Sri Guru Ram Das University of Health Sciences, Sri Amritsar

Department of Biochemistry

Guidelines for question paper as per the Medical Council of India, Competency Based Undergraduate Curriculum for Indian Medical Graduate.

Theory paper should include questions from core competencies and not from Non Core Competency

BLUEPRINT OF THEORY PAPER

Sr. No.	Type	Explanation	Topics	Distribution of marks as per weightage
1.	MCQ		**10 MCQs for Paper A** **10 MCQs for Paper B**	1 X 10 = 10 1 X 10 = 10
2.	Long essay question	1. The question should pose a Clinical/ Practical problem to the students and require them to apply knowledge and integrate it with disciplines. Avoid giving one liners as questions. 2. Avoid giving one liners as questions. 3. The question stem should be structured and marking distribution should be provided. 4. Use action verbs from higher domains as given in this document.	**Paper A (Two Questions)** 1. Structured Question from core competency of Chemistry and metabolism of Carbohydrates, Lipids, proteins and Enzymes. 2. Case based Question from - Diabetes Mellitus. Atherosclerosis & Fatty Liver. Disorders associated with vitamin deficiency. **Paper B (Two Questions)** 1. Structured Question from core	1 X 10= 10 1 X 10= 10 1 X 10= 10

			competency of Molecular Biology, Metabolism/Homeostasis. 2. Case based Question from – Hyperuricemia & Gout. Acidosis & Alkalosis. Porphyria & Jaundice. Nephrotic Syndrome.	1 X 10= 10
3.	Short Notes	These provide opportunity to sample a wider content, able it in a short time. The questions should be task oriented rather than 'Write a short note on xxxxxxxxxxx'. Preferably use verbs (as per List attached) in framing questions and structure them as far as possible.	**Paper A (8 Questions)** From Core Competencies as per competency based undergraduate curriculum for the Indian Medical Graduate , VOLUME 1 Marks for each part should be indicated separately **Paper B (8 Questions)** From Core Competencies as per competency based undergraduate curriculum for the Indian Medical Graduate , VOLUME 1 Marks for each part should be indicated separately	8 X 5 = 40 8 X 5 = 40
4.	Reasoning Questions	These provide excellent opportunities for testing integration, clinical reasoning and analytic ability of the student	**Paper A (3 Questions)** From Core Competencies as per competency based undergraduate curriculum for the Indian Medical Graduate , VOLUME 1 **Paper B (3 Questions)** From Core Competencies as per competency based undergraduate	3 X 5 = 15 3 X 5 = 15

			curriculum for the Indian Medical Graduate , VOLUME 1	
5.	Applied Questions	Questions on applied aspect	**Paper A (3 Questions)** From Core Competencies as per competency based undergraduate curriculum for the Indian Medical Graduate , VOLUME 1 **Paper B (3 Questions)** From Core Competencies as per competency based undergraduate curriculum for the Indian Medical Graduate , VOLUME 1	3 X 5 = 15 3 X 5 = 15

Total Marks 200(Paper A- 100 marks, Paper B-100 marks)

Blueprinting in knowledge domain
(Representative example only. Actual figures may vary with the subject and phase)

Level	Topic A	Topic B	Topic C	Topic D	Total
Knowledge	1	2	1	1	5(20%)
Comprehension	1	1	1	2	5(20%)
Application	2	1	1	1	5(20%)
Analysis	1	1	2	2	6(24%)
Synthesis		1		1	2(8%)
Evaluation	1		1		2(8%)
Total	6(24%)	6(24%)	6(24%)	7(28%)	25(100%)

Verbs in various levels in Knowledge domain (Bloom's taxonomy)

Knowledge	Define, Describe, Draw, Find, Enumerate, Cite, Name, Identify, List, label, Match, Sequence, Write, State, Choose ,Indicate, isolate, Order, Recognize, Underline
Comprehension	Discuss, Conclude, Articulate, Associate, Estimate, Rearrange, Demonstrate understanding, Explain, Generalise, Identify, Illustrate, Interpret, Review, Summarise, Extrapolate, Update
Application	Apply, Choose, Compute, Modify, Solve, Prepare, Produce, Select, Show, Transfer, Use
Analysis	Analyse, Characterise, Classify, Compare, Contrast, Debate, Diagram, Differentiate, Distinguish, Relate, Categorise
Synthesis	Compose, Construct, Create, Verify, Determine, Design, Develop, Integrate, Organise, Plan, Produce, Propose, rewrite
Evaluation	Appraise, Assess, Conclude, Critic, Decide, Evaluate, judge, Justify, Predict, Prioritise, Prove, Rank

The question part of the MCQ (item) is called STEM; correct answer is called the KEY and the rest of the options are called DISTRACTORS.

