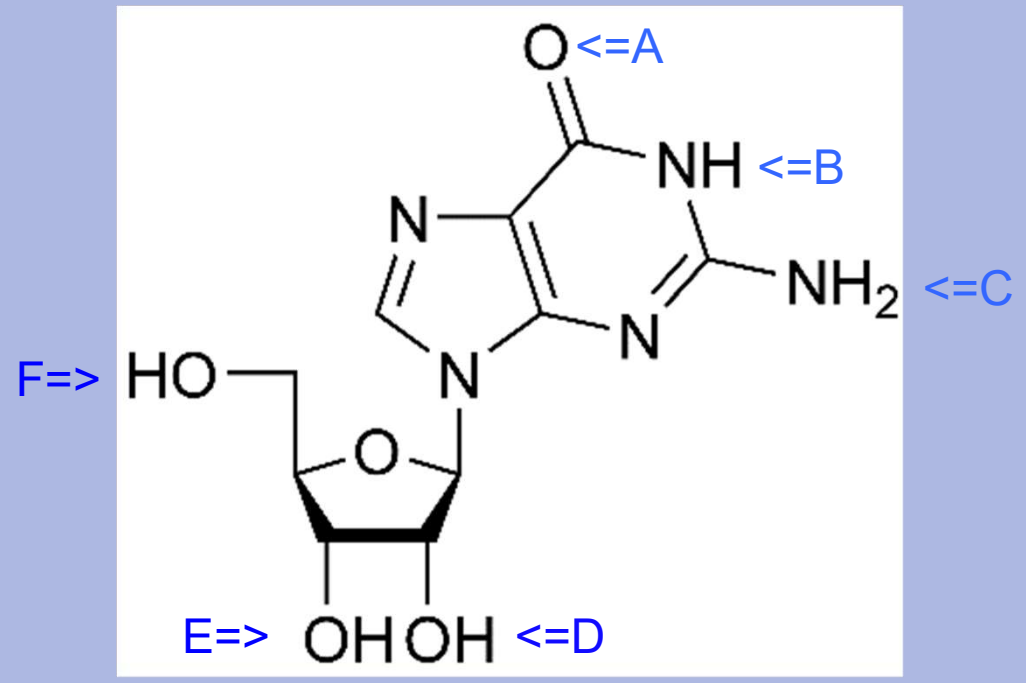
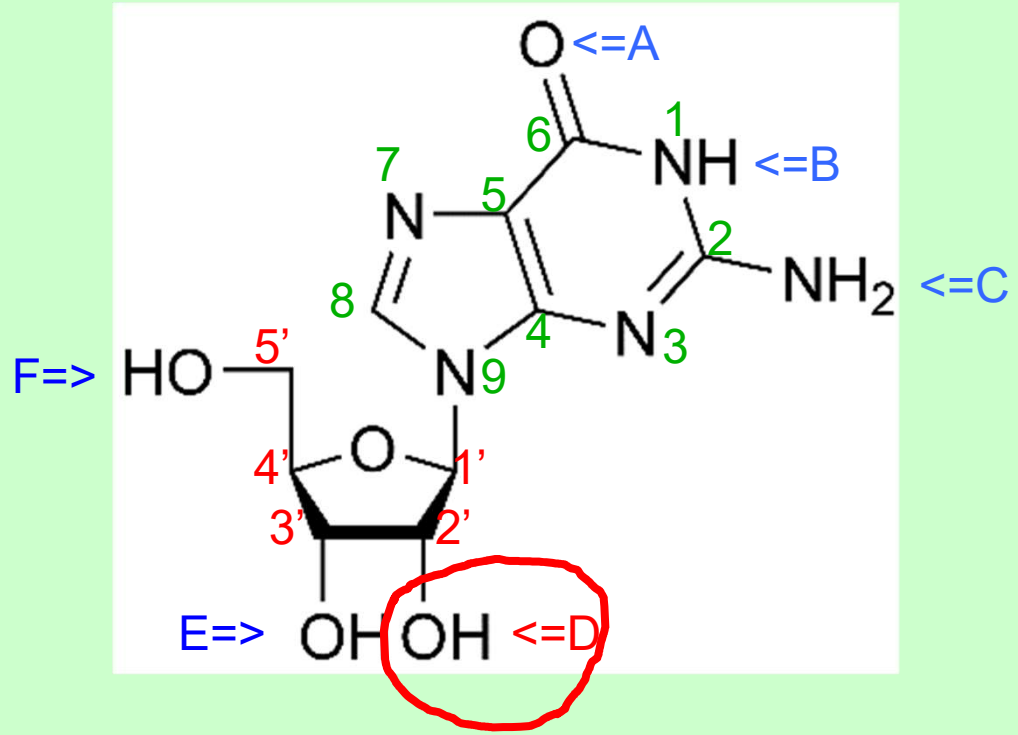
Molecular Medicine Quiz Questions and Answers 2019

Martin Nicklin

1. Where, in this ribonucleoside, is the 2'-hydroxyl (the one that would be missing in a 2'-deoxynucleoside)?



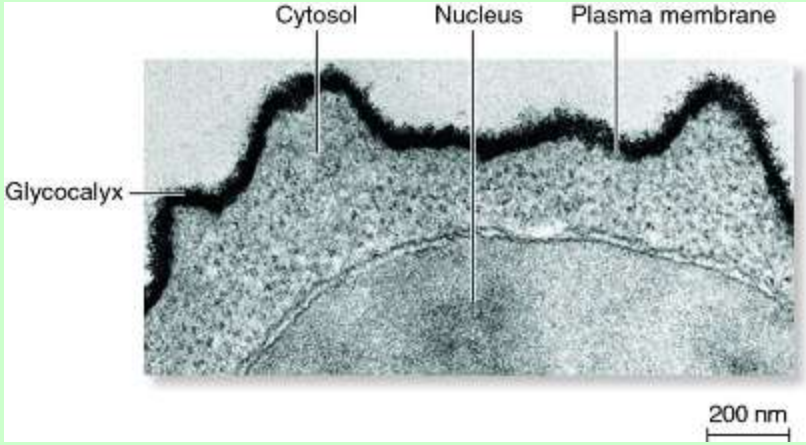
1. Where, in this ribonucleoside, is the 2'-hydroxyl (the one that would be missing in a 2'-deoxynucleoside)?



2. A sub-microscopic probe **approaches and enters** a human cell that is suspended in culture medium. Which type of cell-associated polymer is the probe likely to encounter **first** (or F)?

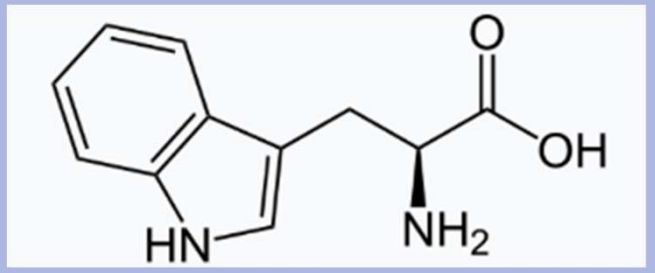
- A. teichoic acid
- B. RNA
- C. polypeptide (protein)
- D. phospholipids
- E. branched polysaccharides
- F. The molecule cannot encounter any of the above.

2. A sub-microscopic probe **approaches and enters** a human cell that is suspended in culture medium. Which type of cell-associated polymer is the probe likely to encounter **first** (or F)?



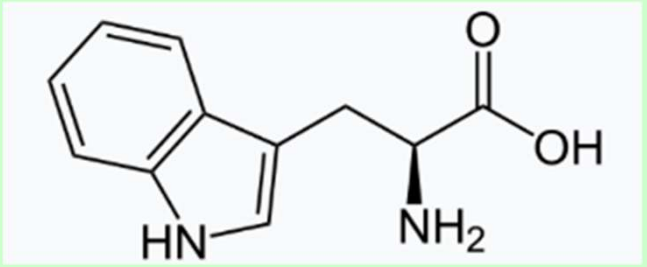
- A. teichoic acid
- B. RNA
- C. polypeptide (protein)
- D. phospholipids
- E. branched polysaccharides
- F. The molecule cannot encounter any of the above.

