

Virtual University of Pakistan

BIO303

Biochemistry

Midterm past papers solved

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What is ncRNAs? (5)

Ans: • Large & Small Noncoding Regulatory RNAs

• One of the most exciting discoveries in the last decade of eukaryotic regulatory biology has been the identification and characterization of regulatory nonprotein coding RNAs (ncRNAs).

- ncRNAs exist in two general size classes,
- small consisting of microRNA (miRNAs) and silencing (siRNAs) and
- Large consisting of long noncoding RNAs (lncRNAs)
- The small ncRNAs termed microRNA (miRNAs) and silencing (siRNAs) typically inhibit gene expression at the level of specific protein production by
- targeting mRNAs through one of several distinct mechanisms.
- Both siRNAs and miRNAs typically hybridize, via the formation of RNA–RNA hybridization to their targeted mRNAs

How industrial product are formed...asa e kch tha exact yd ni (5)

What is cori cycle? (3)

Ans: The pathway through which lactate produced by anaerobic glycolysis in skeletal muscle returns to the liver and is converted to glucose, which moves back to muscle and is converted to glycogen is called cori cycle.

Site: Liver

Substrate: Lactate

“occurs due to absence of glucose-6-phosphate in liver”.

how does ATP synthase work in inner mitochondrial? (2)

Ans: Electrons carried by NADH and FADH₂ are funneled into a chain of mitochondrial (or in bacteria, plasma membrane-bound) electron carriers the respiratory chain- ultimately reducing O₂ to H₂O. This electron flow drives the production of ATP.

three steps of breakdown of industrial product?

Ans: Any industrial fermentation operation can be broken down into three main stages, viz,

1. Upstream processing,
2. The fermentation process
3. Downstream processing

what is transketolase?

Ans: • Transketolase catalyzes the transfer of a two carbon fragment from a ketose donor to an aldose acceptor. In its first appearance in the pentose phosphate pathway, transketolase transfers C-1 and C-2 of xylulose 5-phosphate to ribose 5-phosphate, forming the seven-carbon product sedoheptulose 7-phosphate.

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- 1) V_o is expressed _____ volume (total), initial, final, all of these
- 2) Study of fermentation is called _____ (fermentology)
- 3) If K_{eq} is _____, ΔG^o is positive (less than 1.0)
- 4) When the products of a reaction are less complex and more disordered than the reactants, the reaction is said to proceed with a _____ (gain in entropy), change in enthalpy, increasing order, decreasing order
- 5) RNA is a polymer of (ribonucleotides)
- 6) RNA molecule is a single strand _____ to only one of the two strands of a gene (complementary)
- 7) Is essentially expensive but essential glycolysis, (gluconeogenesis), krebs cycle, PPP
- 8) gluconeogenesis and glycolysis shared.... Reversible steps ___ 1, (3), 5, 7
- 9) in surface technique which of the following are used _____ gas, liquid, solid, (both liquid and solid)
- 10) The reaction catalysed by DNA photolyase is an example of.. (Free-radical reactions)
- 11) In biochemistry and pharmacology, a ligand meant by _____ (binding)
- 12) Arthur Harden and William Young tested their hypothesis on _____ enzymes, products, substrate, (all)
- 13) Lipases hydrolyzing enzymes of _____ (Lipid)
- 14) IUB Classification of Enzymes Aldolases are _____ (aldehyde)
- 15) NAD and NADH are differ due to _____ (phosphate)
- 16) oxidation reduction reaction Loss or gain of _____ (electron), proton, electron and proton, proton

17) Define 1st law of thermodynamics(2)

Ans: The first law is the principle of the conservation of energy: it states that “for any physical or chemical change, the total amount of energy in the universe remains constant; energy may change form or it may be transported from one region to another, but it cannot be created or destroyed.”

18) Write two ketone bodies in cell body(2)

Ans:

- Acetone
- Acetoacetate

19) Write 5th step of glycolysis and name of enzymes(3)

Ans: Step 1: The first step in glycolysis is phosphorylation of glucose at the hydroxyl group on C-6 by a family of enzymes called hexokinases to form glucose-6-phosphate (G6P)

Step 2: The G6P is again phosphorylated in D-fructose 6-phosphate. This time at C-1 to yield D-fructose 1,6-biphosphate (**Step 3**)

For both phosphorylation, ATP is the phosphoryl group doner. Fructose 1,6-biphosphate is split to yield two three-carbon molecules, dihydroxyacetone, phosphate and glyceraldehydes 3-phosphate (**step 4**); this is the lysis step that gives the pathway its name. The dihydroxyacetone phosphate is isomerized to a second molecule of glyceraldehydes 3-phosphate (**step 5**)

20) What are lyases? Give example(3)

Ans: Answer mentioned

21) Difference between DNA and RNA 5 steps?(5)

Ans: Answer mentioned

22) What are thioesters?(5)

- In thioesters a sulfur atom is replaced the usual oxygen in the ester bond.
- Thioesters have large, negative standard free energy change of hydrolysis.
- Acetyl coenzyme A is one of many thioesters important in metabolism and has a large, negative, standard free energy of hydrolysis.
- The acetyl group in these compounds is activated for trans-acylation, condensation or oxidation-reduction reactions.
- Hydrolysis of the ester bond generates a carboxylic acid which can ionize and assume several resonance forms.
- $\Delta G^{10} = -31.4 \text{ kJ/mol}$ for acetyl-CoA hydrolysis.

