

TRIBUTE TO THE LATE PROFESSOR HASSAN SAIDI

**ANSWERS TO ASSORTED BIOCHEMISTRY CLOZE  
TESTS FOR MBCHB AND BPHARM LEVEL 2**

**A TRIBUTE TO THE LATE PROF. HASSAN SAIDI. BSc (Anatomy), MBChB,  
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1. In **high** altitude, the human erythrocyte is capable of modifying its **glycolytic** pathway to the Luebering Rapoport pathway where **1,3-BPG** a high energy substrate is **isomerized** to **2,3BPG**. Consequently, this compound acts as a **negative** allosteric effector of the oxygen affinity of haemoglobin. It decreases the **oxygen** affinity of **deoxyhaemoglobin** thereby promoting the release of oxygen into the peripheral tissue. However this glycolytic modification deprives the cell of **2** molecules of ATP generated by the **phosphorylation** reaction.
2. **Phospholipids** are the most abundant lipids in the plasma membrane. The steroid cholesterol has different effects on membrane **fluidity** at different temperatures such as at 37°C the cholesterol \_\_\_\_\_ movement while at low temperatures (cold) it \_\_\_\_\_ by preventing tight packing. \_\_\_\_\_ in lipid composition of cell membranes in many species appear to be adaptations to specific environment conditions. A membrane is a collage of different proteins, often grouped together and embedded in the fluid matrix of lipid bilayer. \_\_\_\_\_ proteins are bound to the surface of the membrane while \_\_\_\_\_ proteins span the membrane. Membrane proteins serve several important functions namely **transport, receptors, enzymes, adhesion** just to name a few. **Glycophorin** is a single transmembrane protein; the extracellular portion of it contains **oligosaccharides** which constitute the ABO and MN blood group determinants.
3. For a molecule to serve as the genetic material, it must be able to \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_. For a long time, protein was favoured to be the genetic material. Evidence favouring DNA as the genetic material was first obtained during the study of \_\_\_\_\_ and \_\_\_\_\_. \_\_\_\_\_ of viral DNA into bacterial cells proved conclusively that viral DNA alone contains all the necessary information for production of mature viruses. In some viruses \_\_\_\_\_ serve as the genetic material. In \_\_\_\_\_ DNA/RNA strands can be renatured back. \_\_\_\_\_ is used to identify the chromosomal location of a DNA of interest.
4. At the molecular level, \_\_\_\_\_ is a segment of a DNA used to make a functional product. \_\_\_\_\_ is the overall process by which the information within a gene is used to produce a functional product which can, in concert with environmental factors determine a \_\_\_\_\_. There are various types of RNA transcripts. RNA transcripts from \_\_\_\_\_ genes are not translated but form various important cellular functions for example \_\_\_\_\_ and \_\_\_\_\_. \_\_\_\_\_ are DNA sequences located upstream of the site where transcription of a gene starts. Termination of transcription in eukaryotes is complex due to complexity of the organisms involved. However in E. Coli, \_\_\_\_\_ and \_\_\_\_\_ are two types of mechanisms in termination of transcription known to occur. In eukaryotes, structural genes have three features \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ commonly found in most promoter site. Transcription factors are known to bind \_\_\_\_\_ or \_\_\_\_\_ elements found in one of the features to control the rate of transcription. Factors that control gene expression can be divided into two based on their location. \_\_\_\_\_ DNA sequences that exert their effect only over a particular gene and \_\_\_\_\_ that controls gene(s) in a distant location.
5. There are three types of RNA modification in eukaryotic organisms namely \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_. The transcription of structural genes produces long transcription known as \_\_\_\_\_. One of the benefits of genes with introns is a phenomenon called \_\_\_\_\_. The biological advantage of this phenomenon is that two or more \_\_\_\_\_ can be derived from a single \_\_\_\_\_. Mature RNA has a \_\_\_\_\_ covalently attached to