3. Which of the following is not true of biotin (or answer F)?



A. Here is biotin's structure→
B. It is a cofactor for reactions that incorporate CO_2.
C. It forms extremely stable complexes with the egg-white protein avidin.
D. It is used in the laboratory as a tag for macromolecules.
E. It is a vitamin (vitamin H), normally produced by gut flora.
F. All of the above are true.

3. Which of the following is not true of biotin (or answer F)?



What is that?

A. Here is biotin's structure→
B. It is a cofactor for reactions that incorporate CO_2.
C. It forms extremely stable complexes with the egg-white protein avidin.
D. It is used in the laboratory as a tag for macromolecules.
E. It is a vitamin (vitamin H), normally produced by gut flora.
F. All of the above are true.

4. Which of the following statements about the mitochondrion is not true? (or select F)

A. Fatty acid catabolism (breakdown) occurs in the lumen of the mitochondrion.

B. Glucose-6-phosphate is transported into the mitochondria to enter the Krebs cycle.

C. Mitochondria contain the products of ~1500 protein coding genes but the mtDNA contains only 13 genes.

D. The human mitochondrial genome encodes only thirteen proteins.

E. Apoptosis (programmed cell death) can be mediated by the leakage of cytochrome c from the lumen of mitochondria.

F. All of the above are true.

4. Which of the following statements about the mitochondrion is not true? (or select F)

A. Fatty acid catabolism (breakdown) occurs in the lumen of the mitochondrion.

B. Glucose-6-phosphate is transported into the mitochondria to enter the Krebs cycle.

C. Mitochondria contain the products of ~1500 protein coding genes but the mtDNA contains only 13 genes.

D. The human mitochondrial genome encodes only thirteen proteins.

E. Apoptosis (programmed cell death) can be mediated by the leakage of cytochrome c from the lumen of mitochondria.

F. All of the above are true.

5. The commonest type of cell surface receptor for small molecules (and therapeutic drugs) is the seven transmembrane domain "serpentine" class of receptor proteins. Which protein molecules *always* interact directly with their cytoplasmic domains and transduce signals from them?

A. Protein phosphotyrosine phosphatases (PTP).
B. Adenylyl cyclase.
C. Ras-like "small" GTP-ases.
D. 3-subunit (α, β, γ) "large" GTP-ases.
E. Protein tyrosine kinases (PTK).
F. None of the above.

5. The commonest type of cell surface receptor for small molecules (and therapeutic drugs) is the seven transmembrane domain "serpentine" class of receptor proteins. Which protein molecules *always* interact directly with their cytoplasmic domains and transduce signals from them?

A. Protein phosphotyrosine phosphatases (PTP).
B. Adenylyl cyclase.
C. Ras-like "small" GTP-ases.
D. 3-subunit (α, β, γ) "large" GTP-ases.
E. Protein tyrosine kinases (PTK).
F. None of the above.

6. Which of the following statements indicate the direction that DNA or RNA polymerases synthesise a new strand of RNA or DNA (or select F)?

A. from the 2′ end to the 3′ end.
B. from the 5′ end to the 3′ end.
C. from the 3′ end to the 5′ end.
D. from the 5′ end to the 2′ end.
E. from the 2′ end to the 5′ end.
F. All of the above are incorrect.

6. Which of the following statements indicate the direction that DNA or RNA polymerases synthesise a new strand of RNA or DNA (or select F)?

A. from the 2′ end to the 3′ end.
B. from the 5′ end to the 3′ end.
C. from the 3′ end to the 5′ end.
D. from the 5′ end to the 2′ end.
E. from the 2′ end to the 5′ end.
F. All of the above are incorrect.

The new strand and old template strand are complementary and run in opposite directions. The template is read 3'→5'... Synthesis is by 3'-OH of NTP displacing 5'-pyrophosphate from growing chain (5'→3').

7. Which is false? (or indicate F if all other answers are true)

A. 'Growth factors' are essential nutrients for mammalian cells.
B. Apoptosis is programmed cell death.
C. Transcription factors are involved in regulating RNA synthesis.
D. Integral membrane transporter proteins carry molecules through generally impermeable cellular membranes.
E. Cell surface receptors bind to extracellular molecules.
F. All of the above are actually true.

7. Which is false? (or indicate F if all other answers are true)

A. 'Growth factors' are essential nutrients for mammalian cells.
B. Apoptosis is programmed cell death.
C. Transcription factors are involved in regulating RNA synthesis.
D. Integral membrane transporter proteins carry molecules through generally impermeable cellular membranes.
E. Cell surface receptors bind to extracellular molecules.
F. All of the above are actually true.

Growth factors are signals (usually proteins) produced by cells that stimulate cells to survive, proliferate or differentiate. They are usually present at minute concentrations and are not significantly nutritious.

8. Mentally trace a route along the main chain (the backbone) of a protein following only the atoms that are covalently bonded tomake the chain. Which of the following sequences of atoms is connected in the main chain (or select F)?

A. -N-C-N-C-
B. -N-C-C-N-C-C-
C. -N-C-C-C-N-C-C-C-
D. -N-C-C-O-N-C-C-O-
E. -N-H-C-C-O-N-H-C-C-O
F. None of the above are correct

8. Mentally trace a route along the main chain (the backbone) of a protein following only the atoms that are covalently bonded tomake the chain. Which of the following sequences of atoms is connected in the main chain (or select F)?

A. -N-C-N-C-

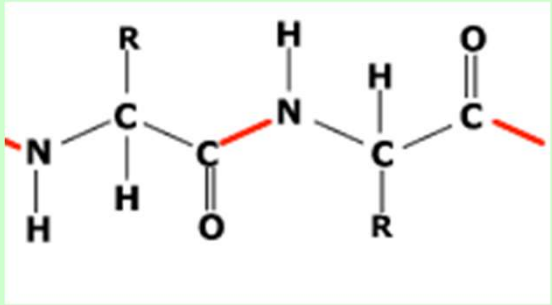
B. -N-C-C-N-C-C-

C. -N-C-C-C-N-C-C-C-

D. -N-C-C-O-N-C-C-O-

E. -N-H-C-C-O-N-H-C-C-O

F. None of the above are correct



9. The segments of RNA that are retained (kept) after conversion of a pre-mRNA to a mature mRNA are called

A. Splice boundaries
B. Codons
C. Exons
D. Introns
E. Nucleotides

A. None of the above.

9. The segments of RNA that are retained (kept) after conversion of a pre-mRNA to a mature mRNA are called

A. Splice boundaries
B. Codons
C. Exons
D. Introns
E. Nucleotides

A. None of the above.

10. If AAA encodes Lys, AAU encodes Asn,
AUA and AUU both encode Ile,
GAA encodes Glu, GAU encodes Asp,
GGG and GGU both encode Gly,
GUA encodes Val, UAU encodes Tyr,
UGG encodes Trp, UUA encodes Leu and
UUU encodes Phe,
then the **product of translation**, *beginning at the initiation codon* of the RNA sequence,
5’ GAUGGGUAUUAAUAAUAAAUUUAAAUAAAUAAAAA
would be –

A. Met-Gly-Ile-Asn-Asn-Lys-Phe-Lys.
B. Asp-Gly-Tyr.
C. Asn-Gly-Tyr-stop-stop-stop-Ile-stop-Ile-Asn-Lys.
D. Met-Gly-Ile-Asn-Asn-Lys-Phe-Lys-stop-Ile-Lys.
E. Trp-Val-Leu-Ile-Ile-Asn-Leu-Asn-Lys.
F. Something other than the above

10. If AAA encodes Lys, AAU encodes Asn,
AUA and AUU both encode Ile,
GAA encodes Glu, GAU encodes Asp,
GGG and GGU both encode Gly,
GUA encodes Val, UAU encodes Tyr,
UGG encodes Trp, UUA encodes Leu and
UUU encodes Phe,
then the **product of translation**, *beginning at the initiation codon* of the RNA sequence,

5’ GAUGGGUAUUAAUAAUAAAUUUAAAUAAAUAAAAA

would be –

“stop” is not part of the product! And translation does not continue, because it stops!

