[MBBS 0221] **FEBRUARY 2021** **Sub.Code :6056**

M.B.B.S. DEGREE EXAMINATION
FIRST YEAR
PAPER II – BIOCHEMISTRY

Q.P. Code: 526056

Time: Three hours **Maximum: 100 Marks (80 Theory + 20MCQs)**

Answer All Questions

I. Essay: **(2 x 15 = 30)**

1. What is the normal pH of blood? Discuss how the pH of blood is maintained.
2. Discuss the metabolism of Phenylalanine. Write a note on the inborn error associated with Phenylalanine.

II. Write notes on: **(10 x 5 = 50)**

1. Compounds derived from Glycine and their functions.
2. Hyperammonemias.
3. Copper metabolism and its applied aspects.
4. Telomerase and its application.
5. Lesch-Nyhan syndrome.
6. Inhibitors of Purine nucleotide biosynthesis.
7. Metabolic Acidosis.
8. Absorption of dietary Iron.
9. Biochemical features of Cancer cells.
10. Conjugation reactions in Xenobiotics.

[MBBS 0821] AUGUST 2021 **Sub.Code :6056**

MAY 2021 SUPPLEMENTRY

M.B.B.S. DEGREE EXAMINATION
FIRST YEAR
PAPER II – BIOCHEMISTRY

Q.P. Code: 526056

Time: Three hours **Maximum : 100 Marks (80 Theory + 20MCQS)**

Answer All Questions

I. Essay: **(2 x 15 = 30)**

1. Describe the process of replication in Prokaryotes? Add a note on inhibitors of DNA Replication?
2. Explain the catabolic pathways of Tyrosine and disorders associated with Tyrosine metabolism?

II. Write notes on: **(10 x 5 = 50)**

1. Brief the functions and diagnostic importance of plasma proteins present in the beta region of electrophoretic pattern?
2. Mention the causes, signs, symptoms and treatment of Hypokalemia?
3. Explain the precipitation reactions of protein?
4. Describe the DNA repair mechanisms with suitable clinical examples?
5. Explain the role of Kidney in regulation of pH?
6. Mention the sources, recommended dietary allowance, function and deficiency manifestation of Copper.
7. Brief the causes, symptoms and treatment of Gout?
8. Applications of DNA recombinant technology.
9. Brief the in vitro thyroid function tests.
10. Explain the cellular signaling and defense mechanism of free radicals?

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[MBBS 0222] FEBRUARY 2022 **Sub.Code : 6056**

M.B.B.S. DEGREE EXAMINATION

(For the candidates admitted from the Academic Year 2019-2020)

FIRST YEAR

PAPER II – BIOCHEMISTRY

Q.P. Code: 526056

Time: Three hours **Maximum : 100 Marks (80 Theory + 20MCQs)**

Answer All Questions

I. Essay: **(2 x 15 = 30)**

1. Write an essay on Recombinant DNA technology. What are the important applications of the technique ?

2. Enumerate liver function tests with their clinical significance.

II. Write notes on: **(10 x 5 = 50)**

1. Potassium.
2. Blotting techniques.
3. Tumour markers.
4. Role of kidney in the regulation of pH.
5. Albumin.
6. Gout.
7. Nitric oxide.
8. Branched chain amino acids.
9. Hypocalcemia.
10. Post translational modification.

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[MBBS 0522] **MAY 2022** **Sub. Code :6056**

M.B.B.S. DEGREE EXAMINATION

(For the candidates admitted from the Academic Year 2019-2020)

FIRST YEAR – SUPPLEMENTARY (CBME)

PAPER II – BIOCHEMISTRY

Q.P. Code: 526056

Time: Three hours **Maximum : 100 Marks (80 Theory + 20MCQs)**

Answer All Questions

I. Essay: **(2 x 15 = 30)**

1. Describe the phases of activation, initiation, elongation and termination of biosynthesis of protein. Add a note on its inhibitors.

2. Describe in detail about Thyroid function tests.

II. Write notes on: **(10 x 5 = 50)**

1. Respiratory acidosis.
2. Creatinine clearance test.
3. Fluorosis.
4. Primary structure of protein.
5. ELISA.
6. Transmethylation reaction.
7. Glutamine.
8. Collagen.
9. Hyponatremia.
10. Post transcriptional modification.