- their 5' end a process referred to as \_\_\_\_\_. The cap-binding protein that recognizes this process plays key roles in the \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.
6. \_\_\_\_\_ is a change in the genetic material. There are two types of base substitutions \_\_\_\_\_ and \_\_\_\_\_ which can lead to twelve different base substitutions. \_\_\_\_\_ mutations alters the pen reading frame (ORF) affecting subsequent polypeptide to be translated. Mutation can be \_\_\_\_\_ or \_\_\_\_\_ induced. Mutagen such as X-rays is known to induce mutation through \_\_\_\_\_ while UV induces mutations through \_\_\_\_\_. Tay-sach's disease is an autosomal \_\_\_\_\_ disease where mutations in the gene encoding \_\_\_\_\_ enzyme occurs. The \_\_\_\_\_ test provides a simple and inexpensive method for detecting the mutagenicity due chemicals.
  7. Three types of hormones are **steroid**, **peptide** and **amine**. They differ on the basis of **storage** and cellular mechanism of **action**. Peptide hormones are synthesized as **pre-prohormones** which undergo post-translational modification to **pro-hormones** then **hormones**. All **steroid** hormones are derived from cholesterol.
  8. Examples of eicosanoids are **prostaglandins**, **leukotrienes** and **thromboxane**. They have roles in **inflammation** and **regulating cell growth**. Prostaglandins and related compounds are transported out of the **cells** that synthesize them. Most prostaglandins affect other cells by interacting with membrane **G-protein coupled** receptors. Depending on the cell type, the activated **G-protein** may stimulate or **inhibit** formation of **adenylyl cyclase**, or may activate a phosphatidyl-inositol signal pathway leading to intracellular **Ca<sup>2+</sup>** release. Different receptors for a particular prostaglandin may affect different **intracellular** cascades.
  9. Viral glycoproteins contain short cytoplasmic tails. These glycoproteins have hydrophobic segment of \_\_\_\_\_ amino acids for anchoring into the \_\_\_\_\_. The glycoproteins have relatively large \_\_\_\_\_. The ecto-domains are extensively \_\_\_\_\_ to prevent aggregation of \_\_\_\_\_. Glycosylation attracts \_\_\_\_\_ and reduces \_\_\_\_\_. Some of these proteins are palmitoylated on \_\_\_\_\_ residues. Most of the envelope proteins are type-\_\_\_\_\_ meaning that the N-terminus of the protein faces \_\_\_\_\_ while the C terminus is near the anchor domain.
  10. The karyotype of a man with Down syndrome is \_\_\_\_\_ while the condition known as \_\_\_\_\_ is defined by 46, XX,5p. The ZW system of sex determination is found in \_\_\_\_\_ in which the female is the \_\_\_\_\_ sex while the male is the \_\_\_\_\_ sex. The haploid-diploid system of sex determination exists in \_\_\_\_\_ and \_\_\_\_\_ in which the male and female members are \_\_\_\_\_ and \_\_\_\_\_ respectively. \_\_\_\_\_ hypothesis is responsible for the dosage compensation in the expression of the X chromosomes in female mammals. Genes that are located very near each other on the same chromosome are said to be \_\_\_\_\_. \_\_\_\_\_ Cross involves F1 x homozygous recessive parent and can be used to estimate how widely genes are separated on a chromosome.
  11. Endocrinology is concerned with the study of the biosynthesis, storage, chemistry and physiological functions of hormones and with the cells of the **endocrine** glands and **organs** that secrete them. Hormones have different **functions** and **modes** of action; one hormone may have several effects on different **body** organs, and conversely **one organ** may be affected by more than one **hormone**. Hormones act by binding to specific **receptors** in the

