Roll No. .....

Question Booklet Number

O. M. R. Serial No.

M. Sc. (Biotechnology) (Fourth Semester)
(NEP) EXAMINATION, 2025-26

ONCOTECHNOLOGY

Paper Code							
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Questions Booklet Series
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Time : 1:30 Hours] [*Maximum Marks : 75*

Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.

2. The booklet contains 100 questions. Examinee is required to answer 75 questions in the OMR Answer-Sheet provided and not in the question booklet. All questions carry equal marks.

3. Examine the Booklet and the OMR Answer-Sheet very carefully before you proceed. Faulty question booklet due to missing or duplicate pages/questions or having any other discrepancy should be got immediately replaced.

परीक्षार्थियों के लिए निर्देश :

1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।

2. प्रश्न-पुस्तिका में 100 प्रश्न हैं। परीक्षार्थी को 75 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। सभी प्रश्नों के अंक समान हैं।

3. प्रश्नों के उत्तर अंकित करने से पूर्व प्रश्न-पुस्तिका तथा OMR आन्सर-शीट को सावधानीपूर्वक देख लें। दोषपूर्ण प्रश्न-पुस्तिका जिसमें कुछ भाग छपने से छूट गए हों या प्रश्न एक से अधिक बार छप गए हों या उसमें किसी अन्य प्रकार की कमी हो, तो उसे तुरन्त बदल लें।

(Remaining instructions on the last page) **(शेष निर्देश अन्तिम पृष्ठ पर)**

(Only for Rough Work)