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THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[MBBS 0123] JANUARY 2023 Sub. Code : 6056

M.B.B.S. DEGREE EXAMINATION
(For the candidates admitted from the Academic Year 2019-2020)
FIRST YEAR – (CBME)
PAPER II – BIOCHEMISTRY
Q.P. Code: 526056

Time: Three hours **Maximum : 100 Marks (80 Theory + 20MCQs)**

Answer All Questions

I. Essay: **(2 x 15 = 30)**

1. Write in detail about the initiation, elongation and termination of transcription. Give an account of post transcriptional processing.
2. A 40 year old woman complains of tiredness and appears pale. She is experiencing a heavy and prolonged menstrual flow. Blood investigation shows decreased haemoglobin and microcytic hypochromic Red Blood Cells.
   a) What are the causes of Anaemia?
   b) Describe in detail about Iron homeostasis.
   c) How will you diagnose and treat Iron deficiency?

II. Write notes on: **(10 x 5 = 50)**

1. Synthesis and mechanism of action of Nitric Oxide.
2. Homocystinurias.
3. Hyperuricemias.
4. Normal Anion gap and High Anion gap metabolic acidosis.
5. Phase Two detoxification.
6. Special products formed from Glycine.
7. A 24 year old physiotherapist consulted his general practioner because of excessive sweating and was also concerned that his eyes seemed to have become more prominent and that he had lost weight recently although his appetite was normal. He also complained of palpitation. On examination, his doctor observed that his pulse rate was 100 / min at rest and that he had a slightly enlarged thyroid gland. Serum TSH: < 0.1 mIU/ mL (0.3 – 5 μIU/mL), Free T_4:3.2 ng/ dL (0.8 – 2.7 ng/dL) Free T_3: 880 pg/ dL (210- 440 pg/dL).
   a) What is your diagnosis? Justify.
   b) What is the cause of tachycardia in this condition?
   c) What is the explanation for the eye prominence in this condition?
8. Electrophoresis.
9. Antioxidants.
10. A 42 year old male was diagnosed with poorly differentiated adenocarcinoma. A family counselling revealed that the proband had five family members with colorectal cancer diagnosed before 45 years of age. Hence all family members were counselled that this would have been caused by a defect of DNA repair and that all family members older than 25 years should undergo regular colonoscopic examination.
    a) What are the different DNA repair mechanisms? Which repair defect causes Hereditary Non polyposis Colon Cancer (HNPCC)? Describe in detail about the repair mechanism.

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THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[MBBS 0323] MARCH 2023 Sub. Code : 6056

M.B.B.S. DEGREE EXAMINATION
(For the candidates admitted from the Academic Year 2019-2020)

FIRST YEAR – SUPPLEMEENTARY (CBME)
PAPER II – BIOCHEMISTRY

Q.P. Code: 526056

Time: Three hours **Maximum : 100 Marks (80 Theory + 20MCQs)**

Answer All Questions

I. Essay: **(2 x 15 = 30)**

1. A 6 year old boy presents with periodic aggressive behaviour. His urinary ALA is elevated. On examination, he is icteric. A mild hepatomegaly is observed. Blood examination revealed massive elevation of AFP. HPLC and Tandem Mass Spectrometry examination revealed elevation of succinylacetone. A diagnosis of Type I Tyrosinemia is made.
   a) What is the most probable enzyme defect? And why does he present with elevation of ALA and neuropsychiatric manifestation?
   b) Describe in detail all tyrosine metabolism disorders.
   c) Add a note on special products formed from Tyrosine.

2. What is cloning? Mention the various types of cloning.
   Describe in detail the steps involved and tools required in recombinant DNA technology.

