



श्री चित्रा तिरुनाल आयुर्विज्ञान और प्रौद्योगिकीसंस्थान, तिरुवनंतपुरम्-11  
SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY  
THIRUVANANTHAPURAM—695 011

ENTRANCE EXAMINATION - ACADEMIC SESSION JANUARY 2022

Program: PhD Biomaterial Science and Technology

Time:90 Minutes

Max. Marks: 100

(Select the most appropriate answer)

(There are **no negative** marks for wrong answers)

- 1 Different properties in different directions in materials is called
  - a. amorphous
  - b. anisotropic
  - c. austenite
  - d. crystalline
- 2 One among the following molecules do not have a rotational spectrum, which?
  - a. H<sub>2</sub>
  - b. CO
  - c. HCL
  - d. HBr
- 3 Which among the following is added to stainless steel to form protective passive film
  - a. Cr
  - b. Ni
  - c. Mo
  - d. Mn
- 4 Commercially available titanium has this crystal structure
  - a. HCP
  - b. HCP+BCC
  - c. BCC
  - d. FCC
- 5 Phase transformation toughening of zirconia involves grains transforming from
  - a. tetragonal to monoclinic
  - b. monoclinic to cubic
  - c. tetragonal to cubic
  - d. cubic to tetragonal
- 6 Diamond Like Carbon is used to refer to range of amorphous carbon films that contain carbon in which hybridization state?
  - a. sp<sup>3</sup>
  - b. sp<sup>2</sup>
  - c. sp
  - d. none
- 7 Bioactive glass production widely uses this precursor
  - a. Purified Sand
  - b. TEOS
  - c. TMS
  - d. Refined Clay
- 8 Select the bioactive ceramic system from the following
  - a. TiN
  - b. HA
  - c. Zirconia
  - d. Alumina

- 9 Monomeric unit in pHEMA is
- Propylene
  - Vinyl Chloride
  - Methyl Methacrylate
  - 2-hydroxyethyl methacrylate
- 10 Which among the following is not a degradable polymer
- PCL
  - PEG
  - PEEP
  - PVC
- 11 Identify the conducting polymer
- PPy
  - PP
  - PVC
  - PET
- 12 Technovit 9100 is an embedding polymer system based on
- MMA
  - PMMA
  - HEMA
  - PE
- 13 Glass knives for TEM sectioning are optimally produced cutting edge at
- 32 degrees angle
  - 45 degrees angle
  - 90 degrees angle
  - 64 degrees angle
- 14 Poise is the unit of coefficient for
- viscosity
  - friction
  - bulk modulus
  - young's modulus
- 15 Auger effect used widely in analysis tools involves emission of
- electrons
  - photons
  - protons
  - neutrons
- 16 Which of the following statement is true regarding the Glass Transition Temperature (T<sub>g</sub>) of a polymer ?
- T<sub>g</sub> increases with increase in flexibility of the polymer chain
  - T<sub>g</sub> decreases with increase in flexibility of the polymer chain
  - T<sub>g</sub> decreases with decrease in flexibility of the polymer chain
  - T<sub>g</sub> decreases with increase in crystallinity of the polymer
- 17 The number average molecular mass (M<sub>n</sub>) and weight average molecular mass (M<sub>w</sub>) of a polymer is 100,000 and 150,000 respectively. The polydispersity index of the polymer "A" is
- $1 < A < 2$
  - $A > 2$
  - $2 < A < 5$
  - $A < 1$
- 18 What may be the consequence of the uncontrolled vinyl polymerization with excessive rise in temperature?
- Discolouration
  - Thermal degradation
  - Branching or cross-linking
  - All of the above
- 19 Solution polymerization overcome the disadvantages of bulk polymerization via
- Solvent reduces the viscosity gain
  - Solvent increases the rate of reaction
  - Solvent leads to frequent chain transfer
  - All the above