A. Met-Gly-Ile-Asn-Asn-Lys-Phe-Lys.
B. Asp-Gly-Tyr.
C. Asn-Gly-Tyr-stop-stop-stop-Ile-stop-Ile-Asn-Lys.
D. Met-Gly-Ile-Asn-Asn-Lys-Phe-Lys-stop-Ile-Lys.
E. Trp-Val-Leu-Ile-Ile-Asn-Leu-Asn-Lys.
F. Something other than the above

5’G AUG GGU AUU AAU AAU AAA UUU AAA UAAAUAAAAA
Met Gly Ile Asn Asn Lys Phe Lys *

11. Which is a true statement about protein kinases? (or answer F)

A. They are molecular motor that move proteins retrograde along microtubules.
B. They are enzymes that transfer the terminal phosphate from a nucleoside triphosphate to a protein.
C. They are enzymes that removes phosphate groups from the β-O of serine residues in proteins.
D. They are protein enzymes that phosphorylate DNA.
E. They are molecular motor that move proteins prograde along microtubules.
F. None of the above describe protein kinases

11. Which is a true statement about protein kinases? (or answer F)

A. They are molecular motor that move proteins retrograde along microtubules.
B. They are enzymes that transfer the terminal phosphate from a nucleoside triphosphate to a protein.
C. They are enzymes that removes phosphate groups from the β-O of serine residues in proteins.
D. They are protein enzymes that phosphorylate DNA.
E. They are molecular motor that move proteins prograde along microtubules.
F. None of the above describe protein kinases

12. Which pair is odd man out (that is, has not the same internal relationship as the other pairs)? Choose F if all have the same relationship.

A. L-phenylalanine and L-tyrosine
B. L-proline and L-hydroxyproline
C. L-alanine and L-serine
D. L-glutamine and L-glutamic acid
E. L-tyrosine and L-DOPA
F. All pairs are related in a similar way

12. Which pair is odd man out (that is, has not the same internal relationship as the other pairs)? Choose F if all have the same relationship.

A. L-phenylalanine and L-tyrosine

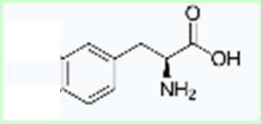
B. L-proline and L-hydroxyproline

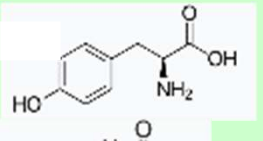
C. L-alanine and L-serine

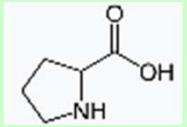
D. L-glutamine and L-glutamic acid

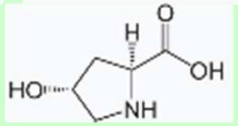
E. L-tyrosine and L-DOPA

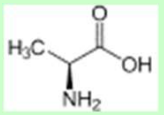
F. All pairs are related in a similar way

