**PRACTICAL LESSON 5**

**WATER-SOLUBLE AND LIPID-SOLUBLE VITAMINS. VITAMINS AS COFACTORS**

**The purposes of the lesson**:

1. to learn general characteristics of vitamins.

2. to compare two types of vitamins: water-soluble and lipid-soluble

3. to obtain knowledge about vitamins as cofactors

**Necessary initial level**

**To know:**

1. chemical nature and structure of enzymes. Holo-enzymes. Structure. Classification of the cofactors. Apo-enzymes, co-enzymes, prosthetic groups

2. properties and functions apo-enzymes and cofactors

3. nomenclature and classification of enzymes

4. active center of enzymes. Structure and properties

5. mechanism of enzyme action

**Key words**: vitamins, general characteristics of the vitamins, nomenclature and classification of vitamins, water-soluble and lipid-soluble vitamins, vitamin deficient states, vitamins as cofactors.

**Content of lesson:**

1. Written control.

2. Recitation.

**QUESTIONS FOR PREPARATION FOR LESSON:**

1. Vitamins. General characteristics of the vitamins.

2. Nomenclature and classification of vitamins (see *Appendix I*).

3. Comparison of two types of vitamins: water-soluble and fat- soluble.

4. Vitamin**-**deficient states (diseases).

\*5. Vitamins as cofactors. Vitamin B1. Biological functions. Clinical manifestations of thiamin deficiency.

\*6. Vitamin B2. Structure of Riboflavin. Biological functions.

7. FAD and FMN. Structure and functions. Clinical manifestations of riboflavin deficiency.

\*8. Vitamin B3. Structure of Niacin. Biological functions.

9. NAD+ and NADP+. Structure and functions. Clinical manifestations of niacin deficiency.

\*10. Vitamin B6. Biological functions. Clinical manifestations of pyridoxine deficiency.

**QUESTIONS FOR WRITTEN CONTROL:**

1. Write classification and nomenclature of the vitamins

2. Compare two types of vitamins: water-soluble and lipid-soluble

3. Name biological function of Thiamin

4. Name clinical manifestations of thiamin deficiency.

5. Draw structure of Riboflavin and its cofactor forms: FMN and FAD.

6. Name FMN-dependent and FAD- dependent enzymes.

7. Draw structure of Niacin and its cofactor forms: NAD+ and NADP+.

8. Name NAD+ -dependent and NADP+- dependent enzymes.

9. Name NADP- generating and NADPH- utilizing reactions.

10. Call biological functions and clinical manifestations of pyridoxine deficiency.

**TEST CONTROL**

See Appendix II

**RECOMMENDED BIBLIOGRAPHY**

**a) Compulsory**:

1. Lectures.

2. DM Vasudevan, Sreekumari S, Kannan Vaidyanathan. (2014) *Textbook of biochemistry for medical students.*7th edn. Jaypee Brothers Medical Publishers (P) Ltd.

**b) Supplementary**:

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3. Lehninger A., David L. Nelson, Michael M. Cox. (2008) *Lehninger Principles of Biochemistry*. 5th edn. W.H.Freeman and company, New York.

4. Mary K. Campbell, Shawn O. Farrell Biochemistry. (2012*) Biochemistry*. 7th edn. Brooks/Cole, Cengage Learning.

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7. Robert K. Murray, David A Bender, Kathleen M. Botham, Peter J. Kennelly, Victor W. Rodwell, P. Anthony Weil. (2009) *Harper's Illustrated Biochemistry*. 28th edn. The McGraw-Hill Companies, Inc.