- 30 which of the following statement is true in Amalgam
- a. A metallic powder composed of silver, tin, copper and Zinc
  - b. An alloy of two or more metals and one of which is mercury
  - c. An alloy of one or more metals that have been dissolved in each other in the molten state
  - d. A powder mixed with mercury
- 31 Non-crystalline polymers are called
- a. soft polymer
  - b. micelle
  - c. amorphous polymer
  - d. hard polymer
- 32 \_\_\_\_\_ is used to measure Flexural strength of a biomaterial?
- a. Calculation from the stress-strain curve
  - b. Tensile test
  - c. Compression test
  - d. Three- and four-point bend test
- 33 Single edge notched-beam Indirect measurement helps in measurement of
- a. Toughness
  - b. Ductility
  - c. Fatigue
  - d. Creep
- 34 Tissue engineering was conceptualized in
- a. 1916
  - b. 1933
  - c. 1865
  - d. 1890
- 35 The ratio of Ca/P in bioactive calcium phosphates is
- a. 1.5
  - b. <1.5
  - c. 1
  - d. None of the above
- 36 Which among the following is a biopolymer?
- a. Polylactic acid
  - b. Polycaprolactone
  - c. Collagen
  - d. Polyvinylalcohol
- 37 The structural integrity of most of the connective tissues in animals is maintained by
- a. Collagen
  - b. Elastic
  - c. Keratin
  - d. Glycolic acid
- 38 The tilting disc of Chitra Heart Valve Prosthesis is made out of
- a. HDPE
  - b. LDPE
  - c. UHMWPE
  - d. LLDPE
- 39 \_\_\_\_\_ is the technology used to weld Chitra Blood Bags
- a. Radio Frequency welding
  - b. Heat welding
  - c. Pressure welding
  - d. Ultraonic welding
- 40 Wollastonite is an example of
- a. Metal
  - b. Polymer
  - c. Bioceramic
  - d. Composite
- 41 Crystallinity of a bioceramic is determined using
- a. XRD
  - b. DSC
  - c. ESCA
  - d. XPS

- 42 Bone can be considered as \_\_\_\_\_ of collagen and calcium phosphate ceramic
- Blend
  - Mixture
  - Composite
  - Alloy
- 43 The science of evaluating wear properties of biomedical implants is called \_\_\_\_\_
- Rheology
  - Tribology
  - Ablation
  - Degradation
- 44 Diamond-like carbon coating is employed to improve \_\_\_\_\_ of metallic implants
- Bulk properties
  - Fluidity
  - Density
  - Surface properties
- 45 Dacron, a material used for fabrication of vascular grafts, is the trade name of \_\_\_\_\_
- PET
  - PEEK
  - PTFE
  - PVC
- 46 Ethylene Oxide is a gas that is used to \_\_\_\_\_ medical devices
- Fumigate
  - Sterilize
  - Disinfect
  - Decompose
- 47 The most important aspects of biomaterial-tissue interactions.
- Bioavailability
  - Biocompatibility
  - Bioequivalence
  - Bioluminescence
- 48 The biomaterials are expected to mimic the functions of
- Extracellular Matrix (ECM)
  - Transmembrane proteins
  - Cytoplasm
  - Cell Organelles
- 49 Which of the following is a characterization technique used to measure Young's modulus of a biomaterial?
- Tensile test
  - Compression test
  - Three- and four-point bend test
  - Calculation from the stress-strain curve
- 50 Which of the following is true for polymers?
- They have very high molecular mass
  - They do not have a linear stress-strain curve
  - They have high strength to mass ratio
  - All of the mentioned
- 51 In terms of which of the following properties, metals are better than ceramics?
- Hardness
  - Ductility
  - Toughness
  - Yield Strength
- 52 Infrared absorption can be observed in which of the following molecules
- Nitrogen
  - Oxygen
  - Hydrochloric acid
  - None of these