1. A patient shows HER2 amplification in breast cancer. Which therapy is most appropriate ?

(A) PARP inhibitor

(B) Trastuzumab

(C) Imatinib

(D) Bevacizumab

2. A tumor exhibits uncontrolled proliferation due to RB1 mutation. Which hallmark is affected ?

(A) Immune evasion

(B) Angiogenesis

(C) Evasion of growth suppressors

(D) Metabolic reprogramming

3. Which model is best for studying tumor-immune interactions ?

(A) 2D cell culture

(B) Organoids

(C) Syngeneic mouse model

(D) Xenograft model

4. Detection of EGFR T790M mutation is best achieved by :

(A) Immunohistochemistry

(B) Liquid biopsy

(C) ELISA

(D) Flow cytometry

5. A tumor shows high VEGF expression. Which therapy is suitable ?

(A) PARP inhibitor

(B) Anti-PD1 antibody

(C) Bevacizumab

(D) Imatinib

6. A patient has BCR-ABL fusion gene. Which drug is used ?

(A) Erlotinib

(B) Imatinib

(C) Olaparib

(D) Nivolumab

7. Which genomic instability is associated with Lynch syndrome ?

(A) Aneuploidy

(B) Chromothripsis

(C) Chromosomal instability

(D) Microsatellite instability

8. Which technique is best for analyzing tumor heterogeneity ?

(A) Western blot

(B) Single-cell sequencing

(C) ELISA

(D) PCR

9. Which cancer type originates from epithelial cells ?

(A) Sarcoma

(B) Leukemia

(C) Carcinoma

(D) Myeloma

10. Which hallmark is associated with telomerase activation ?

(A) Angiogenesis

(B) Replicative immortality

(C) Immune evasion

(D) Metastasis

11. A tumor has TP53 mutation and BCL-2 overexpression. What is the combined effect ?

(A) Increased apoptosis

(B) Reduced proliferation

(C) Resistance to apoptosis

(D) Increased differentiation

12. Which model best mimics tumor microenvironment and drug penetration ?

(A) 2D culture

(B) 3D spheroids

(C) PCR

(D) ELISA

13. A mutation increases KRAS signaling. Which pathway is affected ?

(A) DNA repair

(B) Immune recognition

(C) Apoptosis

(D) MAPK signaling

14. A tumor shows high PD-L1 expression. What is the implication ?

(A) Increased apoptosis

(B) Immune evasion

(C) Reduced angiogenesis

(D) DNA repair activation

15. Which combination best explains tumor heterogeneity ?

(A) Single mutation

(B) Stable genome

(C) Clonal evolution

(D) Uniform gene expression

16. Why are xenograft models limited in immunotherapy studies ?

(A) Lack tumor growth

(B) Lack immune system

(C) High cost

(D) Poor vascularization

17. Which alteration leads to synthetic lethality with PARP inhibitors ?

(A) BRCA mutation

(B) KRAS mutation

(C) TP53 mutation

(D) MYC amplification

18. Which factor contributes most to metastasis ?

(A) Apoptosis

(B) EMT

(C) DNA repair

(D) Cell cycle arrest

19. Which scenario represents gene-environment interaction ?

(A) Random mutation

(B) Aging

(C) BRCA mutation + smoking

(D) DNA replication error

20. Which technique integrates genomic and proteomic data ?

(A) PCR

(B) ELISA

(C) Flow cytometry

(D) Multi-omics

21. Which is the most effective approach for personalized cancer therapy ?

(A) Chemotherapy

(B) Radiotherapy

(C) Genomic profiling

(D) Surgery

22. Which model is best for predicting patient-specific drug response ?

(A) 2D culture

(B) Organoids

(C) CDX model

(D) PCR

23. Which strategy is most effective for early cancer detection ?

(A) Liquid biopsy

(B) Surgery

(C) Chemotherapy

(D) Radiotherapy

24. Which approach best overcomes tumor heterogeneity ?

(A) Single drug therapy

(B) Combination therapy

(C) Radiation alone

(D) Surgery alone

25. Which method best studies metastasis in vivo ?

(A) 2D culture

(B) Organoids

(C) Mouse models

(D) ELISA

26. Which factor limits widespread use of genomics in cancer care ?

(A) Lack of mutations

(B) High cost

(C) Low accuracy

(D) No clinical relevance

27. Which therapy is most suitable for tumors with high TMB ?

(A) Chemotherapy

(B) Immunotherapy

(C) Surgery

(D) Hormonal therapy

28. Which is the most promising future direction in oncology ?

(A) Radiation only

(B) Histology only

(C) Chemotherapy

(D) Multi-omics integration

29. Which approach is best to study drug resistance mechanisms ?

(A) ELISA

(B) Longitudinal genomic analysis

(C) Microscopy

(D) Staining

30. Which model provides highest clinical relevance ?

(A) 2D cell line

(B) CDX model

(C) PDX model

(D) PCR

31. A mutation locks Ras in GTP-bound form. What is the outcome ?

(A) Cell cycle arrest

(B) Apoptosis

(C) Continuous proliferation

(D) DNA repair

32. Which drug is used to target KRAS G12C mutation ?

(A) Erlotinib

(B) Sotorasib

(C) Imatinib

(D) Olaparib

33. Loss of APC gene function leads to activation of :

(A) PI3K pathway

(B) JAK-STAT pathway

(C) MAPK pathway

(D) Wnt/β-catenin pathway

34. Which protein is known as "guardian of the genome" ?

(A) RB

(B) MYC

(C) p53

(D) Ras

35. Cyclin D-CDK4/6 complex regulates :

(A) S phase

(B) G1 phase

(C) G2 phase

(D) M phase

36. Which inhibitor directly suppresses cyclin-CDK activity ?

(A) p21

(B) CDC25

(C) EGFR

(D) Ras

37. EGFR activation primarily triggers which pathway ?

(A) DNA repair

(B) MAPK pathway

(C) Glycolysis

(D) Apoptosis

38. DNA hypermethylation of tumor suppressor genes leads to :

(A) Activation

(B) Mutation

(C) Gene silencing

(D) Amplification

39. miR-21 acts as :

(A) Tumor suppressor

(B) Oncogene (oncomiR)

