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Biochemistry (II) (bio303)

(Most of the portion is created by M.Waryam)

1. How ATP synthase do the chemical work in the inner mitochondrial membrane?

ATP synthase in the inner mitochondrial membrane do work by using the proton-motive force to do chemical work: synthesis of ATP from ADP and Pi as protons flow spontaneously across the membrane. Thus, the proton potential has potential energy.
- Bacterial flagellar motion: use proton-motive force.

2. What is the 1st step of non oxidative pathway of pentose phosphate pathway?

3.What is cori cycle and its substrate?

The pathway through which lactate produced by anaerobic glycolysis in skeletal muscle returns to theliver and is converted to glucose,which moves back to muscle and is converted to glycogen is called the Cori cycle.Its site is liver and substrate is lactate. Occur due absence of glucose 6 phosphate in liver.

4. What is continuous fermentation process?

A Continuous fermentation is a process in which fresh medium (substrate) is continuously added in the bioreactor , and biomass or products containing left over nutrients and microorganisms are continuously removed at the same rate to keep the culture volume constant.

5. Ping pong mechanism?

Ping-pong mechanism of nucleoside diphosphate kinase:
in this mechanism the enzyme binds its first substrate and a phosphoryl group is transferred to the side chain of His residue. ADP departs, andanother nucleoside (or deoxynucleoside) diphosphate replaces it, and this is converted to the corresponding triphosphate by transfer of the phosphoryl group from the phosphohistidine residue.

6. What is ncRNAs?

These are regulatory non protein coding RNAs(ncRNA). These exist in two form 1-small consisting of microRNA or miRNA and silencing RNA siRNA and Large consist of long non coding rna lncRNA.siRNA inhibit the production of protein by targeting the messenger rna at this site of production and lncRNA are also non protein coding RNA as known by their name.

7.write the name of two molecules which can be formed after energy donate from ATP.

(ADP) adenosine di phosphate and (AMP) adenosine mono phosphate are two molecule that could be formed after removal of the energy from ATP.

8.**what is hydrolase ?**

Hydrolase is an enzyme which involve in hydrolysis of substrate. E.g **Estrases Digestive enzymes**

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9.write the three main operations of fermentation.

1. upstream processing,
2. the fermentation process and
3. downstream processing.

10.what is transaldolase? write its function.

Transaldolase is an enzyme which catalyzes a reaction similar to the aldolase reaction of glycolysis, that is, a three-carbon fragment is removed from sedoheptulose 7-phosphate and condensed with glyceraldehyde 3-phosphate, forming fructose 6-phosphate and the tetrose erythrose 4-phosphate

11.what are ncRNA ? (5)

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).NcRNAsexist 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

long noncoding RNAs (lncRNAs).

LncRNAs, which as their name implies, do not code for protein (ie, the mRNA encoding genes). ncRNAs make up a significant portion of eukaryotic transcription
ncRNAs play many roles ranging from contributing to structural aspects of chromatin to regulation of mRNA gene transcription by RNA polymerase II.

12.Write the fates of pyruvate under anaerobic condition.? (5)

solved below

13.Give names of some industrial products fermentation and the products they form in industry?

important products of fermentation can be described in five major groups as follows.

1. **Biomass** (Baker's yeast, SCP, Starter cultures, animalfeed, etc.)
2. **Primary metabolites**(amino acids, organic acids, vitamins, polysaccharides, ethanol, etc.) and **secondary metabolites**(antibiotics, etc.)
3. **Bioconvertion or biotransformation products** (steroid biotransformation, L-sorbitol etc.)
4. **Enzymes** (amylase, lipase, cellulase, etc.)
5. **Recombinant products** (some vaccines, hormones such as isulin and growth hormones etc.)

14Three major fates of animals and vascular plant.

15. advantages of fermentation

1. Preserves and enriches food, improves digestibility,

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and enhances the taste and flavour of foods.
2. Potential of enhancing food safety by controlling the growth and multiplication of a number of pathogens in foods.
3. Important contribution to human nutrition, particularly in developing countries, where economic problems pose a major barrier to ensuring food safety.
4- Low energy consumption due to the mild operating conditions relatively low capital and operating costs relatively simple technologies.
5- They cause highly specific and controlled changes to foodsby using enzymes.
6- Preservation and detoxification of the food.
7- Wastetreatment.
8- Health related product.

