



ENTRANCE EXAMINATION – JULY 2016

QUESTION PAPER

PROGRAMME : Ph. D

NANOTECHNOLOGY

Time : 2 hours

Marks: 100

INSTRUCTION TO THE CANDIDATES

1. Use only Pencil to indicate your answers. Use Ball-Point only for writing Name, Register Number and Signature.
2. Darken the square completely. Mark your answers like this

1	2	3	4
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3. Part A is common to all.

Name of the Student: Programme Applied:	Register Number <table border="1" style="margin: 0 auto; width: 100px; height: 20px;"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table> Exam Centre Seal										
Signature of the Student	Signature of the Invigilator										

NIUEE 2016

Part A

- The development of a solid foundation of reliable knowledge typically is built from which type of research?
 - a. basic research
 - b. action research
 - c. evaluation research
 - d. orientational research
- The idea that when selecting between two different theories with equal explanatory value, one should select the theory that is the most simple, concise, and succinct is known as _____.
 - a. criterion of falsifiability
 - b. critical theory
 - c. guide of simplicity
 - d. rule of parsimony
- Research that is done to examine the findings of someone else using the "same variables but different people" is which of the following?
 - a. exploration
 - b. Hypothesis
 - c. Replication
 - d. empiricism
- A researcher designs an experiment to test how variables interact to influence how well children learn spelling words. In this case, the main purpose of the study was:
 - a. Explanation
 - b. Description
 - c. Influence
 - d. Prediction
- What is the key defining characteristic of experimental research?
 - a. extraneous variables are never present
 - b. a positive correlation usually exists
 - c. a negative correlation usually exists
 - d. manipulation of the independent variable
- Which of the following includes examples of quantitative variables?
 - a. age, temperature, income, height
 - b. grade point average, anxiety level, reading performance
 - c. gender, religion, ethnic group
 - d. both a and b
- One step that is not included in planning a research study is:
 - a. Identifying a researchable problem
 - b. A review of current research
 - c. Statement of the research question
 - d. Developing a research plan
- Sources of researchable problems can include:
 - a. Researchers' own experiences as educators
 - b. Practical issues that require solutions
 - c. Theory and past research
 - d. All of the above
- The feasibility of a research study should be considered in light of:
 - a. Cost and time required to conduct the study
 - b. Skills required of the researcher
 - c. Potential ethical concerns
 - d. All of the above

10. A formal statement of the research question or “purpose of research study” generally _____.
 - a. Is made prior to the literature review
 - b. Is made after the literature review
 - c. Will help guide the research process
 - d. b and c
11. Which term refers to publishing several articles from the data collected in one large study?
 - a. Duplicate publication
 - b. Partial publication
 - c. Triplicate publication
 - d. None of these
12. Which of the following is a right of each participant according to the AERA?
 - a. Deception
 - b. Utilitarianism
 - c. Freedom to withdraw
 - d. Participants have no rights
13. Which of the following is a type of criterion-related validity evidence?
 - a. Concurrent evidence
 - b. Predictive evidence
 - c. Internal consistency
 - d. Both a and b are correct answers
14. Which of the following is not a type of reliability?
 - a. Test-retest
 - b. Split-half
 - c. Content
 - d. Internal consistency
15. Which of the following types of reliability refers to the consistency of test scores over time?
 - a. Equivalent forms reliability
 - b. Split-half reliability
 - c. Test-retest reliability
 - d. Inter-scorer reliability
16. Which type of reliability refers to the consistency of a group of individuals' scores on two equivalent forms of a test designed to measure the same characteristic?
 - a. Split-half
 - b. Test-retest
 - c. Split-forms
 - d. Equivalent forms
17. _____ refers to how well the particular sample of behaviors used to measure a characteristic reflects the entire domain of behaviors that constitutes that characteristic.
 - a. Construct validity evidence
 - b. Criterion-related validity evidence
 - c. Content validity evidence
 - d. Face validity evidence
18. Which of these is not a method of data collection.
 - a. Questionnaires
 - b. Interviews
 - c. Experiments
 - d. Observations
19. Another name for a Likert Scale is a(n):
 - a. Interview protocol
 - b. Event sampling
 - c. Summated rating scale
 - d. Ranking
20. A question during an interview such as “Why do you feel that way?” is known as a:
 - a. Probe
 - b. Filter question
 - c. Response
 - d. Pilot
21. A census taker often collects data through which of the following?
 - a. Standardized tests
 - b. Interviews
 - c. Secondary data
 - d. Observations

