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| Seat<br>No. |  |
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**M.Phil / Ph.D. Entrance Examination, May - 2019 (Special Drive)**  
**NANOSCIENCE & TECHNOLOGY**

Day and Date : Tuesday, 21 - 05 - 2019

Total Marks : 100

Time : 04.00 p.m. to 06.00 p.m.

- Instructions :**
- 1) All questions are compulsory.
  - 2) Each question carries 2 marks.
  - 3) Answers should be marked in the given OMR answer sheet by darkening the appropriate option.
  - 4) Use black ball point pen only for marking the circle. Do not make any stray mark on the OMR Answer Sheet.
  - 5) Follow the instructions given on OMR Sheet.
  - 6) Rough work shall be done on the sheet provided at the end of question paper.
  - 7) Only non-programmable calculators are allowed.

- 1) Working hypothesis is tentative \_\_\_\_\_ made in order to draw out and test its logical or empirical consequences.
  - a) Solution
  - b) Problem
  - c) Diagram
  - d) Assumption
  
- 2) Descriptive research includes \_\_\_\_\_ and fact-finding enquiries of different kinds.
  - a) Hypothesis
  - b) Research papers
  - c) Surveys
  - d) Problems
  
- 3) One can also define research as a scientific and \_\_\_\_\_ search for pertinent information on a specific topic.
  - a) Systematic
  - b) Parallel
  - c) New
  - d) Slightly modified

**P.T.O.**

- 4) Conceptual research is that related to some \_\_\_\_\_ or theory.
- a) Experiment
  - b) Simulation
  - c) abstract(s)
  - d) Conclusions
- 5) Which of the following type is useful to publish specific topic of high relevance with page limit?
- a) Article
  - b) Communication
  - c) Review
  - d) Letter
- 6) The important and originality of the research need to mention in
- a) Abstract
  - b) Cover Letter
  - c) Reply to reviewer's comments
  - d) Conclusions
- 7) What is wrong to mention the cover letter
- a) Speak negatively about other studies or researchers
  - b) History of the manuscript
  - c) Independent reviewers suggestion (or exclusion)
  - d) Explain briefly the specific advances over previous research and potential applications
- 8) Which way is correct to reward the reviewer?
- a) Giving certificates to reviewers
  - b) Elsevier provides reviewers free access to Scopus
  - c) Receiving an 'Acknowledgement in the journal.'
  - d) All the above

- 9) In the synopsis "The motivation of the research area" can be mentioned under
- a) Introduction
  - b) Objectives
  - c) Significance of research
  - d) Literature survey
- 10) All research process starts with \_\_\_\_\_
- a) hypothesis
  - b) experiments to test hypothesis
  - c) observation
  - d) all of these
- 11) Inductive reasoning is \_\_\_\_\_
- a) data collection analysis method
  - b) theory data collection analysis method
  - c) data collection method
  - d) both a and b
- 12) If  $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$  then divergence  $\vec{r}$  is \_\_\_\_\_
- a) 3
  - b) 5
  - c) 7
  - d) 9
- 13) Find curl  $\vec{F}$  for the vector field  $\vec{F} = 3x^2 \hat{i} + 2z\hat{j} - x\hat{k}$
- a)  $5\hat{i} - 4\hat{j} - x\hat{k}$
  - b)  $-2\hat{i} + \hat{j}$
  - c)  $6x$
  - d)  $-2\hat{i} - \hat{j}$
- 14) The particles which obey Pauli's exclusion principle are \_\_\_\_\_
- a) Classical particles
  - b) Quantum particles
  - c) Bosons
  - d) Fermions

**15)** Surface imperfections are \_\_\_\_\_ dimensional defects.

- a) Zero
- b) One
- c) Two
- d) Three

**16)** If constraint relations do not explicitly depend on time then it is \_\_\_\_\_

- a) Scleronomic
- b) Rheonomic
- c) Holonomic
- d) Non-Holonomic

**17)** A particle of mass 'm' moves in a conservative force field, which of the following is not Langrangian.

- a)  $\frac{d}{dt}\left(\frac{\delta L}{\delta r}\right) - \frac{\delta L}{\delta r} = 0$
- b)  $\frac{d}{dt}\left(\frac{\delta L}{\delta \theta}\right) - \frac{\delta L}{\delta \theta} = 0$
- c)  $\frac{d}{dt}\left(\frac{\delta L}{\delta z}\right) - \frac{\delta L}{\delta z} = 0$
- d)  $\frac{d}{dt}\left(\frac{\delta \theta}{\delta L}\right) - \frac{\delta \theta}{\delta L} = 0$

