


Model Question Paper (Blank) is on next page

Name:			
Enrolment No:			
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Semester Examination, May 2021			
Course: Instrumentation in Microbiology		Semester: II	
Program: M.Sc. (Micro) and M.Sc. (N&D)		Time: 03 hrs.	
Course Code: HSMB7015 and HSMB7021		Max. Marks: 100	
Instructions: Read question carefully.			
SECTION A			
S. No.	MCQ's /Fill in the blanks/ T&F (1.5 marks each)	30 Marks	CO
1	Which of the following is an application of polymer chain reaction? (a) Site-directed mutagenesis (b) Site-specific recombination (c) Site-specific translocation (d) All of the above	1.5	CO3
2	Which of the following is true for asymmetric PCR? (a) Used for generating double-stranded copies for DNA sequence (b) Used for generating single-stranded copies for DNA sequence (c) Both a and b (d) None of the above	1.5	CO3
3	Why are vent polymerase and Pfu more efficient than the Taq polymerase? (a) Because of proofreading activity (b) Because of more efficient polymerase activity (c) Both a and b (d) None of the above	1.5	CO3
4	The pH at which a protein carries a net zero charge is termed which of the following? a) pK_a b) pK_b c) pI d) K	1.5	CO3

5	A hydrophobic compound will preferentially partition into an aqueous solvent. True or false?	1.5	CO3
6	The process of passing a mobile phase through a chromatography column is called which one of the following? a) Flushing b) Washing c) Elution d) Partitioning	1.5	CO3
7	What is the first stage of the two-stage two-dimensional PAGE? a) SDS-PAGE b) HPLC c) Isoelectric focussing d) Sedimentation	1.5	CO3
8	Ion exchange chromatography is based on? A. Electrostatic attraction B. Electrical mobility of ionic species C. Partition chromatography D. Adsorption chromatography	1.5	CO3
9	Which of the following is used as a carrier gas in gas chromatography A. Carbon dioxide B. Oxygen C. Helium D. Methane	1.5	CO3
10	Isopyknic or equal density centrifugation is achieved in a) Buoyant density centrifugation b) Density gradient centrifugation c) Electrophoresis d) Differential centrifugation	1.5	CO1
11	The technique used in the detection of particular protein is a) Buoyant density centrifugation b) Density gradient centrifugation c) Immuno-electrophoresis d) Both B and C	1.5	CO1
12	Time and location of DNA synthesis can be studied by means of a) Extracting DNA at regular intervals from different parts b) Electron microscopy c) Carbon dating d) Radioactive DNA precursors	1.5	CO2
13	Ultrastructure of a cell organelle can best be studied through a) Microdissection b) Electron microscope c) Phase-contrast microscope d) Autoradiography	1.5	CO1
14	Buoyant density centrifugation is carried out at centrifugal force of a) 50,000 g for 1 – 3 hours b) 50,000 g for 20 hours c) 1,00,000 g for 1 – 3 hours d) 1,00,000 g for 20 hours	1.5	CO1
15	Organelles can be separated from cell homogenate through	1.5	CO1

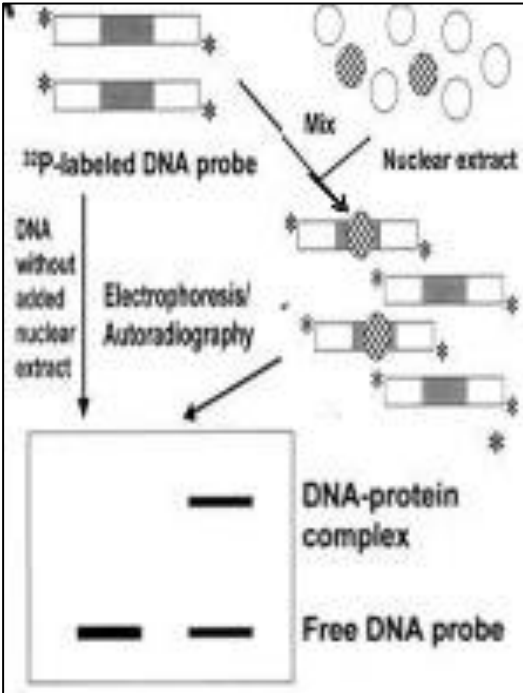
	a) Chromatography b) X-ray diffraction c) Differential/density gradient centrifugation d) Auto-radiography		
16	Which of the following wavelength ranges is associated with UV spectroscopy a) 0.8-500 μm b) 100-400 nm c) 380-750 nm d) 0.01-10 nm	1.5	CO2
17	Which of the following compounds does not absorb light in the UV/Visible spectrum a) Aspirin b) Paracetamol c) Chloral hydrate d) Phenobarbitone	1.5	CO2
18	Which of the following spectroscopy techniques is associated with molecular emission? A. UV-Visible spectroscopy B. IR spectroscopy C. Fluorescence spectroscopy D. X-ray diffraction	1.5	CO2
19	Signal splitting in NMR arises from? A. Shielding B. Spin-spin decoupling C. Spin-spin coupling D. Deshielding	1.5	CO2
20	Which of the following techniques would be most useful to identify as well as quantify the presence of a known impurity in a drug substance? A. NMR B. MS C. IR D. HPLC	1.5	CO2