II. Write notes on: **(10 x 5 = 50)**

1. Purine salvage pathway.
2. Explain the role of lungs in acid base homeostasis
3. A 5 year old boy brought to the hospital with complaints of mental retardation, hypopigmented patches all over the body and mousy odour of urine. On examination his eyes were blue. What is the most probable diagnosis and What is the defective enzyme? Explain the biochemical basis of the clinical features seen in this boy.
4. Serum protein electrophoresis.
5. Cell cycle.
6. Role of Parathormone in Calcium, Phosphate homeostasis.
7. Define Xenobiotics and add a note on the various detoxification reactions.
8. Mutation.
9. Secondary structure of protein.
10. A patient had seizures and usually appeared weak, tired and showed deposition of brown coloured ring in the descemets layer of the cornea and hepatomegaly was noted.
    a) Name the disorder.
    b) Which mineral metabolism is deranged?
    c) What is the biochemical defect?
    d) Mention the functional role of concerned mineral.

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THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[MBBS 1123] **NOVEMBER 2023** **Sub. Code : 6056**

M.B.B.S. DEGREE EXAMINATION
(For the candidates admitted from the Academic Year 2019-2020)

FIRST YEAR – (CBME)
PAPER II – BIOCHEMISTRY

Q.P. Code: 526056

Time: Three hours **Maximum : 100 Marks (80 Theory + 20MCQs)**

Answer All Questions

I. Essay: **(2 x 15 = 30)**

1. Give the salient features of Electrophoresis. What are the abnormalities that you could detect in Serum Electrophoresis?

2. Explain the Operon concept of regulation of Genetic expression. Mention the differences in Eukaryotic cells.

II. Write notes on: **(10 x 5 = 50)**

1. PCR.
2. Secondary structure of protein.
3. Alanine.
4. Causes and deficiency manifestation of Iron.
5. Homocystinuria.
6. Histidine.
7. Amylase.
8. Metabolic alkalosis.
9. DNA repair mechanism.
10. Genetic code.

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THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[MBBS 0124] JANUARY 2024 Sub. Code : 6056

M.B.B.S. DEGREE EXAMINATION
(For the candidates admitted from the Academic Year 2019-2020)

FIRST YEAR – SUPPLEMENTARY (CBME)
PAPER II – BIOCHEMISTRY

Q.P. Code: 526056

Time: Three hours **Maximum : 100 Marks (80 Theory + 20MCQs)**

Answer All Questions

I. Essay: **(2 x 15 = 30)**

1. A 32-year-old woman presents with vomiting and diarrhoea. Evaluation revealed acidosis. ABG analysis revealed that she presents with normal anion gap metabolic acidosis.
   a) What are plasma and urinary buffers?
   b) Which is the major plasma buffer? Why?
   c) What is anion gap?
   d) What is the clinical significance of anion gap?
   e) Why does diarrhoea present with acidosis?
   f) Why is the anion gap normal in this condition?

2. A known case of Decompensated Liver Disease (DCLD) presents with sleep disturbances and confusion. He is diagnosed with hepatic encephalopathy due to hyperammonemia.
   a) Why does DCLD cause hyperammonemia?
   b) Why does hyperammonemia cause encephalopathy?
   c) What are the non-toxic forms of ammonia?
   d) What are the causes of primary hyperammonemia?
   e) Describe in detail the biochemical steps in the formation of Ammonia.

II. Write notes on: **(10 x 5 = 50)**

1. A 65 year old man presents with back pain. On examination he is found to have multiple lytic lesions in the spine. A serum protein electrophoresis (EPP) was performed, which revealed a diagnosis of Multiple Myeloma.
   a) What is the pH of the buffer used for serum protein electrophoresis? Why?
   b) What is the band observed in serum protein electrophoresis in Multiple Myeloma? Describe.
   c) Describe the EPP pattern observed in Nephrotic syndrome.

2. The proband was a 40-year-old male was diagnosed with poorly differentiated adenocarcinoma. A family counseling revealed that the proband had five family members with colorectal cancer diagnosed before 45 years of age. As Hereditary Non Polyposis Colon Cancer (HNPCC) is suspected, all family members were counselled that this caused by a defect of DNA repair and that all family members older than 25 years should undergo regular colonoscopic examination.
   a) What are the errors that can happen in a DNA?
   b) Which is the most common error in a DNA?
   c) Which repair defect causes HNPCC?
   d) Describe in detail about the repair mechanism causative of HNPCC.

3. STATEMENT 1 : More than one codon can code for a single aminoacid.
   STATEMENT 2 : More than one aminoacids can be coded by a single codon.
   a) Which statement is true?
   b) Mention the property of genetic code, that is applicable to the true statement.
   c) What is wobble phenomenon? Explain with an example.
   d) Mention all the properties of genetic code.

