JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST 2 EXAMINATIONS-2022

M.Sc.-II Semester (BT)

COURSE CODE (CREDITS): **20MS1BT215 (2)** MAX. MARKS: **25**

COURSE NAME: **Molecular Diagnostics**

COURSE INSTRUCTORS: **Jitendraa Vashistt** MAX. TIME: **90 Min.**

Note: All questions are compulsory. Marks are indicated against each question in brackets.

Q1. The nasopharyngeal samples (n=20) were processed for the detection of a respiratory disease caused by a viral pathogen. How will you proceed for molecular diagnosis if

a) The report of the detection of all samples need has to be given in 4 hours after the sample taken? What may be the possible limitation of the rapid diagnosis? **(3marks)**

b) Only ten samples per slot required to report and the reporting of detection for next 10 samples may be given after a day? In this case, what will be the major factor for preservation of sample? **(3marks)**

Q2. In majority of the cases, molecular diagnosis of diseases usually carried out using genomic markers, however in the present times protein based disease specific markers and immobilization are also arising for clinical usage. Elucidate the benefits of specific protein based molecular diagnosis over gene based diagnosis. **(3marks)**

Q3. A real time PCR was setup for molecular detection of breast cancer using BRCA1gene expression profiling. Molecular biologist had put following ingredients for the reaction, reverse transcriptase, dNTPs, polymerase and magnesium ions. Although, reaction initiated, however no real time monitoring observed. What would be the possible reason for no signal detection of amplicon and how would you rectify this experimental error? **(3marks)**

Q4. You are designing an experimental methodology using gel based proteomic approach for identification of a blood based protein biomarker in a population (n=100) for a non-communicable disease. What will be the outcome of the study, a) if you restrict the number of test and control blood samples upto 3 in each group. b) if you increase the number with 12 in each group. Justify your answer with the consideration of reproducibility and variation across samples. **(4 marks)**

P.T.O.

Q5. If one can get the differential protein analysis using cy3 and cy5 dyes in Difference in fluorescence gel electrophoresis (DIGE) experiment, then why it is always advisable to incorporate the pool up fraction labeled with cy2 dye? **(3 marks)**

Q6. Two peptides A (mass m1; charge +1) and B (mass m2; charge +1) with unknown peptide length were utilized for mass determination using MALDI TOF. You need to analyze the longer peptide and determine the sequence of this peptide. How do you proceed for mass difference and sequence determination of peptides? **(3 marks)**

Q7. During COVID pandemic, majority of the times common people correlated the severity of the disease with the Ct value of RT-PCR. Why this value is an important factor for relative gene expression and a fair estimate to a disease condition with respect to the control gene? **(3 marks)**