Regulation of Gene Activity

Q.1-Which of the followings does NOT need a primer in order to function?
a) DNA Pol I
b) DNA Pol II
c) DNA Pol III
d) RNA polymerase
Q.2-How many hydrogen bonds form between U and A in a Watson-Crick base pair interactions?
a) 0
b) 1
c) 2
d) 3
Q.3-Which of the followings is required for end to end joining of DNA
a) DNA Pol I
b) DNA ligase
c) DNA Pol III
d) RNA polymerase
Q.4- The only methylated base in mammals is?
a)7-methyl guanine
b) Thymine
c) Methyl adenine
d) 5-methyl cytosine
Q.5- The only nucleoside with base to sugar C-C linkage isa)
Thymidine
b) Pseudouridine
c) Cytidine
d) Adenosine
Q.6- Repressor molecules bind to the:
a) Promoter
b)Enhancer
c) Operator
d) Hormone response element
Q.7- Which of the following enzyme(s) can remove or insert supercoil twists into circular DNA?
a) Topoisomerases
b) DNA Pol II
c) Spliceosomes
d) Helicase
Q.8-Nucleosomes
a) Bind to RNA pol II
b) Package prokaryotic DNA
c) Are only present in prokaryotes
d) Are composed on an octamer of histones and ~150 bp of DNA
Q.9- Which of the following m RNA s lack poly A tail?
a) Ferritin
b) Interferon
c) Insulin
d) None of the above.
Q.10-The RNA primer is removed from the Okazaki fragment by:
a) DNA Pol I

b) DNA Pol II
c) DNA Pol III
d) RNA polymerase
Q.11-Histones have an abundance of which of the following amino acids?
a) Lysine and arginine
b) Alanine and glutamine
c) Glycine and Glutamine
d) Arginine and Glutamine
Q.12-Which of the following is not a cloning vector?
a) Helicase
b) PBR322
c) SV40
d) E.coli genomic DNA
Q.13-Which of the following is false about the E. coli Lac operon?
a) It is polycistronic
b) It is an example of negative control
c) The presence of lactose acts as an inducer
d) The repressor binds to the promoter
Q.14-The part of the bacterial RNA polymerase responsible for recognizing the promoter is the:
a) Alpha subunit
b) Rho protein
c)DNA Pol III
d) sigma subunit
Q.15- Enhancer regions in eukaryotic DNA are -
a) DNA Pol I binding sites
b) Inhibit the binding of repressor
c) Enhance the frequency of transcription
d) Specific for given set of genes
Q.16- In contrast to DNA polymerase, RNA polymerase
a) Fills in the gap between Okazaki fragments
b) Works only in 5`to 3` direction
c) Edits as it synthesizes
d) Synthesizes RNA primer to initiate DNA synthesis.
Q.17- DNA is replicated:
a) Conservatively
b) Distributively
c) Semi-conservatively
d) Dispersively
Q.18- Telomerase does which of the followinga)
Joins Okazaki fragments on the lagging strand
b) Catalyzes DNA replication at the ends of chromosome
c) Enhances transcription
d) Requires dCTP
Q.19-Eukaryotic RNA polymerase I is specialized to transcribe which of the following?
a) mRNA
b) tRNA
c) Ribosomal RNA
d) Mitochondrial RNA
Q.20-The melting temperature of DNA is the temperature where:

a) DNA anneals to RNA
b) DNA denatures into single strands
c) DNA is degraded
d) RNA binds to the ribosome
Q.21- Actinomycin D is an inhibitor ofa)
Replication
b) Transcription
c) Translation
d) all of the above.
Q.22- In protein synthesis which out of the following is not a termination codon?
a) UAG
b) UGA
c) UUU
d) UAA
Q.23- A promoter site on DNA -
a) is present upstream to the start site
b) is present on the coding strand
c) Initiates transcription
d) All of the above
Q.24- All are true for DNA polymerase except one
a) Has exonuclease activity
b) Works only in 5`to 3` direction
c) Edits as it synthesizes
d) Synthesizes RNA primer to initiate DNA synthesis.
Q.25- Which of the following result is provided by Western Blot Analysis
a) Detects DNA molecules
b) Detects Protein molecules
c) Detects RNA molecules
d) Determines chromosomal structure
Q.26- Which of the following is an anticancer drug?
a) 5- methyl thymidine
b) Ribose phosphate
c) Ara C
d) PRPP (5- phosphoribosylpyrophosphate)
Q.27- A 10-year-old Caucasian girl is brought in by her parents for evaluation of a skin disorder. The child has many freckles on her face, arms, and legs. The parents were told by previous physicians thatshe suffers from Xeroderma pigmentosum and that they should limit her exposure to sun light. What is
the most likely etiology of this disorder?
a) Deficient DNA replication
b) Impaired DNA repair by nucleotide excision
c) Defective RNA transcription from TATA-less promoter
d) Impaired DNA repair by photo reactivation
Q.28- Which of the following events would occur at the *E. coli lac* operon when the glucose concentrationof the growth medium is low and the lactose concentration is high?
a) The *lac* repressor protein will bind to the operator sequence.
b) Ribosomes will stall during translation of the first 13 amino acids.
c) The transcribed RNA will form a cAMP-dependent stem-loop structure to terminate transcription.

d) The catabolite gene activator protein (CAP), bound with cAMP, will stimulate binding of RNA polymerase
to the promoter.
Q.29- BRCA-1 is associated with which cancer?
a) Breast
b) Nerve
c) Thyroid
d) Leukemia
Q.30- The p53 protein normally promotes
a) DNA replication
b) Cell division
c) Tumor formation
d) Apoptosis
Q.31- What is added to the 3′-end of many eukaryotic mRNAs after transcription?
a) Introns
b) Cap of modified G nucleotide
c) Poly A tail
d) Trinucleotide CCA
Q.32-The binding of the prokaryotic DNA dependent RNA polymerase to promoter site is inhibited bya)
Streptomycin
b) Puromycin
c) Rifampicin
d) Tetracycline
Q.33-The mutagenicity of a compound can be detected by
a)ELISA
b) Ame's test
c) Western blotting
d) Any of the above.
Q.34- A 20 year old man was diagnosed with abnormal form of β – globin (Hemoglobin Constant Spring) which is longer than the normal protein, which of the following point mutation is consistent with the abnormality?
a) UAA——->CAA
b) CGA——>UGA
c) UAA——->UAG
d) GAC——-> UAC
Q.35- Which of the following sugar is found in RNA?
a) 2- deoxy Ribose
b) 3-deoxy Ribose
c) D- Ribose
d) D- Xylulose
Q.36-All are nucleosides except
a)Cytosine
b) Guanosine
c) Inosine
d) Adenosine
Q.37- What is added to the 3′-end of many eukaryotic tRNAs after transcription?
a)Introns
b) Cap of modified G nucleotide

c) Poly A tail
d) Trinucleotide CCA
Q.38-Restriction endonucleases are enzymes –
a) Used for joining DNA to cloning vector
b) That cleave randomly
c) That digest DNA from ends
d) Cleave DNA at specific sites
Q.39- An 8 –year-old boy is treated with Ciprofloxacin for some respiratory infection. Which of the following enzyme activity is most directly affected by this drug?
a) DNA polymerase
b) Topo Isomerase
c) Reverse transcriptase
d) RNA polymerase
Q.40-Which one of the following molecules is not a component of the 30 S initiation complex?
a) GTP
b) m RNA
c) Initiation factor 2
d) ATP
Q.41- Out of the following, one class of RNA characteristically contains unusual purines and pyrimidines. This RNA is
a) tRNA
b) rRNA
c) m RNA
d) 16s RNA
Q.4-The enzyme responsible for initiating DNA replication in prokaryotes is:
a) DNA polymerase I
b) DNA polymerase III
c) Polymerase beta
d) Primase
Q.5- The enzyme responsible for continuing DNA replication in prokaryotes, once it is initiated is:
a) DNA polymerase I
b) DNA polymerase III
c) polymerase beta
d) polymerase delta
Q.6- Antibiotics such as Ciprofloxacin and Flouroquinolines work by inhibiting a specific enzyme. This enzyme is normally necessary to relieve torsional strain that is caused by the unwinding of the helix. What is the name of this enzyme?
a) DNA ligase
b) Topoisomerase (DNA Gyrase)
c) single-stranded binding protein
d) primase
Q.7- Which of the following techniques is primarily undertaken to amplify DNA?
a) PCR
b) Microarrays
c) Northern Blotting
d) Southern Blotting
Q.8- In Pyrimidine Synthesis, Eukaryotes can use uracil to feedback inhibit which of the following enzymes?

