure, and thereby represses transcription. This is which level of gene regulation?: transcriptional
   ncRNA is small RNA and transcription is repressed, these two can only be regulated at the translational level
   2.7

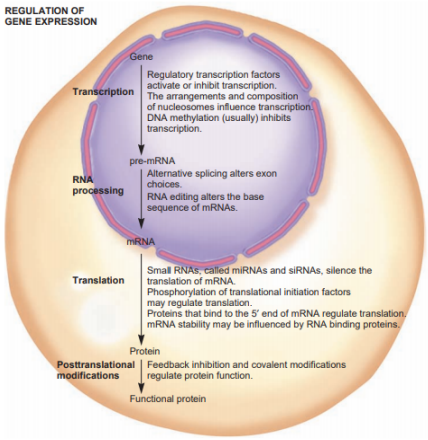


3. A bacterial ncRNA called OxyS binds to the Shine-Dalgarno ribosomal binding sequence on mRNA, which prevents ribosome binding. This is what type of gene regulation?: translational
   ncRNA is small RNA and the ribosomal binding occurs on mRNA, both these are at the translational level.

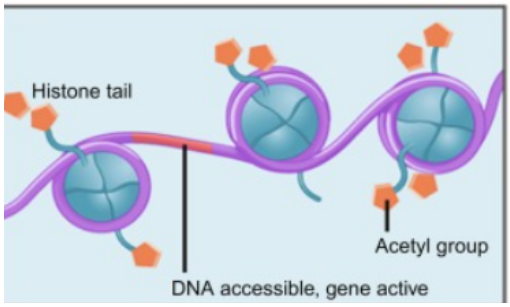
2.7



4. Transcription factors recognize specific areas of what molecule?: DNA
   Transcription factors work only with genes(DNA) in the nucleus so they must recognize DNA in a molecule.
   2.7

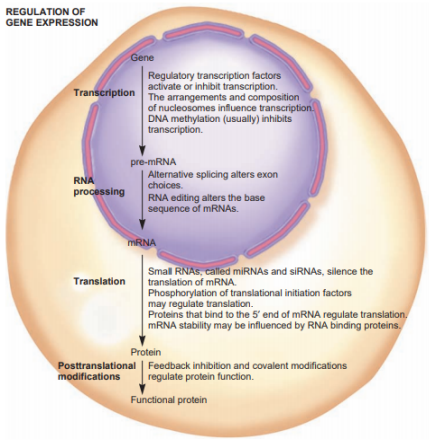


5. Which of the following is the correct gene regulation mechanism by the action of Histone Acetyltransferase (HAT)?: HAT as co-activator causes chromatin decondensation
   Acetylation of histones activates transcription. Activation decondenses chromatin and allows the transcription to occur by making chromatin more accessible.
   2.27

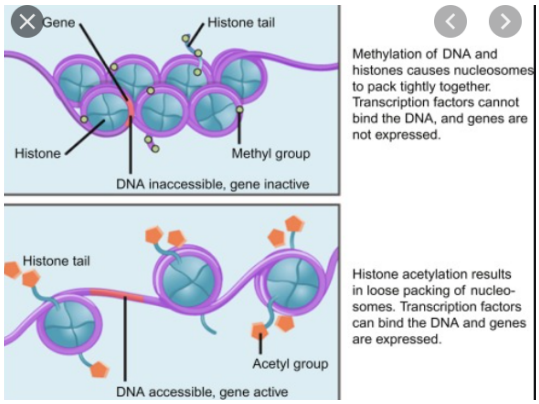


Histone acetylation results in loose packing of nucleosomes. Transcription factors can bind the DNA and genes are expressed.

