

# Competency Based Questions and Answers in **Physiology** for First MBBS Professional Examination

## Salient

- Questions and MCQs Prepared as per CBME Guidelines
- Content Written and Arranged as per the CBME | Competency-Based Curriculum for Indian Medical Graduate
- Included are Long Essays, Short Essays and Short Notes
- Types of MCQs are Case-Based, Picture-Based and Matching Options, etc.
- Questions are Based on **Know**, **Know How** Components
- Copious Flowcharts, Tables and Line Diagrams are included
- Text is Given in Simple and Easy to Remember Points.



has been founded and developed by a team of passionate doctors and entrepreneurs to bring out a series of high-quality study companions for the MBBS students as per the latest MCI syllabus. This is being the first venture among them. The Academy is also involved in preparing and delivering the content for upcoming NEXT. It encourages young doctors who have outstanding teaching and writing skills to collaborate in this unique project.



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Competency Based  
Questions and Answers in  
**Physiology**  
for First MBBS  
Professional  
Examination



# Competency Based Questions and Answers in **Physiology** for First MBBS Professional Examination


Compiled and designed as per CBME Guidelines | Competency Based Undergraduate Curriculum for the Indian Medical Graduate

- 50 Long Essays
- 244 Short Essays
- 255 Short Notes
- 621 MCQs

Sushrutha Academy



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Bengaluru



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## Preface

*“Assessment drives learning”*

The purpose of assessment is not just to assess learning but also assist learning. The new CBME curriculum proposed by the Medical Council of India (MCI) calls for an outcome-based teaching-learning approach and transition from just acquisition of knowledge to application and practice of knowledge. Assessments need to be designed to suit the newer teaching-learning methods and to assess if the required competency has been achieved or not.

The purpose of bringing out this book is to introduce the I MBBS students to the new format of questions that is most likely to be asked during the internal assessment and the university examination and also equip them to face these exams without fear. Students can use this book for self-assessment of learning, preparing for internal assessment and university examination.

The book has been compiled by group of teachers who have undergone MCI recognized training in revised basic medical education technologies and

advanced course in medical education. The questions in this book have been arranged according to competencies as listed in the MCI curriculum document. Various types of questions including structured long essays, modified essays, short answers, and multiple choice questions are added. These questions have been framed according to the guidelines set by the MCI with appropriate use of verbs at each level of Bloom's taxonomy of cognitive domain. The questions not only assess recall but also higher levels of learning.

We would like to acknowledge all the people who are involved in the preparation of this book especially Shri SK Jain (Chairman), Shri Varun Jain (Managing Director), Shri YN Arjuna (Vice President—Publishing, Editorial and Publicity), Ms Ritu Chawla (GM Production), and Ms Jassi, and of CBS for their all-time support and bringing out this book in record short time.

We hereby wish all the readers of the book all the best in their endeavors.

Happy reading!

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# Contents

*Contributors*

*vii*

*Preface*

*ix*

S. No.	Chapter	Page number	
		Q and A	MCQs
1.	General Physiology	01	439
2.	Haematology	20	441
3.	Nerve and Muscle Physiology	67	443
4.	Gastrointestinal Physiology	132	454
5.	Cardiovascular Physiology (CVS)	163	459
6.	Respiratory Physiology	208	464
7.	Renal Physiology	241	467
8.	Endocrine Physiology	267	471
9.	Reproductive Physiology	301	475
10.	Neurophysiology	330	483
11.	Integrated Physiology	416	492