a) Carbamoyl phosphate synthase
b) Aspartate Transcarbamoylase
c) Dihydrooratase
d) Thymidylate synthase
Q.13- The following are features of DNA replication EXCEPT:
a) Semi-conservative
b) Semi-discontinuous
c) unidirectional
d) chain growth in the 5' –> 3' direction
Q.14- The oncogene Ras binds:
a) ATP
b) GTP
c) Glucose
d) Hemoglobin
Q.17-Which of the following does not have introns?
a) DNA
b) Non-processed pseudo genes
c) Processed m RNA
d) Primary RNA transcript
Q.18- Which of the following is NOT true of RNA synthesis?
a) The key enzyme is RNA polymerase
b) The energy is supplied by ring cleavage
c) The RNA sequence is complementary to the template strand of DNA
d) The RNA sequence is of opposite polarity to the template strand of DNA
Q.19- If the molar amount of G in a DNA sample is 20%, what is the molar amount of T in the sample?
a) 20%
b) 30%
c) 40%
d) 60%
Q.20- With respect to the LAC operon, if both glucose and lactose are present and glucose is low, which
of the following is NOT true?
a) High CAP
b) increased uptake of lactose
c) low cAMP
Q.21- Which of the following subunits of the bacterial RNA polymerase is responsible for promoter recognition?
a)recognition?
a) alpha
b) B
c) B'
d) sigma
Q.22-Which is true of the melting temperature of G-C pairs compared to A-T pairs in DNA?
a) The Tm are equal
b) Tm of G-C is less than the Tm of A-T
c) Tm of G-C is greater than the Tm of A-T
d) None of the above

Q.23- A 10-year-old boy comes to the ER after eating wild mushrooms. The poison associated with these mushrooms most likely DIRECTLY inhibits the synthesis of the following:
a) hn RNA
b) t RNA
c) DNA
d) m RNA
Q.24- DNA methylation is associated with:
a) CpG islands
b) CAT box
c) TATA box
d) increasing gene transcription
Q.25-Alternative splicing…
a) Creates protein from multiple segments of DNA on different chromosomes
b) Is the reason why the human genome is much more complex than other species
c) Creates different proteins from a single gene
d) is not tissue specific
Q.26-All of the following are involved in translating information into proteins EXCEPT:
a) rRNA
b) siRNA
c) tRNA
d) snRNA
Q.27-Which histone is NOT part of the nucleosome?
a) H1
b) H2A
c) H2B
d) H3
Q.28-Which out of the following is an inhibitor of prokaryotic transcription?
a) Ciprofloxacin
b) Etoposide
c) Erythromycin
d) Rifampicin
Q.29- Choose the nucleoside analogue used as an anticancer drug out of the following
a) Methotrexate
b) 6- Mercaptopurine
c) Vinblastin
d) Cytosine Arabinoside
Q.30- Which amino acid residue is in abundance in histones?
a) Arginine
b) Aspartic acid
c) Tryptophan
d) Phenyl alanine
Q.31– Which out of the following techniques is used for the detection of gene of interest –
a) Southern Blotting
b) Polymerase chain reaction
c) Northern Blotting
d) DNA Foot printing
Q.32–Which out of the following is an example of post translational modification?
a) Splicing
b) Class switching

c) Subunit aggregation
d) Base modification
Key to Answers-
1-d, 2-c, 3-b, 4-b, 5-b, 6-c, 7-a, 8-d, 9-b 10-a, 11-a, 12-a, 13-d, 14-d, 15-c, 16-d, 17-c, 18-b, 19-c, 20-b, 21-b, 22-c, 23-d, 24-d, 25-b, 26-c, 27-b, 28-d, 29-a, 30-d, 31-c, 32-c, 33-b, 34-a, 35-c 36-a, 37-d, 38-d, 39-b, 40-d, 41-a.
5-b, 6-b, 7-a, 8-a, 13- c, 14-b, 17-c, 18-b, 19-b, 20-c, 21-d, 22-c, 23-a, 24-a, 25-c, 26-b, 27-a, 28-d, 29-d, 30-a, 31-a, 32-c,