(C) Repair enzyme

(D) Growth factor

40. UV radiation induces which DNA damage ?

(A) Pyrimidine dimers

(B) Double-strand breaks

(C) Insertions

(D) Deletions

41. Mutation in Ras and overexpression of MYC together result in :

(A) Reduced proliferation

(B) Increased apoptosis

(C) Enhanced tumor growth

(D) DNA repair

42. Loss of p53 and Rb simultaneously affects :

(A) Angiogenesis

(B) Cell cycle checkpoints

(C) Immune evasion

(D) Metabolism

43. Why is CDC25 overexpression oncogenic ?

(A) Inhibits CDKs

(B) Blocks transcription

(C) Degrades DNA

(D) Activates CDKs

44. Which mechanism explains Src-mediated metastasis ?

(A) DNA methylation

(B) FAK phosphorylation

(C) Histone acetylation

(D) RNA splicing

45. Which scenario indicates epigenetic regulation ?

(A) Gene deletion

(B) DNA mutation

(C) Histone acetylation

(D) Chromosomal translocation

46. Why does loss of let-7 miRNA promote cancer ?

(A) Activates p53

(B) Inhibits Ras

(C) Enhances Ras signaling

(D) Blocks apoptosis

47. Which pathway is activated by both EGFR and IGFR ?

(A) MAPK and PI3K-Akt

(B) DNA repair

(C) Glycolysis

(D) Apoptosis

48. HPV E6 and E7 proteins cause cancer by :

(A) Activating Ras

(B) Inhibiting p53 and Rb

(C) Activating EGFR

(D) Inducing apoptosis

49. Chemical carcinogenesis involves which sequence ?

(A) Promotion → initiation → progression

(B) Initiation → promotion → progression

(C) Progression → initiation → promotion

(D) Mutation → repair → apoptosis

50. Which best explains radiation-induced cancer ?

(A) Protein denaturation

(B) RNA degradation

(C) Lipid oxidation

(D) DNA double-strand breaks

51. Which is the most effective strategy to target EGFR-mutant cancer ?

(A) Chemotherapy

(B) EGFR inhibitors

(C) Surgery

(D) Radiation

52. Which approach is best to restore tumor suppressor function ?

(A) Activate oncogenes

(B) Increase methylation

(C) Gene therapy

(D) Radiation

53. Which strategy is most effective against epigenetic silencing ?

(A) DNMT inhibitors

(B) Antibiotics

(C) Radiation

(D) Surgery

54. Which approach best targets Ras-driven cancers ?

(A) Direct Ras inhibition

(B) Blocking downstream pathways

(C) Radiation

(D) Surgery

55. Which therapy is best for cancers with CDK over activation ?

(A) EGFR inhibitors

(B) Immunotherapy

(C) PARP inhibitors

(D) CDK4/6 inhibitors

56. Which approach is most suitable for viral-induced cancers ?

(A) Antibiotics

(B) Vaccination

(C) Radiation

(D) Surgery

57. Which method best prevents UV-induced cancer ?

(A) Chemotherapy

(B) Surgery

(C) Sunscreen

(D) Antibiotics

58. Which strategy is most effective against miRNA dysregulation ?

(A) Chemotherapy

(B) miRNA mimics/inhibitors

(C) Radiation

(D) Surgery

59. Which approach best addresses multi-pathway activation in cancer ?

(A) Single drug therapy

(B) Radiation alone

(C) Surgery alone

(D) Combination targeted therapy

60. Which is the most comprehensive cancer treatment strategy ?

(A) Surgery alone

(B) Chemotherapy alone

(C) Precision medicine approach

