

# CBCS SCHEME

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BBOC407

## Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024 Biology for Engineers (CSE)

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Discuss the various components of Eukaryotic cells.	10	L3	CO1
	b.	Identify the applications of stem cells.	5	L2	CO1
	c.	Explain the functions of vitamins.	5	L2	CO1
<b>OR</b>					
Q.2	a.	Compare Prokaryotic and Eukaryotic cells.	10	L3	CO1
	b.	Explain the properties of Carbohydrates.	5	L2	CO1
	c.	Explain the functions of Lipids.	5	L2	CO1
<b>Module – 2</b>					
Q.3	a.	Highlighting the properties of cellulose, justify cellulose as an effective water filter.	10	L3	CO1
	b.	Explain the working and development of DNA vaccines by taking suitable example.	10	L2	CO1
<b>OR</b>					
Q.4	a.	What are Bioplastics? Justify the use of PHA as Bioplastic mentioning its properties and applications.	10	L3	CO1
	b.	Discuss the following : (i) Meat analogs of protein. (ii) Lipids as cleaning agents.	10	L2	CO1
<b>Module – 3</b>					
Q.5	a.	What is Electro Encephalogram (EEG)? Discuss the types of Brain activity detected with EEG. Write any three applications.	10	L3	CO2
	b.	What are Pace Makers? Explain basic design and construction of Pace Makers.	10	L2	CO2
<b>OR</b>					
Q.6	a.	Justify Lungs as purification system.	10	L3	CO2
	b.	Explain architecture of Rod and Core cells with suitable diagram.	10	L2	CO2
<b>Module – 4</b>					
Q.7	a.	What is ultrasonography? Explain the uses and working principle.	10	L2	CO3
	b.	What is lotus leaf effect? Explain the mechanism and applications of super Hydrophobic effect.	10	L2	CO3
<b>OR</b>					
Q.8	a.	The structure and design of Kingfisher beak lead to the design of Bullet trains. Explain.	10	L2	CO3
	b.	Explain the working and applications of Bionic Leaf Technology.	10	L2	CO3

Module – 5					
Q.9	a.	Explain the use of Electrical tongue in food science.	10	L2	CO4
	b.	Explain the advantages and limitations of Artificial Intelligence for disease diagnosis.	10	L2	CO4
OR					
Q.10	a.	Explain Bioengineering solutions for muscular dystrophy and Osteoporosis.	10	L2	CO4
	b.	Explain most commonly used Bioprinting Techniques.	10	L2	CO4

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VTU EXAMS JUNE-JULY-2024



Visvesvaraya Technological University

Belagavi, Karnataka - 590 018.

Scheme & Solutions

Signature of Scrutinizer

Subject Title : BIOLOGY FOR ENGINEERS Subject Code : BBOC407

Question Number	Solution	Marks Allocated
1. a)	components of Eukaryotic cells Cell membrane, cytoplasm, organelles, Nucleus, Nucleolus, Mitochondria, Ribosomes, Endoplasmic Reticulum, Golgi Bodies, Vacuole, Vesicles etc. Explanation of any 10, 1 mark each.	10x1=10.
b)	Applications of stem cells - 1) HSC Transplantation 2) Placental stem therapy 3) Artificial organ Engineering 4) Anti-aging effects 5) wound healing Explanation of any five applications	5
c)	Functions of vitamins - Vitamin A - Vision, Skin health Vitamin B - RBC formation, Nerve function Vitamin C - Boosts Immune system, antioxidant Vitamin D - Bone health, Calcium absorption Vitamin E - Protecting cells from damage Vitamin K - Blood clotting, Bone health etc. Any 5 - 1 mark each	5

Question Number	Solution	Marks Allocated																																				
2) a)	<table border="0"> <tr> <td>comparision -</td> <td></td> <td></td> </tr> <tr> <td>Parameter</td> <td>Prokaryotic</td> <td>Eukaryotic</td> </tr> <tr> <td>Nucleus</td> <td>Absent</td> <td>Present</td> </tr> <tr> <td>cell size</td> <td>smaller</td> <td>larger</td> </tr> <tr> <td>cell structure</td> <td>unicellular</td> <td>Most Multicellular</td> </tr> <tr> <td>complexity</td> <td>Simpler</td> <td>complex</td> </tr> <tr> <td>DNA</td> <td>circular</td> <td>linear</td> </tr> <tr> <td>Mitochondria</td> <td>Absent</td> <td>Present</td> </tr> <tr> <td>Golgi Apparatus</td> <td>Ab</td> <td>Present</td> </tr> <tr> <td>Reproduction</td> <td>Asexual</td> <td>Sexual</td> </tr> <tr> <td>cell wall</td> <td>Present</td> <td>absent</td> </tr> <tr> <td>Example</td> <td>Bacteria</td> <td>Fungi, animal, Plant</td> </tr> </table>	comparision -			Parameter	Prokaryotic	Eukaryotic	Nucleus	Absent	Present	cell size	smaller	larger	cell structure	unicellular	Most Multicellular	complexity	Simpler	complex	DNA	circular	linear	Mitochondria	Absent	Present	Golgi Apparatus	Ab	Present	Reproduction	Asexual	Sexual	cell wall	Present	absent	Example	Bacteria	Fungi, animal, Plant	1x10
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b)	<p>Properties -</p> <p>Physical - Stereoisomerism optical activity, Anomerism</p> <p>Chemical - Osazone formation oxidation Reduction to alcohols.</p>	5																																				
c)	<p>Functions of Lipids</p> <p>Energy storage, Insulation, cell membrane structure, Hormone synthesis, Transport with explanation (mark each)</p>	1x5																																				
3) a)	<p>Properties - High Porosity, Biodegradability, cost effective, Good mechanical strength, Chemical resistance</p> <p>Explanation of working</p>	05 05																																				
b)	<p>DNA vaccine - is a type of vaccine that uses a piece of viral or bacterial DNA to simulate an immune response against pathogen</p>	02																																				