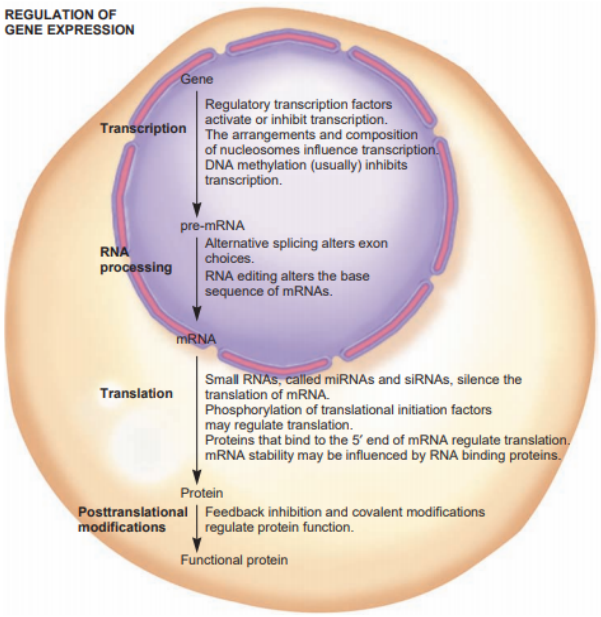
6. Binding of proteins to the 5' end of mRNA can regulate gene expression on which level?: translational
   Any changes made to mRNA must occur when mRNA is in the translation level.
   2.7



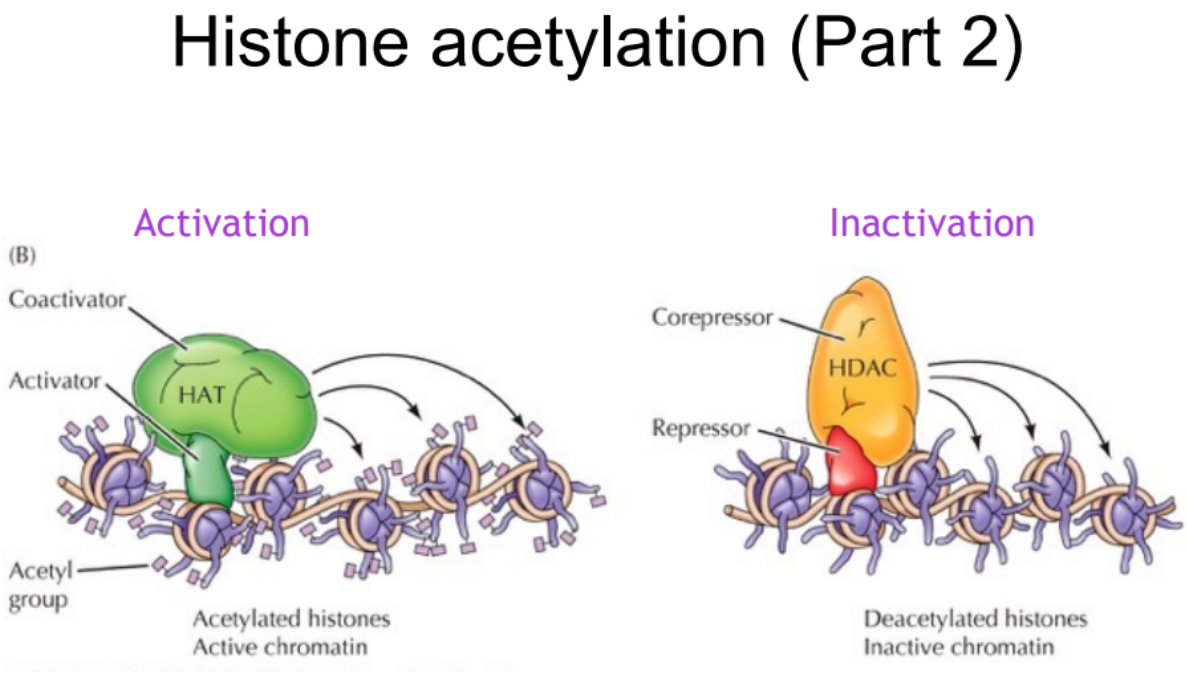
7. DNA methyltransferase changes cytosine to 5-methylcytosine (C-CH3), and causes gene silencing. Which of the following is correct mechanism?: chromatin condensation and G / C-CH3 are paired
   For a gene to be silenced the chromatin must be less accessible/more difficult to reach. Condensing chromatin silences the gene. 5-methylcytosine can still pair with Guanine.
   2.36



8. Regulating functions of proteins by modifications on proteins is what type of gene regulation?: post-translational
   Protein modification can only occur when proteins are present during the post-translational level
   2.7

