



Elizade University, Ilara Mokin, Ondo State, Nigeria

Faculty of Sciences,

Department of Biological Sciences

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Industrial Microbiology BTH 303

End of Semester I Exam, Feb 17th 2016

Time: Two hours

Maximum Marks: 100

60% weight

Examiner: Professor Dr. Mansi El-Mansi

There are **THREE SECTIONS** in this paper.

- SECTION A: Answer two questions only
- SECTION B: Answer two questions only
- SECTION C: Answer ALL questions (Compulsory)

There are **FIVE** pages in this paper

SECTION A [30 Marks]

Answer TWO questions only

Q1. Answer the following Multiple Choice parts by writing the correct answer in your answer book:

- a. A distinct advantage of the production of human proteins using eukaryotic cells instead of bacterial cells is that
- Eukaryotic cells can grow over a wider range of temperature.
 - Eukaryotic cells can perform post-translational modification processes.
 - It is easier to purify the final product from eukaryotic cells.
 - Eukaryotic cells are not pathogenic.

b. The end products of alcohol fermentation are

- Ethanol and pyruvate.
- Lactic acid and carbon dioxide.
- Ethanol and carbon dioxide.
- Ethanol and lactic acid.

c. If carbohydrates undergo catabolism and the final products are lactic acid, ethanol, and carbon dioxide, what type of fermentation has occurred?

- Homolactic fermentation has occurred.
- Heterolactic fermentation has occurred.
- Alcohol fermentation has occurred.
- Acetone and butanol fermentation has occurred.

d. Which of the following is true of *Agrobacterium tumefaciens*?

- Agrobacterium tumefaciens* infections have no effect on host plants.
- Agrobacterium tumefaciens* plant cells with opines, which are amino acid derivatives.
- Agrobacterium tumefaciens*' Ti plasmid integrates into the host plant DNA.
- Agrobacterium tumefaciens* provide plant cells with VirD1 and VirD2; transcription factor genes.

e. The organism used for the industrial production of citric acid is:

- Penicillin notatum*
- Rhizopus nigrificins*
- Aspergillus niger*
- Lactobacillus delbrueckii*

f. Riboflavin is a by-product of which fermentation that is carried out by *Clostridium* spp:

- i. Citric acid
- ii. Acetone butanol
- iii. Streptomycin
- iv. Ethanol

g. The commonly used medium for submerged industrial fermentation is:

- i. Beet molasses
- ii. Liver extract
- iii. Germinated seeds
- iv. None of the above

h. Which of the following microorganisms produces only L (+) - lactic acid without further racemization? Is it:

- i. *Leuconostoc mesenteroides*
- ii. *Lactobacillus delbrueckii*
- iii. *Rhizopus oryzae*
- iv. *Lactobacillus bulgaricus*

i. Penicillin G is also known as:

- i. Hydroxybenzyl penicillin
- ii. Phenoxy methyl penicillin
- iii. *Benzyl penicillin*
- iv. 2-Pentenyl penicillin

j. β -Carotene is also known as:

- i. Vitamin A
- ii. Provitamin A
- iii. Vitamin C
- iv. Vitamin D

Q2. Compare and contrast between batch culture and continuous culture fermentations with respect to the following:

- i. Suitability for primary and secondary metabolites production
- ii. Risk of Contamination
- iii. Downstream processing
- iv. Fermentor down time
- v. Selective pressure for mutant generation

Q3. Answer the following parts:

A. Compare and contrast among the following phases during the course of penicillin production by *Penicillium chrysogenum* in batch culture:

- i. Idiophase
- ii. Trophophase
- iii. Senescence

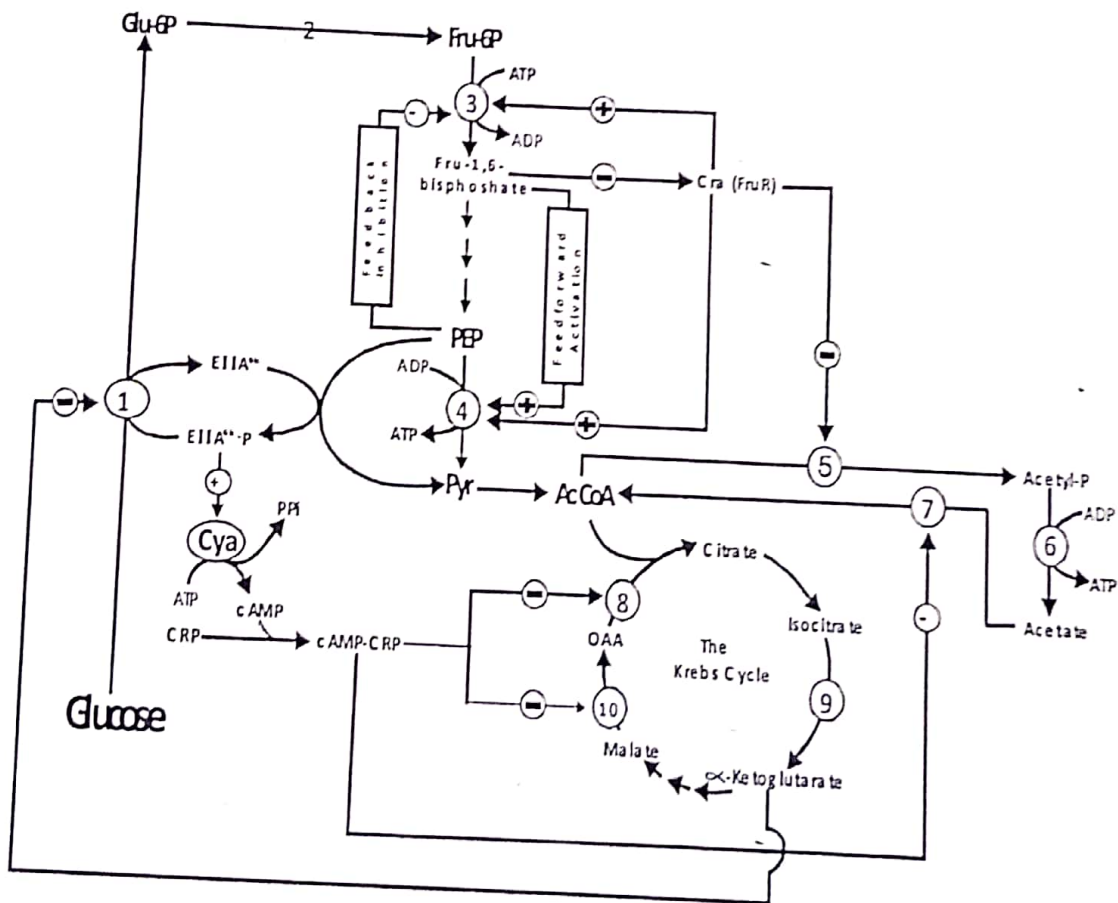
B. What are the consequences of the following on alcohol fermentation by the yeast *Saccharomyces cerevisiae*?