Multiple Choice Questions

1. Regarding the *lac* operon, if lactose is present, which of the following occurs?
   A) Lactose binds to the operator preventing the promoter from attracting RNA polymerase and preventing transcription.
   B) Lactose bind to RNA polymerase, which then binds to the promoter and transcribes the needed genes.
   C) Lactose binds to the repressor, which does not bind to the operator, and RNA polymerase transcribes the needed genes.
   D) Lactose binds to the operon, which attracts RNA polymerase, then transcription of the needed genes occurs.
   E) Lactose binds to the CAP site to prevent the CAP protein from binding

   Answer: C

2. Which of the following is likely to be expressed?
   A) euchromatin
   B) heterochromatin
   C) DNA without methyl groups
   D) DNA with many methyl groups
   E) euchromatin and DNA without methyl groups is more likely to be expressed

   Answer: E

3. Which of the following is a method of posttranscriptional control?
   A) transcription factors
   B) the life span of a mRNA molecule
   C) differential processing of mRNA
   D) how fast the mRNA leaves the nucleus
   E) both differential processing and how fast mRNA leaves the nucleus are involved in posttranscriptional control.

   Answer: E

4. Which gene in an operon is incorrectly matched with its function?
   A) promoter--where RNA polymerase first binds to DNA
   B) regulator--binds to the repressor protein
   C) structural--makes mRNA by transcription

D) operator--if unbound, allows RNA polymerase to bind to DNAE. All of these are correctly matched
E) All of these are correctly matched.

Answer: B

5. Which statement is NOT correct about the lac operon?
A) It regulates the production of a series of five enzymes.
B) It is normally turned off if glucose is present.
C) Lactose binds to the repressor protein and inactivates it.
D) It is an inducible system.
E) The structural genes make products that allow lactose metabolism.

Answer: A

6. Which statement is NOT correct about the *trp* operon?
A) The structural genes make products that act in a metabolic pathway to produce tryptophan.
B) It is normally turned off if tryptophan is present.
C) Tryptophan acts as the corepressor.
D) The regulator gene product is inactive by itself.
E) Tryptophan binds to the repressor protein and inactivates it.

Answer: E

7. Which statement is NOT true about genetic control in prokaryotes?
A) RNA polymerase must bind to a promoter on the DNA to begin RNA synthesis.
B) Most gene expression is regulated at the level of translation.
C) An active repressor protein keeps RNA polymerase from binding to DNA.
D) Structural genes produce enzymes that act in a metabolic pathway.
E) Repressors control gene transcription by binding to operator sites.

Answer: B

8. Stopping mRNA from being continuously translated into protein is an important mechanism when enough protein product is available. How is this accomplished?
A) Transcribe antisense RNA from ordinarily inactive DNA; this will bind with sense mRNA and prevent the ribosome from further translating it.
B) Regulator genes produce repressor proteins that physically bind to mRNA and stop its activity in ribosomes.
C) mRNA contains stop units encoded in its sequence so only a limited number of passes can be made through ribosomes.
D) The protein products of mRNA translation are feedback repressors that limit translation.
E) Other genes turn on to produce enzymes that digest the mRNA.

Answer: D

9. The universal regulatory mechanism in eukaryotes for controlling gene expression includes
   A) control of the genes transcribed and the rate they are transcribed.
   B) control of the processing of mRNA after it is transcribed from DNA but before it leaves the nucleus, and control of the rate it leaves the nucleus.
   C) control of mRNA in the cytoplasm after it leaves the nucleus, including changes to mRNA before translation begins.
   D) control of polypeptides after they have been synthesized but before they are functional.
   E) All of these mechanisms are used; there is no single universal mechanism.