- target **cells**. Griffin and Ojeda identified three chemical classes of hormones based on their chemical composition namely; 1. **Peptide** 2. **Amine** 3. **Steroid**.
12. Interferons are naturally occurring \_\_\_\_\_. They are secreted by eukaryotic cells in response to \_\_\_\_\_, \_\_\_\_\_ and other biological inducers. Structurally, they are part of the \_\_\_\_\_ family which are characterized by an amino acid chain that is \_\_\_\_\_ - \_\_\_\_\_ amino acids long. The antiviral activity of interferons is mediated by three pathways. These are \_\_\_\_\_, \_\_\_\_\_ and Mx \_\_\_\_\_ pathways. MxA is produced during viral infections and inhibits viral replication at the level of \_\_\_\_\_ by binding to susceptible viral \_\_\_\_\_ in the cytoplasm and preventing their movement into the nucleus.
  13. Bacteria unlike animal cells are surrounded by a **cell wall** that confers **structural** support. Thus due to **high** concentration of **metabolites**, osmotic pressure may reach as high as 20 Atmosphere in bacterial cell and this can lead to **lysis** in ordinary media. Some bacteria are resistant to **penicillin** because they secrete **penicillinase** enzyme that cleaves the **amide** bond in the  $\beta$ -lactam of **natural penicillin** to form **penicillanic acid** which is inactive as antibiotic.
  14. One of the pathways by which the antiviral activity of interferon is mediated is the \_\_\_\_\_. In this pathway, PKR is activated by binding to \_\_\_\_\_. Once activated, PKR phosphorylates \_\_\_\_\_. This then inhibits \_\_\_\_\_ translation. PKR can also activate \_\_\_\_\_ which leads to increased \_\_\_\_\_ and \_\_\_\_\_ levels. Increased PKR activity can also induce \_\_\_\_\_ by \_\_\_\_\_ and \_\_\_\_\_-dependent mechanisms.
  15. The receptors for **amine** and peptide hormones are located on **membranes** of target cells because hormones are not **lipid** soluble and cannot pass through **cell membrane**. The receptors for **steroid** hormones are located within one cytoplasm or **nucleus** because these kind of hormones are **lipid** soluble and can easily pass through **cell membranes** and enter **cytoplasm**. The receptors of amine hormones are also located on the **membranes** of the target cells.
  16. A **Xenobiotic** is a compound that is foreign to the body. It can be either **endogenous** or **exogenous** depending on its origin within or outside the body respectively. Its metabolism occurs mainly in **3** phases. The major reaction is **redox** catalyzed by a family of coenzymes known as **cytochrome p450** which promote a reaction involving substrate **drug** and **molecular oxygen** as well as coenzymes known as **NADPH** acting as a **reducing agent**
  17. A \_\_\_\_\_ also called PrP<sup>Sc</sup> is an \_\_\_\_\_ agent composed of only an \_\_\_\_\_ in a misfolded form. This is in contrast to all other known infectious agents that contain \_\_\_\_\_. The word prion, coined in 1982 by \_\_\_\_\_, is derived from the words protein and infection. Prions are responsible for \_\_\_\_\_ in a variety of mammalian species, including \_\_\_\_\_, also known as "mad cow disease" in cattle. In humans, prions cause \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ diseases among others.
  18. Hormones are signalling molecules synthesized within the body that regulate and **control** physiological and **biological** functions by acting on **receptors** located on target cells. They can be produced by specialized secretory **vesicles** that are either localized in secretory **cells** or within **organs** that have other primary functions. The hormones are classified into three categories **steroid**, **peptide** and **amine** hormones. They can also be distinguished as **lipid** soluble and **water** soluble hormones.

19. Most hormones are stored, often in large quantities, in their **glands** of origin, a factor that facilitates their original **isolation** and **characterization** (except steroids). Proteins and **peptides** are tyrosine derivatives, **epinephrine** and **norepinephrine** are stored as dense granules in membrane bound vesicles and are secreted in response to an external stimulus by the process of **exocytosis**. Synthesis of hormones must be coupled in some way with **secretion** so that cells can replenish their supply of hormones. In general, the same cellular events that signal secretion also signal **synthesis**. In addition, some cells may be able to monitor how much hormone is stored and adjust rates of synthesis and **degradation** accordingly. In contrast to the peptide hormones, there is little storage of steroid hormones in their cells of **origin**.
20. Myosin has two **globular** heads and two **filamentous** tails. It is an asymmetric hexamer consisting of one pair of **heavy** chains and two pairs of **light** chains.
21. Hormone receptors are cellular **proteins** that bind with high affinity to **ligands** and are altered in shape and **size** by binding; they exist in limited **forms**. Binding to hormone is non-covalent and **temporary**. Hormone levels rise and fall due to **release** of hormone and due to degradation and clearance of hormone. Hormones are classified into 3 main types: **amine**, **peptide**, and **steroid**. They differ on the basis of **synthesis**, storage, release, transport and cellular mechanism of action.
22. Peptide hormones are synthesized as \_\_\_\_\_ that undergo post-translational modification to \_\_\_\_\_ then \_\_\_\_\_. Cellular mechanism of action for peptide hormones require \_\_\_\_\_ 2<sup>nd</sup> messenger system. Steroid hormones are all derived from \_\_\_\_\_. Amine hormones are derived from one or \_\_\_\_\_ amino acids. Catecholamines behave like \_\_\_\_\_ hormones while thyroid hormones behave like \_\_\_\_\_ hormones. Peptide hormones have \_\_\_\_\_ half-life while steroid hormones have \_\_\_\_\_ half-life.
23. A chemical modification on a compound by an organism is known as \_\_\_\_\_ while a \_\_\_\_\_ is a foreign chemical substance found within an organism and which can be removed through a process known as \_\_\_\_\_ that includes a process of biochemical modification of pharmaceutical substances specifically known as \_\_\_\_\_. Drug metabolism is divided into two main phases namely \_\_\_\_\_ and \_\_\_\_\_ which are involved respectively in the \_\_\_\_\_ and \_\_\_\_\_ of the drug and their metabolites.
24. Fill in the missing information (use I<sup>A</sup>, I<sup>B</sup>, i)

