(University of Choice)

MASINDEMULIROUNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

THIRD YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE
OF
BACHELOR OF SCIENCE IN MEDICAL BIOTECHNOLOGY

COURSE CODE: BMB 322

COURSE TITLE: MOLECULAR ONCOLOGY

DATE: 28/04/2022 **TIME:** 8.00 -10.00AM

INSTRUCTIONS TO CANDIDATES

Answer ALL questions

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

SECTION A: MCQs answer all (20 marks)

1. RB is a tumour suppressor protein that has an important role during which part of the cell cycle:
    a. G1
    b. G2
    c. S
    d. M
2. Cyclin B-CDK1 kinase activity peaks at which phase of cell cycle?
    a. G1
    b. G2
    c. S
    d. M
3. Which of the following is not a proto-oncogene?
    a. C-myc
    b. p53
    c. Ras
    d. c-erbB
4. Which of the following tumors exhibit 30-60 fold amplification of the K-ras gene?
    a. Adrenal carcinoma
    b. Colon carcinoma
    c. Burkits lymphoma
    d. Chronic myelogenousleukaemia
5. Which of the following exhibit a change of glutamine to leucine at amino acid number 61 of the H-ras protein?
    a. Lung carcinoma
    b. Adrenal carcinoma
    c. Retinoblastoma
    d. Colon cance
6. Which of the following classes of proteins are not considered tumor suppressor proteins?
    a. Proteins that inhibit progression through a specific stage of the cell cycle
    b. Checkpoint-control proteins that arrest the cell cycle if DNA is damaged
    c. Receptors for secreted hormones that function to inhibit cell proliferation
    d. Proteins that inhibit apoptosis
7. Which of the following factors is NOT Pro-apoptotic?
    a. Bax
    b. Bak
    c. Bid
    d. Bcl-2
8. Which of the following molecules is not an immune checkpoint target for immunotherapy?
    a. Cytotoxic T-lymphocyte antigen-4 (CTLA-4),
    b. Programmed cell death-1 (PD-1)
    c. Programmed cell death ligand-1 (PD-L1)
    d. Caspase3

9. Loss of function mutations in genes of the MMR system are detected by testing for:

a. Microsatellite instability
b. Point mutations
c. Insertions
d. Translocations

10. Which of the following is true about the PI3K/Akt/mtorsignal pathway
    a. The pathway is inhibited by growth factors
    b. The pathway inhibits cellular growth
    c. The pathway promote apoptosis
    d. The pathway promotes cellular proliferation and growth
11. p53 is a tumour suppressor protein that regulates cell cycle at:
    a. G1 phase
    b. G2 phase
    c. S phase
    d. M phase
12. Which of the following is NOT a typical mechanism involved in the conversion of a proto-oncogeneto an oncogene?
    a. Complete deletion of the proto-oncogene
    b. A point mutation in the proto-oncogene
    c. Amplification of the proto-oncogene
    d. A chromosomal translocation resulting in the up-regulation of the proto-oncogene
13. Which of the following *c-myc* gene translocations occur in up to 80% of Burkitslymphomas?
    a. t (8, 14)
    b. t (8, 22)
    c. t (2, 8)
    d. t (14, 8)
14. Which of the following tumors exhibit 5-1000 fold amplification of the *N-myc* gene?
    a. Adrenal carcinoma
    b. Small cell lung carcinoma
    c. Epidermoid carcinoma
    d. Neuroblastoma
15. Which of the following exhibit a change of glycine (gly) to cysteine (Cys) at position 12 of the K-ras protein?
    a. Lung carcinoma
    b. Adrenal carcinoma
    c. Retinoblastoma
    d. Bladder carcinoma
16. Which of the following factors is NOT antiapoptotic?
    a. Bcl-2
    b. Bcl-xL
    c. Mcl-1
    d. Bax
17. Inherited mutations in BRCA1 or BRCA2 significantly increase risk of:
    a. Colon cancer
    b. Lung cancer
    c. Liver cancer
    d. Breast cancer
18. The unstable microsatellite loci appear in theelectrophoresid gel as:
    a. Point mutations

b. Insertions
c. Translocations
d. Extra products in tumor tissue compared to normal tissue

19. PTEN is mutated in most cancers; what is its normal role in PI3K/Akt/mTORsignalling pathway
    a. Catalyse the dephosphorylation of PI3K
    b. Conversion of PIP3 to PIP2
    c. Phosphorylates Akt
    d. Dephosphorylates Akt
20. All of the following mechanisms are involved in the conversion of proto-oncogenes to oncogenes except:
    a. Point mutations
    b. Chromosomal Translocation
    c. Gene amplification
    d. Loss of function mutations

SECTION B: SAQs: Answer all (40 marks)

1. Outline the **FIVE** key hallmarks of cancer **(5marks)**
2. Using a specific example explain how retroviral oncogenes arise **(5marks)**
3. List and give examples of **EIGHT** classes of proto-oncogenes and tumour suppressor proteins**(8marks)**
4. Using a specific example describe how microsatellite instability analaysis can be used to diagnose cancer**(8 marks)**
5. Describe three mechanisms that convert proto-oncogenes to oncogenes **(6 marks)**
6. Using colon cancer as an example, illustrate the role of proto-oncogene and tumour suppressor gene mutations in initiation and progression of carcinomas **(8 marks)**

SECTION C: LAQs:Answer Any THREE(60 marks)

1. Describe in detail the steps involved in whole exome RNA sequencing of cancer transcriptomes**(20 marks)**
2. Discuss the T cell chimeric antigen receptor (CAR) technology (CART) in cancer immunotherapy **(20 marks)**
3. Discuss the steps and mechanism in tumor metastasis **(20 marks)**
4. Describe the molecular mechanisms involved in tumor angiogenesis **(20 marks)**