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Sohag University
Faculty of Sciences
Department of Botany
Exam Date: Wednesday 31/5/2017

Final Exam of Plant Biochemistry and Virology (302 N)
For 3rd year students of Chemistry/Microbiology Program
Exam Time: 3 hrs. (10 am – 1 pm

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Section I (Plant Biochemistry (Enzymology)) (82.5 marks)

الاجابة بورقة الاجابة وليس فى ورقة الاسئلة ويرجى عدم زيادة حجم الاجابة عن المطلوب واى كتابة زائدة عن المطلوب لن ينظر اليها ، وفى حال اضافة الناقص فى الفراغات يلزم كتابة الكلمة او المعلومة الناقصة فقط ولاتعيد كتابة السؤال كله وترتب بالترتيب الموجود داخل السؤال الواحد ولا تعيد الرسوم او الاشكال بورقة الاجابة - كما يرجى ان تنظم الاجابات بنفس الترتيب والترقيم الذى جاء بورقة الاسئلة بالضبط وفى حال الصح والخطا يوضع رقم السؤال فقط ولايعاد كتابة الجمل ثم وضع العلامة المناسبة. والكتابة بخط واضح

Question # I (12 marks)

A) In a research case, the researcher found that a compound A is the precursor to produce product B. Trying to identify the enzyme responsible for conversion of A to B, this researcher could isolate and purify four enzymes 1, 2 , 3 and 4 and he is not sure which of them is the main enzyme responsible for conversion of A to B.

a. What factor should the researcher determine to identify which of these four enzymes is the one that catalyzes the conversion? **(Only 2 lines)** (3 marks)

b. Explain how the researcher determines that factor? **(not more than 5 lines and a diagram)** (5 marks)

B) Explain how pH change affects enzyme activity? **(Only 5 lines)** (4 marks)

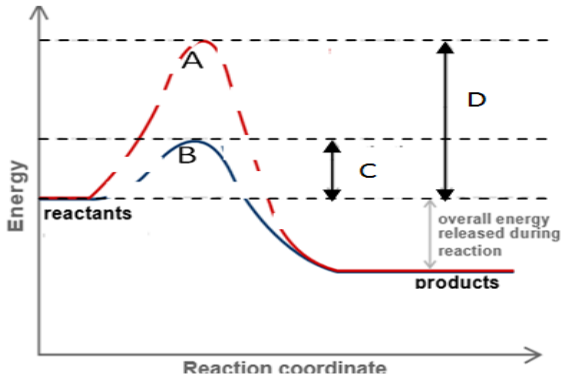
Question # II (46.5 marks – 1.5 for each space)

Examine corresponding figure in each of the following and then add required information

A) Examine the following diagram showing the free energy curves of for nitrogen fixation process in two cases (in case of biological fixation catalyzed by nitrogenase enzyme and in case of industry).

a) The biological N fixation is represented by curve .....B..... (A or B)

b) In one line, write why you choosed A or B?



Because the biological process is catalyzed by Enzyme which nessitates less activation energy to start the reaction

....

c) Arrow C represents activation energy in case of biological N2 fixation while arrow D represents activation energy in case of ....industrial N2 fixation..............

d) Comparing C to D what fact is concluded? Answer in not more than two lines

Enzymes speed up the rate of chemical reactions because they lower the energy of activation, the energy that must be supplied in order for molecules to react with one another.

