10 question from *Biochemical-Computers.docx*

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1- Name the factors involved in chemical reactions .

quantity of catalytic enzymes present, the amount of reactants present, the amount of products present, and the presence of molecules that bind to and thus alter the chemical reactivity of any of the aforementioned factors.

2- What biological chemical reactions' characteristic do biochemical computers use ?

Biochemical computers use the immense variety of feedback loops that are characteristic of biological chemical reactions in order to achieve computational functionality.

3- In Biochemical computers , How we get a computational output from a chemical reaction?

The presence of the particular product that results from the pathway can serve as a signal, which can be interpreted—along with other chemical signals—as a computational output based upon the starting chemical conditions of the system (the input).

4- what are the similarities between biochemical , biomechanical and bioelectronic computers ?

They are similar in that they all perform a specific operation that can be interpreted as a functional computation based upon specific initial conditions which serve as input.

5- what are the differences between biochemical and biomechanical computers ?

They differ, however, in what exactly serves as the output signal.

6- what serves as the output signal in biomechanical computers ?

In biomechanical computers, however, the mechanical shape of a specific molecule or set of molecules under a set of initial conditions serves as the output.

7- what serves as the output signal in bioelectronic computers ?

In bioelectronic computers, the measured output is the nature of the electrical conductivity that is observed in the bioelectronic computer.

8- how can a networks-based biocomputer solve a mathematical problem ?

In networks-based biocomputation , self-propelled biological agents, such as molecular motor proteins or bacteria, explore a microscopic network that encodes a mathematical problem of interest. The paths of the agents through the network and/or their final positions represent potential solutions to the problem.

9- in the system described by Nicolau et al. , What mathematical problem does the microscopic network encode ?

NP-Complete problem called SUBSET SUM

10- How does Network-based biocomputers solve SUBSET SUM problem ?

mobile molecular motor filaments are detected at the "exits" of a network .All exits visited by filaments represent correct solutions to the algorithm. Exits not visited are non-solutions.When adenosine triphosphate (ATP) is added, the actin filaments or microtubules are propelled through the channels, thus exploring the network.

11- Compare Network-based biocomputers and electronic computers in terms of energy consumption.

The energy conversion from chemical energy (ATP) to mechanical energy (motility) is highly efficient when compared with e.g. electronic computing, so the computer, in addition to being massively parallel, also uses orders of magnitude less energy per computational step.

12- what are the chemical building blocks of a proteins ? What about DNA?

Amino acids are he chemical building blocks of a proteins and nucleotides are ones for DNA

13- How do ribosomes manufacture proteins ?

Proteins are manufactured in biological systems through the translation of nucleotide sequences by biological molecules called ribosomes, which assemble individual amino acids into polypeptides that form functional proteins based on the nucleotide sequence that the ribosome interprets.

14- Why is implementing nanobiotechnology in designing and producing proteins , useful ؟

implementing nanobiotechnology to design and produce synthetically designed proteins—as well as the design and synthesis of artificial DNA molecules—can allow the construction of functional biocomputers (e.g. Computational Genes).

15- How does a cell as a basic component of a biocomputer , work ?

Chemically induced dimerization systems can be used to make logic gates from individual cells. These logic gates are activated by chemical agents that induce interactions between previously non-interacting proteins and trigger some observable change in the cell.

16- How are Network-based biocomputers engineered ?

Network-based biocomputers are engineered by nanofabrication of the hardware from wafers where the channels are etched by electron-beam lithography or nano-imprint lithography.