   Answer: E

10. The first level of primary control in eukaryotic gene activity is _____ control.
   A) feedback
   B) translational
   C) transcriptional
   D) posttranscriptional
   E) posttranslational

   Answer: C

11. Which level of primary control in eukaryotic gene activity involves the life span of the mRNA molecule and the ability of the mRNA to bind to ribosomes?
   A) feedback control
   B) translational control
   C) transcriptional control
   D) posttranscriptional control
   E) posttranslational control

   Answer: B

12. Which level of primary control in eukaryotic gene activity involves processing early RNA transcripts to mRNA and control of the rate at which mRNA leaves the nucleus?
   A) feedback control
   B) translational control
   C) transcriptional control
   D) posttranscriptional control
   E) posttranslational control

   Answer: D

13. Which level of primary control in eukaryotic gene activity involves changes in the polypeptide chain before it becomes functional?
    A) feedback control
    B) translational control
    C) transcriptional control
    D) posttranscriptional control
    E) posttranslational control

    Answer: E

14. A form of active chromatin might also be referred to as
    A) a Barr body.
    B) heterochromatin.
    C) a chromosome.
    D) euchromatin.
    E) None of these

    Answer: D

15. An enhancer site is
    A) part of an operon.
    B) found only in prokaryotes.
    C) located at a distance from the gene it affects.
    D) an attachment site for RNA polymerase.
    E) the location of transposons

    Answer: C

16. A form of gene regulation that occurs while RNA is still in the nucleus is
    A) differential intron removal and splicing.
    B) feedback control.
    C) binding of the repressor protein to DNA.
    D) enzymatic cleavage of a polypeptide.
    E) rate of binding to ribosomes.

    Answer: A

17. Human red blood cells can live from two to four months without a nucleus and yet they continue to synthesize hemoglobin. This
    A) means that the necessary mRNAs are able to persist all this time.
    B) suggests that there is a low level of ribonucleases to degrade the mRNA.
    C) means that both the necessary mRNAs must persist and there must be a low level of ribonucleases present.
    D) still requires DNA coding, although the nuclear membrane is gone, there must be chromatin spread throughout the red blood cell.
    E) is a chemical process that does not require continued living pathways; the red blood cells are essentially dead after they lose their nuclei.

    Answer: C

18. "Jumping genes" that have the ability to move within and between chromosomes are called
    A) introns.
    B) oncogenes.
    C) transposons.
    D) retroviruses.
    E) exons.

    Answer: C

19. A deletion of one base pair that alters the sequence of codons, as the loss of "A" in C-C-G-T-A-G-C... to form C-C-G-T-G-C... is called a(an)
    A) transposon.
    B) point mutation.
    C) carcinogen.
    D) oncogene.
    E) frameshift mutation.

    Answer: E

20. All of these are considered carcinogens EXCEPT
    A) cigarette smoke.
    B) ultraviolet light.
    C) cabbage and related vegetables.
    D) X-rays.
    E) mold-produced aflatoxin.

    Answer: C

21. An oncogene is
    A) a viral gene with no relation to the host cell's genes.
    B) a mutated form of a proto-oncogene.
    C) a bacterial gene that causes cancer in the host.
    D) always seen in human cancer cells.
    E) a gene that turns off cellular reproduction.

    Answer: B

22. You are more likely to develop some forms of cancer if you:
    A) are exposed to higher doses of radiation including X rays.
    B) are exposed to carcinogens.
    C) have a high incidence of cancer in your family history leading to your hereditary lineage.
    D) are exposed to ultraviolet light.
    E) All of the choices are correct.

    Answer: E

23. The _____ are associated with breast cancer as well as a substantial proportion of ovarian cancers.
    A) p53 gene
    B) BRCA1 and BRCA2 genes
    C) ras oncogene
    D) bel-2 protein
    E) RB tumor-repressor gene

    Answer: B

24. The _____ stimulate(s) apoptosis.
    A) p53 gene
    B) BRCA1 and BRCA2 genes
    C) ras oncogene
    D) bcl-2 protein
    E) RB tumor-repressor gene

    Answer: A

25. Malfunction in the ____ is involved in retinoblastoma.
    A) p53 gene
    B) BRCA1 and BRCA2 genes
    C) ras oncogene
    D) bcl-2 protein
    E) RB allele

    Answer: E

26. A Barr body
    A) is only found in female cells.
    B) is due to an inactivated X chromosome.
    C) has the genes contained therein suppressed.
    D) is in the heterochromatin form
    E) All of the choices are correct.