SECTION B (5 marks each question)

Q	Short Answer Type Question (5 marks each) Scan and Upload 4 questions 5 marks. Word limit (100-120)	20 Marks	CO
1	Mention the difference between rate-zonal and isopycnic centrifugation.	5	CO1
2	Mention the characteristics of a scintillator. Write the applications of a Scintillation counters.	5 (2+3)	CO2
3	Write different designs of PFGE. Mention the applications of PFGE.	5 (2+3)	CO3
4	Write the difference between TEM and SEM.	5	CO1

SECTION C 30 marks

Q	Two case studies 15 marks each subsections	30 Marks	CO
1	Case Study 1 (Word limit-250-300) You are amplifying a portion of blood group antigen binding adhesin A (BabA) gene from <i>Helicobacter pylori</i> polymerase chain reaction (PCR). The organism was isolated from the	15 (4+4+2 +3+2)	CO3

	<p>stool samples of an infected individual. After the agarose gel electrophoresis of amplified PCR products, you observed non-specific amplification or smear.</p> <p>Q1: What could be the reasons behind the observation? Q2: How are you going to troubleshoot the problem? Q3: What is primer dimer? Q4: What is nested PCR? Q5: Why bovine serum albumin (BSA) was added in a PCR reaction?</p>		
2	<p>Case Study 2 (Word limit- 250-300)</p> <p>Laser scanning confocal microscopy represents one of the most significant advances in optical microscopy ever developed, primarily because the technique enables visualization deep within both living and fixed cells and tissues and affords the ability to collect sharply defined optical sections from which three-dimensional renderings can be created. Development of modern confocal microscopes has been accelerated by new advances in computer and storage technology, laser systems, detectors, interference filters, spectral technology, and fluorophores for highly specific targets. During working with a confocal microscope, you found certain problems related with the microscope, which are provided below. Identify the reasons behind these problems with potential solutions.</p> <p>1: The bulb is on, but image cannot be seen or is dark. 2. Image is unclear, blurred or has insufficient contrast. 3. Image is partially obscured or unevenly illuminated. 4. Excessive glaring. 5. Power switch indicator does not light up.</p>	<p>15 (3x5)</p>	<p>CO1</p>
SECTION- D 20 marks			
Q	<p>Long Answer type Questions Scan and Upload (10 marks each) Word limit 200-250</p>	<p>20 Marks</p>	<p>CO</p>
1	 <p>The diagram illustrates the process of EMSA. At the top, a ³²P-labeled DNA probe (represented as a horizontal bar with a shaded segment) and nuclear extract (represented as a cluster of circles) are mixed. An arrow labeled 'Mix' points to the next stage where the probe is bound to a protein from the nuclear extract, forming a DNA-protein complex. A control path shows 'DNA without added nuclear extract' leading to 'Free DNA probe'. Both the DNA-protein complex and the free DNA probe are subjected to 'Electrophoresis/Autoradiography'. The resulting gel image shows two bands: a higher band labeled 'DNA-protein complex' and a lower band labeled 'Free DNA probe'.</p>	<p>10 (1+4+1 +4)</p>	<p>CO3</p>

	<p>Q1: Identify the name of method from the above figure. Q2: Mention the basic steps associated with the method. Q3: What is dissociation constant (Kd)? Q4: Mention the advantages and limitations of the method.</p>		
2	<div data-bbox="399 344 1166 919" data-label="Image"> </div> <p>Q1: Identify the name of method from the above figure. Q2: Mention different types of this method. Q3: What are the basic differences among different types? Q4: What are the applications of the method?</p>	<p>10 (1+2+4 +3)</p>	<p>CO3</p>