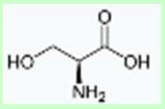


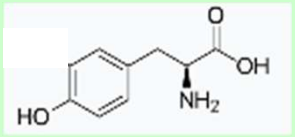


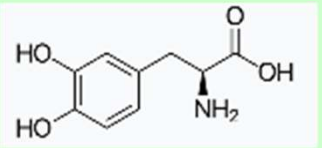


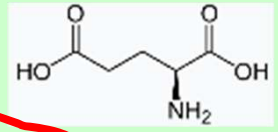


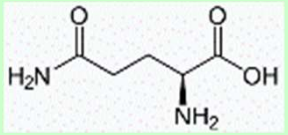






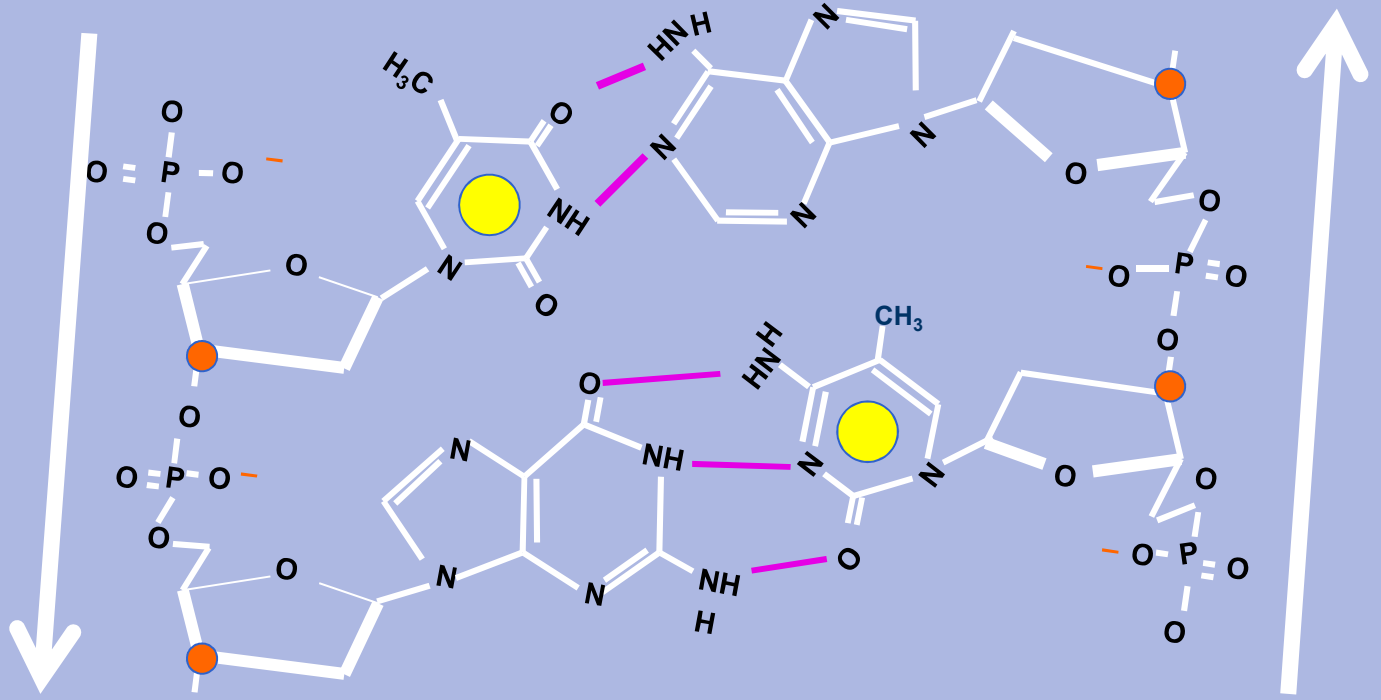






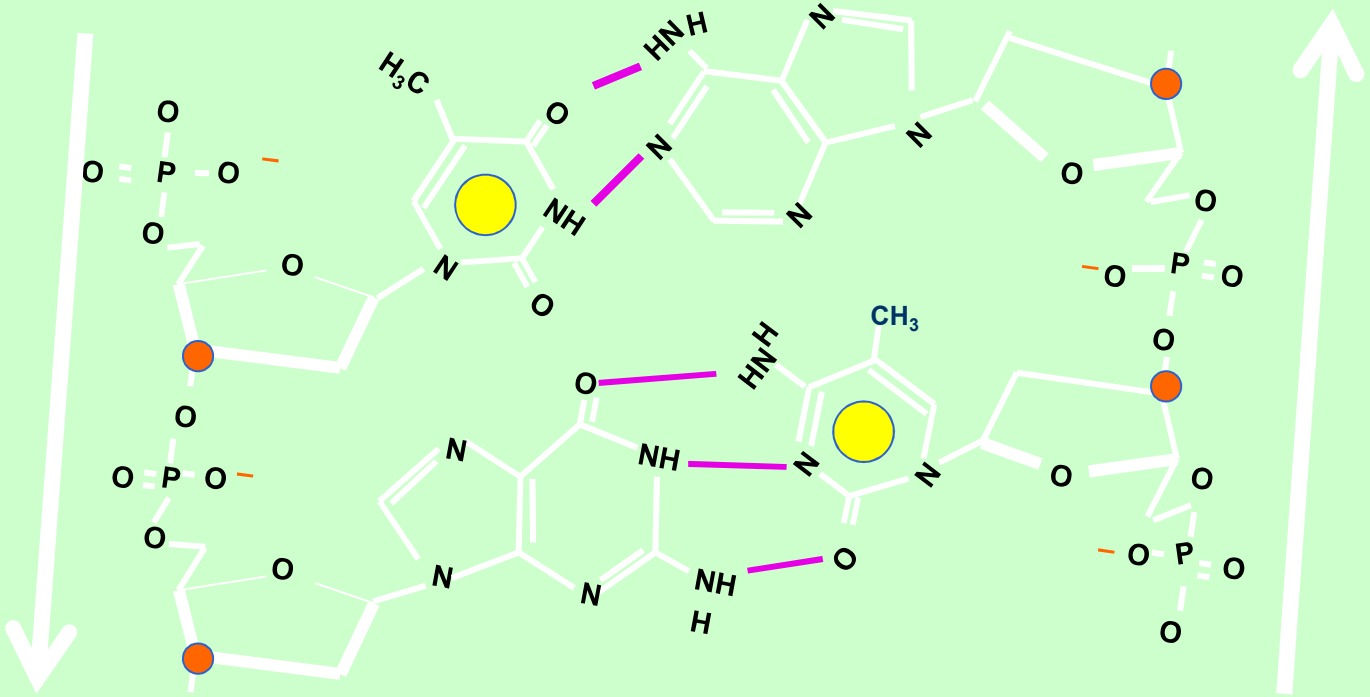
All of the other pairs are different only by the addition of an oxygen atom

13. The diagram shows a two base-pair segment of a DNA double helix. Which of the following is ***false*** (or select F)?



A. The orange circles mark the 5′-position ●.
B. The sequence of one of the strands is T-G.
C. The magenta bonds ___ are hydrogen bonds.
D. The pyrimidine bases are marked with yellow circles ●.
E. The cytosine is 5-methylated.
F. Actually, all of the above are true.

13. The diagram shows a two base-pair segment of a DNA double helix. Which of the following is ***false*** (or select F)?



A. The orange circles mark the 5′-position.
B. The sequence of one of the strands is T-G.
C. The magenta bonds are hydrogen bonds.
D. The pyrimidine bases are marked with yellow circles.
E. The cytosine is 5-methylated.
F. Actually, all of the above are true.

14. Which of the following statements is in error by at least a factor of five ? (or select F)?

A. A single copy of a human genome contains 3100 million bp of DNA.
B. Free-living bacteria have 5,000 protein encoding genes.
C. The nucleus of a single human heart muscle cell contains 2 metres of DNA.
D. A single copy of a free-living bacterial genome contains 8 million base pairs.
E. Human cells contain 200,000 protein-encoding genes.
F. All of the above are fair estimates.

14. Which of the following statements is in error by at least a factor of five ? (or select F)?

A. A single copy of a human genome contains 3100 million bp of DNA.
B. Free-living bacteria have 5,000 protein encoding genes.
C. The nucleus of a single human heart muscle cell contains 2 metres of DNA.
D. A single copy of a free-living bacterial genome contains 8 million base pairs.
E. Human cells contain 200,000 protein-encoding genes.
F. All of the above are fair estimates.

15. In the organisation of genes in mammals, which statement is false (or choose F)?

A. The initiation codon (AUG) marks the start of the first exon.

B. The stop codon of a functional coding sequence must lie in an exon.

C. A transcriptional enhancer for a given gene can lie inside a different gene.

D. A transcriptional promoter usually lies upstream of or surrounds the transcription start.

E. The poly-A signal lies in the last exon.

F. All of the above statements are true

15. In the organisation of genes in mammals, which statement is false (or choose F)?

A. The initiation codon (AUG) marks the start of the first exon.

B. The stop codon of a functional coding sequence must lie in an exon.

C. A transcriptional enhancer for a given gene can lie inside a different gene.

D. A transcriptional promoter usually lies upstream of or surrounds the transcription start.

E. The poly-A signal lies in the last exon.

F. All of the above statements are true

16. Which of the following is not true of the *carbohydrate* portions of glycoproteins (or choose F)?

A. They may be linked to side-chain oxygen of Ser and Thr or nitrogen atoms of Asn residues.
B. They may be more massive than the protein component.
C. They may contain disulphide bonds.
D. They are usually branched.
E. They may contain amino-sugar residues.
F. Actually, all of the statements above are true.

16. Which of the following is not true of the *carbohydrate* portions of glycoproteins (or choose F)?

A. They may be linked to side-chain oxygen of Ser and Thr or nitrogen atoms of Asn residues.
B. They may be more massive than the protein component.
C. They may contain disulphide bonds.
D. They are usually branched.
E. They may contain amino-sugar residues.
F. Actually, all of the statements above are true.

17. Which of the following is not required for a polymerase chain reaction reaction involving a thermophilic DNA polymerase (or select F)?

A. A primer
B. Four 2'-deoxynucleoside triphosphates or their analogues
C. either magnesium (Mg^{2+}) or manganese (Mn^{2+}) ions
D. A DNA template
E. ATP
F. All of the above are needed

17. Which of the following is not required for a polymerase chain reaction reaction involving a thermophilic DNA polymerase (or select F)?

A. A primer
B. Four 2′-deoxynucleoside triphosphates or their analogues
C. either magnesium (Mg^{2+}) or manganese (Mn^{2+}) ions
D. A DNA template
E. ATP
F. All of the above are needed

18. What is DNA synthesis using a RNA template called? (or select F)

A. Splicing
B. Reverse transcription
C. Transcription
D. Translation
E. Replication
F. None of the above

b

18. What is DNA synthesis using a RNA template called? (or select F)

A. Splicing
B. Reverse transcription
C. Transcription
D. Translation
E. Replication
F. None of the above

Discovered in retroviruses. Used by all eukaryotic mobile genetic elements. Vital (of course) in vitro for molecular biology.

19. The current expression for all of the genetic information in a cell is the cell's

A. 'proteome'
B. 'metabolome'
C. 'exome'
D. 'transcriptome'
E. 'genome'
F. None of the above are the correct current expression for all of the genetic information in a cell.

19. The current expression for all of the genetic information in a cell is the cell's

A. 'proteome'
B. 'metabolome'
C. 'exome'
D. 'transcriptome'
E. 'genome'
F. None of the above are the correct current expression for all of the genetic information in a cell.

20. Which of the following is wrong by a factor of more than 5-fold? (or select F if all the estimates are acceptable).
A nucleated human cell (weighing around 2 ng) contains

A. 140 mM K^+ ions,
B. 2 mM (1 mg/ml) adenosine triphosphate (ATP),
C. 5 % (0.1 ng per cell) DNA.
D. 1 mM (24 µg/ml) Mg^{2+} ions,
E. 150 mg/ml (15%, 0.3 ng) total protein,
F. All of these values are roughly correct.