    Answer: E

27. In transcriptional control in eukaryotic cells
    A) a different combination of DNA binding proteins (transcriptional factors) may regulate the activity of a particular gene.
    B) enhancers may be involved in the promotion as well as regulation of gene transcription.
    C) may be due to the phosphorylation of transcriptional factors by a kinase.
    D) enhances may be some distance from the promotor sites they control.
    E) All of the choices are correct.

    Answer: E

28. Transposons
    A) are specific DNA sequences that move within and between chromosomes.
    B) alter the expression of neighboring genes especially if the transposon is a regulator gene.
    C) have been discovered in corn, fruit flies, bacteria, and humans.
    D) compose a significant portion of the human genome.
    E) All of the choices are correct.

    Answer: E

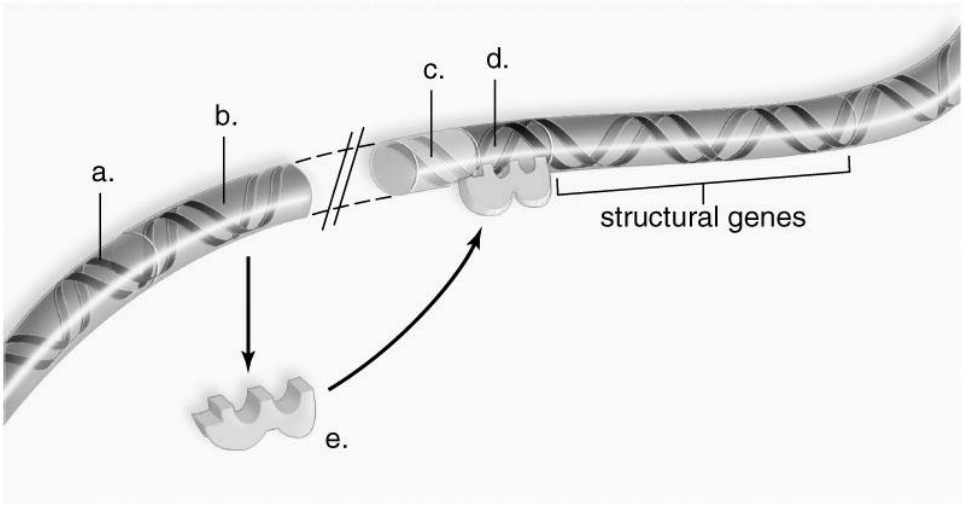
29. Point mutations
    A) are due to a change in one DNA nucleotide.
    B) are a change in a specific codon.
    C) can cause a genetic disease such as sickle cell disease that is due to a base change that codes for valine rather than glutamate.
    D) may have no effect on an organism.
    E) All of the choices are correct.

    Answer: E

30. Frameshift mutations
    A) can occur when one or more nucleotides are inserted into a DNA sequence.
    B) can result in a completely new codon sequence that results in the production of non-functional proteins.
    C) applies to the reading frame (sequence of codons) being changed.
    D) can occur when one of more nucleotides is deleted from a DNA sequence.
    E) All of the choices are correct.

    Answer: E

Use the following to answer questions 31-35:



31. The portion of the DNA labeled "b" represents the
    A) promoter site
    B) operator site
    C) regulator gene
    D) repressor protein
    E) CAP site

    Answer: C

32. The portion of the DNA labeled "d" represents the
    A) promoter site
    B) operator site
    C) regulator gene
    D) repressor protein
    E) CAP site

    Answer: B

33. The repressor is labeled
    A) a
    B) b
    C) c
    D) d
    E) e

    Answer: E

34. If this is the try operon, tryptophan would bind to
    A) a
    B) b
    C) c
    D) d
    E) e

    Answer: E

35. RNA polymersase would bind to which location?
    A) a
    B) b
    C) c
    D) d
    E) e

    Answer: C

Essay Questions

36. Gene regulation is an important process to the life of a cell.
    a. Describe the advantages of a cell being able to control its gene activity.
    b. Using either the trp or the lac operon as an example, explain how a prokaryote can control its gene activity.
    c. Describe one method by which a eukaryote might control expression of a gene.