16.What is isozyme?
ANS.
Two or more enzymes that catalyze the same reaction but are encoded by different genes are called **isozymes.**
Submerged fermention ?

17.What is snRNA?
small nuclear RNA (snRNA)-
play pivotal roles in RNA processing, particularly mRNA processing.
Write first 5 steps of glycolysis ?without write name of enzyme ?

How can ribonucleotidecombine ?
RNAis a polymer of ribonucleotides of Adenine,Uracil, Guanine and Cytosine and these ribonucleotide are joined together by3′-5′phosphodiester bonds

18.What is binding site of ligand?
A ligand binds at a site on the protein called the binding site, binding site is complementary to the ligand in
- size,
- shape,
- charge, and
- hydrophobic or
- hydrophilic character.

19.define bioenergetics?
ANS-Bioenergetics is the quantitative study of the **energy transductions** changes of one form of energy into another—that occur in living cells,and of the nature and function of the chemical processes underlying these transductions.
components of fermentor
cause of gulcagon on liver
19.function of catalase

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catalase is a common enzyme found in nearly all organisms exposed to oxygen and its main function is decomposition of H2O2into water and oxygen.

20. What is tRNA Write its function?

This is transfer RNA which is adapter molecule which carry specific amino acid for the production of specific protein.

21. Write down experiment of Arthur and Melliin in 1906 o yeast Extract?

Experiment by A. Harden and W. Young

• In the preparatory phase ofglycolysis, two molecules of ATP are invested and the hexose chain is
cleaved into **two triose phosphates**
• In 1906, Arthur Harden and William Young tested their hypothesis that **inhibitors of proteolytic enzymes would stabilize the glucose. fermenting enzymes in yeast extract.**
• They added blood serum (known to contain inhibitors of proteolytic enzymes) to yeast extracts and observed the predicted stimulation of glucose metabolism.
• However, in a control experiment with the boiling serum, they discovered that boiled serum was just as effective at stimulating glycolysis!
• Careful examination revealed that inorganic phosphate was responsible for the stimulation.
• Harden and Young soon discovered that glucoseadded to their yeast extract was converted to a hexose bisphosphate (the "Harden- Young ester,"eventually identified as **fructose**

22.Denaturation of DNA

DNA Denaturation
• Separation of the two strands of the double helix when hydrogen bonds between the paired bases are
disrupted.
• Disruption can occur in the laboratory if the pH or the salt concentration of the DNA solution is altered.
if the solution is heated above 80°C Disruption of the hydrogenbonds between paired basesand of base stacking causes unwinding of the double helix to form two single strands complete separation of DNA stands along the entire length. No covalent bonds in the DNA are broken.

23.Diff between actual free energy and standard free energy.

Already given.

24.Pentose phosphate pathway

25.NAD and NADP stand for.

NAD stand for Nicotinamide adenine dinuleotide.
While NADP stand for Nicotinamide adenine dinuleotide phosphate.
transketolase
name three elcetron carrier of ETC cycle
NAD, NADP, and FAD are electron carrier of ETC Cycle.

26.define glycogenosis

The process of synthesis of glucose from noncarbohydrate sources is known as Gluconeogenesis ("new formation of sugar"), OR Gluconeogenesis is the pathway, which converts pyruvate and

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related three- and four-carbon compounds to glucose.

27what are fate of pyruvate under anaerobic condition

1-Lactate
2-Ethanol
3-AcetylecoA this is an uncertain solution plz confirm

28_why transketolase requires cofactor during Pentose phosphate pathway?

Brain neuron, skeletal muscle, adipose tissue are the organ in which glucose transporter are found. Name of glucose transporter are as follow. GLUT1, GLUT2, GLUT3.

29_features of DNA denaturation and circumstances which cause DNA denaturation in Labs

• Separation of the two strands of the double helix when hydrogen bonds between the paired bases are
disrupted.
• Disruption can occur in the laboratory if the pH or the salt concentration of the DNA solution is altered.
if the solution is heated above 80°C Disruption of the hydrogen bonds between paired bases and of base stacking causes unwinding of the double helix to form two single strands complete separation of DNA stands along the entire length. No covalent bonds in the DNA are broken.