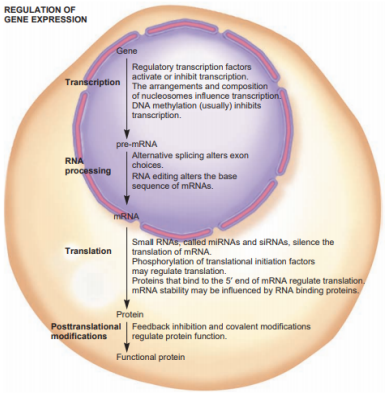


9. Which of the following can turn transcription ON?: Histone acetyltransferases modify histones and make chromatin decondensation
   Acetyltransferases allow chromatin to decondense and increase transcription.
   Condensing or deacetylation would turn transcription off.
   2.27



10. Alternative splicing can process the same pre-mRNA into different mRNAs by selectively using different exons. Alternative splicing of exons is which type of gene regulation?: post-transcriptional

Working with pre-mRNA BEFORE it becomes different mRNA, pre-mRNA only shows up in post-transcriptional level. Focusing on processing mRNA not working w mRNA
2.7



Test 3

1. The regulation of protein function is what type of gene regulation?: post-translational Protein modification
   2.7

2. Transcription factors recognize specific areas of what molecule?: DNA
   Transcription acts on DNA straight from gene in nucleus
   2.7

3. Which of the following can turn transcription ON?: Histone acetylation causing chromatin decondensation
   2.27

4. In protein tertiary structure, the R groups from two amino acids can form certain bonding based on their structural characteristics. What type of bonding can be formed between the R groups of an acidic and a basic amino acids?: ionic bonding
   2.29

5. Charging of tRNA requires which of the following?: aminoacyl-tRNA synthetase, ATP, amino acid
   3.13

6. What type of bonding can be formed between the R groups of hydrophobic amino acids such as Valine and Leucine?:hydrophobic interaction
   3.29

7. There are four levels of protein structure. Which level of structure determines the other three levels of structure?: primary
   3.24

8. Antisense RNA binds to the mRNA and prevents translation. This is gene regulation on which level?: translational. Focusing on mRNA, this occurs during translation
   2.7

9. Which of the following triplets is the anticodon carried by the initiator tRNA?: UAC

3.22

10. Proteins that facilitate the folding of other proteins are called which of the following?:chaperones
    3.35/36

11. A tRNA that has an amino acid attached is called which of the following?: charged tRNA
    3.14

12. Alternative splicing can process the same pre-mRNA into different mRNA by selectively using different exons. Alternative splicing of exons is which type of gene regulation?: post-transcriptional. Processing mRNA and changes already made seq, beyond translation
    3.7

13. Proteins fold into conformation of lowest energy by various interactions. Which of the following is a covalent bonding?: disulfide bonding. Covalent is NM with NM, S with S is NM x NM
    3.29

14. The first amino acid that initiates the eukaryotic polypeptide is which of the following?: methionine
    3.3

15. How many amino acids are coded for a polypeptide by the following mRNA?
    5'-GCC ACC AUG GGC CAA UUA CGA UGA CCA GGU-3' : 5
    Met 2 3 4 5 stop
    3.7

Test 4

1. The pH inside lysosomes is about which of the following?: B.4 to 5

   4.50

2. On which amino acid can glycosylation occur by O-linkage: C. threonine and serine

   4.21-22

3. N-linked like glycosylation attaches a complex carbohydrate on to which of the following?: C. amino group of asparagine

   4.21-22

4. Prions are which of the following?: D. Misfolded proteins that can self-replicate

   4.43

5. In proteasome degradation pathway, a short polypeptide is attached to a protein to target it for destruction. Which of the following is the polypeptide?: C. ubiquitin

   4.27

6. Proteins are often regulated through phosphorylation by enzymes called which of the following?: D. protein kinases

   4.3

7. Proteins can be regulated by the removal of phosphates by which of the following enzymes?: A. protein phosphatases

   4.3

8. Which of the following amino acids is not commonly phosphorylated to regulate protein activity?: B. tryptophan

   4.3

9. Acetylation and methylation can occur on which of the following amino acids?: C. lysine

   4.13

10. Which enzyme gives the ubiquitin- proteasome system specificity as to which protein gets targeted for degradation?: B. E3 (Ubl)

