Benha University
Faculty of science
Botany Dept.
Time : 2hrs
Total mark: 48 mark

3rd year Micro. & Chem.
Physiology of fungi
27, Dec. 2016 (1st semestre)
Course code: B363

All questions are to be attempted in sequence

Question I: ***Write short notes on the following?***

1. Fungal growth curve

the growth of fungi (or other microorganisms, as protozoa, microalgae or yeasts) in batch culture can be modeled with four different phases: lag phase (A), log phase or exponential phase (B), stationary phase (C), and death phase (D).

1. During lag phase, bacteria adapt themselves to growth conditions. It is the period where the individual bacteria are maturing and not yet able to divide. During the lag phase of the bacterial growth cycle, synthesis of RNA, enzymes and other molecules occurs.
2. The log phase (sometimes called the logarithmic phase or the exponential phase) is a period characterized by cell doubling.[4] The number of new bacteria appearing per unit time is proportional to the present population. If growth is not limited, doubling will continue at a constant rate so both the number of cells and the rate of population increase doubles with each consecutive time period. For this type of exponential growth, plotting the natural logarithm of cell number against time produces a straight line. The slope of this line is the specific growth rate of the organism, which is a measure of the number of divisions per cell per unit time.[4] The actual rate of this growth (i.e. the slope of the line in the figure) depends upon the growth conditions, which affect the frequency of cell division events and the probability of both daughter cells surviving. Under controlled conditions, cyanobacteria can double their population four times a day.[5] Exponential growth cannot continue indefinitely, however, because the medium is soon depleted of nutrients and enriched with wastes.
3. The stationary phase is often due to a growth-limiting factor such as the depletion of an essential nutrient, and/or the formation of an inhibitory product such as an organic acid. Stationary phase results from a situation in which growth rate and death rate are equal. The

number of new cells created is limited by the growth factor and as a result the rate of cell growth matches the rate of cell death. The result is a "smooth," horizontal linear part of the curve during the stationary phase.

4. At death phase (decline phase), bacteria die. This could be caused by lack of nutrients, environmental temperature above or below the tolerance band for the species, or other injurious conditions.

2. The role of *two essential nutrients* in microbial metabolism

Are any molecular or elemental form of nutrient that is required by an organism.

Two categories of essential nutrients; macro-nutrients and micro-nutrients.

Macro-nutrients are needed in larger amounts. Used to help with cell structure and the cell's metabolism. Examples are proteins, and carbohydrates.

Micro-nutrients or trace elements are needed in a lot smaller amount.

They help enzyme function and help to maintain protein structure.

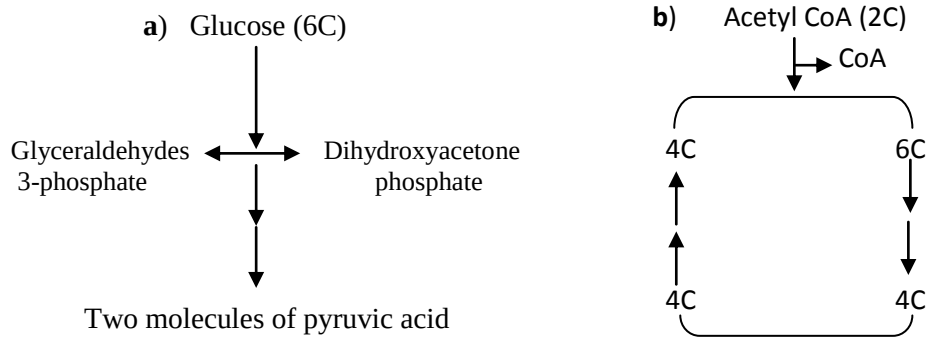
They include elements such as zinc, manganese, and nickel.

THE SOURCE OF COMMON ESSENTIAL NUTRIENTS ARE: CHNOPS

1. Carbon
2. Hydrogen
3. Nitrogen
4. Oxygen
5. Phosphorous
6. Sulfur

Student should select two essential nutrient and explaine.