20. Which of the following is wrong by a factor of more than 5-fold? (or select F if all the estimates are acceptable).
A nucleated human cell (weighing around 2 ng) contains

A. 140 mM K^+ ions,
B. 2 mM (1 mg/ml) adenosine triphosphate (ATP),
C. 5 % (0.1 ng per cell) DNA.
D. 1 mM (24 µg/ml) Mg^{2+} ions,
E. 150 mg/ml (15%, 0.3 ng) total protein,
F. All of these values are roughly correct.

21. Which of the following *does not* happen to proteins post-translationally within a human cell? (or select F)

A. Branched polysaccharide chains can be built up on the δ-amide NH_2 group of a asparagine.
B. Peptide bonds may be selectively cleaved.
C. A phosphate group may be added to the side-chain oxygen of serine, threonine or tyrosine.
D. Intramolecular disulphide bonds –S-S- may be created by oxidation of pairs of -SH groups from cysteine residues.
E. Glycine side chains may be selectively hydroxylated.
F. Actually, all of the above occur, post-translationally.

21. Which of the following *does not* happen to proteins post-translationally within a human cell? (or select F)

A. Branched polysaccharide chains can be built up on the δ-amide NH_2 group of a asparagine.
B. Peptide bonds may be selectively cleaved.
C. A phosphate group may be added to the side-chain oxygen of serine, threonine or tyrosine.
D. Intramolecular disulphide bonds –S-S- may be created by oxidation of pairs of -SH groups from cysteine residues.
E. Glycine side chains may be selectively hydroxylated.
F. Actually, all of the above occur, post-translationally.

22. Mature mRNA is generated from primary RNA transcripts through the specific removal of parts of the molecule followed by re-joining of the retained parts. What is this process called? (or select F).

A. Plagiarism
B. Splicing
C. Transcription
D. Translation
E. Retrotranscription
F. None of the above.

b

22. Mature mRNA is generated from primary RNA transcripts through the specific removal of parts of the molecule followed by re-joining of the retained parts. What is this process called? (or select F).

A. Plagiarism
B. Splicing
C. Transcription
D. Translation
E. Retrotranscription
F. None of the above.

b

23. In molecular biology, hybridisation *of nucleic acids* means (or select F)?

A. Mixing and joining of complementary DNA or RNA from different species of organism.

B. The specific non-covalent association of two complementary or partially complementary single-stranded nucleic acid strands.

C. The molecular association of two single-stranded fragments of DNA or RNA with identical sequences.

D. The non-covalent association of similar double stranded nucleic acid molecules.

E. The covalent joining of two complementary single-stranded DNA or RNA molecules.

F. None of the above.

23. In molecular biology, hybridisation *of nucleic acids* means (or select F)?

A. Mixing and joining of complementary DNA or RNA from different species of organism.

B. The specific non-covalent association of two complementary or partially complementary single-stranded nucleic acid strands.

C. The molecular association of two single-stranded fragments of DNA or RNA with identical sequences.

D. The non-covalent association of similar double stranded nucleic acid molecules.

E. The covalent joining of two complementary single-stranded DNA or RNA molecules.

F. None of the above.

24. Which of the following is false (or select F)?

A. In a western blot, you transfer protein from an electrophoresis gel to a membrane, then visualise a specific protein on the membrane with a specific reagent such as an antibody.

B. In a northern blot, you transfer RNA from an electrophoresis gel to a membrane, then visualise a specific RNA on the membrane by hybridisation with an antibody.

C. In a Southern blot, you transfer DNA from an electrophoresis gel to a membrane, then visualise a DNA by its hybridisation to a labelled DNA probe.

D. Proteins in a mixture may be separated analytically in polyacrylamide gels as negatively charged complexes with the detergent SDS. Complexes are resolved roughly according to their molecular mass/size.

E. Double stranded DNA fragments of different sizes may be resolved on electrophoresis in agarose gels.

F. All of the above are true.

24. Which of the following is false (or select F)?

A. In a western blot, you transfer protein from an electrophoresis gel to a membrane, then visualise a specific protein on the membrane with a specific reagent such as an antibody.

B. In a northern blot, you transfer RNA from an electrophoresis gel to a membrane, then visualise a specific RNA on the membrane by hybridisation with an antibody.

C. In a Southern blot, you transfer DNA from an electrophoresis gel to a membrane, then visualise a DNA by its hybridisation to a labelled DNA probe.

D. Proteins in a mixture may be separated analytically in polyacrylamide gels as negatively charged complexes with the detergent SDS. Complexes are resolved roughly according to their molecular mass/size.

E. Double stranded DNA fragments of different sizes may be resolved on electrophoresis in agarose gels.

F. All of the above are true.

Can anyone tell me why I spelt 'Southern' with a capital S?

25. Which of the following statements about the endoplasmic reticulum (ER) is false (or select F)?

A. Rough ER is the site of the synthesis of secreted and trans-membrane proteins.
B. Smooth ER is so named because in electron microscopy it contains no ribosomes.
C. The smooth and rough ER are freely connected through the endosome compartment.
D. Membrane-bound vesicles leave the ER to carry proteins into the Golgi apparatus.
E. Signalase clips off signal peptides from secreted proteins in the lumen of the rough ER.
F. Actually, all of the above statements are true.

25. Which of the following statements about the endoplasmic reticulum (ER) is false (or select F)?

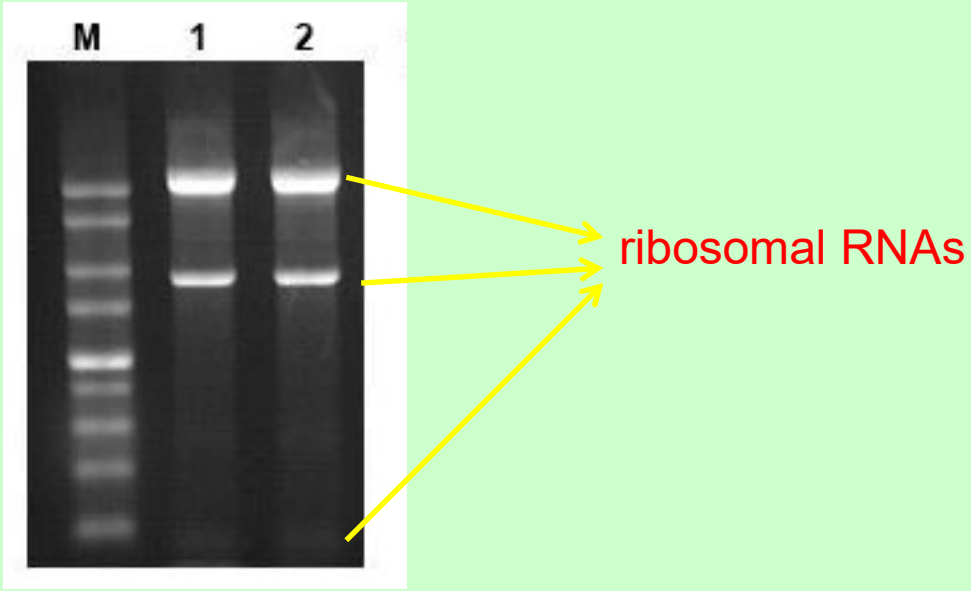
A. Rough ER is the site of the synthesis of secreted and trans-membrane proteins.
B. Smooth ER is so named because in electron microscopy it contains no ribosomes.
C. The smooth and rough ER are freely connected through the endosome compartment.
D. Membrane-bound vesicles leave the ER to carry proteins into the Golgi apparatus.
E. Signalase clips off signal peptides from secreted proteins in the lumen of the rough ER.
F. Actually, all of the above statements are true.

26. Give a best estimate from the numbers below for the proportion of RNA that is messenger RNA (mRNA) in a growing human cell.