4. A 11 year old boy is diagnosed with Type 1 diabetes. He was prescribed Human Biosynthetic Insulin (BHI).
   a) Mention the technology used for the synthesis of BHI.
   b) Mention the tools required for the technology.
   c) What is cDNA? How is it synthesized?

5. A 17 year old girl is diagnosed with iron deficiency anemia. She is a vegetarian and hence her nutritionist suggests her mom that her greens be given the tangy flavor using lime instead of tomato.
   a) How is heme iron absorbed along the apical side of intestine?
   b) How is non heme iron absorbed along the apical side of intestine?
   c) What is the rationale behind adding lime to greens?
   d) Describe in detail the basolateral side transport of iron.

6. A 56-year-old man, a known hypertensive presented to his family doctor with loss of appetite, weight loss, generalized weakness and lethargy of six months duration. A blood sample was taken for analysis.

   Serum : Sodium 130 mmol/L
   Potassium 5.2 mmol/L
   Bicarbonate 16 mmol/L
   Urea 258 mg/dL
   Creatinine 7.1 mg/dL
   Calcium 7.2 mg/dL
   Phosphate 8.6 mg /dL
   Albumin 2.8g /dL
   Alkaline phosphatase 205 U/L

   A diagnosis of chronic kidney disease was made
   a) Interpret serum calcium and substantiate the change observed in chronic kidney disease.
   b) Interpret and reason out potassium level alteration observed in the condition.
   c) What is the expected change in Parathormone levels in this patient? Why?

7. A 6 year old boy presents with periodic aggressive behavior. His urinary ALA is elevated. On examination, he is icteric. A mild hepatomegaly is observed. Blood examination revealed massive elevation of AFP. HPLC and TMS examination revealed elevation of succinylacetone. A diagnosis of Type I Tyrosinemia is made.
   a) What is the most probable enzyme defect?
   b) Why does he present with elevation of ALA and neuropsychiatric manifestation?
   c) Mention other Tyrosine metabolism disorders and mention the respective enzyme defects.

8. A 55-year-old person was diagnosed with Type 2 diabetes. The diabetologist asked him to get HbA1C estimated. His HbA1C was reported with a special mention that there was an abnormal migration of the hemoglobin in electrophoresis. His SpO2 was normal.
    a) What type of mutation is this?
    b) Classify mutation based on effects of mutation on nucleotide sequence, aminoacid sequence and function of protein.
    c) Give suitable examples.

9. An 8 months old male child was referred with severe transfusion dependent anemia. Complete Blood Count (CBC) showed microcytic hypochromic anemia. In view of clinical suspicion of Thalassemia major, HPLC for Hb Variant detection was performed, which revealed, HbF-23% (very high).
    a) What are the differences between Fetal hemoglobin (HbF) and adult hemoglobin (HbA)?
    b) Draw the Oxyhemoglobin Dissociation curve of HbA and HbF in a single graph.
    c) Why does fetal hemoglobin shift the oxyhemoglobin dissociation curve?

10. A 72-year-old woman from a nursing home presents to the emergency department with a change in her mental state over the past few hours. She has a medical history of hypertension and is on diuretics. Her serum sodium was 110mEq/L and serum Osmolality was 278mmol/L. On physical examination, she has decreased skin turgor, orthostatic hypotension and disorientation to time, place and person without focal neurologic deficits.
    a) What is the normal serum Sodium and Serum Osmolality?
    b) Interpret and comment on her serum sodium levels and serum Osmolatity.
    c) What are the types of Hyponatremia and give examples?
    d) Which types of Hyponatremia has the 72 year old woman presented with?

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[MBBS 0124]

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[MBBS 08234 AUGUST 2024 Sub. Code : 6056

M.B.B.S. DEGREE EXAMINATION

(For the candidates admitted from the Academic Year 2020 -2021 Onwards)

FIRST YEAR – (CBME)

PAPER II – BIOCHEMISTRY

Q.P. Code: 526056

Time: Three hours Maximum : 100 Marks (80 Theory + 20MCQs)

Answer All Questions

I. Essay: (2 x 15 = 30)

1. Briefly explain the Glomerular function tests of the Kidney with suitable clinical applications. Add a note on Immunological tests in renal disease.