**18)** Shortest distance between two point in plane have \_\_\_\_\_ path.

- a) Cycloid
- b) Elliptic
- c) Semi cycloid
- d) Straight line

**19)** In case of modified Hamilton's principle, the path refers to

- a) Configuration space
- b) Phase space
- c) Position space
- d) All of these

**20)** In hydrogen atom, potential is \_\_\_\_\_ dimensional.

- a) One
- b) Two
- c) Three
- d) Zero

- 21)** Quantum confinement results in
- a) Energy gap in semiconductor is proportional to the inverse of the square root of size
  - b) Energy gap in semiconductor is proportional to the inverse of the size
  - c) Energy gap in semiconductor is proportional to the square of size
  - d) Energy gap in semiconductor is proportional to the inverse of the square of size
- 22)** The properties like melting point, solubility, color, etc changes on varying the
- a) Size
  - b) Composition
  - c) Surface properties
  - d) None of the mentioned
- 23)** What are the advantages of nano-composite packages?
- a) Lighter and biodegradable
  - b) Enhanced thermal stability, conductivity and mechanical strength
  - c) Gas barrier properties
  - d) a, c & b
- 24)** Which of the following is the principal factor which causes the properties of nanomaterials to differ significantly from other materials?
- a) Size distribution
  - b) Specific surface feature
  - c) Quantum size effects
  - d) a, c & b
- 25)** Bio-MEMS stands for
- a) Bio mini electro micro system
  - b) Bio micro electro mechanical system
  - c) Bio nano electro mechanical system
  - d) Bio macro electro micro system

- 26)** Nanobiorobots used for *in-vivo* applications are primarily based on
- a) Machines
  - b) batteries
  - c) Molecular motors
  - d) Imaging
- 27)** Self assembly is the characteristic property of
- a) Magnetic nanoparticles
  - b) Quantumn Dots
  - c) Biomolecules
  - d) Carbon Nanotubes
- 28)** SERS stands for
- a) Surface Plasmon Resonance
  - b) Surface Enhanced Resonance
  - c) Surface Enhanced Raman Spectroscopy
  - d) Solid Enhanced Raman Spectroscopy
- 29)** 'Nacre' are produced by
- a) Bacteria
  - b) Fungus
  - c) Molluscs
  - d) Virus
- 30)** Which of the following is a well known bone repairing widely used in orthopaedics and dentistry?
- a) Dendrimer
  - b) Quantumn dot
  - c) Titanium
  - d) None of the above
- 31)** Which one of the following is NOT a molecular tag
- a) Dendrimers
  - b) Quantumn Dots
  - c) Nanoprobes
  - d) Nanoarrays
- 32)** Blood is
- a) Not a tissue
  - b) A tissue
  - c) A liquid connective tissue
  - d) A liquid ground tissue

- 33)** The yeast that is used in alcohol production and bread making is
- a) *Escherichia coli*
  - b) *Saccharomyces cerevisiae*
  - c) *Bacillus subtilis*
  - d) *Pseudomonas putida*
- 34)** The "lock and key" model of enzyme action illustrates that a particular enzyme molecule
- a) May be destroyed and resynthesized several times
  - b) Interacts with a specific type of substrate molecule
  - c) Reacts at identical rates under all conditions
  - d) Forms a permanent enzyme-substrate complex
- 35)** Which of the following is not a characteristic in all the living organism
- a) Reproduction
  - b) Photosynthetic respiration
  - c) Presence of unique genetic make up
  - d) Maintaining body homeostasis
- 36)** Nanowires can find application in
- a) gene mutation detection
  - b) protein sensing
  - c) expression detection
  - d) all

**37)** Nanoshells are

- a) spherical nanoparticles
- b) works on oscillation of electrons
- c) both
- d) none

**38)** DPL stands for

- a) Density probe lithography
- b) Dip pen lithography
- c) Dip probe lithography
- d) None

**39)** The area bounded by  $y = 0$ ,  $x = 1$ ,  $x = 3$  and  $y = x + 3$  is

- a) 12 units
- b) 10 units
- c) 09 units
- d) 11 units

**40)** The area bounded by the parabola  $x = y^2$  and  $x = 9$  is

- a) 54 units
- b) 104 units
- c) 108 units
- d) 52 units

**41)** The angle made by the complex number  $z = 1 + I$  with the positive X axis is

- a)  $\frac{\pi}{6}$
- b)  $\frac{\pi}{3}$
- c)  $\frac{\pi}{2}$
- d)  $\frac{\pi}{4}$



**42)** The distance of a complex number  $z = 3i$  from the origin is

- a) 3 units
- b) 2 units
- c) 1 unit
- d) 1.5 units

**43)** The partial derivative of  $z = \sin(xy)$  w.r.t.  $x$  is

- a)  $\cos(xy)$
- b)  $-\cos(xy)$
- c)  $y\cos(xy)$
- d)  $-y\cos(xy)$

**44)** Series connection of thermopiles provides \_\_\_\_\_

- a) Higher current
- b) Higher EMF
- c) Higher conductance
- d) Higher Charge

**45)** The analog meters are based on the \_\_\_\_\_ sensing principle.

- a) Voltage
- b) Resistance
- c) Current
- d) EMF

**46)** \_\_\_\_\_ is an example of pressure transducer.

- a) Thermistor
- b) Inductive Transducer
- c) Bourdon Tube
- d) LVDT

- 47) The absorbance is inversely proportional to the \_\_\_\_\_ of the solution.
- a) Concentration
  - b) Path length
  - c) Transmittance
  - d) Absorptivity
- 48) The Raman Effect is a \_\_\_\_\_ process.
- a) Diffraction
  - b) Elastic Scattering
  - c) Inelastic Scattering
  - d) Interference
- 49) Due to the surface area to volume ratio which factor is affected significantly
- a) Reactivity
  - b) Absorption
  - c) Conductivity
  - d) Magnetism
- 50) The Surface Plasmon Resonance can be observed in
- a) Metal NPs
  - b) Bulk Metal
  - c) QDs
  - d) Semiconductor NPs



**Rough Work**

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