A. 0.3%
B. 3%
C. 30%
D. 90%
E. 97%
F. 99.7%

26. Give a best estimate from the numbers below for the proportion of RNA that is messenger RNA (mRNA) in a growing human cell.

A. 0.3%
B. 3%
C. 30%
D. 90%
E. 97%
F. 99.7%



Total RNA by agarose gel electrophoresis

27. Which of the following DNA sequence pairs are completely complementary?

A. 5′-CTGACCTGG and 5′-GGTCCAGTC.
B. 5′-TTGATGACC and 5′-TTGATGACC.
C. 5′-AGTCTTAGC and 5′-GCTAAGACT.
D. 5′-GAGCTAATA and 5′-GAGCATTAT.
E. 5′-GTCTATCAG and 5′-CTGATAGTC.
F. None of the above are complementary.

27. Which of the following DNA sequence pairs are completely complementary?

A. 5′-CTGACCTGG and 5′-GGTCCAGTC.
B. 5′-TTGATGACC and 5′-TTGATGACC.
C. 5′-AGTCTTAGC and 5′-GCTAAGACT.
D. 5′-GAGCTAATA and 5′-GAGCATTAT.
E. 5′-GTCTATCAG and 5′-CTGATAGTC.
F. None of the above are complementary.

28. Which gene is most commonly mutated in human cancers? (or choose F)

A. TP53 (also known as p53)
B. BRCA2
C. BRCA1
D. HRAS
E. FOS
F. None of the above

28. Which gene is most commonly mutated in human cancers? (or choose F)

A. TP53 (also known as p53)
B. BRCA2
C. BRCA1
D. HRAS
E. FOS
F. None of the above

29. Which of the following is false (or select F)?

The activity of transcription at a specific location in the human genome may be naturally regulated by localised…

A. acetylation of specific Lys residues in histones.
B. phosphorylation of Ser, Thr and Tyr residues in histones.
C. methylation of specific Lys and Arg residues in histones.
D. deacetylation of Ac-Lys residues in histones.
E. methylation of cytosine bases in DNA.
F. all of the above are true.

29. Which of the following is false (or select F)?

The activity of transcription at a specific location in the human genome may be naturally regulated by localised…

A. acetylation of specific Lys residues in histones.
B. phosphorylation of Ser, Thr and Tyr residues in histones.
C. methylation of specific Lys and Arg residues in histones.
D. deacetylation of Ac-Lys residues in histones.
E. methylation of cytosine bases in DNA.
F. all of the above are true.

30. Which of the following sets of codons would you recognise as the end of the coding sequence within a **genomic DNA sequence** [they are "nonsense" (stop) codons] in humans and Escherichia coli?

A. AUG, UGA, UAA
B. TCA, TTA, CTA
C. ATG, ATC, ATA
D. UGA, UAA, UAG
E. TAG, TAA, TGA
F. None of the above sets represent the set of stop codons that might terminate the sense sequence of a gene.

o

30. Which of the following sets of codons would you recognise as the end of the coding sequence within a **genomic DNA sequence** [they are "nonsense" (stop) codons] in humans and Escherichia coli?

A. AUG, UGA, UAA
B. TCA, TTA, CTA
C. ATG, ATC, ATA
D. UGA, UAA, UAG
E. TAG, TAA, TGA
F. None of the above sets represent the set of stop codons that might terminate the sense sequence of a gene.

o

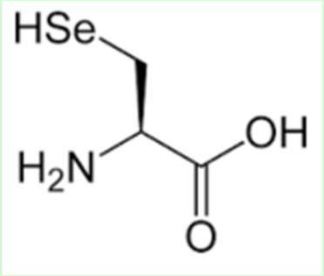
31. Which of the following trace elements is incorporated into animal proteins naturally during translation, as part of an unusual amino acid (or select F)?

A. magnesium
B. selenium
C. iron
D. chlorine
E. iodine

F. None of the above are incorporated during translation

31. Which of the following trace elements is incorporated into animal proteins naturally during translation, as part of an unusual amino acid (or select F)?

A. magnesium
B. selenium
C. iron
D. chlorine
E. iodine



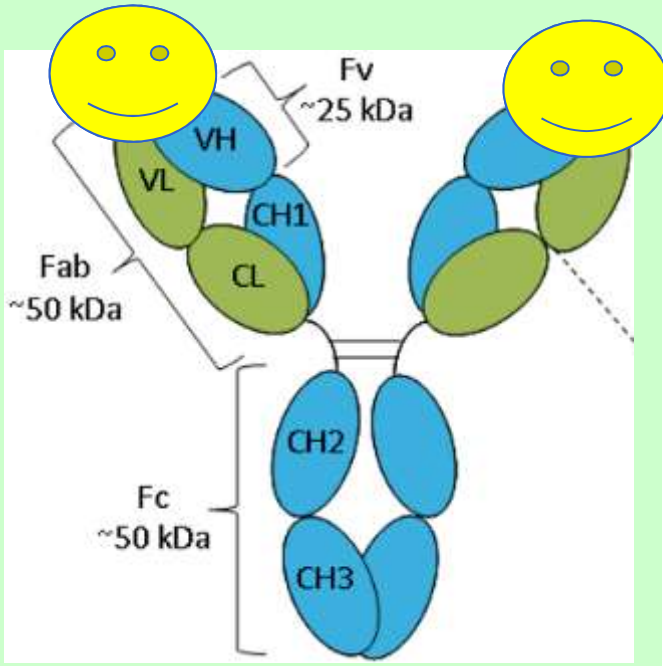
In selenocysteine, Sec, encoded by UGA in special contexts

F. None of the above are incorporated during translation

32. Which part or parts of an immunoglobulin G molecule is/are **not** involved in specific antigen specificity?

A. The variable regions: V_H and V_L.
B. The light chain
C. The heavy chain
D. The F_{ab} domains
E. The F_c domain
F. All of the above are involved in antigen specificity

32. Which part or parts of an immunoglobulin G molecule is/are **not** involved in specific antigen specificity?



A. The variable regions: V_H and V_L.
B. The light chain
C. The heavy chain
D. The F_{ab} domains
E. The F_c domain
F. All of the above are involved in antigen specificity

33. Which chemical element is always present in all nucleic acid but absent from polypeptides as they are synthesised (or choose F)?

A. nitrogen (N)
B. hydrogen (H)
C. sulphur (S)
D. phosphorus (P)
E. oxygen (O)
F. Actually, all of the above are present in both.

33. Which chemical element is always present in all nucleic acid but absent from polypeptides as they are synthesised (or choose F)?

A. nitrogen (N)
B. hydrogen (H)
C. sulphur (S)
D. phosphorus (P)
E. oxygen (O)
F. Actually, all of the above are present in both.

34. Which answer *does not* correctly identify a function that is performed by the following subcellular components in ***human*** cells (or select F)?

A. Ribosomes convert glucose to ribose in the endoplasmic reticulum.

B. Proteasomes are protein complexes that progressively digest ubiquitinated proteins.

C. Mitochondria couple the phosphorylation of ADP to the oxidation of metabolites.

D. The Golgi body is the major site of protein glycosylation.

E. Nucleoli are the sites for ribosomal RNA synthesis.

F. All of the above are true in human cells.

34. Which answer *does not* correctly identify a function that is performed by the following subcellular components in ***human*** cells (or select F)?

A. Ribosomes convert glucose to ribose in the endoplasmic reticulum.

B. Proteasomes are protein complexes that progressively digest ubiquitinated proteins.

C. Mitochondria couple the phosphorylation of ADP to the oxidation of metabolites.

D. The Golgi body is the major site of protein glycosylation.

E. Nucleoli are the sites for ribosomal RNA synthesis.

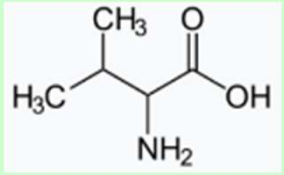
F. All of the above are true in human cells.