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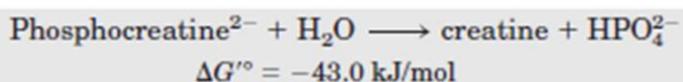
Qno.1.write the phenomenon of phosphoryl group transfer by example of phosphocreatine(pcr).(5)

Ans: In the phosphocreatine the P-N bond can be hydrolysed to generate free creatine and Pi. The release of pi and the resonance stabilization of creatine favour the forward reaction. Pi is also resonance stabilized.

The standard free energy change of phosphocreatine is large and negative $\Delta G^0 = -49,3 \text{ kJ/mol}$

Phosphocreatine

Creatine



Phosphoryl group is the attachment of a good leaving group to a metabolic intermediate to activate the intermediate for subsequent reaction.

A phosphoryl group (PO_3^{2-}) can be transferred to an alcohol or to a carboxylic acid.

Qno.2. differentiate between DNA and RNA.?(5)

Ans:

Comparison	DNA	RNA
Full Name	Deoxyribonucleic Acid	Ribonucleic Acid
Function	DNA replicates and stores genetic information. It is a blueprint for all genetic information contained within an organism	RNA converts the genetic information contained within DNA to a format used to build proteins, and then moves it to ribosomal protein factories.
Structure	DNA consists of two strands, arranged in a double helix. These strands are made up of subunits called nucleotides. Each nucleotide contains a phosphate, a 5-carbon sugar molecule and a nitrogenous base.	RNA only has one strand, but like DNA, is made up of nucleotides. RNA strands are shorter than DNA strands. RNA sometimes forms a secondary double helix structure, but only intermittently.
Length	DNA is a much longer polymer than RNA. A chromosome, for example, is a single, long DNA molecule, which would be several centimetres in length when unravelled.	RNA molecules are variable in length, but much shorter than long DNA polymers. A large RNA molecule might only be a few thousand base pairs long.
Sugar	The sugar in DNA is deoxyribose, which contains one less hydroxyl group than RNA's ribose.	RNA contains ribose sugar molecules, without the hydroxyl modifications of deoxyribose.

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Bases	The bases in DNA are Adenine ('A'), Thymine ('T'), Guanine ('G') and Cytosine ('C').	RNA shares Adenine ('A'), Guanine ('G') and Cytosine ('C') with DNA, but contains Uracil ('U') rather than Thymine.
Base Pairs	Adenine and Thymine pair (A-T) Cytosine and Guanine pair (C-G)	Adenine and Uracil pair (A-U) Cytosine and Guanine pair (C-G)
Location	DNA is found in the nucleus, with a small amount of DNA also present in mitochondria.	RNA forms in the nucleolus, and then moves to specialised regions of the cytoplasm depending on the type of RNA formed.
Reactivity	Due to its deoxyribose sugar, which contains one less oxygen-containing hydroxyl group, DNA is a more stable molecule than RNA, which is useful for a molecule which has the task of keeping genetic information safe.	RNA, containing a ribose sugar, is more reactive than DNA and is not stable in alkaline conditions. RNA's larger helical grooves mean it is more easily subject to attack by enzymes.
Ultraviolet (UV) Sensitivity	DNA is vulnerable to damage by ultraviolet light.	RNA is more resistant to damage from UV light than DNA.

Qno.3 define high energy and low energy compounds?(3)

Ans: High energy compounds: Compounds that contain phosphate are called or described as high-energy ones when they have a large value of $-\Delta G$ (the change in Gibbs free energy), of the order of -25 or -30 kJ/mol.

The high-energy phosphate compounds represent temporary forms of stored energy, transporting energy from one reaction to another.

Examples: ATP, GTP, ADP etc.

Low energy compounds: Hydrolysis of low-energy phosphate compounds releases Pi, which has an even lower group transfer potential. ... The phosphate group transfer potential of phosphoenolpyruvate is very high, that of ATP is high, and that of glucose-6-phosphate is low.

Examples: Glucose 6-phosphate

Qno.4. what are lyase.give example?(3)

Ans:

- These enzymes catalyze the addition of
 - NH₃,
 - H₂O or
 - CO₂
- to double bonds or
- the removal of these groups leaving behind double bonds.

Examples: Decarboxylases Aldolases

Qno.5. how ribonucleotide held together?(2)

Ans: The ribonucleotides are held together by 3' - 5' phosphodiester bonds.

Qno.6.write about the thermodynamically unstable the condition reaction?(2)

Ans: Thermodynamic instability means a system exists that is not at equilibrium. That means that some kind of chemical reaction is thermodynamically possible. One of the results of thermodynamics is that a system at equilibrium at a given temperature and pressure is at a minimum of its Gibbs Free Energy. An unstable system has the potential to reach another state in such a way that lowers its Gibbs Free Energy.

Objective

Some variation are

1- phosphoenolpyruvate contain a phosphate ester bond that undergoes to yield to **enol** form of pyruvate.

2-equilibrium constant is **K** or K_{eq}

3-in a surface technique ,the microorganism are cultivated on the surface of **liquid or solid substrate**

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4- **Gluconeogenesis** Is essentially expensive but essential glycolysis.

5-glyconeogenesis and glycolysis shared reversible steps.

6-non-protein moiety is a metal ion such as Zn^{2+} or Fe^{2+} is

7- ΔG° is a way of expressing the Of the reaction.

8-miRNA is the type of **RNA**

9-single stranded globular molecule is **tRNA**

10-pyruvate is reduced into lactate in which process **glycolysis**

11-ligand bind at **binding** site.

12- V_o is expressed as..... volume.

13-RNA is polymer of **ribonucleotide**

-----**GOOD LUCK**-----