Reg. No.										

MANIPAL UNIVERSITY

MBBS PHASE I STAGE I DEGREE EXAMINATION – AUGUST 2014

SUBJECT: BIOCHEMISTRY – I (ESSAY)

Wednesday, August 20, 2014

Time: 09:00 – 11:00 Hrs. Max. Marks: 60

1. Describe the general structure of a proteoglycan aggregate with the help of a diagram. List any TWO glycosaminoglycans present in them and state their function.

(4 marks)

2. Define isoenzymes and add a note on their clinical utility taking the example of any ONE enzyme.

(3 marks)

3. Explain the oxidation of acetyl CoA in the TCA cycle. Justify the amphibolic role of this metabolic cycle.

(8 marks)

4. A 45 year old overweight, busy executive noticed that he had been feeling uneasy when climbing the stairs. The following day, he collapsed with chest pain during a board meeting. He was rushed to the emergency and put on oxygen. An abnormal cardiac rhythm showed up on his ECG. His angiogram showed a block in the right coronary artery. Lab investigations revealed the following:

Total cholesterol - 310 mg/dL
Triglycerides - 240 mg/dL
HDL - 25mg/dL
LDL cholesterol - 210mg/dL
Blood glucose (random) - 122 mg/dL
Troponin I - highly elevated
Creatine kinase MB - highly elevated

4A. What is your diagnosis?

4B. Describe the metabolism of the lipoprotein which plays a major role in precipitating this condition.

4C. List THREE measures which are helpful in reducing the onset of this condition.

(½+4+1½ = 6 marks)

5. **Write short notes on:**

5A. Carnitine shuttle

5B. Basal metabolic rate

5C. Mutual supplementation of proteins

(2+3+3 = 8 marks)

6. Justify the following giving reasons:

6A. Night blindness is seen in vitamin A deficiency

6B. Vitamin C deficiency causes bleeding gums

6C. Megaloblastic anemia is a feature of B_{12} deficiency

6D. Methemoglobin is unable to bind oxygen

(2 marks × 4 = 8 marks)

7. A six year old boy was brought to the hospital with complaints of swelling and pain in the distal phalangeal joints. Hepatomegaly was evident on physical examination. Liver biopsy revealed high glycogen content with normal structure. Lab investigations showed the following:

Fasting blood glucose - 35 mg%
Blood urea - 20 mg%
Blood uric acid - 55 mg%
Blood lactate and ketone bodies - increased

7A. What is your diagnosis?

7B. Give the biochemical basis for the changes in blood parameters.

(½+4½ = 5 marks)

8. With the help of the Henderson-Hasselbalch equation explain how compensatory mechanisms stabilise pH in respiratory acidosis and metabolic acidosis.

(4 marks)

9. Explain the factors that regulate blood calcium levels.

(5 marks)

10. Draw the structure of the replication fork and explain the process of chain elongation in prokaryotes.

(6 marks)

11. Explain the clinical and biochemical findings in Wilson's disease.

(3 marks)

Reg. No.										

MANIPAL UNIVERSITY

MBBS PHASE I STAGE I DEGREE EXAMINATION – AUGUST 2014

SUBJECT: BIOCHEMISTRY – II (MCQs)

Wednesday, August 20, 2014

Time: 11:30 – 12:30 Hrs. Max. Marks: 120

INSTRUCTIONS

1. For each statement, select **T** (True) or **F** (False) as your choice.

2. Indicate your choice by darkening the appropriate circle in the answer sheet provided.

3. Use only HB or 2B pencils to darken the circle.

4. Leave blank for Don't Know response.

5. Scoring systems is as follows:

For every **Correct** response	**1** mark is awarded
For every **Wrong** response	**0.5** mark is deducted
For every **Don't Know** response	**No** mark is deducted

6. Indicate your roll number (Registration Number) clearly and correctly.

7. Do not write anything in the question paper.

8. The true/false statements are numbered 101 to 160 and 201 to 260 (Total 120 statements).

9. This question paper contains **04 pages**. Please make sure that the question paper provided to you has all the pages.

Amino acid/s

101. Tyrosine is essential
102. Lysine in collagen is post-translationally modified
103. Histidine acts as a buffer at physiological pH
104. Glutamic acid has two carboxyl groups

Phosphatidylcholine

105. Is a derived lipid
106. Contains sphingosine
107. Is a major component of lung surfactant
108. Is a precursor for second messenger

Regarding enzyme kinetics

109. Km represents substrate concentration at half maximal velocity
110. Vmax increases in the presence of a competitive inhibitor
111. Km is represented by an intercept on the Y-axis in the Lineweaver-Burk plot
112. In the presence of a noncompetitive inhibitor Vmax remains constant

In the following pairs, the electrophoretic patterns correctly match with their clinical conditions

113. Thin albumin band: Liver cirrhosis
114. β - γ bridging: Nephrotic syndrome
115. M band: Multiple myeloma
116. Thick α2 -globulin band: Sickle cell anemia

Heme synthesis

117. Is regulated by lead
118. Requires vitamin B_6 derived cofactor
119. Is induced by barbiturates
120. Is compartmentalized between cytosol and mitochondria