30.Write 5 steps of glycolysis?

solved below.

31.Primary structure of tRNA?

Primary structure.
t RNA molecules consist of 74-95 nucleotides in a particular sequence. The t RNA molecules contain not only the usual bases like adenine, guanine, cytosine, uracil but also contain **unusual** bases
• These unusual bases(also called modified bases) include Dihydrouracil . Pseudouridine .Thymine.

32.In which conditions renaturation of DNA takes place?

DNA Renaturation
• Under appropriate conditions *(temp. & salt concentration)*,separated strands of DNA will renature or reassociate and
form the double helix by the process called renaturation (or reannealing).

33.Define gluconeogensis? (3)

already solved

34.Glycolysis from pyruvate is via 3 other courts,name them and write on oxidation state..?

solved below.

35.What is snRNA? (5)

solved below.

36.Diff between actual free energy and standard free energy

It's very important to be aware of this distinction; that little ° symbol makes a world of sdifference! First, the standard free energy change $\Delta G°$ has negative and has a larger absolute value than G' .Another important point is that some thermodynamically favorable reactions (that is,reactions for which G' is large and negative) do not occur at measurable rates.

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37.transketolase

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 toribose 5-phosphate,forming the seven-carbon product sedoheptulose 7-phosphate.

38.what are fate of pyruvate under anaerobic condition

39.why transketolase requires cofactor during Pentose phosphate pathway?

Transketolase requires the cofactor thiamine pyrophosphate(TPP), which stabilizes a two-carbon carbanion in this Reaction

40.Name organ in which glucose transporters are found and name of 3 transporters

Brain neuron, skeletal muscle, adipose tissue are the organ in which glucose transporter are found. Name of glucose transporter are as follow. GLUT1, GLUT2, GLUT3.

41_components of fermenter

1.Formulation of media to be used in culturing the organism during development of inoculum and in the production fermenter

2.Sterilization of the medium, fermenter and ancillary equipment

3.Production of an active, **pure culture** in sufficient quantity to inoculate the production vessel

4.The **growth of the organism in** the production **fermenter** under optimum conditions for product

formation

42.Two strands of DNA are_complementary_____to each other.

43.80% of RNA is_____

44.Ligand binds at__binding site___site.

45.Animals use chemical fuel as___heat and motion___ (opt:heat,heat and motion etc)

46.___submersion____is placed in liquid medium (opt:surface,submersion,both or none)

Questions:

47.Why sterilisation is essential in fermentation? (2)

Sterilizing the feed solution is essential because the media cannot contain foreign microbes because this could severely hinder the growth of the production

48.Define gluconeogensis? (3)

The process of synthesis of glucose from noncarbohydratesources is known asGluconeogenesis (“new formation of sugar”), OR **Gluconeogenesis** is the pathway, which converts pyruvate and related three- and four-carbon compounds to glucose.

49.Glycolysis from pyruvate is via 3 other courts,name them and write on oxidation state..?

The pyruvate formed by glycolysis is further metabolized via one of three catabolic routes. In aerobic organisms or in the complete degradation of glucose

1. Oxidation of Pyruvate: Pyruvate is oxidized, with loss of its carboxyl group as CO_2, to yield the acetyl group of acetylcoenzyme A; the acetyl group is then oxidized completely to CO_2 by the citric acid cycle. The electrons from these oxidations are passed to O_2 through a chain of carriers in mitochondria, to form H_2O. The energy from the electron transfer reactions drives the synthesis of ATP in mitochondria

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2. The second route for pyruvate is its reduction to lactate via lactic acid fermentation. When vigorously contracting skeletal muscle must function under low oxygen conditions (hypoxia), NADH cannot be reoxidized to NAD1, but NAD1 is required as an electron acceptor for the further oxidation of pyruvate. Under these conditions pyruvate is reduced to lactate,accepting electrons from NADH and thereby regenerating the NAD1 necessary for glycolysis to continue. Certain tissues and cell types (retina and erythrocytes, for example) convert glucose to lactate even under aerobic conditions. lactate is also the product of glycolysis under anaerobic conditions in some microorganisms.