22. In which of the following nonrandom sampling techniques does the researcher ask the research participants to identify other potential research participants?
 a. Snowball b. Convenience c. Purposive d. Quota
23. Which of the following is the most efficient random sampling technique?
 a. Simple random sampling b. Proportional stratified sampling
 c. Cluster random sampling d. Systematic sampling
24. Which of the following would usually require the smallest sample size because of its efficiency?
 a. One stage cluster sampling b. Simple random sampling
 c. Two stage cluster sampling d. Quota sampling
25. _____ is a set of elements taken from a larger population according to certain rules.
 a. Sample b. Population c. Statistic d. Element

Part B

26. The monomer of PMMA is
 a. Methyl methacrylate b. Ethyl acrylate
 c. Acrylonitrile d. Methyl acrylate
27. Which of the following is a natural polymer?
 a. Polythene b. Polysaccharides c. Nylon d. Terylene
28. The momentum associated with a photon of frequency ν is where 'h' is Planck's constant and 'c' is velocity of light
 a. $h\nu/c$ b. hc/ν c. $\nu c/h$ d. $h/\nu c$
29. Electromagnetic radiation with maximum wavelength is
 a. Ultraviolet rays b. Radio waves
 c. X-Rays d. Infrared
30. The number of orbitals in the fourth energy level is
 a. 4 b. 16 c. 32 d. 9
31. Which electronic transition in hydrogen atom is accompanied by maximum release of energy?
 a. $n = 2$ to $n = 1$ b. $n = 3$ to $n = 2$ c. $n = 4$ to $n = 3$ d. $n = 4$ to $n = 2$
32. The ratio of radius of the nucleus to the radius of the atom is of the order of
 a. 10^5 b. 10^6 c. 10^{-5} d. 10^{-8}
33. Wave character of electrons was experimentally verified by
 a. Einstein b. de Broglie c. Max Planck d. Davisson and Germer
34. Holes exists in

- a. Semiconductors
c. Conductors
- b. Insulators
d. None of these
35. The thickness P-N junction is of the order of
a. 10^{-8} cm b. 10^{-6} cm c. 1mm d. 10^{-12} cm
36. Thermionic current is proportional to
a. $T^{1/2}$ b. $T^{3/2}$ c. T^2 d. T
37. Number of atoms in a unit cell of a simple cubic crystal is
a. 1 b. 2 c. 3 d. 4
38. A solar cell can be made from
a. A thin wafer of Si doped with As b. A thin wafer of germanium
c. A thin wafer of pure gallium arsenide d. None of the above
39. Energy in a current carrying coil is stored in the form of
a. Electric field b. Magnetic field
c. Dielectric strength d. Heat
40. A tube made of a single graphitic layer rolled up into a hollow cylinder is called
a. Graphite Nanotube b. Graphene tube
c. Carbon cylinder d. Carbon Nanotube.
41. Honey comb arrangement of carbon atom in the form of single atom layer called
a. Carbon nano sheet b. Graphite
c. Graphene d. None of the above
42. The chiral vector of the Carbon Nanotube denoted by $C=(m, n)$, if $m=n$
a. Zig-Zag CNT b. Armchair CNT c. Chiral CNT d. Multiwall CNT
43. One of the methods shown below can be used to produce carbon nanotube.
a. Arc method b. CVD c. Ball mill d. All the above
44. Quantum dot also known as _____ structure
a. 0 Dimension b. 1 Dimension c. 2 Dimension d. 3 Dimension
45. Thin film known is a _____ structure
a. 1D confinement b. 2D Confinement
c. 3D Confinement d. 0D Confinement
46. The equivalent value of one nanometer is
a. 10^{-9} m b. 10 Å c. 0.001 μ m d. all the above
47. At nanoscale the Ferromagnetism changed to _____
a. Para magnetism b. Super Paramagnetism
c. Anti Ferromagnetism d. No change
48. The meaning of quantum confinement is