Blood type of the child	Genotype(s) of the child	Possible mother's genotype(s)	Possible father's genotype(s)
B			
O			

In the table below, fill in the information on chromosomal basis of sex determination in the animal kingdom.

No.	System used	Male chromosomes	Female chromosomes	Example?
1.				
2.				
3.				

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4.			
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25. Fill in the missing information on human genetic conditions/disorders

Type of defect	Name the genetic disorder	State the karyotype	Mention one symptom
A male with extra chromosome 21			
A female with only one X chromosome			
		47, XXY	
	Cri-du-chat		

26. In the animal kingdom, fill in the missing information on chromosomal basis of sex determination.

In which animal?	System used	Male chromosomes	Female chromosomes
			XX
Birds			
		XO	
		Haploid	

Type	Main RNA product	Effect of $\alpha$ -amanitin
Polymerase I		
Polymerase II		
Polymerase III		

27. PCR is a technique which is used to amplify the number of copies of a \_\_\_\_\_ region of the DNA, in order to produce enough DNA to be adequately \_\_\_\_\_. Understanding the properties of DNA polymerase helps in applying PCR technology in modern medicine. For example, DNA polymerase requires \_\_\_\_\_ as a cofactor in PCR reaction. DNA polymerase moves from one direction which is \_\_\_\_\_. Typical PCR goes through three steps namely \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_. \_\_\_\_\_ is an oligonucleotide sequence that targets specific sequence of opposite single strand nucleic acids. In annealing, optimal temperature varies based on primer's \_\_\_\_\_ and \_\_\_\_\_ content.

28. Eukaryotic cells regulate gene expression to maintain \_\_\_\_\_ in the organism. Control of these gene expressions requires \_\_\_\_\_ factors. The factors are required for the proper \_\_\_\_\_ of RNA polymerase to the DNA. To fully regulate expression, post-transcriptional regulation utilizing various mechanisms such as \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_ are known to occur. Mature mRNA molecules have various \_\_\_\_\_ depending on the \_\_\_\_\_ and \_\_\_\_\_ of expression.

29. Using available DNA sequences, geneticists can study genes in a direct approach called \_\_\_\_\_. The identification of protein coding genes within DNA sequences in a database is called \_\_\_\_\_. \_\_\_\_\_ is the systematic study of all proteins encoded by a genome. The two different alleles at a locus, as in the F<sub>1</sub> hybrid is referred to as \_\_\_\_\_. \_\_\_\_\_ mating increases the chance of offspring getting an autosomal recessive genetic condition. Sickle-cell disease is caused by the substitution of the amino acid in the β-haemoglobin protein in the red blood cells in which glutamate is replaced with \_\_\_\_\_. In genetic terminology, ψ is a sign used to denote \_\_\_\_\_. The karyotypes 45 XO, 46XX5p and 47 XXY stand for which conditions respectively \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_. Write the karyotype of a human male with an extra chromosome 18 and a deletion in short arm of chromosomes 5 \_\_\_\_\_
30. Virus attachment consists of specific binding of a \_\_\_\_\_ to a cellular receptor molecule. Target receptor molecules on cell surfaces may be either \_\_\_\_\_ or \_\_\_\_\_ residues present on glycoproteins or \_\_\_\_\_. Virus receptors fall into many different classes; these include: \_\_\_\_\_ molecules, \_\_\_\_\_ receptors, transmembrane transporters and \_\_\_\_\_. Viruses have subverted molecules required for normal cellular functions. For example, the major Human Rhinovirus (HRV) receptor molecule, is \_\_\_\_\_, which is an adhesion molecule whose normal function is to bind cells to adjacent substrates. The \_\_\_\_\_ spikes are responsible for binding the influenza virus receptor, which is \_\_\_\_\_.
31. Three babies were mixed up in a hospital. After consideration of the data below, which of the following represent the correct baby and parent combinations