Question II:



1. Name the pathways diagrammed in parts (a) and (b) of the figure above?

A Embeden myerhoof b. Krebs cycle

2. Show how these pathways are related?

Pyruvic acid is decraboxylated and 2C combined with CoA then enter krebs cycle

3. Explain in details one of these two pathways? In text book, see glycolsis or krebs cycle
4. In microbial metabolism, ***Describe*** the reaction between H^+ and oxygen at the final step of electron transport?

In text book, see chemiosmosis step

Question III: Clarify two only of the following?

1. Environmental factors that influence fungi (***two only***)

Microbes are exposed to a wide variety of environmental factors that affect growth and survival. Microbial ecology focuses on ways that microorganisms deal with or adapt to such factors as ***heat, cold, gases, acid, radiation, osmotic and hydrostatic pressures, and even other microbes***. Adaptation involves a complex adjustment in biochemistry or genetics that enables long-term survival and growth.

The totality of adaptations organisms make to their habitats is niche. For most microbes, environmental factors fundamentally affect the function of metabolic enzymes. Thus, survival is largely a matter of whether the enzyme systems of microorganisms can continue to function even in a

changing environment. Select two factors only (temp., pH, oxygen and.....,etc)and speak on it.

2. Controls of the microbial enzyme

There are five main ways that enzyme activity is controlled in the cell.

Regulation

Enzymes can be either activated or inhibited by other molecules. For example, the end product(s) of a metabolic pathway are often inhibitors for one of the first enzymes of the pathway (usually the first irreversible step, called committed step), thus regulating the amount of end product made by the pathways. Such a regulatory mechanism is called a negative feedback mechanism, because the amount of the end product produced is regulated by its own concentration. Negative feedback mechanism can effectively adjust the rate of synthesis of intermediate metabolites according to the demands of the cells. This helps with effective allocations of materials and energy economy, and it prevents the excess manufacture of end products. Like other homeostatic devices, the control of enzymatic action helps to maintain a stable internal environment in living organisms.

Post-translational modification

Examples of post-translational modification include phosphorylation, myristoylation and glycosylation. For example, in the response to insulin, the phosphorylation of multiple enzymes, including glycogen synthase, helps control the synthesis or degradation of glycogen and allows the cell to respond to changes in blood sugar. Another example of post-translational modification is the cleavage of the polypeptide chain. Chymotrypsin, a digestive protease, is produced in inactive form as chymotrypsinogen in the pancreas and transported in this form to the stomach where it is activated. This stops the enzyme from digesting the pancreas or other tissues before it enters the gut. This type of inactive precursor to an enzyme is known as a zymogen or proenzyme.

Quantity

Enzyme production (transcription and translation of enzyme genes) can be enhanced or diminished by a cell in response to changes in the cell's environment. This form of gene regulation is called enzyme induction. For example, bacteria may become resistant to

antibiotics such as penicillin because enzymes called beta-lactamases are induced that hydrolyse the crucial beta-lactam ring within the penicillin molecule. Another example comes from enzymes in the liver called cytochrome P450 oxidases, which are important in drug metabolism. Induction or inhibition of these enzymes can cause drug interactions. Enzyme levels can also be regulated by changing the rate of enzyme degradation.

Subcellular distribution

Enzymes can be compartmentalized, with different metabolic pathways occurring in different cellular compartments. For example, fatty acids are synthesized by one set of enzymes in the cytosol, endoplasmic reticulum and Golgi and used by a different set of enzymes as a source of energy in the mitochondrion, through β-oxidation. In addition, trafficking of the enzyme to different compartments may change the degree of protonation (cytoplasm neutral and lysosome acidic) or oxidative state [e.g., oxidized (periplasm) or reduced (cytoplasm)] which in turn affects enzyme activity.

Organ specialization

In multicellular eukaryotes, cells in different organs and tissues have different patterns of gene expression and therefore have different sets of enzymes (known as isozymes) available for metabolic reactions. This provides a mechanism for regulating the overall metabolism of the organism. For example, hexokinase, the first enzyme in the glycolysis pathway, has a specialized form called glucokinase expressed in the liver and pancr

Good Luck