2. An adolescent girl presents with subluxation of lens and mental retardation. On Examination, she is tall, thin and with elongated limbs. One of her sisters has similar complaints. Her Serum Homocysteine level is 1500 µmol/L.
   a) What is the probable diagnosis?
   b) What are the causes and types of that illness?
   c) What are the Lab Investigations?

II. Write notes on: (10 x 5 = 50)

1. Markers of Obstructive Liver Disease.
2. Microalbuminuria.
3. Respiratory Regulation of Plasma pH.
4. Generation of Free Radicals in our body.
5. Precipitation of Proteins.
6. Alkaptonuria.
7. Orotic Aciduria.
8. Cell Cycle.
9. Brief the products derived from Glycine.
10. Reverse Transcriptase PCR.

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THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[MBBS 0924] **SEPTEMBER 2024** **Sub. Code : 6056**

M.B.B.S. DEGREE EXAMINATION

(For the candidates admitted from the Academic Year 2020 -2021 Onwards)

FIRST PROFESSIONAL – (CBME) - SUPPLEMENTARY

PAPER II – BIOCHEMISTRY

Q.P. Code: 526056

Time: Three hours **Maximum : 100 Marks (80 Theory + 20MCQs)**

Answer All Questions

I. Essay: **(2 x 15 = 30)**

1. Explain how mRNA synthesized in the cytoplasm is translated into a protein with suitable diagram? Add a note on Post translational modification.
2. Explain how Phenylalanine is both a ketogenic and glucogenic amino acid. Add a note on inborn errors associated with Phenylalanine.

II. Write notes on: **(10 x 5 = 50)**

1. Write a note on the following:
   a) Hartnup's disease.
   b) Secondary orotic aciduria.
   c) How does the supplementation of vitamin B6, B12 and folic acid help in the management of homocystinuria.
2. Short note on the DNA repair system which is defective in hereditary nonpolyposis colon cancer. Mechanism of action of Methotrexate and Actinomycin D as anticancer drugs.
3. A 5-year-old male child with uneventful birth history was brought with c/o self injurious behavior, irritability and emotional lability for the past 2 years. From the age of 3 yrs he started biting his lips, tongue and banging his head over the wall and scratching his face (self-mutilation). Developmental history revealed delayed milestones. Serum uric acid level was 9.5 mg/dL.
   a) What is your probable diagnosis?
   b) Enumerate the biochemical basis of the neurological manifestations in this disease.
   c) Discuss the salvage pathway for Purine synthesis.
4. Explain the catabolism of Tryptophan to serotonin and its clinical features.
5. Mention five tumour markers with their diagnostic importance.
6. What are the types of gene therapy? Give examples of any three diseases for which gene therapy has beneficial effects?
7. Polymerase chain Reaction.
8. How will you explain to the patient that his blood cholesterol levels are high?
9. What is quality control? Explain the types of quality control.
10. Interpret the following Liver Function Test report:

Total bilirubin	Direct bilirubin	Alkaline phosphatase	Ehrlich's test	Stool sample
7.7 mg/dL	3.6 mg/dL	265 IU/L	Negative	Clay colour

   a) What is the probable diagnosis?
   b) Mention the possible causes for the above condition.
   c) Substantiate with reasons for increase in conjugated fraction of Bilirubin.

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THE TAMIL NADU Dr. M.G.R. MEDICAL UNIVERSITY

[MBBS 0825] **AUGUST 2025** **Sub. Code: 6056**

M.B.B.S. DEGREE EXAMINATION
(For the candidates admitted from the Academic Year 2021 – 2022 to 2023 – 2024)

FIRST PROFESSIONAL – (CBME)
PAPER II – BIOCHEMISTRY
Q.P. Code: 526056

Time: Three hours **Maximum: 100 Marks (80 Theory + 20 MCQs)**

Answer All Questions

I. Essay: **(2 x 15 = 30)**

1. A 5-year-old boy presents with developmental delay, hypotonia, irritability and self mutilating behavior. On examination there was testicular atrophy and Hematuria. Serum uric acid level was 10 mg/dl.
   a) State the probable diagnosis.
   b) Discuss on the defective enzyme, the metabolic pathway the defective enzyme catalyses and its significance.
   c) Mention the normal levels of uric acid. Describe the production of uric acid.
   d) Evaluate the biochemical basis of hyperuricemia in this patient.