    Answer:
    a. Various correct responses: Greater efficiency for the cell. Does not waste energy making products it does not need. Must be able to respond to changing environmental circumstances (e.g. change in nutrient supply, activation of chemical defenses (immune system), etc.).
    b. Either correct description of operons: trp operon: should include discussion of tryptophan as a corepressor binding to repressor which in turn binds to the operator to block RNA polymerase from binding to promoter site and thus initiating transcription. The lac operon could include either positive or negative control or both. Positive: camp binds to CAP protein which binds to CAP site to turn on transcription. Negative: lactose binds to repressor protein to remove it from operator site which allows mRNA to bind to promoter site and initiate transcription.
    c. Students may choose any one of the forms of eukaryotic control (chromatin structure, transcriptional control, posttranscriptional, translational, posttranslational) with a correct description.

Question Bank for Molecular Biology Prepared by Dr.K .R.Shah

DNA & PROTEIN SYNTHES IS

1. One of the functions of DNA is to

A. secrete vacuoles. B. make copies of itself. C. join amino acids to each other. D. carry genetic information out of the nucleus.

2. Two sugars found in nucleic acids are

A. sucrose and ribose. B. glucose and fructose. C. deoxyribose and ribose. D. deoxyribose and glucose.

3. The number of adenine bases in a DNA molecule equals the number of thymine bases because

A. DNA contains equal numbers of all four bases.
B. thymine always follows adenine on each DNA strand.
C. DNA is made of alternating adenine and thymine bases.
D. adenine on one strand bonds to thymine on the other strand.

4. Which of the following would **not** occur during complementary base pairing?

A. A-T **B**. U-G **C**. C-G **D**. A-U

5. Which of the following describes a DNA molecule?

A. Double helix of glucose sugars and phosphates. B. Ladder-like structure composed of fats and sugars.

C.Double chain of nucleotides joined by hydrogen bonds. D. A chain of alternating phosphates and nitrogenous bases.

6. Which of the following is an example of complementary base pairing?

A. Thymine – uracil. B. Guanine – adenine. C. Adenine – thymine. D. Cytosine – thymine.

7. Which of the following is the correct matching of base pairs in DNA?

A. Adenine–Guanine and Thymine–Uracil.
B. Guanine–Cytosine and Adenine–Uracil.
C. Adenine–Thymine and Guanine–Cytosine.
D. Guanine–Thymine and Adenine–Cytosine.

8. DNA replication involves the breaking of bonds between

A. bases. B. sugars and bases. C. phosphates and bases. D. sugars and phosphates.

9. Which of the following statements best describes **DNA replicatio**n?

A. tRNA, by complementary base pairing with mRNA, produces proteins.
B. RNA nucleotides, by complementary base pairing with DNA, produce DNA.
C. DNA nucleotides, by complementary base pairing with DNA, produce DNA.
D. RNA nucleotides, by complementary base pairing with DNA, produce tRNA.

10. The base found in RNA nucleotides but **not** in DNA nucleotides is

A. uracil (U). B. adenine (A). C. guanine (G). D. cytosine (C).

11. The product of transcription is A. DNA. B. protein. C. mRNA. D. a ribosome.

12. A section of DNA has the following sequence of nitrogenous bases: **CGATTACAG**
Which of the following sequences would be produced as a result oftranscription?

A. CGTUUTCTG B. GCTAATGTC C. CGAUUACAG D. GCUAAUGUC

13. mRNA is produced in the process called

A. respiration. B. translation. C. replication. D. transcription.

14. A function of transfer RNA (tRNA) is to

A. stay in the nucleus and be copied by DNA. B. carry amino acids to the growing polypeptide chain.

C. copy DNA and carry the information to the ribosome. D. read the codons and provide the site for protein synthesis.

15. Which of the following **best** describes the function of mRNA?
A. It stays in the nucleus and is copied by DNA. B. It carries amino acids to the growing polypeptide chain. C. It makes up the ribosomes and provides the site for protein synthesis. D. It is transcribed from the DNA and carries the information to the ribosome.