3. The **third major route** of pyruvate catabolism leads to formation of ethanol. In some plant tissues and in certain invertebrates, protists, and microorganisms such as brewer's or baker's yeast, pyruvate is converted under hypoxic or anaerobic conditions to ethanol and CO_2, a process called **ethanol (alcohol) fermentation**

The oxidation of pyruvate is an important catabolic process, but pyruvate has anabolic fates as well. It can, provide the carbon skeleton for the synthesis of the amino acid alanine or for the synthesis of fatty acids.

50.What is snRNA? (5)

Small nuclear RNA (snRNA)

• Small nuclear RNA (snRNA) are large number of small stable RNA species found in eukaryotic cells.

• They are distributed in the nucleus, in the cytoplasm or in both.They are significantly involved in rRNAand Mrna processing and gene regulation.for long solution get more information.

51. what is glycolysis name its first 5 steps.

It is the metabolic pathway which convert glucose into pyruvate. The energy released during this process is used in formation of high energy molecule like ATP and NADH

5steps of glycolysis.

1-Hexokinase

2- phosphoglucose isomerase

3- phosphofructokinase

4- aldolase

5-triosephophate isomerase

Besides these steps there are also some involve in glycolysis.

52.Name steps of synthesis of phosphophenolpyruvate from pyruvate?

53.What is isozyme

Two or more enzymes that catalyze the same reaction but are encoded by different genes are called **isozymes.**

54.Write down the effect of camp casecade of liver

in liver:

- Gluconeogenesis is stimulated.
- Glycolysis is inhibited.
- Glycogen breakdown is stimulated.
- Glycogen synthesis is inhibited.
- Free glucose is formed for releaseto the blood

55.Wriye down the five stp of glycolysis. Without mention the name of enzyme

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Solved above

56.Nucleaophiles and electrophiles ??

many biochemical reactions involve interactions between nucleophiles and electrophiles

- nucleophiles: functional groups

rich in and capable of donating electrons

- Electrophiles: electron-deficient functional groups that seek electrons

57.What is hyperchromiticy in denaturation of dna?

Hyperchromicity is the increase of absorbance of the material. The most famous example is the hyperchromicity of DNA after DNA denaturation.

58.Name 6 type of fermenter

1- stirred tank reactor
2- air lift fermenter
3- fermenter with venture eductor
4- waldhof type fermenter
5- self priming fermenter
6- tower fermenter
7- koji fermenter

59.First three step of glyconeogenesis

60.Types of RNA and what is sn RNA 5

There are 3 major types of RNA mentioned below

1-messenger RNA
Encode amino acid sequence of a polypeptide.
2-Trna. Brings amino acids to ribosomes during translation.
3-ribosomal RNA Rrna. With ribosomal protein make make up the ribosmes, the organelles the translate the Mrna.
SnRNA – small nuclear ribonucleic acid is a class of small RNA molecules which are found in nuclear bodies of eukaryotic cells.length of these is approx 150 nucleotide.

Bio303
2-july-2018 ....10:30am
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 cretine favour the forward reaction.
Pi is also resonance stabilized.
The standard free energy change of phosphocreatine is large and negative □*G*0 □□□49,3 kj mol
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*32□□can be tranferred to an alcohol or to a carboxilic acid.
Qno.2. differentiate between DNA and RNA.?(5)
Ans:

Comparison	DNA	RNA

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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.
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 -ΔG-ΔG (the change in Gibbs free energy), of the order of -25-25 or -30 kJ/mol-30 kJ/mol.

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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:
• Theses enzymes catalyze the addition of
• NH,
• HO or
• CO
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 as way that lowers its Gibbs Free Energy.
Objective
Some variation are
1- phosphoenolpyruvate contain a phosphate ester bond that undergoes to yeild to **enol** form of pyruvate.
2-equilibrium constant is **K or**
eq
K
3-in a surface technique ,the microrganism are cultivated on the surface of **liquid or solid substrate**
4- **Gluconeogenesis** Is essentially expensive but essential glycolysis.
5-glyconeogensis and glycolysis shared ..... reversible steps.
6-non-protein moiety is a metal ion such as Zn2+ or Fe2+ 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-Vo is expressed as..... volume.
13-RNA is polymer of **ribonucleotide**

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“Best wishes for you exam”.
“Remember us in your prayers”.

Regards;

Muhammad Waryam Thathia, Muhammad Talha Waraich and All Admins + Moderators.

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