    4.26

Test 5

1. Lysosomal proteins are marked by the addition of a phosphate to a ( ) group.: mannose

   5.36

2. Ribosomes that are free in the cytosol and those that are bound to the ER membrane have: the same types of large and small subunits

   5.12

3. Which of the following statements about mannose-6-phosphate receptor that bind and take up lysosomal hydrolases into lysosomal transport vesicles is true?: they release the lysosomal hydrolases in the late endosomes and are recycled in vesicles back to the Golgi

   5.36

4. Transport vesicles carrying acid hydrolases fuse with ( ): late endosomes

   5.36

5. Which of the following proteins do not pass through the Golgi apparatus?: Ribosomal proteins

   5.18

6. Most higher eukaryotic plasma membrane proteins are synthesized on: rough ER ribosomes and carried to the plasma membrane by vesicles that pinch off from the golgi apparatus

   5.13

7. Which of the following proteins are synthesized in the free ribosomes in cytosol?: mitochondrial proteins

   5.9

8. Which of the following represents the pathway taken by secreted proteins?: rough ER to Golgi to secretory vesicles to cell exterior

   5.13

9. Which of the following types of vesicles does not bud directly from the trans-Golgi network?: lysosomes

   5.36

10. N-linked oligosaccharides are added in the ( ) and modified in the ( ): ER; Golgi

5.38

Test 6

1. Phosphatidylserine (PS) ia s phospholipid found in plasma membrane of

   A. inner layer

   6.6

2. Transport through protein pump in plasma membrane is which of the following?

   A. uphill of concentration gradient and energy input

   6.56

3. Tissue cells are connected to the extracellular matrix by cell surfce receptors that bind to an adherive protein in ECM called

   A. fibronectin

   7.27

4. Cholesterol is present in the the membranes of all animal cells, and

   B. in both layers

   6.8

5. The major cell surface receptor(s) responsible for the attachment of cells to the extracellular matrix is (are) which of the following?

   D. integrins

   7.24

6. Molecules composed of proteins attached to unbranched repeating disaccharide chains (Glycosaminoglycans-GAGs) are termed as which of the following?

   B. proteoglycans

   7.7

7. Cell adhesion molecules can be dividied into four major groups. Which of the following is not one of those groups?

   C. collagens

   7.30

8. Molecules that diffuse passively across the plasma membrane most rapidly are which of the following?

    A. small and hydrophobic

    6.49

9. The transport through a protein channel in plasma membrane is which of the following?

    C. passive and selective

    6.57

10. Plasma membrane glycolipids are found in which of the following?

    C. in the outer leaflet

    6.8

Test 7

1. Movement of vesicles within the cell depends on what cellular structures?

   C. microtubules

   8.11

2. The intermediate filaments in the nucleus are made of which of the following?

   B. lamins

   8.8-40

3. Which of the following correctly matches a component of the cytoskeleton to one of its functions?

   A. microtubules move chromosomes

   8.20-21

4. Actin filaments are bound into bundles of parallel filaments by which of the following proteins?

   B. fimbrin and alpha-actinin

   8.30

5. Expression of a shortend skin keratin gene in place of the normal keratin gene in transgenic mice results in a phenotype in which mice have:

   A. fragile, easily blistered skin

   8.46-47

6. Intermediate filaments function in which of the following?

   C. providing mechanical strength for cells

   8.1-35

7. Microtubules are not involved in which of the following?

   A. cytokinesis of animal cells

   8.20

8. Keratin filaments are found in which of the following cell types?

    C. epithelial cells

    8.50

9. To form microfilaments, each monomer of actin binds one molecule of the nucleotide triphosphate:

    D. ATP

    8.34

10. Microtubules are assembled from which of the following?

    C. heterodimers of alpha- and beta-tubulin

    8.18

Test 8

1. During this phase of the cell cycle, the chromosomes line up in the center of the cell.

   A. Metaphase

   9.24

2. During this phase of the cell cycle, the nuclear membrane reforms around the chromosomes.

   C. telophase

   9.26

3. During this phase of the cell cycle chromosomes start to condense.
   D. prophase
   9.22

4. The retinoblastoma protein (Rb) as a negative regulator binds to and inhibits
   B. transcription factor E2F
   10.39

5. P21 inhibits cell cycle progression by binding to and inhibiting
   D. CDKs
   10.45-46

6. During this phase of the cell cycle, sister chromatids separate and head towards opposite poles of the cell.
   C. anaphase
   9.25