- 53 A crystal is held together entirely by
- a. Gravitational force
  - b. Electrostatic force
  - c. Magnetic force
  - d. Nuclear force
- 54 Wavelength range of visible light is
- a. 0.39 - 0.77 mm
  - b. 0.39 - 0.77 nm
  - c. 0.39 - 0.77  $\mu\text{m}$
  - d. 0.39 - 0.77 cm
- 55 Which one of the following metal ion is crucial for signaling in biological process?
- a. Calcium
  - b. Magnesium
  - c. Copper
  - d. Zinc
- 56 The colour of Gold nanoparticle dispersed in a dielectric medium is due to
- a. Diffraction
  - b. Interference
  - c. Total Internal Reflection
  - d. Surface Plasmon Resonance
- 57 Piezoelectric effect is the production of electricity by
- a. chemical effect
  - b. Pressure
  - c. varying field
  - d. Temperature
- 58 Frankel and Schottky imperfections are
- a. dislocations in ionic crystals
  - b. Grain boundaries in covalent crystals
  - c. Vacancies in ionic crystals
  - d. Vacancies in covalent crystals
- 59 Gas chromatography is used for the measurement of
- a. Temperature
  - b. Pressure
  - c. flow rate
  - d. Concentration
- 60 With increase in the temperature, viscosity of a liquid
- a. always increases
  - b. always decreases
  - c. remains constant
  - d. may increase or decrease; depends on the liquid
- 61 Genome of COVID-19 causing virus genome is made of
- a. ssDNA
  - b. dsDNA
  - c. ssRNA
  - d. dsRNA
- 62 PPE means?
- a. Public private enterprise
  - b. Personal protective equipment
  - c. Public protection entity
  - d. Personal protection enterprise
- 63 In a certain code "DIVISION" is written as "DVISOIN", then how is "STATES" written?
- a. SATETS
  - b. SATTES
  - c. SAETTS
  - d. STTAES
- 64 A room has 10 doors. In how many ways one can enter through a door and exit through a different door?
- a. 9
  - b. 10
  - c. 100
  - d. 90

- 65 In this "see and tell" sequence, what is the next number?: 1, 11, 21, 1211, 111221,  
\_\_\_\_\_.
- a. 312211
  - b. 1112221
  - c. 1112222
  - d. 112131
- 66 At extreme depths in the sea (beyond 170 m depth), divers experience hallucinations, dizziness, tremors etc because of ----- .
- a. hyperventilation
  - b. decompression sickness
  - c. high-pressure neurological syndrome
  - d. diving reflex
- 67 Which is the primary stress hormone
- a) cortisol
  - b) aldosterone
  - c) adrenaline
  - d) noradrenaline
- 68 Name a plastic-degrading systems
- a. PETase
  - b. ACE
  - c. MHETase
  - d. both 1 &3
- 69 SARS-CoV-2 spike protein is a
- a. surface glycoprotein
  - b. small envelope protein
  - c. nucleocapsid protein
  - d. matrix protein
- 70 Covishield is a ----- type of vaccine
- a. whole virion inactivated
  - b. recombinant, replication-deficient adenovirus vector encoding Spike protein
  - c. mRNA
  - d. DNA
- 71 Paralympic Games 2020 was conducted at
- a. Abu Dhabi
  - b. Tokyo
  - c. Rio
  - d. Beijing
- 72 Nobel Prize for Physics in 2020 was awarded for the discovery of
- a. cosmology
  - b. optical tweezers
  - c. theory for Black hole formation
  - d. discovery in alloys
- 73 The theory of relativity is presented by which scientist
- a. Albert Einstein
  - b. Isaac Newton
  - c. Stephen Hawking
  - d. Marie Curie
- 74 Total number of elements in the Periodic table
- a. 112
  - b. 118
  - c. 115
  - d. 127
- 75 Which one is the purest form of carbon
- a. coal
  - b. diamond
  - c. graphite
  - d. iron

- 76 The membrane proteins can span across the lipid bilayer strictly due to the presence of
- alpha helices
  - parallel beta sheet
  - antiparallel beta sheet
  - zinc finger domain
- 77 To detect specific macromolecule or structure by electron microscopy, the frequently used procedure is to couple the antibody with
- Osmium tetroxide
  - Alexa 568
  - Gold Particle
  - Cy5
- 78 The inner cell mass of mammalian embryo in the blastocyst stage are
- totipotent
  - pluripotent
  - multipotent
  - unipotent
- 79 Which of the following number is a prime number
- 121
  - 163
  - 183
  - 1020
- 80 The enzyme Rennin is secreted in which among the following parts of the Alimentary Canal?
- Mouth
  - Duodenum
  - Pancreas
  - Stomach
- 81 Both prokaryotic as well as eukaryotic cells have
- Lysosomes
  - Mitochondria
  - Ribosomes
  - Golgi Bodies
- 82 Which one of the following is does not involve in maturation of red blood cells
- pyridoxine
  - tocopherol
  - vitamin B12
  - folic acid
- 83 Migration of individual cells from the surface into the embryo's interior is termed as
- ingression
  - involution
  - invagination
  - delamination
- 84 Which of the following hormone is detected by pregnancy kits?
- Estrogen
  - Progesterone
  - Human Chorionic Gonadotropin
  - Lutinizing Hormone
- 85 Five persons A, B, C, D, and E are sitting in a row. C in the middle of the group and D is at an extreme end. There are at least two persons between B and E. Which of the following statements is incorrect?
- E can be on extreme left
  - A is always a neighbour of B or D
  - A cannot be on extreme left
  - E can be on extreme right
- 86 Each pixel in a liquid crystal display (LCD) television is composed of 3 sub-pixels that can transmit red, green and blue colours because
- White light is made of three primary colours viz red, green, blue
  - Liquid crystals can only filter these primary colours
  - The human retina contains only three types of colour-sensitive cells
  - These colours are the most pleasing to the human eye.