(D) Radiation alone

61. Cancer cells preferentially use glycolysis even in the presence of oxygen. This phenomenon is called :

(A) Pasteur effect

(B) Warburg effect

(C) Crabtree effect

(D) Cori cycle

62. Why do cancer cells increase glucose uptake despite low ATP yield ?

(A) To reduce ROS

(B) To generate biosynthetic intermediates

(C) To inhibit apoptosis

(D) To activate ETC

63. Which imaging technique is based on increased glycolysis in tumors ?

(A) MRI

(B) CT scan

(C) FDG-PET

(D) X-ray

64. Mutation in mitochondrial ETC leads to :

(A) Reduced ROS

(B) Increased ROS

(C) Increased ATP

(D) Reduced glycolysis

65. Which pathway provides NADPH for antioxidant defense ?

(A) Glycolysis

(B) TCA cycle

(C) Pentose phosphate pathway

(D) β-oxidation

66. Which molecule initiates mitochondrial apoptosis ?

(A) ATP

(B) Cytochrome c

(C) NADH

(D) $FADH_2$

67. Which protein is anti-apoptotic ?

(A) Bax

(B) Bak

(C) Bcl-2

(D) Bid

68. Which metabolic pathway uses glutamine as a carbon source ?

(A) Glycolysis

(B) Glutaminolysis

(C) PPP

(D) β-oxidation

69. Autophagy primarily involves :

(A) DNA replication

(B) Protein synthesis

(C) Degradation of cellular components

(D) Cell division

70. Which ROS acts as a signaling molecule at low levels ?

(A) Hydroxyl radical

(B) Superoxide

(C) Hydrogen peroxide

(D) Nitric oxide

71. Why is aerobic glycolysis advantageous despite low ATP yield ?

(A) Faster ATP production

(B) Reduced glucose uptake

(C) Increased oxidative stress

(D) Decreased proliferation

72. Which combination promotes tumor survival ?

(A) High ROS + low antioxidants

(B) Low ROS + high antioxidants

(C) High ROS + high antioxidants

(D) Low ROS + low antioxidants

73. How do mtDNA mutations contribute to cancer ?

(A) Increase apoptosis

(B) Enhance OXPHOS

(C) Promote metabolic reprogramming

(D) Reduce proliferation

74. Why do cancer cells exhibit mitochondrial hyperpolarization ?

(A) Increased apoptosis

(B) Reduced ROS

(C) Resistance to apoptosis

(D) Reduced metabolism

75. Which factor links ROS to carcinogenesis ?

(A) DNA repair
(B) DNA damage
(C) Protein synthesis
(D) Cell adhesion

76. Why is lactate production beneficial to tumors ?

(A) Increases oxygen
(B) Enhances immune response
(C) Acidifies microenvironment
(D) Reduces proliferation

77. What is the effect of Bcl-2 overexpression ?

(A) Increased apoptosis
(B) Reduced apoptosis
(C) Increased ROS
(D) DNA repair

78. Which process shows dual role in cancer ?

(A) Glycolysis
(B) DNA replication
(C) OXPHOS
(D) Autophagy

79. Why do cancer cells show metabolic flexibility ?

(A) To reduce mutations
(B) To adapt to nutrient availability
(C) To decrease growth
(D) To inhibit signalling

80. Which factor promotes metastasis via mitochondria ?

(A) Reduced ROS
(B) Increased apoptosis
(C) Altered mitochondrial dynamics
(D) Decreased metabolism

81. Which is the best strategy to target cancer metabolism ?

(A) Increase glycolysis
(B) Inhibit glycolysis
(C) Increase OXPHOS
(D) Block DNA repair