	Couple #1	Couple #2	Couple #3
Parent's blood group	A and A	A and B	B and O
Baby's blood group	B	O	AB

In a table format, write all possible genotypes of the parents in couples.

- (i) The parents in the three couples
  - (ii) The babies for the three couples
  - (iii) From (i) and (ii), above, assign the babies to their biological parents and justify.
32. Choose the correct answer in the last column to the statement given in column 1 and insert the answer (letter) in the middle column.

Statement	Answer (letter only)	Choose the answer?
Flexibility in the codon anticodon interaction at the 3' nucleotide in the codon		A. Alternative splicing
Not all the individuals with a mutant allele have a mutant phenotype in domination trait		B. Incomplete penetrance
Removing base sequences corresponding to introns from the primary transcript		C. Codon

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The strand of DNA that has the same base sequence as the primary transcript		D. Reading frame
A group of three mRNA bases signify one amino acid		E. Degeneracy of the genetic code
Most amino acids are not specified by a single codon		F. Nonsense codon
		G.
Using the information in the nucleotide sequence of a strand of DNA to specify the nucleotide sequence of a strand of RNA		H. Initiation codon

AUG in a particular content		I. Template strand
		J.
The linear sequence of amino acids in the polypeptide corresponds to the linear sequence of nucleotide pairs in the gene		K. Coding strand
Addition or deletion of a number of base pairs other than three into the coding sequence		L. Intron
		M. RNA splicing N. Transcription O. Translation P. Wobbling
		Q.

33. Peptide hormones are synthesized as \_\_\_\_\_. During post-translational modification, the later (1) is converted into \_\_\_\_\_ and then \_\_\_\_\_. Peptide hormones are lipophobic, therefore their messages get into target cell by initiating the synthesis of \_\_\_\_\_. The second messenger (4) system is most common to target \_\_\_\_\_. Steroid hormones are driven from \_\_\_\_\_. Amide hormones are driven from \_\_\_\_\_ or \_\_\_\_\_ amino acids. There are three groups of amine hormones; melatonin, \_\_\_\_\_, which behave like peptide hormones and \_\_\_\_\_ which behave like steroid hormones.

34. ABO blood group is valuable in helping to settle cases of disputed parentage. The following table lists the blood types of various mother-child combinations. In each case, list the possible blood types for the father.

No.	Blood type of the child	Blood type of the mother	Possible blood types of the father
1.	O	O	
2.	A	B	
3.	B	O	
4.	AB	A	