Steps in writing:

1. Select the specific learning objectives which you want to test.
2. Write the stem, it should be self-explanatory and complete, avoid using terms like (NOT, EXPECT, NEVER, ALWAYS, SOMETIMES) in the stem, if the terms are being used they should be in UPPERCASE and **bold** letter.
3. Write unambiguous and unarguably the correct answer to the stem.
4. Select the most plausible alternatives and arrange them in the form of options.
5. Avoid window dressing of the stem. This means adding superfluous and unnecessary words which confuses the student.
6. Abbreviations should be avoided.
7. Options should be grammatically parallel to the key, and should be parallel and have the same relation to the stem.
8. When writing options, avoid duplications or making options all inclusive, e 1-6, 6-10 etc.
9. The options should be arranged in rank order, eg. 256, 266, 280, 290 and not 290, 266, 280, 256.
10. "All the above" and "None of the above" should be avoided as an option.

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Theory Paper A			Theory Paper B	
Topics	**Marks Distribution**		**Topics**	**Marks Distribution**
Basic Biochemistry	5		Molecular Biology	35
Enzyme	15		Nutrition	10
Chemistry and Metabolism of carbohydrates	25		Extracellular Matrix	10
Lipids	20		Oncogenesis & Immunology	15
Chemistry & Metabolism of proteins	20			
Metabolism & Homeostasis(B1 6.1, 6.5, 6.6) **B1 6.1-** Metabolic processes in specific organ in body in fed & fasting state. **B1 6.5-** Vitamins **B1 6.6-** Biological Oxidation	15		Metabolism & Homeostasis(B1 6.2, 6.3,6.4,6.7,6.8,6.9,6.10,6.11,6.12,6.13,6.14,6.15) **B1 6.2, 6.3, 6.4-** Chemistry & Metabolism of Nucleotides. **B1 6.7-** Acid Base Balance, water & Electrolyte Balance. **B1 6.8-** Results of ABG analysis in various Disorders. **B1 6.9 & 6.10-** Minerals & Disorders associated with mineral metabolism. **B1 6.11-** Haem Metabolism **B1 6.13,6.14, 6.15-** Functions, Tests & Abnormalities associated with liver, kidney, Thyroid, Adrenal Glands	30
Total	**100**		**Total**	**100**

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Maximum Marks : 100 | **MBBS 1st Professional Examination** | Time : 3 Hours

Subject- Biochemistry

Paper-A

Note: 1. Attempt all questions. Illustrate your answer with suitable diagrams where applicable.
2. Question No. 1 (MCQ) to be attempted on OMR Sheet (Time: 15 Min.)
3. Question No. 2-6 to be attempted on separate answer book (Time: 2:45 Min.)

QP Code: MB20605

1. Multiple Choice Questions(MCQs) : [10x1=10]

A. A 3 month old child is being evaluated for vomiting and an episode of convulsions, Laboratory results show hyperammonemia and Orotic aciduria. Which of the following defect is likely to be there?
a. Glutaminase
b. Arginase
c. Argino succinic acid synthase
d. Ornithine Transcarbamoylase

B. A recently diagnosed hypertensive patient has been prescribed alpha methyl Dopa which is known to act by increasing the Km and Vmax remaining same, what is the possible mechanism of inhibition of this drug?
a. Competitive inhibition
b. Non-competitive inhibition
c. Uncompetitive inhibition
d. Suicidal inhibition

C. Which of the following generates free glucose during the enzymatic breakdown of glycogen in skeletal muscles?
a. Phosphorylase
b. Debranching enzyme
c. Glucose-6- phosphatase
d. Alpha amylase