- 87 The Nobel prize in physiology or medicine 2020 was shared by Harvey J. Alter, Michael Houghton and Charles M. Rice for
- The development of a method for genome editing
  - The discovery of Hepatitis C virus
  - The discoveries of how cells sense and adapt to oxygen availability
  - The discoveries of molecular mechanisms controlling the circadian rhythm
- 88 The first WHO recognized outbreak of Nipah virus was reported in
- Malaysia
  - Bangladesh
  - Singapore
  - India
- 89 Who among the following is a climate campaigner?
- Verghese Kurien
  - Malala Yousafzai
  - Greta Thunberg
  - Michelle Obama
- 90 The only active volcano of India is located at
- Gujarat
  - Haryana
  - Maharashtra
  - Andaman & Nicobar Islands
- 91 EJOT, DHLP, CFIL, ?
- BHLM
  - BDFH
  - DGKL
  - DEIJ
- 92 A man walks 30 meters towards south. Then turning to his right, he walks 30 meters. Then turning left, he walks 20 meters. Again, he turns to his left and walks 30 meters. How far is he from his initial position?
- 110 meters
  - 80 meters
  - 60 meters
  - 50 meters
- 93 The ratio of the ages of a man and his wife is 4:3. After 4 years, this ratio will be 9:7. If at the time of marriage, the ratio was 5:3, then how many years ago were they married?
- 15 years
  - 12 years
  - 10 years
  - 8 years
- 94 The first track and field athlete to win a gold medal for India at the Olympics
- Abhinav Bindra
  - PV Sindhu
  - Neeraj Chopra
  - Nirav Modi
- 95 By the end of next month my grandmother \_\_\_\_\_ in the same house for more than 80 years
- will have been living
  - will live
  - will have lived
  - will be living
- 96 Leaf of a plant appears green in daylight. If this plant were observed in red light, what colour would its leaf appear ?
- green
  - black-brown
  - red
  - blue

- 97 Twenty one liters of milk in a tank is to be divided into three equal parts using only 5, 8 and 12 liters capacity cans. The minimum number of transfers needed to achieve this is.....
- a. 3  
b. 4  
c. 5  
d. 7
- 98 How many times starting at 1:00 pm would the minute and hour hands of a clock make an angle of 40 Degree with each other in the next 360 minutes?
- a. 6  
b. 7  
c. 11  
d. 12
- 99 Which is not an essential amino acid
- a. proline  
b. methionine  
c. valine  
d. lysine
- 100 Which Indian city has the Drink-from-Tap facility for the first time in India?
- a. Bangalore  
b. Srinagar  
c. Trivandrum  
d. Puri

Academic Session – January 2022

PhD Biomaterial Science and Technology

1	b
2	a
3	a
4	a
5	a
6	a
7	b
8	b
9	d
10	d
11	a
12	a
13	b
14	a
15	a
16	b
17	a
18	d
19	a
20	a

21	a
22	c
23	b
24	b
25	c
26	d
27	a
28	c
29	b
30	b
31	c
32	d
33	a
34	b
35	a
36	c
37	a
38	c
39	b
40	c

41	a
42	c
43	b
44	d
45	a
46	b
47	b
48	a
49	d
50	d
51	b
52	c
53	b
54	c
55	a
56	d
57	b
58	c
59	d
60	b

61	c
62	b
63	a
64	d
65	a
66	c
67	a
68	d
69	a
70	b
71	b
72	c
73	a
74	b
75	b
76	a
77	c
78	b
79	b
80	d

81	c
82	b
83	c
84	c
85	b
86	c
87	b
88	a
89	c
90	d
91	b
92	d
93	b
94	c
95	a
96	b
97	d
98	c
99	a
100	d