35. In humans, the prion is a product of a human gene termed the \_\_\_\_\_ gene. This gene is found on chromosome \_\_\_\_\_. The gene contains \_\_\_\_\_ exons separated by \_\_\_\_\_ introns. The spliced mRNA contains an open reading frame (ORF) or protein coding region which is translated into \_\_\_\_\_ precursor protein. This precursor undergoes several \_\_\_\_\_ modifications to become the prion protein denoted \_\_\_\_\_. In normal cells, only the \_\_\_\_\_ form of the protein in the neural cell membrane protein is synthesized. Its function is to sequester \_\_\_\_\_ ions. In abnormal cells, the PrP 27-30 produced from the PrP 33-35 protein triggers a series of reactions that produce more \_\_\_\_\_ proteins, showing that this mutant protein induces its own synthesis.
36. . In intact peptidoglycan, **N-acetylglucosamine** and **N-acetylmuramic acid** alternate in sequence to form a linear **glycan** chain and the **peptide** bridge cross-links \_\_\_\_\_ residues on different **glycan** strands by forming \_\_\_\_\_ bond with the carboxyl group of \_\_\_\_\_ while the carboxyl group of \_\_\_\_\_ bridge forms a \_\_\_\_\_ bond with the side chain amino group of L-lysine.
37. Plasma membrane exhibit \_\_\_\_\_ permeability allowing some molecules to cross it more easily than others. Phospholipids have \_\_\_\_\_ and hydrophobic regions. Membrane fluidity is affected by two factors namely \_\_\_\_\_ and \_\_\_\_\_. \_\_\_\_\_ in lipid composition of all membranes of many species appear to be adaptations to specific environmental conditions. Membrane proteins determine most of the membrane specific functions namely \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_. Some diseases are caused by \_\_\_\_\_ in specific transport systems, for example the kidney disease \_\_\_\_\_.
38. Understanding the molecular nature of mutation is a deeply compelling area of research in medicine. \_\_\_\_\_ is a change in a single base pair while \_\_\_\_\_ mutations are those base substitutions in which an amino acid change does occur. Mutations can occur spontaneously or be induced. The most common cause of spontaneous mutations can arise due to \_\_\_\_\_ that involves removal of a \_\_\_\_\_ from the DNA. Several human genetic diseases are caused by an unusual form of mutation called \_\_\_\_\_, a phenomenon that refers to a sequence of 3 nucleotide that increase from one generation to the next. An enormous array of agents can act \_\_\_\_\_ that permanently alters the structure of the DNA. Chemical mutagens occur in three main forms. \_\_\_\_\_ that covalently modify the structure of nucleotide, \_\_\_\_\_ that cause flat planar structure, and \_\_\_\_\_ that becomes incorporated into daughter strands during DNA replication. Since mutations can be quite harmful, organisms have developed ways to repair damaged DNA. \_\_\_\_\_ repair remove large defects of damaged DNA such as thymine dimers.
39. Membrane and organelle protein contain \_\_\_\_\_ in their amino acid sequence. Proteins targeted to the nuclear or mitochondria are synthesized on \_\_\_\_\_ ribosomes as soluble polypeptides. \_\_\_\_\_ disease is caused by a defect in lysosomal targeting. Defect in peroxisomal targeting is known to cause \_\_\_\_\_ syndrome that affects mainly cardiovascular and renal systems. \_\_\_\_\_ and \_\_\_\_\_ gets the ribosome with secretory protein mRNA's to bind to the endoplasmic reticulum membrane. \_\_\_\_\_ powers dissociation of SRP, SRP receptors from transcolon. \_\_\_\_\_ controls the insertion of nascent secretory proteins into the transcolon. Most proteins synthesized in the rough ER are \_\_\_\_\_ by a core oligosaccharide that is linked to \_\_\_\_\_ residues.

40. Controlling gene expression is often accomplished by controlling transcription initiation. \_\_\_\_\_ proteins bind to DNA to either block or stimulate transcription. \_\_\_\_\_ motifs are regions of regulatory proteins which bind to the DNA. Genes involved in some metabolic pathway are organized in \_\_\_\_\_. In prokaryotes \_\_\_\_\_ contains genes for use of lactose as an energy source. In presence of lactose, an \_\_\_\_\_ molecule binds to the \_\_\_\_\_ protein which can no longer bind to operator. In eukaryotes, controlling the expression requires \_\_\_\_\_ factors that bind to the \_\_\_\_\_ region of the gene. Eukaryotic structure too plays role in gene regulation. Chromatin structure begins with organization of the DNA into \_\_\_\_\_ that blocks RNA polymerase II from gaining access to promoters. In addition \_\_\_\_\_ of DNA or Histone proteins is associated with control of gene expression.
41. Gout is a disease affecting the joints and is caused by elevated concentration of **uric acid** in the blood and tissues. The joints become inflamed, painful and arthritic. The **kidneys** are also affected, as excess uric acid is deposited in the tubules. Gout occurs predominantly in **males** (males/females). Its precise cause is not known but it often involves an under-excretion of **uric acid**. Gout is effectively treated by a combination of nutritional and drug therapies. Foods, especially rich in **purine**, such as liver or glandular products, are withheld from diet. Major alleviation of the symptoms is provided by the drug **allopurinol** which inhibits the enzyme **xanthine oxidase** that catalyzes the conversion of purines to uric acid. The compound is a substrate analog of **hypoxanthine**, and is converted to **xanthine**. When the enzyme is inhibited, the excreted products of purine metabolism are **hypoxanthine** and **xanthine**, which are more water soluble than **uric acid** and less likely to form crystalline deposits. Two forms of gout are identified as **pseudogout** and **tophaceous** gout.
42. Write the answer to the statement in the first column