- a. The movement of electron is restricted
 - b. The size of the particle reduced
 - c. The movement of electron is free in all direction
 - d. Tunneling of electron
49. How many C3 axis of rotation a cub has
- a. 1
 - b. 2
 - c. 3
 - d. 4
50. A primitive lattice contain how many atoms
- a. 1
 - b. 2
 - c. 3
 - d. 4
51. Protein responsible for blood coagulation
- a. Kinin
 - b. Fibrin
 - c. dyenin
 - d. Casein
52. Beer Lambert's law explains about
- a. Particle interaction
 - b. Positron interaction
 - c. Atomic interaction
 - d. Light interaction
53. Plank's constant (h) supports the importance of
- a. Energy relation
 - b. Vibration relation
 - c. temperature relation
 - d. Potential relation
54. Chargaff's rule explains the importance of
- a. Protein structure
 - b. DNA structure
 - c. Atomic structure
 - d. Enzyme structure
55. Chaperones help in
- a. Stabilizing the configuration of proteins
 - b. Stabilizing the structure of DNA
 - c. Stabilizing the configuration of lipids
 - d. Stabilizing the structure of carbohydrates
56. Which is popularly known as the secretory antibody?
- a. IgM
 - b. IgE
 - c. IgA
 - d. IgG
57. Climbing of gecko on smooth surfaces is enabled by
- a. Covalent forces
 - b. Electrostatic forces
 - c. Ionic forces
 - d. Vanderwaals forces
58. The strongest bond is
- a. Ionic bond
 - b. Electrochemical bond
 - c. Electrostatic bond
 - d. Covalent bond
59. Neuronal cells do not have the following cell organelle
- a. Nucleus
 - b. Centrosome
 - c. Mitochondria
 - d. Chromosome
60. The cells involved in cell mediated immunity are
- a. Lymphocytes
 - b. Thrombocytes
 - c. Plastids
 - d. Glucocytes

61. Micelles are
 a. Amphiphilic in nature
 b. Hydrophobic in nature
 c. Hydrophilic in nature
 d. Aerophilic in nature
62. The percentage of expressing genes in our genome
 a. 10%
 b. 3%
 c. 25%
 d. 5%
63. The charge of a DNA molecule is
 a. Negative
 b. Zwitterionic
 c. Positive
 d. Neutral
64. Jumping genes are popularly known as
 a. Transcriptomes
 b. Translases
 c. Transposons
 d. Transvertases
65. p53 genes are popularly known for
 a. Tumor suppression
 b. Catalytic effect
 c. Tumor initiation
 d. toxic effect
66. The final acceptor of electrons in the electron transport chain is
 a. water
 b. Oxygen
 c. Cytochrome a3
 d. Cytochrome –a
67. From DNA template with the sequence CTGATAGE the mRNA is.
 a. GAUTATUG
 b. GUCTUTCG
 c. UACTATCU
 d. GACUAUCG
68. Apoptosis is necessary to
 a. Destroy unwanted cells
 b. Enhance proliferation
 c. promote tumor
 d. replicate DNA
69. The life of the erythrocytes in mamalian clood is about
 a. 120 days
 b. 150 days
 c. 190 days
 d. 180 days
70. Vitamin necessary for blood clotting is
 a. A
 b. C
 c. E
 d. K
71. What is the length scale used in nanotechnology?
 a. Size of the order of 10^{-9} m
 b. Size of the order of 10^{-8} m
 c. Size of the order of 10^{-7} m
 d. Size of the order of 10^{-6} m
72. Under what condition the continuum model breaks down.
 a. When volume is so small that mass is not uniformly distributed.
 b. When volume is so small that mass is uniformly distributed.
 c. When volume is less than $1.0 \times 10^{-3} \text{ cm}^3$
 d. When volume is greater than $1.0 \times 10^{-3} \text{ cm}^3$
73. Macroscopic view of properties.
 a. Consider behavior of individual molecules.
 b. Consider behavior of all molecules as identical.
 c. Consider gross or average behavior of a number of molecules.
 d. None of these