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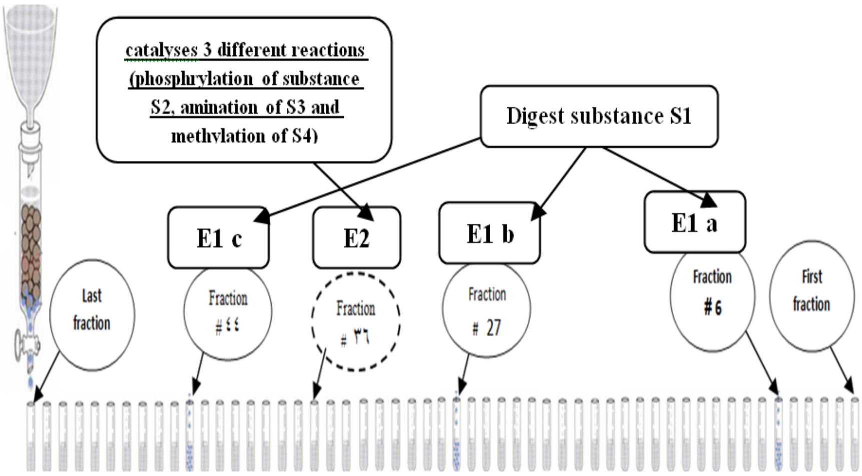
B) This figure represents an experiment to separate and purify an enzyme (E1) which digests a substance (S1). The researcher found that activity of this enzyme (E1) was found in fractions 6, 27 and 44.
He also found that fraction 36 contains another enzyme (E2) that catalyses 3 different reactions (phosphrylation of a substance S2, amination of S3 and methylation of S4)



a) Enzyme copies E1a, E1b and E1c are known as .....Isozymes... because ....they are different in molecular size and separated differently.........

b) Enzyme E2 is called .....Polyzyme........................... because ....it catalyzes several different reactions

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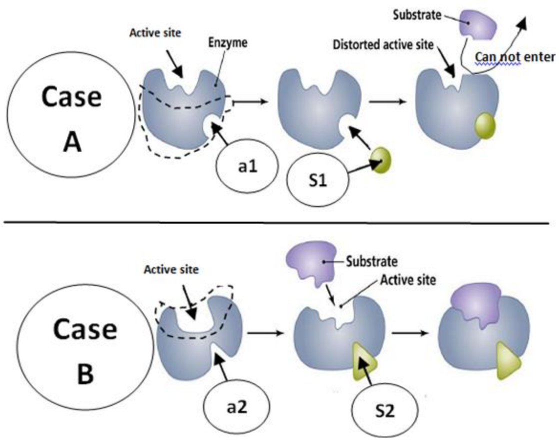
C) The corresponding figure shows how enzyme is affected by foreign substances in its microenvironment.



a. Sites labeled a1 and a2 are called ....Allosteric sites

b. Substances S1 and S2 are called ....Allosteric Effectors

c. Substance S1 is considered ...Inhibitor....... (activator or inhibitor) while S2 is considered ...Activator..... (activator or inhibitor)

d. Catalysis happened in case ....B.............. but did not happen in case ....A......................

e. The portion of the enzyme body encircled by the dashed line in case A is called ... Regulatory part while the portion encircled in case B is called ....Catalytic part.........

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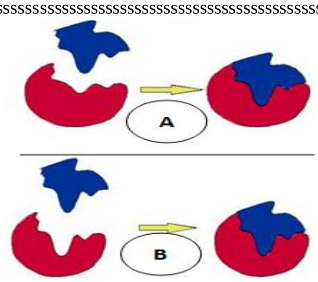

D) Two models were proposed to describe enzyme active site: 1) the first is known as ....Lock and key............. which explained in figure ....B....... states that the active site shape constantly has the same shape of the substrate and pairs only with this substrate 2) the second is known as ... Induced fit.................. which which explained in figure ....A............ states that the enzyme molecule changes shape

as the substrate molecules gets close. The change in shape is 'induced' by the approaching substrate molecule.