35. Which description of the side-chain of an amino acid residue is incorrect (or select F)?

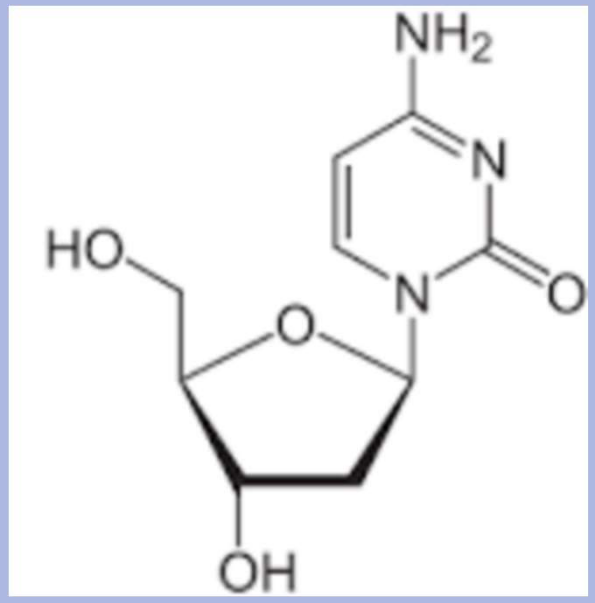
	Description	Amino acid
A.	planar, hydrophobic	phenylalanine (Phe, F)
B.	positively charged	arginine (Arg, R)
C.	bulky, hydrophobic	leucine (Leu, L)
D.	negatively charged	aspartic acid (Asp, D)
E.	polar, not charged	valine (Val, V)
F.	*All of the descriptions are appropriate*	

35. Which description of the side-chain of an amino acid residue is incorrect (or select F)?

	Description	Amino acid
A.	planar, hydrophobic	phenylalanine (Phe, F)
B.	positively charged	arginine (Arg, R)
C.	bulky, hydrophobic	leucine (Leu, L)
D.	negatively charged	aspartic acid (Asp, D)
E.	polar, not charged	valine (Val, V)
F.	*All of the descriptions are appropriate*	



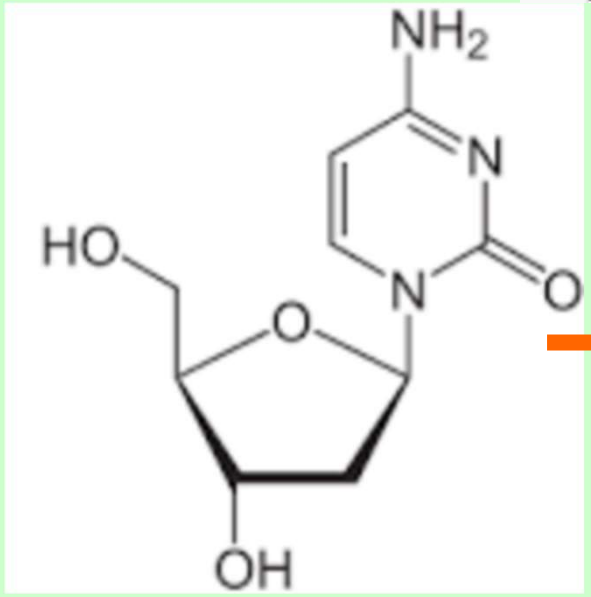
36. What is this nucleoside (or choose F)?

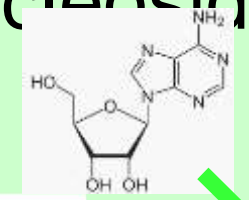


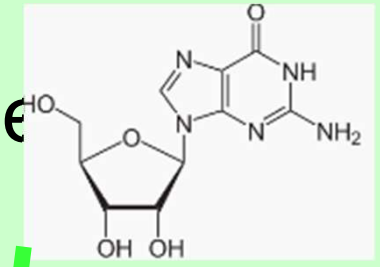
A. guanosine
B. guanidine
C. adenosine
D. 2'-deoxycytidine
E. thymidine
F. or none of the above

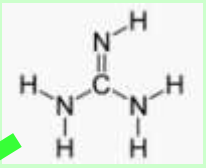
a

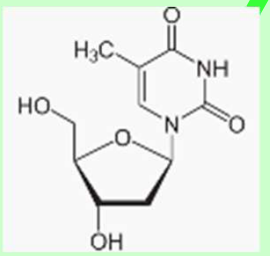
36. What is this nucleoside (or choose











A. guanosine
B. guanidine
C. adenosine
D. 2'-deoxycytidine
E. thymidine
F. or none of the above

37. Transcription factors are components of DNA binding complexes that regulate transcription (and some bind directly to DNA). What are transcription factors generally composed of?

A. DNA
B. protein
C. heparin
D. inositol-containing lipids
E. RNA
F. None of the above

e

37. Transcription factors are components of DNA binding complexes that regulate transcription (and some bind directly to DNA). What are transcription factors generally composed of?

A. DNA
B. protein
C. heparin
D. inositol-containing lipids
E. RNA
F. None of the above

e

38. In human cells, which of the following is not a sequence-specific DNA location, where transcription factors bind and regulate gene expression (or select F)?

A. A Shine-Dalgarno sequence
B. A kappa-B element (κBE)
C. A TATAA box
D. An enhancer
E. A phorbol ester-response element (e.g.TGAGTAA)
F. All of the above are involved in transcriptional control

38. In human cells, which of the following is not a sequence-specific DNA location, where transcription factors bind and regulate gene expression (or select F)?

A. A Shine-Dalgarno sequence
B. A kappa-B element (κBE)
C. A TATAA box
D. An enhancer
E. A phorbol ester-response element (e.g.TGAGTAA)
F. All of the above are involved in transcriptional control

39. Which one of the following enzymes catalyses synthesis of tRNA skeletons and some small RNA in the eukaryotic nucleus (or select F)?

A. RNA polymerase I
B. RNA polymerase II
C. RNA polymerase III
D. T7 RNA polymerase
E. AMV reverse transcriptase

F. None of the above catalyse tRNA synthesis

39. Which one of the following enzymes catalyses synthesis of tRNA skeletons and some small RNA in the eukaryotic nucleus (or select F)?

A. RNA polymerase I
B. RNA polymerase II
C. RNA polymerase III
D. T7 RNA polymerase
E. AMV reverse transcriptase

F. None of the above catalyse tRNA synthesis

40. Which statement is not true? (or choose F)

What has been called the "universal" genetic code...

A. applies to sequential triplets of nucleotides.
B. shows redundancy (there being more than one codon for most amino-acids).
C. indicates how mRNA is translated into protein.
D. does not apply precisely to protein synthesis in mitochondria.
E. always includes the de-coding of "AUG" as methionine.
F. All of these statements are true.

40. Which statement is not true? (or choose F)

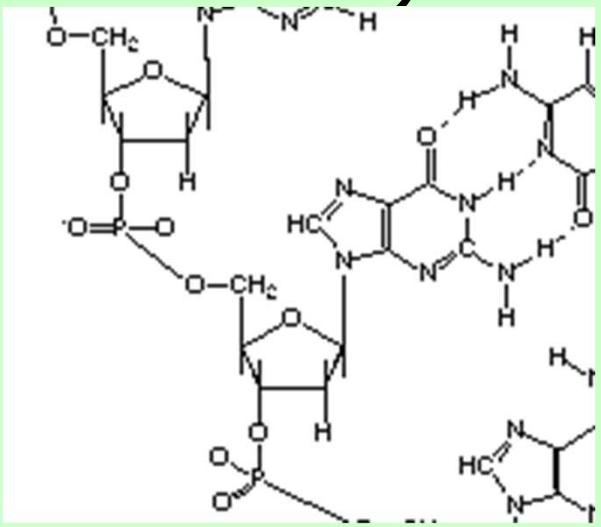
What has been called the "universal" genetic code...