2. A 10-year-old girl presented with excessive tiredness, poor appetite, inability to concentrate and complained of breathlessness on climbing stairs. On examination there was pallor. Laboratory examination revealed decreased haemoglobin, Ferritin and MCV. Total iron biding capacity (TIBC), transferring and RDW were increased.
   a) State the likely diagnosis.
   b) Describe the sources, RDA, absorption, transport, storage and excretion of the defective nutrient. Add a note on its regulation.
   c) Analyse the biochemical basis of excessive tiredness in this patient.

II. Write notes on: **(10 x 5 = 50)**

1. A patient was operated for intestinal obstruction and had continuous gastric aspiration for 3 days. Arterial blood gas analysis of the patients showed pH-7.55, pCO2-50 mmHg, plasma bicarbonate – 30mEq/L. Se.sodium 130 mEq/L, potassium – 2.0mEq/L.
   a) Common on the acid – base status of the patient.
   b) Discuss the causes and compensatory mechanism for the acid-base disorder in the patient.

2. A 2-week-old infant was brought to the hospital with H/o diaper turning dark in color while changing. Urine examination showed positive benedicts and ferric chloride tests.

a) Identify the likely diagnosis.
b) Discuss on the enzymes deficiency, the biochemical defect and the manifestations in patients with this disorder.
c) Analyse the biochemical basis of the baby's diaper turning dark on changing.

3. 70-year-old women with carcinoma colon is admitted with weight loss, anorexia and anaemia. Biochemical results reveal se. sodium -123meq/1, potassium -3.8 meq/1.
   a) Identify the electrolyte abnormality in this patient.
   b) Discuss the causes of hypo and hypernatremia.
   c) Analyse the role of diuretics in the management of edema.

4. In most normal human somatic cells, telomeres shorten with each division. In stem cells and in cancer cells, however, telomeric length is maintained.
   a) Describe telomeres.
   b) Discuss the reasons for shortening of telomeres in somatic cells.
   c) Analyse on how in stem cells and cancers, the telomere length is maintained.

5. A 34-year-old man comes to outpatient clinic. He gives a positive family history of myocardial infarction in his father at the age of 42. List the biochemical investigations with their reference ranges that can rate the cardiovascular risk of this patient.

6. A 40-year-old female presented to the clinic with lump in right breast. Physical examination revealed a fixed and non tender mass on right breast. Biopsy report revealed intraductal carcinoma. Family history revealed that her sister had breast cancer at 35 years. Discuss the likely role of oncogenes and tumor suppressor genes.

7. Discuss the role of Cytochrome P450 enzymes in the metabolism of drugs.

8. 40-year-old male patients presents with weight loss, palpitations, nervousness, exophthalmos and goiter.
   a) State the probable diagnosis.
   b) Discuss the functions of the hormone.
   c) State the mineral required for the synthesis of the hormone.

9. Brief the factors altering the absorption of Calcium.

10. Short note on specimens used for Blood sugar estimation.

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THE TAMIL NADU Dr. M.G.R. MEDICAL UNIVERSITY

[MBBS 1025] **OCTOBER 2025** **Sub. Code: 6056**

M.B.B.S. DEGREE EXAMINATION
(For the candidates admitted from the Academic Year 2021 – 2022 to 2023 – 2024)

FIRST PROFESSIONAL – SUPPLEMENTARY (CBME)
PAPER II – BIOCHEMISTRY
Q.P. Code: 526056

Time: Three hours **Maximum: 100 Marks (80 Theory + 20 MCQs)**

Answer All Questions

I. Essay: **(2 x 15 = 30)**

1. Explain the process of Detoxification phases in human body. Add a note on free radical scavenging systems.

2. The treatment of type I diabetes mellitus required insulin. Harvesting of insulin from pancreas of animals remained the technique initially, which has the disadvantage of triggering allergic response in individuals receiving it.
   a) State the technology by which large scale production of proteins for therapeutic purposes ie, insulin, erythropoietin etc., are manufactured.
   b) Explain the preparation of insulin in pure form by the above technique.
   c) Mention the applications of the above technique.
   d) Analyse the used of mRNA of the concerned protein and not DNA as the starting materials for the above technology.