82. Which therapy is most effective for apoptosis-resistant tumors ?

(A) Antibiotics
(B) BH_3 mimetics
(C) Radiation
(D) Hormones

83. Which approach best exploits ROS imbalance ?

(A) Antioxidants
(B) Pro-oxidant therapy
(C) Chemotherapy
(D) Surgery

84. Which pathway is the best target for biosynthesis inhibition ?

(A) ETC

(B) Glycolysis

(C) PPP

(D) Autophagy

85. Which therapy targets mitochondrial apoptosis directly ?

(A) EGFR inhibitors

(B) Venetoclax

(C) Imatinib

(D) Erlotinib

86. Which approach is best to block tumor nutrient supply ?

(A) Increase glycolysis

(B) Inhibit glutaminolysis

(C) Activate PPP

(D) Increase lipids

87. Which strategy is most effective for metabolic plasticity ?

(A) Single pathway inhibition

(B) Multi-pathway inhibition

(C) Surgery

(D) Radiation

88. Which approach is best to target autophagy-dependent tumors ?

(A) Induce autophagy

(B) Block apoptosis

(C) Increase glycolysis

(D) Inhibit autophagy

89. Which biomarker is most promising for cancer diagnosis ?

(A) mtDNA mutations

(B) ATP levels

(C) Lipid levels

(D) Protein synthesis

90. Which is the most comprehensive therapeutic approach ?

(A) Target glycolysis only

(B) Target mitochondria + metabolism + apoptosis

(C) Surgery alone

(D) Radiation alone

91. A 55-year-old smoker undergoes screening for lung cancer. Which is the most appropriate test ?

(A) MRI

(B) Low-dose CT

(C) PET scan

(D) Chest X-ray

92. A mutation in EGFR is detected in a lung cancer patient. Which therapy is most appropriate ?

(A) Chemotherapy

(B) Radiation

(C) Tyrosine kinase inhibitors

(D) Hormone therapy

93. Which screening method is used for early detection of cervical cancer ?

(A) Mammography

(B) PSA test

(C) Pap smear

(D) Colonoscopy

94. Detection of BCR-ABL fusion gene is best achieved using :

(A) ELISA

(B) PCR

(C) Western blot

(D) Spectroscopy

95. Which biomarker is used in prostate cancer screening ?

(A) AFP

(B) CA-125

(C) PSA

(D) CEA

96. Which molecular technique is most suitable for detecting HER2 amplification ?

(A) PCR

(B) FISH

(C) ELISA

(D) Southern blot

97. Liquid biopsy primarily detects :

(A) Tumor proteins

(B) ctDNA

(C) DNA repair enzymes

(D) Ribosomes

98. Which cancer is strongly associated with HPV infection ?

(A) Lung cancer

(B) Cervical cancer

(C) Liver cancer

(D) Colon cancer

99. Which therapy directly enhances immune response against tumors ?

(A) Chemotherapy

(B) Radiation

(C) Immunotherapy

(D) Surgery

100. Which test evaluates gene expression profiles for prognosis in breast cancer ?

(A) PCR

(B) Oncotype DX

(C) ELISA

(D) Western blot

(Only for Rough Work)

4. Four alternative answers are mentioned for each question as—A, B, C & D in the booklet. The candidate has to choose the correct answer and mark the same in the OMR Answer-Sheet as per the direction :

Example :

Question :

Q. 1 (A) ● (C) (D)
Q. 2 (A) (B) ● (D)
Q. 3 (A) ● (C) (D)

Illegible answers with cutting and over-writing or half filled circle will be cancelled.

5. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
6. All answers are to be given on OMR Answer Sheet only. Answers given anywhere other than the place specified in the answer sheet will not be considered valid.
7. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.
8. After the completion of the examination candidates should leave the examination hall only after providing their OMR Answer Sheet to the invigilator. Candidate can carry their Question Booklet.
9. There will be no negative marking.
10. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
11. To bring and use of log-book, calculator, pager and cellular phone in examination hall is prohibited.
12. In case of any difference found in English and Hindi version of the question, the English version of the question will be held authentic.

Impt. : On opening the question booklet, first check that all the pages of the question booklet are printed properly. If there is any discrepancy in the question Booklet, then after showing it to the invigilator, get another question Booklet of the same series.

4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर—A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से सही उत्तर छाँटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

उदाहरण :

प्रश्न :

प्रश्न 1 (A) ● (C) (D)
प्रश्न 2 (A) (B) ● (D)
प्रश्न 3 (A) ● (C) (D)

अपठनीय उत्तर या ऐसे उत्तर जिन्हें काटा या बदला गया है, या गोले में आधा भरकर दिया गया, उन्हें निरस्त कर दिया जाएगा।

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर ही दिये जाने हैं। उत्तर-पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
7. ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
8. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी OMR Answer Sheet उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें। परीक्षार्थी अपने साथ प्रश्न-पुस्तिका ले जा सकते हैं।
9. निगेटिव मार्किंग नहीं है।
10. कोई भी रफ कार्य, प्रश्न-पुस्तिका के अन्त में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैलकुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।
12. प्रश्न के हिन्दी एवं अंग्रेजी रूपान्तरण में भिन्नता होने की दशा में प्रश्न का अंग्रेजी रूपान्तरण ही मान्य होगा।

महत्वपूर्ण : प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्न-पुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्न-पुस्तिका प्राप्त कर लें।