74. Nanotechnology rests on the technology that involves devices and systems:
- less than 200 nm.
 - Less than 100 nm.
 - less than 1000 nm.
 - less than 300 nm.
75. Define energy carrier phonon.
- It is the energy carrier for macro-scale mechanism
 - It is the quantized lattice vibration energy.
 - It is the quantized electromagnetic energy.
 - All the above.
76. What is the definition of mean free path length of a heat carrier?
- Size of the heat carrier
 - Characteristic dimension of the device.
 - Average distance traveled by the heat carrier before successive collisions.
 - None of these.
77. What is a carbon nanotube?
- Circular tube made of graphite
 - Nanotubes are hollow cylinders made up of carbon atoms.
 - Nanotubes are made of carbon sheet
 - all the above
78. What is a nanofluid?
- Nanofluids are fluids in nanosize device
 - Nanofluids are mixture of different fluids
 - Nanofluids are fluids with suspensions of solid nano-particles it.
 - None of these.
79. Identify the material that under goes the most deflection:
- Titanium
 - Aluminum
 - Steel
 - Titanium alloy
80. Carbon nanotubes are stronger than steel.
- Carbon nanotubes are 100 times stronger than steel at one-sixth of the weight.
 - Carbon nanotubes are 10 times stronger than steel at one-sixth of the weight.
 - Carbon nanotubes are 1000 times stronger than steel at one-sixth of the weight.
 - Carbon nanotubes are 20 times stronger than steel at one-sixth of the weight.
81. Carbon nanotubes have the ability to sustain temperature as high as:
- 800 C
 - 2000 C
 - 3000 C
 - 1000 C\
82. Single Walled Carbon Nano-Tubes (SWCNT) are:
- excellent conductors
 - Poor conductor
 - Poor conductor than MWCNT
 - Excellent conductor than MWCNT
83. Nanofluid thermal conductivity is increase by a factor of 20-30% by adding:
- 10-15 % of nanoparticles
 - 20-30% of nanoparticles
 - (3-4%) of nanoparticles
 - (1-5%) of nanoparticles

84. Piezoelectric Effect involves
- Generating electrical voltage
 - Generating mechanically stress
 - Generating vibration
 - All the above
85. Gravity plays:
- Plays a strong role in nanoscale
 - Do not play a strong role in nanoscale
 - Is as important as other forces in nanoscale
 - None of these.
86. Human body generates energy of the order of:
- 1 KW
 - 50 W
 - 1 mW
 - 2 KW
87. Zinc Oxide is:
- A good conductor
 - has only good piezoelectric property
 - has good piezoelectric and semiconductor properties.
 - all the above
88. Nanoparticle properties are:
- May be same as in bulk material
 - Little bit different from bulk material properties.
 - Significantly different from bulk material properties.
 - None of these.
89. The prefix nano comes from
- French word meaning small
 - Spanish word meaning spherical
 - Latin word meaning invisible
 - Greek word meaning dwarf
90. Which of the following order is correct?
- Bulk-crystal-atom-nanoparticle -cluster
 - Crystal- cluster-atom-nanoparticle-bulk
 - Atom- cluster-crystal-nanoparticle-bulk
 - Nanoparticle-atom-crystal -cluster-bulk
91. What is meant by aspect of nanoparticles?
- Surface to volume ratio
 - Size to volume ratio
 - surface to size ratio
 - None
92. Which is/are the following feature(s) of nanoscale materials?
- Discrete energy levels
 - High surface energy
 - reduced band gap
 - ALL
93. Which of the Statement is not true?
- Gold at nanoscale is red
 - Silver at nanoscale is yellow
 - Silicon at nanoscale is an insulator
 - Aluminium at nanoscale is highly non-conducting
94. What is graphene
- Thin film made from fullerenes
 - Software tool to measure and graphically represents nanoparticles
 - A one-atom thick sheet of carbon
 - A new material made from carbon nanotubes

95. Which of the following is not the type of SPM?
- Magnetic force microscopy (MFM)
 - Scanning microwave microscopy (SMM)
 - Scanning capacitance microscopy (SCM)
 - Scanning electron microscopy (SEM)
96. In ideal Superparamagnetic nanomaterials, the Coercivity will be
- Zero
 - Increase
 - remain same
 - none of the above
97. Which type of microscope uses a metal and diamond probe that is gently forced down along the surface of a specimen?
- Atomic force
 - Transmission electron
 - Scanning electron
 - Confocal
98. In scanning electron microscopy (SEM), the three dimension image created by
- Primary electron
 - Back scattered electron
 - Secondary electron
 - ALL
99. What is Nanonewton?
- Quantum nano sheet
 - High intensity static magnetic field
 - A kind of electromagnetic force
 - The amount of force required to break a chemical bond between the atoms
100. Which one of the following isotropic nanomaterial?
- Nano rods
 - Nano cubes
 - Nano tubes
 - Spherical nanoparticles