- i. Growing the yeast on a Zinc-free medium.
- ii. Growing the yeast on inorganic phosphate-free medium.
- iii. If NAD^+ runs out.

SECTION B

[30 Marks] Answer TWO questions only

Q4. With the aid of the following diagrammatic representation, describe how flux through central of microorganisms is coordinated to ensure unidirectional flow of carbon from carbon source to biomass and products formation.



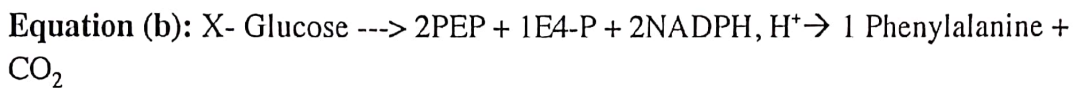
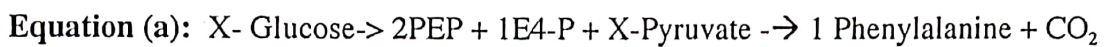
- Q5. With the aid of diagrammatic representation describe the following:
- i. The technique of microinjection into the germ line in the creation of transgenics.
 - ii. How one might create a transgenic fish carrying hormone growth factor.

Q6. Describe the down stream processing employed for the recovery of Green Fluorescence Protein (GFP) from recombinant *E. coli* culture following industrial production.

SECTION C [40 Marks] Answer ALL QUESTIONS (COMPULSARY)

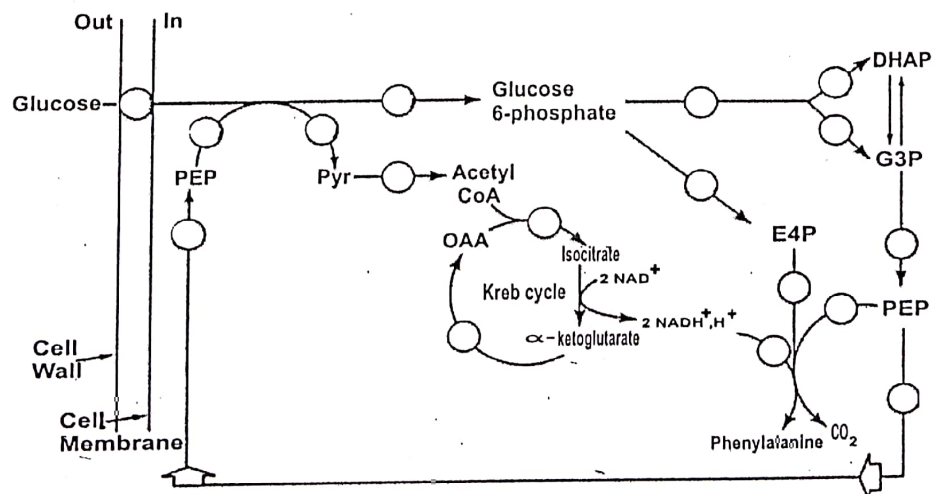
Q7. A product called *Turbo Yeast* is available for home brewers. It consists of freeze-dried yeast cells and a mixture of nutrients, which when mixed it gives a medium containing 90 grams of sucrose/L. The manufacturer claims that yeast will ferment sucrose to 14% ethanol overnight or to 20% ethanol after 48hrs. Armed with your knowledge of the glycolytic pathway of central metabolism of yeast, critically appraise whether this claim is stoichiometrically justifiable or not; giving a detailed account of your reasons.

Q8. The following stoichiometric reaction equations were given for the industrial fermentation of glucose and its subsequent conversion to phenylalanine by *Escherichia coli*.



With the aid of the following diagram, compare and contrast between the two equations with respect to the following points:

- i. Stoichiometric balance
- ii. Efficiency of glucose conversion to phenylalanine.
- iii. The need for expression of other enzymes to balance the stoichiometry of the reaction.



END OF QUESTIONS