16. The molecule that is responsible for carrying amino acids to ribosomes is A. DNA. B. tRNA. C. rRNA. D. mRNA.

17. A polypeptide found in the cytoplasm of a cell contains 12 amino acids. How many nucleotides would be required in the mRNA for this polypeptide to be translated?
A. 4 B. 12 C. 24 D. 36

18. If the nucleotide sequence of an anticodon was AUC, then the DNA triplet would be A. ATC. B. TAG. C. AUC. D. UAG.

19. If the code for an amino acid is AGC on the DNA molecule, the anticodon on the tRNA would be
A. AGC B. TGC C. UCG D. UGC

20. During protein synthesis, peptide bonds are formed at the
A. nucleus. B. nucleolus. C. lysosomes. D. ribosomes.

21. Determine the sequence of amino acids produced by this DNA sequence:
GGAGTTTTC
A. Proline, Valine, Lysine. **B**. Glycine, Valine, Leucine. **C**. Proline, Glutamine, Lysine. **D**. Glycine, Glutamic acid, Leucine.

22. **Use the following information to answer the question:**
1. Uracil bonds with adenine. 2. Complementary bonding between codon and anticodon. 3. DNA unzips. 4. mRNA joins with ribosome. The correct order of the above during protein synthesis is **A**. 1, 2, 4, 3 **B**. 1, 3, 2, 4 **C**. 3, 1, 4, 2 **D**. 3, 2, 1, 4

23. The tRNA anticodon for the DNA sequence AGT would be A. UCA. B. AGU. C. TCA. D. AGT.

24. A change in the sequence of bases in a strand of DNA that occurs as a result of exposure to X-rays is an example of
A. mutation. B. denaturation. C. transcription. D. protein synthesis.

25. For a substance to be classified as a mutagen, it must cause
A. a change in DNA. B. enzymes to denature. C. hydrolysis of proteins. D. mRNA to be produced.

26. Which of the following would be a result of the substitution of one base pair in DNA by a different base pair during replication?
A. A mutation would occur. B. tRNA would bond to DNA. C. Phosphate would join with adenine. D. Uracil would appear in the DNA strand.

27. Recombinant DNA is defined as DNA produced from
A. RNA and a protein. B. DNA and hemoglobin. C. viral DNA and glucose. D. DNA of two different organisms.

28. When a foreign gene is incorporated into an organism's nucleic acid, the resulting molecule is called

A. ATP. B. recombinant DNA. C. transfer RNA (tRNA). D.
messenger RNA (mRNA).

29. If the triplet code on a DNA molecule changes from ACT to AGC, the result is called
A. mutation. B. metastasis. C. translation. D. transcription.

30. **Use the following events to answer the question.**
A. mRNA is formed. 2. DNA segment opens (unzips). 3. mRNA attaches to ribosomes. 4. amino acids
form peptide bonds. 5. tRNA carries amino acids to mRNA. 6. The correct order of events required for protein synthesis is
A. 1, 2, 3, 4, 5. **B**. 2, 1, 3, 4, 5. **C**. 2,
1, 3, 5, 4. **D**. 2, 1, 4, 5, 3.

31. Which of the following terms describes the process shown below? A **DNA** to **mRNA**
A. Unzipping. B. Translation. C. Replication. D. Transcription.

32. One of the functions of DNA is to
A. secrete vacuoles. B. make copies of itself. C. join amino acids to each other. D. carry genetic information out of the nucleus.

33. A role of mRNA in protein synthesis is to
A. form ribosomes. B. form the protein's tertiary structure. C. carries appropriate amino acids into place. D. carry genetic information out of the nucleus.

1. B 2. C 3. D 4. B 5. C 6. C 7. C 8. A 9. C 10. A 11. C 12. D 13. D 14. B 15. D 16. B 17. D 18. A 19. A 20. D 21. C 22. C 23. B 24. A 25. A 26. A 27. D 28. B 29. A 30. C 31. D 32. B 33. D