7. Protein kinases ATM and ATR are activated in response to DNA damages. Upon activation of ATM or ATR, Chk1 or Chk2 is activated. Which of the following is correct for causing cell cycle arrest?
   A. inactivation of phosphatase cdc 25, and then inactivation of CDK1/CDK2
   10.42-44

8. MPF is a dimer of CDK1 and cyclin B, a general regulator of the transition from
   B. G2 to M
   10.16

9. In the cell cycle progression from G2 phase to M phase, firstly CDK1 must bind cyclin B, and then its three sites of threonine 14, tyrosine 15, and threonine 161 are phosphorylated. To activate the CDK 1, which of the following is correct?
   A. be dephosphorylated on threonine 14 and tyrosine 15, and phosphorylated on threonine 161
   10.20

10. The eukaryotic cell cycle is composed of four phases in the following order:
    B. G1 to S to G2 to M
    9.6

Test 9

1. Receptor tyrosine kinases have which of the following?: an extracellular N-terminal ligand-binding domain, and a cytosolic C-terminal kinase domain
   12.4

2. Protein kinase A regulates glycogen metabolism by ( ) glycogen synthase and ( ) phosphorylase kinase.:inactivating; activating
   11.48

3. Signaling by neurotransmitters is an example of which signaling?: paracrine
   11.7

4. The transcription factor CREB is activated through which of the following?: Phosphorylation by catalytic subunit of protein kinase A in the nucleus
   11.49

5. Protein kinase A is activated by which of the following?: binding of cAMP to its regulatory subunits
   11.48

6. JAK is a non-receptor tyrosine kinase, and upon activation of JAK, it can activate its downstream target protein STAT (Signal Transducer and Activator of Transcription). Which of the following is the order of the JAK-STAT signaling pathway after a cytokine binding to its receptor ?: receptor dimerization - JAK activation - STAT activation
   12.31

7. The difference between receptor tyrosine kinases (RTKs) and non-receptor tyrosine kinases (nRTKs) is which of the following?: the cytosolic domains of RTK receptors have catalytic activity, but cytosolic domains of nRTK receptors have no catalytic activity
   12.25

8. Most receptors of polypeptide growth factors are which of the following?: tyrosine protein kinases
   12.3

9. In an active state of a heterotrimeric G protein, which of the following is correct?:the alpha, and beta-gama subunits both can bind to target proteins
   11.34-38

10. Steroid hormones usually act via receptors that: bind to DNA
    11.10

Test 10

1. Hematopoietic stem cells in bone marrow are which of the following?: multipotent
   14.14

2. Which of the following cell death is from acute injury , causing cell swelling, leaking and lysis?: necrosis
   13.9

3. Pluripotent stem cells can generate which of the following?: body and germ cells
   14.10

4. Apoptotic cells produce " eat me" signals, which include ( ) of cell suface ( ).:gain; phosphatidylserines
   13.17, G pg 657

5. Apoptosome is composed of which of the following?:cytochrome c, Apaf-1, and caspase 9
   13.28

6. Which of the following is the process of reprogramming somatic cells into other types differentated cells, such as from fibroblasts to muscle cells or to neurons?: trans-differentiation
   14.29

7. The function of Apoptosome is to cleave which of the following?: caspase 3
   13.28

8. Early experiments by Takahashi and Yamanaka showed that a set of four genes introduced by retroviral expression are capable of transforming somatic cells into induced pluripotent stem cells. These four proteins encoded by these genes are which of the following?: transcription factors
   14.26, G pg 652

9. Totipotent stem cells can generate which of the following?: both embryonic and extra embryonic cells
   14.10

10. Which of the following causes accumulation of lysosomes, provides energy, and recycles materials by degradation of cell components?: autophagy
    13.11