## Details of the Number of Questions and MCQs Included as per the Competency

S. No.	Competency No.	Competency details	Long essays	Short essays	Short answers	MCQs
<b>1. General Physiology</b>						
1.	PY 1.1	Describe the structure and functions of a mammalian cell	—	—	03	5
2.	PY 1.2	Describe and discuss the principles of homeostasis	—	02	02	3
3.	PY 1.3	Describe intercellular communication	—	01	01	3
4.	PY 1.4	Describe apoptosis-programmed cell death	—	01	05	1
5.	PY 1.5	Describe and discuss transport mechanisms across cell membranes	—	01	—	6
6.	PY 1.6	Describe the fluid compartments of the body, its ionic composition and measurements	—	01	—	4
7.	PY 1.7	Describe the concept of pH and buffer systems in the body	—	02	—	1
8.	PY 1.8	Describe and discuss the molecular basis of resting membrane potential and action potential in excitable tissue	—	02	01	2
9.	PY 1.9	Demonstrate the ability to describe and discuss the methods used to demonstrate the functions of the cells and its products, its communications and their applications in clinical care and research.	—	01	—	1
<b>2. Haematology</b>						
10.	PY 2.1	Describe the composition and functions of blood components	—	01	—	1
11.	PY 2.2	Discuss the origin, forms, variations and functions of plasma proteins	—	02	02	2
12.	PY 2.3	Describe and discuss the synthesis and functions of haemoglobin and explain its breakdown. Describe variants of haemoglobin	—	—	02	3
13.	PY 2.4	Describe RBC formation (erythropoiesis and its regulation) and its functions	02	—	—	1
14.	PY 2.5	Describe different types of anaemias and jaundice	01	02	—	2
15.	PY 2.6	Describe WBC formation (granulopoiesis) and its regulation	—	01	02	5
16.	PY 2.7	Describe the formation of platelets, functions and variations.	—	02	—	3
17.	PY 2.8	Describe the physiological basis of hemostasis and anticoagulants. Describe bleeding and clotting disorders (hemophilia, purpura)	02	05	02	4
18.	PY 2.9	Describe different blood groups and discuss the clinical importance of blood grouping, blood banking and transfusion	—	04	—	1

S. No.	Competency No.	Competency details	Long essays	Short essays	Short answers	MCQs
19	PY 2.10	Define and classify different types of immunity. Describe the development of immunity and its regulation	—	05	02	1
20	PY 2.11	Estimate Hb, RBC, TLC, RBC indices, DLC, blood groups, BT/CT	—	07	—	2
21	PY 2.12	Describe test for ESR, osmotic fragility, hematocrit. Note the findings and interpret the test results, etc.	—	03	—	2
22	PY 2.13	Describe steps for reticulocyte and platelet count.	—	—	03	2
<b>3. Nerve and Muscle Physiology</b>						
23	PY 3.1	Describe the structure and functions of a neuron and neuroglia; discuss nerve growth factor and other growth factors/cytokines	—	03	—	5
24	PY 3.2	Describe the types, functions and properties of nerve fibers	02	08	06	7
25	PY 3.3	Describe the degeneration and regeneration in peripheral nerves	01	02	04	5
26	PY 3.4	Describe the structure of neuromuscular junction and transmission of impulses	01	03	01	5
27	PY 3.5	Discuss the action of neuromuscular blocking agents	—	01	02	5
28	PY 3.6	Describe the pathophysiology of myasthenia gravis	—	02	01	5
29	PY 3.7	Describe the different types of muscle fibres and their structure	—	03	02	5
30	PY 3.8	Describe action potential and its properties in different muscle types (skeletal and smooth)	01	10	13	5
31	PY 3.9	Describe the molecular basis of muscle contraction in skeletal and in smooth muscles	02	08	03	5
32	PY 3.10	Describe the mode of muscle contraction (isometric and isotonic)	—	02	02	5
33	PY 3.11	Explain energy source and muscle metabolism	—	03	03	5
34	PY 3.12	Explain the gradation of muscular activity	—	—	02	4
35	PY 3.13	Describe muscular dystrophy: Myopathies	—	02	01	5
36	PY 3.14	Perform ergography	—	02	—	5
37	PY 3.15	Demonstrate effect of mild, moderate and severe exercise and record changes in cardiorespiratory parameters	—	01	—	5
38	PY 3.16	Demonstrate Harvard step test and describe the impact on induced physiologic parameters in a simulated environment	—	01	—	4
39	PY 3.17	Describe strength–duration curve	—	—	01	5
40	PY 3.18	Observe with computer assisted learning (i) Amphibian nerve–muscle experiments (ii) Amphibian cardiac experiments	—	—	—	6