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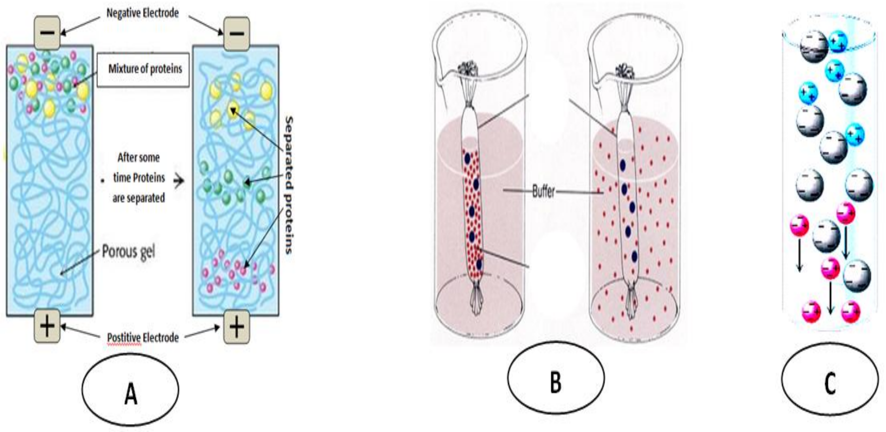
E) The separation method in case **A** is called ..Electrophoresis.. in which proteins are separated on basis of their difference in ......Electric charge..... ... and in case **B** is called ... ..Dialysis.... in which we remove ,....Ions....... .. from proteins mixture but in **C** the method is called ....Ion Exchange......... and is based on difference of proteins in ......Electric charge......



Question # III

(11 marks 1 mark for each space**)**

Complete the missing information:

A) The amount of substrate the enzyme converts per mg protein in the enzyme preparation, per unit of time is known as **......**Specific activity**......** which we determine to measure .Enzyme purity..

B) **Metabolic processes are coordinated and controlled through** .Regulation of enzyme activities

C) **Two types of mechanisms act to regulate enzyme activity:** 1. **coarse control** which determines How many molecules of enzyme protein are present in the cell and **2. fine control which** determines ....the activity of these molecules.................

D) **During enzyme extraction from tissue, no need for mechanical desdtruction of tissue if the enzyme is** ..Exoenzyme.......... **and no need to add detergent in extraction buffer if enzyme is** Not membrane integrated... **but we add exogenous protein like BSA in extraction buffer to** Minimize peffect of proteases

E) Of the forces acting to cause protein folding and to reach the unique functional globular 3-dimentional structure are:

a. Hydrogen Bonding -- Hydrophobic Forces: Hydrophilicity and hydrophobicity
b. Electrostatic Forces -- Van der Waals Forces -- S-S Bridging
c. ....

Question # IV

A) Choose the right answer by **<u>writing the correct choice only in the answer notebook.</u>** **(12 marks)**

1. **Of the methods employed in enzyme purification depending on differences in electric charge (**Fractional Precipitation by titration with an acid or alkali – **dialysis – ultracentrifugation – ultrafiltration)**
2. **Enzymes are (globular proteins - coiled into a very precise 3-dimentional shape - control almost every metabolic reaction in living organisms – all of these choices**)

3. **Metabolism is regulated by all of the following except (controlling the concentration of enzyme - <u>formation of polyenzymes</u> - enzyme compartmentalization - covalent modification of enzymes)**
4. **Enzyme specificity is determined by (<u>apoenzyme</u> - coenzyme – cofactor - prothetic group)**
5. **Of the economic applications based on using enzymes are all of the following except (improving food flavor, odor and color - production of insecticides – production of biocleaners - <u>stell and metal industry</u>)**
6. Which of the following correctly represents the mechanism of enzyme function?

A) S + P -> E-P -> E + P B) E + P -> E-P -> E-S -> E + S C) E + P -> E-S -> E-P -> E + P

D) E + S -> E-S -> E-P -> E + P E) E + S -> E-P -> E-S -> E + S

B) Check TRUE (✓) OR FALSE (X) and <u>if False Rewrite the correct information</u>:

<u>Only write the question number and add correct or wrong label in the answer notebook (14 marks)</u>

1. **Enzyme-catalyzed reaction takes longer time than if non-enzymatic catalyst is used to accomplish the same reaction.**
2. **Enzyme is said to be dimeric enzyme when it has one molecule of Vitamin B in addition to one polypeptide chain.**
3. **Enzyme-catalyzed reaction takes longer time than if non-enzymatic catalyst is used to accomplish the same reaction.**
4. **In medicine, some drugs are used as enzyme inhibitors and some as activators**
5. **Enzymes that catalyze addition or removal of protons (H^+) to a compound belong to the class transferases.**
6. **All enzymes have the <u>same exact values</u> of the minimum, optimum and maximum of pH or temperature.**
7. **The value of specific activity of an enzyme becomes larger as an enzyme preparation becomes more pure.**