Fructose 2, 6- bisphosphate

121. Inhibits glycolysis
122. Concentration increases in the presence of insulin
123. Is produced by the activity of PFK-1
124. Is a bifunctional allosteric effector

The non-oxidative phase of the HMP shunt pathway

125. Produces intermediates which are metabolised in glycolysis
126. Requires pyridoxal phosphate
127. Produces NADPH
128. Contributes to nucleic acid synthesis

In the electron transport chain

129. The components are arranged in the increasing order of their redox potential
130. FAD- dependent enzymes transfer their reducing equivalents to complex I
131. Ubiquinone works as a mobile electron carrier
132. Cyanide inhibits complex III

High density lipoprotein

133. Contains more TAG than chylomicrons
134. Contains ApoB-48
135. Is involved in reverse cholesterol transport
136. Donates Apo C-II to nascent VLDL

Cholesterol synthesis

137. Requires enzymes of the endoplasmic reticulum
138. Occurs in the adrenal cortex
139. Is regulated by HMG CoA reductase
140. Is decreased by glucagon

Acetyl CoA carboxylase

141. Is active in the dephosphorylated form
142. Converts acetyl CoA to malonyl CoA
143. Is activated by citrate
144. Is highly active in the fasting state

β- oxidation

145. Is defective in Refsum's disease
146. Produces NADPH
147. Takes place in peroxisomes
148. Of stearic acid gives more energy than that of palmitic acid

Thiamine pyrophosphate is the coenzyme for the following

149. Pyruvate dehydrogenase complex
150. Transketolase
151. Glycogen synthase
152. Succinate dehydrogenase

Folic acid

153. Occurs in high concentration in green leafy vegetables
154. Deficiency causes spina bifida
155. Is trapped as methyl THF in B_{12} deficiency
156. Is involved in one carbon transfer reactions

Biochemical findings in obstructive jaundice include

157. Markedly high levels of unconjugated bilirubin
158. Slight elevation of transaminases
159. Highly elevated alkaline phosphatase
160. Prolonged prothrombin time

Gluconeogenesis from

201. Lactate requires coenzyme form of niacin
202. Propionyl CoA requires deoxyadenosyl cobalamine
203. Pyruvate requires biotin
204. Acetyl CoA occurs in kidney

In the following pairs, the enzymes correctly match the bonds they cleave

205. Trypsin: Peptide bonds with carbonyl group contributed by aromatic amino acids
206. Sucrase: $\alpha(1\rightarrow4)$ glycosidic bond
207. Salivary amylase: $\alpha(1\rightarrow6)$ glycosidic bond
208. Pancreatic lipase: Ester bond at first position in triacylglycerol

Bile acid/s

209. Are derivatives of cholesterol
210. Synthesis requires vitamin C
211. Chenodeoxycholic acid is formed from cholic acid
212. Conjugation requires lysine

Regarding the functions of minerals in the body

213. Molybdenum is required for purine metabolism
214. Copper helps in cross-linking during collagen synthesis
215. Iron binds to oxygen in myoglobin
216. Selenium has an antioxidant action

Anion gap

217. Is the difference in concentration between the measured cations and anions
218. Is normally 20-25 mEq/L
219. Is increased in diabetic ketoacidosis
220. Remains unchanged in diarrhoea

The following biochemical parameters correctly match with their normal levels in blood

221. Calcium: 5-7 mg/dL
222. Sodium: 3.5-5.5 mEq/L
223. Uric acid: 13-18 mg/dL
224. Fasting glucose: 60-100 mg/dL

Glycogen phosphorylase

225. Removes glucose from glycogen as glucose 6-phosphate
226. Has pyridoxal phosphate as a prosthetic group
227. Cleaves $\alpha(1\rightarrow6)$ linkages
228. Deficiency in liver causes McArdle's disease

Ketone bodies

229. Are produced in the mitochondria
230. When in excess cause metabolic alkalosis
231. Require thiophorase for their catabolism
232. Are utilised by liver

Dopamine

233. Is an excitatory neurotransmitter
234. Is synthesised from dihydroxyphenylalanine
235. Synthesis requires vitamin C
236. Synthesis is defective in Parkinson's disease

Transamination of amino acid/s

237. Produces essential amino acids
238. Is reversible
239. Requires NADH + H^+
240. Releases ammonia

Carbamoyl phosphate synthetase - I

241. Is found in the mitochondria
242. Is involved in pyrimidine synthesis
243. Is activated by N-acetyl glutamate
244. Deficiency causes hyperammonemia type II

Formation of purine ring requires

245. Glycine
246. N^5N^{10} methyl tetrahydrofolate
247. Glutamate
248. Histidine

Among tumor markers from serum

249. CA125 is specific for prostatic carcinoma
250. Alkaline phosphatase is increased in bone malignancy
251. Carcinoembryonic antigen is elevated in liver cancer
252. β- hCG is raised in choriocarcinoma

Regarding prokaryotic transcription

253. Promoter region is recognised by sigma factor
254. RNA polymerase requires a primer
255. Requires dNTPs
256. Termination requires rho factor

Posttranscriptional modifications of RNA include

257. Removal of introns
258. Attachment of 7-methyl-guanosine triphosphate cap to the 5'-end
259. Addition of a poly -U tail
260. Addition of ACC sequence to 5'-terminal