

Examination

Biochemistry and Molecular Biology (KBB032) (2016)

Date and place: Monday, October 24, 08.30, “SB”

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Aids: Chalmers approved calculator and dictionaries

”Grade limits”: 50% = 3; 65% = 4; 80% = 5

Code.....

1. Glycolysis is one of the most central metabolic pathways in a cell. Which end products are formed from 1 mole of glucose in this pathway? Suggest **one** metabolite that activates and **one** that inhibit this pathway. Give the name of the enzyme(s) that these two metabolites affect (7p)

2. Formation of ATP via oxidative phosphorylation is an extremely important process in the cell. (6p)

A) Describe the process that “liberates energy” and which factors that determines the amount of energy “liberated”

B) What is the “force” used by ATP:ase for formation of ATP, which are the components constituting this force?

C) How will the process be affected if subjected to oligomycin, which complex is the target?

3. Describe schematically the processes involved in the complete oxidation of pyruvate during aerobic conditions. Which enzyme is catalysing the initial step of pyruvate oxidation. Describe the reaction (substrates and products) and give the name of the enzyme. How is the oxidised product of this reaction further oxidised? Give the name of the collective processes and which products are formed from 1 pyruvate (10p)

4. Describe in which process/pathway the following enzymes are active and the reaction catalysed. (10p)

Glycogen phosphorylase

Malate synthase

Pyruvate decarboxylase

Glutamate dehydrogenase

Ribulose-1,5-bisphosphate carboxylase (Rubisco)

5. Which are the two most important functions of the pentose phosphate pathway? Which end products are formed in the non-oxidative part of the pathway? (4p)

6. Photosynthesis is a very important process for life on earth. (6p)

A) What is the “energy source” that drives this process?

B) How is ATP generated?

C) Which products, apart from ATP, are produced during non-cyclic photosynthesis?

7. Explain (with one or two sentences) what is meant by the following expressions. (7p)

- a) β -oxidation
- b) Anaerobic respiration
- d) Allosteric regulation
- e) Antiport
- f) Gluconeogenesis
- g) Endosymbiont theory
- h) Substrate level phosphorylation

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8. Topoisomerase, Helicase, SSB, Primase, DNAPolymerase III, DNAPolymerase I and ligase are all involved in replication of DNA. What is the role of each of these enzymes? In some cases enzymes perform more than one activity, which should be clear in your answer. (10 p)

9. Describe the principle for methylation dependent mismatch repair, and why this process is important. (5 p)

10. Bacterial genes are usually preceded by -10 and -35 regions. Why are they there, and what binds to them? (3 p)

11. Three classes of RNA are directly involved in protein synthesis, which are they and what is the role of each class? (3 p)

12. What is PCR? Why is it important, and briefly, how does it work (e.g. what needs to be in the test-tube and how is the sample treated)? (5 points)

13. EF-Tu and EF-G are the elongation factors responsible for carrying out translation elongation together with the ribosome. What functions do they mediate in this process, and in which form do they use energy? (6 p)

14. The promotor of the lactose operon is regulated by both glucose and lactose levels. How is this accomplished? Your answer should include the proteins and metabolites involved. (6 p)

15. The following terms have all been described in your lectures, provide a brief explanation for each of them and why they are important (1 p/term, total 12 points)

- a. Histone
- b. S-phase
- c. Telomere
- d. Transposase
- e. Restriction endonuclease
- f. 5' cap
- g. Dideoxy-nucleotide
- h. Signal peptide
- i. RNAi
- j. Mediator-complex
- k. Splicing
- l. Anticodon