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<u>Section II: Virology (82.5 marks)</u>

Answer the following questions :- **(82.5 marks)**

<u>I- Mark the following as true (√) or false (×) and correct the wrong ones?</u> **(20 marks, 1 mark each)**

1. Inclusion bodies can be seen by light microscopy. ( )
2. Less virulent viruses are used in prevention. ( )
3. Most DNA viruses contain a single genome of linear ds DNA. ( )
4. Viroids produce proteins. ( )
5. Capsid is more flexible than envelope. ( )
6. RNA viruses tend to be larger in size than DNA viruses. ( )
7. In complex viruses, the viral particles exhibit simple cubic or helical symmetry. ( )
8. Prions can be transmitted by dried food. ( )
9. Influenza virus antigenic shift results from reassortment of genome segments. ( )
10. Prion is a proteinaceous infectious agent associated with spongiform encephalopathies. ( )
11. Naked viruses are generally stable than enveloped viruses. ( )

12. Capsid participates in attachment of virions to susceptible cells. ( )
13. Some viruses, when exposed to a low pH, will denature spontaneously. ( )
14. Envelope of virus makes the initial contact with host cell. ( )
15. Capsid and envelope responsible for transfer of the viral genetic material from one cell to another. ( )
16. Capsomeres are arranged in regular patterns and their numbers vary in different viruses. ( )
17. Helical symmetry can be seen in RNA viruses. ( )
18. Capsids with icosahedral symmetry are more complex than those with helical symmetry. ( )
19. The virus genome may consist of DNA or RNA, which cannot be circular. ( )
20. Proteins are the major macromolecule of the viral envelope. ( )

II- Choose the correct answer? (20 marks, 2 marks each)

1. The shape of virus is determined by its……
(a) nucleic acid - (b) capsid. - (c) envelope

2. HIV virus is an example of…….
(a) retrovirus - (b) adenovirus - (c) bacteriophage

3. For the host cell, the lytic cycle ends when……..
(a) it replicates - (b) it bursts open - (c) it collapses

4. The receptors to which animal virus attached are……
(a) carbohydrates - (b) lipids - (c) glycoproteins

5. Most RNA viruses assemble the virion within the host cell……..
(a) nucleus - (b) cytoplasm - (c) membrane

6. Prions affect the ……..
(a) respiratory system - (b) lymphatic system - (c) nervous system

7. Bacteriophages tend to have ……..…genomes.
(a) single-stranded RNA - (b) double-stranded DNA - (c) double-stranded RNA

8. Most animal viruses are…….
(a) icosahedral symmetry - (b) helical symmetry - (c) complex symmetry

9. The viral envelope closely resembles the……
(a) prokaryotic cell wall - (b) eukaryotic cell membrane - (c) cytoplasm

10. A simple translation of cytopathic is ……
(a) cell lysis - (b) cell disease - (b) cell cancer

III- Complete the following? (10 marks, 1 mark each)

1. Phage life cycle which does not kill the host cell is called…….
2. Amount of virus required to kill 50% of host cells is called……
3. ……occurs when a virus induces multiple cells to fuse making a large multinucleated cell.
4. ……are changes in cells that can be observed microscopically.
5. The theory of the origins of viruses, which is called the escape theory, proposes that……
6. ……..of mRNA varies depending on the nucleic acid type.
7. ……describes any virus that can lead to cancer.
8. The Influenza virus causes has ……..as its genetic material.

9. Viral carbohydrates are …………cell derived.

10. Herpes viruses acquire their envelope from the………….. membrane.

11. --

IV- Define each of the following? **(12 marks, 3 marks each)**

1-Satellite viruses **2**- Plaque forming unit

3- Latent viruses **4**- Antigenic drift

V- Answer the following? **(20 marks, 5 marks each)**

1- What are the functions of virion proteins?

2- In what sites of host cell can uncoating occur?

3- List at least three differences between viroids and viruses?

4- Describe one technique used for detection of virus replication in cell cultures?

,, Our best wishes ,,

Dr. Ahmed M. Mazen Dr. Abdel Naser Galal