S. No.	Competency No.	Competency details	Long essays	Short essays	Short answers	MCQs
<b>4. Gastrointestinal Physiology</b>						
41	PY 4.1	Describe the structure and functions of digestive system	—	—	02	5
42	PY 4.2	Describe the composition, mechanism of secretion, functions, and regulation of saliva, gastric, pancreatic, intestinal juices and bile secretion	—	07	01	9
43	PY 4.3	Describe GIT movements, regulation and functions. Describe defecation reflex. Explain role of dietary fibre.	01	03	05	6
44	PY 4.4	Describe the physiology of digestion and absorption of nutrients	01	01	01	6
45	PY 4.5	Describe the source of GIT hormones, their regulation and functions	—	02	02	5
46	PY 4.6	Describe the gut-brain axis	—	—	02	5
47	PY 4.7	Describe and discuss the structure and functions of liver and gall bladder	—	02	02	5
48	PY 4.8	Describe and discuss gastric function tests, pancreatic exocrine function tests and liver function tests	—	—	03	5
49	PY 4.9	Discuss the physiology aspects of: Peptic ulcer, gastro-oesophageal reflux disease, vomiting, diarrhoea, constipation, adynamic ileus, Hirschsprung's disease	—	—	06	5
50	PY 4.10	Demonstrate the correct clinical examination of the abdomen in a normal volunteer or simulated environment	—	—	—	5
<b>5. Cardiovascular Physiology (CVS)</b>						
51	PY 5.1	Describe the functional anatomy of heart including chambers, sounds; and pacemaker tissue and conducting system.	—	02	01	5
52	PY 5.2	Describe the properties of cardiac muscle including its morphology, electrical, mechanical and metabolic functions	—	04	01	5
53	PY 5.3	Discuss the events occurring during the cardiac cycle	01	02	01	5
54	PY 5.4	Describe generation, conduction of cardiac impulse	—	01	—	5
55	PY 5.5	Describe the physiology of electrocardiogram (ECG), its applications and the cardiac axis	—	01	01	5
56	PY 5.6	Describe abnormal ECG, arrhythmias, heart block and myocardial infarction	—	04	04	6
57	PY 5.7	Describe and discuss haemodynamics of circulatory system	—	01	02	5
58	PY 5.8	Describe and discuss local and systemic cardiovascular regulatory mechanisms	01	02	—	5
59	PY 5.9	Describe the factors affecting heart rate, regulation of cardiac output and blood pressure	—	04	06	5

S. No.	Competency No.	Competency details	Long essays	Short essays	Short answers	MCQs
60	PY 5.10	Describe and discuss regional circulation including microcirculation, lymphatic circulation, coronary, cerebral, capillary, skin, foetal, pulmonary and splanchnic circulation	—	05	—	5
61	PY 5.11	Describe the pathophysiology of shock, syncope and heart failure	01	—	01	5
62	PY 5.12	Record blood pressure and pulse at rest and in different grades of exercise and postures in a volunteer or simulated environment	02	01	—	—
63	PY 5.13	Record and interpret normal ECG in a volunteer or simulated environment	—	—	01	—
64	PY 5.14	Observe cardiovascular autonomic function tests in a volunteer or simulated environment	—	01	—	—
65	PY 5.15	Demonstrate the correct clinical examination of the cardiovascular system in a normal volunteer or simulated environment	—	01	—	—
66	PY 5.16	Record arterial pulse tracing using finger plethysmography in a volunteer or simulated environment.	—	02	—	—
<b>6. Respiratory Physiology</b>						
67	PY 6.1	Describe the functional anatomy of respiratory tract	—	01	02	5
68	PY 6.2	Describe the mechanics of normal respiration, pressure changes during ventilation, lung volume and capacities, alveolar surface tension, compliance, airway resistance, ventilation, V/P ratio, diffusion capacity of lungs	06	07	03	7
69	PY 6.3	Describe and discuss the transport of respiratory gases: Oxygen and carbon dioxide	—	03	02	6
70	PY 6.4	Describe and discuss the physiology of high altitude and deep-sea diving	—	01	—	5
71	PY 6.5	Describe and discuss the principles of artificial respiration, oxygen therapy, acclimatization, and decompression sickness.	—	—	01	4
72	PY 6.6	Describe and discuss the pathophysiology of dyspnea, hypoxia, cyanosis, asphyxia; drowning, periodic breathing	—	02	03	5
73	PY 6.7	Describe and discuss lung function tests and their clinical significance	—	—	01	3
74	PY 6.8	Demonstrate the correct technique to perform and interpret spirometry	—	—	02	—
75	PY 6.9	Demonstrate the correct clinical examination of the respiratory system in a normal volunteer or simulated environment	—	01	—	—
76	PY 6.10	Demonstrate the correct technique to perform measurement of peak expiratory flow rate in a normal volunteer or simulated environment	—	01	—	—