D. A 10 year old child has accidentally ingested and has presented with high fever. The chemical is known to affect ATP formation in electron transport chain, which out of the following could cause the similar manifestations
a. Cyanide
b. Malonate
c. 2-4 dinitrophenol
d. Rotenone

E. S-Adenosyl methionine is required for the synthesis of which of the following compounds?
a. Thyroid hormone
b. Melanin
c. Epinephrine
d. Serotonin

F. The glycosaminoglycan which does not contain uronic acid is
a. Dermatan sulphate
b. Chondroitin sulphate
c. Keratan sulphate
d. Heparan sulphate

G. Which one of the following vitamins is essential for the liberation of free THF from N5 –Methyl THF
a. Vitamin B1
b. Vitamin B2
c. Vitamin B6
d. Vitamin B12

H. Which of the following apoproteins is an activator of lipoprotein lipase?
a. Apo A
b. Apo CII
c. Apo B
d. Apo E

I. **A 63 -year old woman reports a long history of joint pain. Her fingers are severely deformed secondary to rheumatoid arthritis. Upon visiting a rheumatologist, she is started on methotrexate. This drug inhibits which of the following conversions ?**

a. Dopamine to norepinephrine conversion
b. Tyrosine to Dopa
c. Dihydrofolate to Tetra hydro folate
d. Phenyl Alanine to Tyrosine

J. **Which one of the following mechanisms transports cytosolic NADH to mitochondria.**

a. Glycerolphosphate shuttle
b. Creatine phosphate shuttle
c. ATP-ADP translocase
d. Phosphate carrier

2. Write briefly the biochemical role of Tyrosine & all its derivatives. Describe any two diseases associated with tyrosine metabolism. [6+4=10]

3. **A 19 yr old boy with the history of Juvenile Diabetes Mellitus for 4 years was brought to Emergency Department in state of coma with following laboratory investigation report.** [2+2+2+4=10]

Blood Glucose = 1200 mg %
Plasma pH = 7.1
HbA1c =10 %
Benediet's Test (Urine) = ++++
Rothera's Test (Urine) = +

Answer the following questions.

a. What is the diagnostic criterion of Diabetes mellitus?
b. What is the biochemical basis of these Laboratory findings?
c. Discuss significance of glycated haemoglobin in diagnosis of Diabetes Mellitus.
d. Discuss biochemical basis of various Chronic and acute complications of Uncontrolled Diabetes Mellitus.

4. **Draw & Label / Preferably Reasoning Questions:** [3x5=15]

a. Justify how Chronic Alcoholism leads to fatty liver?
b. Explain formation & utilization of Ketone bodies. How are they harmful when present in excess?
c. Explain the role of rate limiting enzymes in regulation of Glycogenesis & Glycogenolysis.

5. **Write short notes on:** [8x5=40]

a. Specify the role of Vitamin B6 in any 3 biochemical reactions.
b. Discuss biologically important peptides.
c. Diagrammatically explain chemiosmotic theory of Oxidative Phosphorylation. Enumerate its inhibitors.
d. Specify the role of carnitine in Fatty acid Metabolism.
e. Differentiate Competitive and non-competitive Enzyme Inhibition & give 3 examples of Clinical Relevance.
f. Explain structure & functions of biomembranes.
g. Use of Vitamin E as antioxidant in preventing lipid peroxidation.
h. Compare & contrast features of glucokinase & Hexokinase. How they are utilized in the body.

6. **Write short notes on (Applied Questions):** [3x5=15]

a. Illustrate the role of Enzymes as Markers of Pancreatic diseases.
b. Describe Glucose tolerance test. Discuss its clinical significance?
c. Explain biochemical basis of Homocystinuria & Investigations done to diagnose it.

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Maximum Marks : 100 | **MBBS 1st Professional Examination** | Time : 3 Hours

Subject- Biochemistry

Paper-B

Note: 1. Attempt all questions. Illustrate your answer with suitable diagrams where applicable.
2. Question No. 1 (MCQ) to be attempted on OMR Sheet (Time: 15 Min.)
3. Question No. 2-6 to be attempted on separate answer book (Time: 2:45 Min.)