II. Write notes on: **(10 x 5 = 50)**

1. A 1-year-old female patient is lethargic, weak and anemic. Her height and weight are both low for her age. Her urine contains an elevated level of orotic acid.
   a) Identify the provisional diagnosis.
   b) Discuss the enzyme deficiency, biochemical manifestations and treatment for this patient.

2. A 20-year-old female is admitted in the emergency department with history of overdose of acetaminophen tablets. The patient presents with nausea, vomiting and abdominal pain. Laboratory tests reveal elevated liver enzymes with low potassium and high blood levels of acetaminophen.
   a) Discuss the normal metabolism of acetaminophen in the body.
   b) Analyse the biochemical basis of liver toxicity during poisoning
   c) Mention the antidote for acetaminophen toxicity and its biochemical mechanism.

3. A 65-year-old female patient presents with history of vomiting and diarrhea of few days. On examination patient is dehydrated with postural hypotension. Serum electrolytes measured shows the following values: Serum Sodium - 135meq/1, Serum Potassium -2.2meq/1.
   a) Identify the electrolyte abnormality in this patient and mention the normal values of Serum Sodium and Potassium in blood.
   b) Mention the source, RDA, functions and causes of disturbances of Potassium levels.

4. Normal metabolic process in the body produces large quantities of volatile and fixed acids.
   a) Mention the normal pH range of blood.
   b) Discuss the role of kidney in maintaining acid-base homeostasis.

5. Carries of tooth can be prevented by fluoride ions.
   a) Mention the safe limit of fluorine in drinking water.
   b) Describe the biochemical basis of fluoride in preventing caries.
   c) Discuss on Fluorosis with its attendant complications.

6. Cretinism, if identified in early neonatal period and treated, will lead to normal mental and physical development.
   a) Identify the hormone defective in Cretinism.
   b) Enumerate the functions of the involved hormone.
   c) List the biochemical test that can identify the disorders caused by the hormone.

7. Explain the catabolism of Tryptophan to serotonin and its clinical features.

8. A 14-year-old boy presents with fever and jaundice. Enumerate the biochemical tests that help in identifying the type of jaundice in this patient with their reference ranges.

9. A 2-year-old Scottish-American girl presents with deeply pigmented and scarred skin and her growth is delayed. Her skin also becomes bright red after sunlight exposure and leaves scars after healing. Her dermatologist obtains a skin biopsy, suspecting xeroderma pigmentosum.
   a) Identify the defective DNA repair mechanism.
   b) Describe the process of DNA repair mechanism.

10. Short note on Biochemical investigation for myocardial infection.

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[MBBS 1025]

THE TAMIL NADU Dr. M.G.R. MEDICAL UNIVERSITY

[MBBS 0726] **JULY 2026** **Sub. Code: 6056**

M.B.B.S. DEGREE EXAMINATION
(For the candidates admitted from the Academic Year 2022 – 2023 & 2023 – 2024)

FIRST PROFESSIONAL –(CBME)
PAPER II – BIOCHEMISTRY
Q.P. Code: 526056

Time: Three hours **Maximum: 100 Marks (80 Theory + 20 MCQs)**

Answer All Questions

I. Essay: **(2 x 15 = 30)**

1. A person presents with fever and cough for the past 2 days. He is asked to undergo a nucleic acid amplification test (RT-PCR) for identifying the presence or absence of SARS CoV2 infection.
   a) What is Polymerase Chain Reaction? (2)
   b) Which are the requirements of PCR? (2)
   c) What are the steps involved in PCR? (5)
   d) What is Reverse Transcription PCR or RT-PCR? (3)
   e) Mention any three types of PCR. Mention their uses. (3)
2. A 50-year-old male was brought to the OPD with signs and symptoms of prominent flushing, on and off diarrhoea, features of Heart failure and increased urinary excretion of 5 HIAA (Hydroxyl Indole Acetic acid) suggestive of carcinoid syndrome.
   a) Name the amino acid involved in the above disorder. (1)
   b) Brief the metabolic pathways associated with this amino acid. (8)
   c) Name the products derived from this amino acid. (2)
   d) Write the clinical signification of these biological products. (4)