S. No.	Competency No.	Competency details	Long essays	Short essays	Short answers	MCQs
<b>7. Renal Physiology</b>						
77	PY 7.1	Describe structure and functions of kidney	—	02	01	20
78	PY 7.2	Describe the structure and functions of juxta-glomerular apparatus and role of renin-angiotensin system	02	01	02	
79	PY 7.3	Describe the mechanism of urine formation involving processes of filtration, tubular reabsorption and secretion; concentration and diluting mechanism.	01	04	03	
80	PY 7.4	Describe and discuss the significance and implication of renal clearance	—	—	01	5
81	PY 7.5	Describe the renal regulation of fluid and electrolytes and acid–base balance	—	02	—	8
82	PY 7.6	Describe the innervations of urinary bladder, physiology of micturition and its abnormalities	—	02	03	4
83	PY 7.7	Describe artificial kidney, dialysis and renal transplantation	—	—	02	2
84	PY 7.8	Describe and discuss renal function tests	—	01	—	3
85	PY 7.9	Describe cystometry and discuss the normal cystometrogram	—	01	—	2
<b>8. Endocrine Physiology</b>						
86	PY 8.1	Describe the physiology of bone and calcium metabolism	01	01	—	5
87	PY 8.2	Describe the synthesis, secretion, transport, physiological actions, regulation and effect of altered (hypo and hyper) secretion of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas and hypothalamus	07	08	12	19
88	PY 8.3	Describe the physiology of thymus and pineal gland	—	—	03	2
89	PY 8.4	Describe function tests: Thyroid gland; adrenal cortex, adrenal medulla and pancreas	—	—	03	10
90	PY 8.5	Describe the metabolic and endocrine consequences of obesity and metabolic syndrome, stress response. Outline the psychiatry component pertaining to metabolic syndrome.	—	—	04	
91	PY 8.6	Describe and differentiate the mechanism of action of steroid, protein and amine hormones	—	—	03	4
<b>9. Reproductive Physiology</b>						
92	PY 9.1	Describe and discuss sex determination, sex differentiation and their abnormalities and outline psychiatry and practical implication of sex determination.	—	—	05	7



S. No.	Competency No.	Competency details	Long essays	Short essays	Short answers	MCQs
93	PY 9.2	Describe and discuss puberty: Onset, progression, stages; early and delayed puberty and outline adolescent clinical and psychological association.	—	01	03	5
94	PY 9.3	Describe male reproductive system: Functions of testis and control of spermatogenesis and factors modifying it and outline its association with psychiatric illness	—	01	04	6
95	PY 9.4	Describe female reproductive system: (a) Functions of ovary and its control; (b) Menstrual cycle—hormonal, uterine and ovarian changes	01	01	02	7
96	PY 9.5	Describe and discuss the physiological effects of sex hormones	—	01	01	5
97	PY 9.6	Enumerate the contraceptive methods for male and female. Discuss their advantages and disadvantages	—	02	03	5
98	PY 9.7	Describe and discuss the effects of removal of gonads on physiological functions	—	—	02	4
99	PY 9.8	Describe and discuss the physiology of pregnancy, parturition and lactation and outline the psychology and psychiatry—disorders associated with it.	—	04	02	6
100	PY 9.9	Interpret a normal semen analysis report including (a) sperm count, (b) sperm morphology and (c) sperm motility, as per WHO guidelines and discuss the results	—	—	03	5
101	PY 9.10	Discuss the physiological basis of various pregnancy tests	—	—	01	5
102	PY 9.11	Discuss the hormonal changes and their effects during perimenopause and menopause	—	01	01	5
103	PY 9.12	Discuss the common causes of infertility in a couple and role of IVF in managing a case of infertility.	—	02	01	5
<b>10. Neurophysiology</b>						
104	PY 10.1	Describe and discuss the organization of nervous system	—	01	04	6
105	PY 10.2	Describe and discuss the functions and properties of synapse, reflex, receptors	—	05	03	10
106	PY 10.3	Describe and discuss somatic sensations and sensory tracts.	01	06	02	7
107	PY 10.4	Describe and discuss motor tracts, mechanism of maintenance of tone, control of body movements, posture, and equilibrium and vestibular apparatus	02	08	04	11
108	PY 10.5	Describe and discuss structure and functions of reticular activating system, autonomic nervous system (ANS)	—	01	02	5