QP Code: MB20606

1. Multiple Choice Questions (MCQs) : [10x1=10]

A. Which out of the following is NOT a haemo protein?
a. Catalase
b. Peroxidase
c. Ubiquinone
d. Cytochrome C

B. The disorder in which the patients have an irresistible urge to bite their fingers and lips.
a. Lesch-Nyhan Syndrome
b. Zellweger Syndrome
c. Von-Gierk's Disease
d. Gaucher's Disease

C. Immunoglobin which can cross the placenta
a. IgA
b. IgG
c. IgM
d. IgD

D. Which of the following has NO role in calculating calorie requirements
a. Respiratory Quotient
b. Specific dynamic action
c. Nature of work
d. Basal Metabolic Rate

E. A Hormone which has an effect on fluid and electrolyte balance?
a. Epinephrine
b. Glucagon
c. Thyroxine
d. Aldosterone

F. Out of the following mechanism which one is involved in the production of variety of immunoglobulins each specific for a specific Antigen?
a. Class Switching
b. Gene amplification
c. Gene rearrangement
d. RNA editing

G. Which out of the following techniques is used for the detection of the gene of interest.
a. Southern blotting
b. Polymerase chain reaction
c. Northern blotting
d. DNA Footprinting

H. Triple repeat sequence disease occurs in:
a. Alzheimer's disease
b. Cystic fibrosis
c. Ataxia telangiectasia
d. Huntington's chorea.

I. Which of the following is most important Physiological buffer of the plasma
a. HCO_3^-/ H_2CO_3
b. HPO_4^{2-}/$H_2PO_4^-$
c. Protein buffer
d. Hemoglobin

J. **Pick out the mismatched pair**
   a. Ceruloplasmin and iron absorption
   b. Hemopexin and heme binding
   c. Hepatoglobin and hemolysis
   d. Transferrin and copper binding

2. Describe the process of protein biosynthesis in prokaryotes. Enumerate various inhibitors of translation & discuss mechanism of action of any one. [2+2+4=10]

3. **Interpret the following laboratory reports of Blood gas analyzer.** [1+2+3+4=10]

Blood pH = 7.10
pCo_2 = 13.8 mm Hg (Normal PCo_2 – 35-45 mm Hg)
pO_2 = 103 mm Hg (Normal Po_2 =80-100 mg Hg)
HCo_3 = 4.1 mmol /l (HCo_3 -22.26mmol/L)
Na^+ - 131 mmol/L
K^+ - 5.0 meq/l
Cl^- - 92 meq/l

Answer the following questions:
   a. Identify the type of acid base disorder.
   b. What are the causes for this condition?
   c. Explain how the bicarbonate buffer system play role in maintaining a steady pH of blood?
   d. Discuss anion gap? Give its biological significance.

4. **Draw & Label /Preferably Reasoning Questions:** [3x5=15]
   a. Differentiate between Oxygen Dissociation Curve of Haemoglobin & Myoglobin. Give main reason for the same.
   b. Discuss the causes of pre hepatic& post hepatic Jaundice. Discuss their differential diagnosis on the basis of their biochemical findings.
   c. What are Oncogenes? Discuss the mechanism of carcinogenesis by any 2 oncogenes protein product.

5. **Write the short notes on:** [8x5=40]
   a. Discuss Structure of Collagen & Elastin.
   b. Summarize the role of PTH and calcitonin in Calcuim Homeostasis.
   c. Discuss thyroid function tests and their clinical significance.
   d. What is Gene Therapy? Describe the role of viruses in Gene Therapy.
   e. Define the term RFLP & VNTR. Explain their role in DNA fingerprinting.
   f. Explain the mechanism of action of any two synthetic nucleotide analogues which are used therapeutically.
   g. Compare the features of Kwashiorkar & Marasmus.
   h. Compare & contrast T cells &B cells with respect to Antigen recognition.

6. **Write short notes on (Applied Questions):** [3x5=15]
   a. Explain what is BMI? Give an account on its clinical Importance.
   b. Describe principle & procedure of PCR. Give its applications in medicine.
   c. In the light of Operon model explain why glucose is preferentially utilized even in presence of lactose.