No.	Statement	Answer
1.	The nitrogenous base in Inosine 5' monophosphate	
2.	Nucleotide NOT utilized for RNA biosynthesis	
3.	Deficient enzyme in Lesch-Nyhan syndrome	
4.	The enzyme that seals gaps to make a continuous DNA strand	
5.	A compound with anti-folate properties	
6.	Deficient enzyme in severe combined immunodeficiency disease(SCID)	
7.	The nucleic acid to which amino acids are activated?	
8.	The opened-up part of DNA double helix during replication	
9.	The pyrimidine nucleotide from which the others are synthesized from	
10.	Enzyme that lays a primer during replication	

43. Fill in the missing information in the table below

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Defective enzyme	Disease
Glucose 6- phosphatase	
	McArdles
$\alpha$ 1-4 glucosidase (lysosomal)	
	Andersen's
Glycogen phosphorylase (liver)	
	Cori's
Phosphofructokinase	
	Type O
Phosphorylase kinase b	
	Type 1X

44. Non-essential amino acids are synthesized from intermediate of \_\_\_\_\_ from essential amino acids. \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ amino acids are synthesized by transfer of an  $\alpha$ -amino group to the  $\alpha$ -keto acids pyruvate, oxaloacetate and  $\alpha$ -ketoglutarate respectively. Serine is synthesized from glycolysis intermediate \_\_\_\_\_. Tyrosine and cysteine are non-essential amino acids, but their synthesis is dependent on the essential amino acids \_\_\_\_\_ and \_\_\_\_\_ respectively. Glutamine contains an amide linkage with ammonia at the gamma-carboxyl group formed from \_\_\_\_\_ in a reaction driven by \_\_\_\_\_ enzyme. This reaction requires ATP and serves as a major step for \_\_\_\_\_ of ammonia in addition to the synthesis of glutamine for protein synthesis.
45. Match the information in table A to the most appropriate statements in table B (write the number in the answer column. Only one answer is required in each case)

Table A	Answer	Table B
1. Translocation		Breaks chromosomes segments
2. Transversion		Protein biosynthesis
3. Translation		Found on processed mRNA
4. Deletion		Present on lagging strand
5. cAMP		Shifts the reading frame
6. 7-methylguanosine		A point mutation with a purine replaced by
7. Ethidium bromide		Chromosomal alteration
8. RNA directed		Inhibits replication
9. AUG		Start codon on mRNA
10. Okazaki fragments		A modified nucleotide

46. During transcription, the DNA strand of the duplex acts as the template. The enzyme RNA polymerase binds to specific sequences on DNA known as the \_\_\_\_\_. In E coli, the holoenzyme is made up of \_\_\_\_\_ subunits of which the subunit is not required for catalytic activity but is necessary for \_\_\_\_\_. Unlike DNA polymerase, this enzyme lacks activity and this results in lower fidelity. The inhibitor \_\_\_\_\_ prevents transcription by binding to P-subunit on the enzyme.

47. During DNA replication, the DNA double helix need to be unwound by **DNA helicase**, the +ve supercoils introduced by unwinding needs to be removed by **single stranded DNA binding proteins** and the unwound single strand need to be stabilized by **topoisomerase 2**. The enzyme **primase** which is a DNA dependent **RNA** polymerase, must synthesize the primers. Elongation requires **DNA** polymerase. The 5'-3' exonuclease activity is done by **DNA polymerase** and is necessary for maintaining high **accuracy** during the process.