S. No.	Competency No.	Competency details	Long essays	Short essays	Short answers	MCQs
109	PY 10.6	Describe and discuss spinal cord, its functions, lesion and sensory disturbances	01	—	01	6
110	PY 10.7	Describe and discuss functions of cerebral cortex, basal ganglia, thalamus, hypothalamus, cerebellum and limbic system and their abnormalities	05	03	06	9
111	PY 10.8	Describe and discuss behavioral and EEG characteristics during sleep and mechanism responsible for its production	—	02	01	6
112	PY 10.9	Describe and discuss the physiological basis of memory, learning and speech	—	04	04	6
113	PY 10.10	Describe and discuss chemical transmission in the nervous system. (Outline the psychiatry element.)	—	01	—	5
114	PY 10.11	Demonstrate the correct clinical examination of the nervous system: Higher functions, sensory system, motor system, reflexes, cranial nerves in a normal volunteer or simulated environment	—	—	01	—
114	PY 10.12	Identify normal EEG forms	—	01	—	—
115	PY 10.13	Describe and discuss perception of smell and taste sensation	01	03	—	5
116	PY 10.14	Describe and discuss pathophysiology of altered smell and taste sensation	—	—	02	2
117	PY 10.15	Describe and discuss functional anatomy of ear and auditory pathways and physiology of hearing	01	04	03	5
118	PY 10.16	Describe and discuss pathophysiology of deafness. Describe hearing tests	—	02	02	5
119	PY 10.17	Describe and discuss functional anatomy of eye, physiology of image formation, physiology of vision including colour vision, refractive errors, colour blindness, physiology of pupil and light reflex	—	07	08	9
120	PY 10.18	Describe and discuss the physiological basis of lesion in visual pathway	01	—	—	3
121	PY 10.19	Describe and discuss auditory and visual evoke potentials	—	—	01	5
122	PY 10.20	Demonstrate (i) testing of visual acuity, colour and field of vision, (ii) hearing, (iii) testing for smell, and (iv) taste sensation in volunteer/simulated environment	—	—	01	—
<b>11. Integrated Physiology</b>						
123	PY 11.1	Describe and discuss mechanism of temperature regulation	—	01	02	5
124	PY 11.2	Describe and discuss adaptation to altered temperature (heat and cold)	—	01	—	5
125	PY 11.3	Describe and discuss mechanism of fever, cold injuries, and heat stroke	—	—	03	6

S. No.	Competency No.	Competency details	Long essays	Short essays	Short answers	MCQs
126	PY 11.4	Describe and discuss cardiorespiratory and metabolic adjustments during exercise; physical training effects	—	—	03	5
127	PY 11.5	Describe and discuss physiological consequences of sedentary lifestyle	—	02	03	6
128	PY 11.6	Describe physiology of infancy	—	—	01	5
129	PY 11.7	Describe and discuss physiology of aging; free radicals and antioxidants	—	—	03	6
130	PY 11.8	Discuss and compare cardiorespiratory changes (isometric and isotonic) with that in the resting state and under different environmental conditions (heat and cold)	01	01	01	5
131	PY 11.9	Interpret growth charts	—	—	02	5
132	PY 11.10	Interpret anthropometric assessment of infants	—	—	01	5
133	PY 11.11	Discuss the concept, criteria for diagnosis of Brain death and its implications	—	—	01	5
134	PY 11.12	Discuss the physiological effects of meditation	—	—	01	5
135	PY 11.13	Obtain history and perform general examination in the volunteer/simulated environment.	—	—	01	5
136	PY 11.14	Demonstrate basic life support in a simulated environment	—	—	01	6
		<b>Total Content</b>	<b>50</b>	<b>244</b>	<b>255</b>	<b>621</b>