A. applies to sequential triplets of nucleotides.
B. shows redundancy (there being more than one codon for most amino-acids).
C. indicates how mRNA is translated into protein.
D. does not apply precisely to protein synthesis in mitochondria.
E. always includes the de-coding of "AUG" as methionine.
F. All of these statements are true.

41. Mentally trace a route along the backbone of a DNA or RNA molecule. Which of the following sequence of atoms is connected by bonds in a continuous series? (or select F)?

A. -P-C-O-P-C-O
B. -P-C-C-C-O-P-C-C-C-O-
C. -P-O-C-C-O-P-O-C-C-O-
D. -P-O-C-C-C-C-O-P-O-C-C-C-C-O-
E. -P-O-C-C-C-O-C-C-O-P-O-C-C-C-O-C-O-
F. None of the above is correct

41. Mentally trace a route along the backbone of a DNA or RNA molecule. Which of the following sequence of atoms is connected by bonds in a continuous series? (or select F)?



A. -P-C-O-P-C-O

B. -P-C-C-C-O-P-C-C-C-O-

C. -P-O-C-C-O-P-O-C-C-O-

D. -P-O-C-C-C-C-O-P-O-C-C-C-C-O-

E. -P-O-C-C-C-O-C-C-O-P-O-C-C-C-O-C-O-

F. None of the above is correct

Nasty trick—you need to read right round the sugar ring 3'-5' to get E.
-P-O-C-C-C-O-P-O-C-C-C-O- would have been easier, but I didn't offer it!

42. Which one of the following chemical species *does not* diffuse efficiently through the plasma membrane without using transporters or channels (or select F)?

- A. CO carbon monoxide
- B. H_2S hydrogen sulphide
- C. NO nitric oxide
- D. H_2O water
- E. O_2 oxygen
- F. None of the above require transporters or channels to cross the plasma membrane.

42. Which one of the following chemical species *does not* diffuse efficiently through the plasma membrane without using transporters or channels (or select F)?

- A. CO carbon monoxide
- B. H_2S hydrogen sulphide
- C. NO nitric oxide
- D. H_2O water Aquaporins and co-transport through ion channels
- E. O_2 oxygen
- F. None of the above require transporters or channels to cross the plasma membrane.

43. In which of the following situations does the polymerase chain reaction occur in nature?

A. During the replication of HIV.
B. In ancient DNA.
C. When a thermophilic bacterium replicates its DNA.
D. During a replication cycle of mitochondrial DNA.
E. During replication of Qβ phage.
F. None of the above.

43. In which of the following situations does the polymerase chain reaction occur in nature?

A. During the replication of HIV.
B. In ancient DNA.
C. When a thermophilic bacterium replicates its DNA.
D. During a replication cycle of mitochondrial DNA.
E. During replication of Qβ phage.
F. None of the above. (It is a laboratory technique!)

44. Which of the following is *not* required for ***all*** natural template-directed synthesis of DNA *in vivo* (or select F)?

A. dATP
B. dTTP
C. A DNA template
D. A primer that hybridises to the template
E. A DNA polymerase
F. Actually, all of the above are required.

44. Which of the following is *not* required for ***all*** natural template-directed synthesis of DNA *in vivo* (or select F)?

A. dATP
B. dTTP
C. A DNA template (Reverse transcriptases are DNA polymerases that can use RNA templates)
D. A primer that hybridises to the template
E. A DNA polymerase
F. Actually, all of the above are required.

45. Which of the following is not true of precursor mRNA processing in human cells (or select F)?

A. The 5’ nucleotide cap structure is added to all polII transcripts.
B. Introns are removed from pre-mRNA in the nucleus by splicing during and after transcription.
C. Introns represent the far greater part of most primary transcripts.
D. The poly-A tail (if added) is added after completion of splicing.
E. Replication-phase histone mRNA transcripts do not have poly-A tails.
F. Actually, all of the statements above are true.

45. Which of the following is not true of precursor mRNA processing in human cells (or select F)?

A. The 5’ nucleotide cap structure is added to all polII transcripts.
B. Introns are removed from pre-mRNA in the nucleus by splicing during and after transcription.
C. Introns represent the far greater part of most primary transcripts.
D. The poly-A tail (if added) is added after completion of splicing.
E. Replication-phase histone mRNA transcripts do not have poly-A tails.
F. Actually, all of the statements above are true.

Poly-A tails are added when transcription terminates!

46. Which is *not true* of the plasma membrane of resting, live mammalian cells (or select F)?

A. Na^+/K^+ ATPase ejects $3Na^+$ for each $2K^+$ it imports.
B. Membrane potential is largely maintained by an ion pump called the Na^+/K^+ ATPase.
C. The plasma membrane is highly impermeable to ions.
D. The membrane potential is negative outside.
E. Membrane potential is in the range of 0.08 V.
F. All of the above are statements are true.

46. Which is *not true* of the plasma membrane of resting, live mammalian cells (or select F)?

A. Na^+/K^+ ATPase ejects $3Na^+$ for each $2K^+$ it imports. (A, B & C explain why D is untrue)
B. Membrane potential is largely maintained by an ion pump called the Na^+/K^+ ATPase.
C. The plasma membrane is highly impermeable to ions.
D. The membrane potential is negative outside.
E. Membrane potential is in the range of 0.08 V.
F. All of the above are statements are true.

47. For circulating human erythrocytes, which one of the following statements is true? (or select F)

A. X chromosomes are present.
B. Mitochondria are present.
C. Ribosomes are absent.
D. There is no mRNA.
E. There is no DNA.
F. All the statements above are wrong.

47. For circulating human erythrocytes, which one of the following statements is true? (or select F)

A. X chromosomes are present.
B. Mitochondria are present.
C. Ribosomes are absent.
D. There is no mRNA.
E. There is no DNA.
F. All the statements above are wrong.

48. Which chemical element is present in nascent human proteins but is not incorporated into nucleic acids (or choose F)?

A. hydrogen (H) - .
B. nitrogen (N) - .
C. oxygen (O) - .
D. phosphorus (P) - .
E. sulphur (S) - .
F. Actually, all of the above are present. - .

y

48. Which chemical element is present in nascent human proteins but is not incorporated into nucleic acids (or choose F)?

A. hydrogen (H)
B. nitrogen (N)
C. oxygen (O)
D. phosphorus (P)
E. sulphur (S)
F. Actually, all of the above are present.

y

49. A sub-microscopic device approaches and passes through a human cell that is suspended in culture medium. It records its first meeting with each of the following polymers. Which is the last of the following polymers that it would record? (or F)

A. cholesteryl esters
B. polypeptide (protein)
C. DNA
D. RNA
E. polysaccharide
F. The molecule cannot encounter any of the above.

49. A sub-microscopic device approaches and passes through a human cell that is suspended in culture medium. It records its first meeting with each of the following polymers. Which is the last of the following polymers that it would record? (or F)

A. cholesteryl esters
B. polypeptide (protein)
C. DNA
D. RNA
E. polysaccharide
F. The molecule cannot encounter any of the above.

50. For human blood leukocytes, which of the following statements is true (or select F)?

A. There is no DNA in human leukocytes.
B. There are hundreds of copies of the mitochondrial genome per cell.
C. Women's leukocytes have two copies of all human genes.
D. X-linked genes in women are present in a single copy.
E. X-linked genes are absent specifically from male leukocytes.
F. All the statements above are wrong.

50. For human blood leukocytes, which of the following statements is true (or select F)?

A. There is no DNA in human leukocytes.
B. There are hundreds of copies of the mitochondrial genome per cell.
C. Women's leukocytes have two copies of all human genes. [Lack the few Y-linked genes]
D. X-linked genes in women are present in a single copy.
E. X-linked genes are absent specifically from male leukocytes.
F. All the statements above are wrong.

END OF QUIZ