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PROF. SAIDI WAS A CELEBRATED GENERAL AND LAPAROSCOPIC SURGEON AT KENYATTA NATIONAL HOSPITAL AND AGA KHAN HOSPITALS, A FELLOW OF THE AMERICAN COLLEGE OF SURGEONS AND MEMBER OF THE KENYA MEDICAL ASSOCIATION. CHAIRMAN DEPARTMENT OF HUMAN ANATOMY, PRESIDENT SURGICAL SOCIETY OF KENYA, EDITOR IN CHIEF OF THE ANNALS OF AFRICAN SURGERY JOURNAL, ASSOCIATE DEAN SCHOOL OF MEDICINE UNIVERSITY OF NAIROBI, BOARD CHAIR NAIROBI SURGICAL SKILLS CENTRE.

*We celebrate his life legacy for being an excellent teacher of Anatomy, with a thirty-year experience in instruction and teaching Human Anatomy at the University of Nairobi, Aga Khan University Nairobi and University of Pennsylvania. He has mastery of Embryology, Gross Anatomy, Histology and molecular biology, with surgical anatomy as his pet subject. Having taught over 4000 undergraduate medical students, supervised over 40 B.Sc. Anatomy students, 30 Master of Medicine Surgery students, and 4 Master of Anatomy students. He mentored many renowned surgeons, doctors and clinical officers.*

*Prof. Hassan Saidi was able to publish over 60 high impact peer reviewed articles in local and international journals. His research activity focused on clinical anatomy in all its aspects, trauma, oncology and surgery of the digestive tract. He published a book on histology and was in the process of publishing a text book of Surgical Anatomy. Prof. Hassan Saidi held many leadership roles in the University of Nairobi, initially as a course coordinator and rising to become the chairman of thematic areas within the department. He was the substantive Chairman of the Department of Human Anatomy until the time of his death. Prof. Hassan Saidi was also the associate dean, Preclinical departments of the University of Nairobi. During his tenure as a chairman, he shepherded the establishment of the Nairobi Surgical Skills Centre, publication of the Kimani's Histology Text and Atlas, Establishment of the Anatomy Journal of Africa, supported staff development, training and promotion as well as supporting many local and international staff retreats.*

*Prof Hassan indeed had many friends. He definitely did not know all of them, but yet he would never deny any genuine person seeking assistance. Taking time to engage with different age groups and this he did effortlessly. An opportunity to watch football, play some basketball or just have a 'chat' (always very insightful and refreshing) over some coffee snack was a sought-after opportunity by many. In his 36hr day, he would still find time to call up and catch up with his friends, his objective to savour every moment with friends to improve them in one way or another. What better HE WAS!*

*Prof. Hassan Saidi was married, with three sons. He was actively involved in charity and volunteer activities through HAIBA foundation and other charity groups. He was a mentor, a great teacher, researcher and a surgeon. He surely fought a good fight and finished the race. He will be missed by many but his legacy lives on forever in our hearts and lives, till always and forever!!!*

WHAT ARE YOU DOING TO EMULATE THE KIND OF LIFE PROF. SAIDI LIVED? IN ALL THE ABOVE CITED ACHIEVEMENTS, AND THE IMPACT HE GENERATED IN ALL WALKS OF LIFE, DO YOU THINK IT'S POSSIBLE TO LEAVE A TRAIL OF THE SAME MAGNITUDE OF EXQUISITION?

YES IT IS! START WITHIN YOUR SPHERE OF INFLUENCE. LOOK FOR A WAY TO BLESS AND MOULD YOUR FELLOW MEDICS. STUDY MEDICINE WITH PASSION, TRANSFORMATIVE PURPOSE AND PURSUE EXCELLENCE WITH DISTINCTIONS IN ALL YOU DO. ABOVE IT ALL, PURSUE GOD WITH ALL OF YOUR BEING, WHILE PLUGGING INTO HIS SOURCE TO HELP YOU ACHIEVE IT ALL IN KEEPING PROF. SAIDI'S LEGACY ALIVE!!!

ALL THE BEST IN YOUR STUDIES AND UPCOMING EXAMS AS GOD LEADS YOU INTO THE GREAT DOCTORS HE ORCHESTRATED YOU TO BE!!!



Where  
God guides,  
He provides

ISAIAH 58:11



**WHERE GOD LEADS, HE PROVIDES. WHERE HE GUIDES, HIS GRACE IS SUFFICIENT!**