Question Number	Solution	Marks Allocated
	working -	3
	DNA vaccine for Rabies, Importance -	5
4) a)	Bio Plastics - Biodegradable and Biocompatible	02
	Properties of PHA -	04
	Applications -	04
b) (i)	Meat analogs & Protein	
	- Meat analogs - meat substitutes are plant based foods designed to mimic the taste, texture and appearance of meat.	02
	Explanations with examples - Tofu, Tempeh, Seitan, Veggie Burgers, Plant based Sausage.	03
(ii)	Lipids as cleaning agents -	
	Explanation with examples -	03
	Advantages and limitations (2 each)	02
5) a)	EEG - Non invasive method for measuring and recording of the electrical activity of the brain.	02
	Types of Brain activity - Delta waves (0.5-4 Hz)	
	Theta wave (4-8 Hz), Alpha wave (8-12 Hz)	05
	Beta wave (12-30 Hz), Gamma wave (30-100 Hz)	
	with explanation.	
	Any 3 applications	03
5) b)	A pacemaker is a small device that surgically implanted in the chest to regulate the heart beat.	02
	<del>type</del> - Design with explanation, construction	04
		04

Question Number	Solution	Marks Allocated
6) a)	<p>The lung purifies air by removing harmful substances and adding oxygen to the blood stream.</p> <p>Process - Filtration, Moisturization, Gas Exchange with explanation</p>	<p>02.</p> <p>03</p> <p>05</p>
b)	<p><u>Rod cells</u> - are photoreceptor cells in the retina of the eye that are responsible for detecting light and transmitting signals to the brain for perception of vision especially in low light condition</p> <p>Explanation with diagram</p>	<p>02</p> <p>03</p>
	<p><u>Cone cells</u> - photoreceptor cells in the retina that are responsible for color vision and visual acuity.</p> <p>Explanation with diagram</p>	<p>02</p> <p>03</p>
7) a)	<p>Ultrasonography is a medical imaging technique that uses high freq. sound waves to produce images of the internal organs and tissues of the body.</p> <p>Uses - Gynecology, Abdominal Imaging, Musculoskeletal Imaging, Vascular Imaging, Eye and Neck Imaging, Emergency medicine.</p> <p>working</p>	<p>02</p> <p>04.</p> <p>04.</p>
b)	<p>The ability of lotus leaves to repel water and self clean through their unique surface structure.</p> <p>Mechanism of Super Hydrophobic Effect</p> <p>Applications - Electronics Industry, Automobile Ind, Aerospace Industry, with explanation</p>	<p>02</p> <p>04.</p> <p>04</p>

Question Number	Solution	Marks Allocated
8) a)	<p>Physics behind Kingfisher - Beak streamlining, surface tension, minimizing splash with explanation</p> <p>Technological Importance with explanation</p>	<p>05</p> <p>05</p>
b)	<p>Bionic leaf - which aims to mimic the process of photosynthesis in plants.</p> <p>consists of photovoltaic cell - captures sunlight and convert it into electrical energy.</p> <p>Applications - Renewable Energy production, CO<sub>2</sub> Reduction, Agriculture and food production, etc. with explanation (any 5)</p>	<p>05</p> <p>05</p>
9) a)	<p>Electrical tongue is a used to analyze the taste and flavor of food and beverage.</p> <p>Technology and working</p> <p>Advantages - Non Invasive, High throughput, objective analysis, cost effective.</p>	<p>02</p> <p>04</p> <p>04</p>
b)	<p>Advantages - Image analysis, Data analysis, Diagnose medicine, clinical decision support with explanation</p> <p>Limitation - any 5 with explanation</p>	<p>05</p> <p>05</p>
10) a)	<p>Bio Engineering soln for muscular dystrophy</p> <p>any 5 - Gene therapy, stem cell therapy, Tissue engineering, Exoskeleton technology</p> <p>Bio Engineering soln for osteoporosis</p> <p>Tissue Eng, stem cell therapy, biomaterial, gene therapy</p>	<p>05</p> <p>05</p>
b)	<p>Bioprinting - working explanation</p> <p>Advantages &amp; limitation.</p>	<p>05</p> <p>05</p>