II. Write notes on: **(10 x 5 = 50)**

1. i) Describe the formation and fate of homocysteine.
   ii) Write about the causes and features of homocystinuria.
2. A person presents with hypersensitivity to UV light, increased propensity to develop skin malignancies. He is diagnosed with Xeroderma Pigmentosa.
   a) What are the errors that can happen in a DNA?
   b) What is the most common DNA damage caused by UV light?
   c) Which repair defect causes Xeroderma Pigmentosa?
   d) Describe in detail about the repair mechanism, the defect of which causes Xeroderma Pigmentosa.
3. STATEMENT 1 : Recombinant DNA technology is a cloning technique.
   STATEMENT 2 : Human genes can be cloned and expressed in E.Coli by Recombinant DNA technology.
   a) Which statement is true?
   b) What are the various types of vectors used in recombinant DNA technology?
   c) What is the role of CtDNA in recombinant DNA technology?
4. Normal mRNA : 5’ – AUG – GAU – GAU – GGU-3’
   Normal Aminoacid sequence : $_2$NH –met –asp –asp-gly-COOH
   Mutated mRNA : 5’ – AUG – GAC – GAU – GGU-3’
   Mutated Aminoacid sequence : $_2$NH –met –asp –asp-gly-COOH
   a) Identify the type of mutation.
   b) What are the types of mutation? Give examples.
   c) What is the difference between silent mutation and acceptable mutation?

…2…

5. Briefly describe the biochemical importance of Lysine and Arginine.

6. A 25-year-old male opted for a master health check up. His Liver function test values are shown below:

Bilirubin	1.3mg/dl (confirmed by rpt analysis)
Conjugated Bilirubin	0.2mg/dl
Alanine Transaminase	31Lu/L
Aspartate Transaminase	30Lu/L
Alkaline Phosphatase	55Lu/L
Gamma Glutamyl Transferase	24Lu/L
Albumin	4 g/dl
LDH	190Lu/L

   a) Comment on the values of enzymes and Bilirubin in the provided report.
   b) How is Bilirubin estimated?
   c) What are the congenital and acquired causes of elevation of unconjugated Bilirubin?
   d) Explain the biochemical basis of one of the causes of unconjugated hyperbilirubinemia.

7. A 6 months old female infant began to vomit occasionally and ceased to gain weight. The child became habitually drowsy, temperature raised and her liver was enlarged. The EEG was abnormal. When the milk feeding was avoided and was started on glucose, the condition improved. Urine analysis showed abnormally high glutamine, Uracil, orotic acids. Blood showed high ammonium concentration. Type II Hyperammonemia was diagnosed.
   a) Which enzyme defect causes Type II Hyperammonemia?
   b) What are the differences between Carbamoyl phosphate synthetase 1 and Carbamoyl phosphate synthetase ll?
   c) Why is orotic acid levels high in Type II Hyperammonemia?

8. Apo B100 and Apo B48 are formed in hepatocytes and enterocytes respectively. However, both are products of ApoB gene.
   a) What explains this example of tissue specific regulation of gene expression?
   b) Which enzyme is responsible for this tissue specific regulation?
   c) Mention three post transcriptional modifications involved in mRNA formation.

9. The arterial blood gas analysis report of a patient of Chronic Obstructive Lung Disease is as follows:

pH	: 7.28
pCO2	: 60mmHg
Bicarbonate	: 30mEq/L

   a) Diagnose the acid base disorder in this patient.
   b) What are the causes of respiratory alkalosis?
   c) What is the normal pH and PCO_2 range?
   d) How do kidneys compensate in respiratory alkalosis and in acidosis?

10. A known patient of Type 1 diabetes was admitted for the treatment of Diabetic Ketoacidosis. He had to be treated with high dose insulin, following which he presented with weakness of all limbs and inability to move without support. His serum potassium level was 1.8mEq/L, serum sodium was 135mEq/L.
   a) What is the normal serum sodium and serum potassium?
   b) What are the causes of hypokalemia?
   c) What are the causes of hyperkalemia?

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