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ENTRANCE EXAMINATION - ACADEMIC SESSION JANUARY 2023

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	Which of the following statement is true regarding the Glass Transistion Temperature (Tg) of a polymer ?	
	a	Tg increases with increase in flexibility of the polymer chain
	b	Tg decreases with increase in flexibility of the polymer chain
	c	Tg decreases with decrease in flexibility of the polymer chain
	d	Tg decreases with increase in crystalinity of the polymer
2	The number average molecular mass (Mn) and weight average molecular mass (Mw) of a polymer is 100,000 and 150,000 respectively. The polydispersity index of the polymer "A" is	
	a	$1 < A < 2$
	b	$A > 2$
	c	$2 < A < 5$
	d	$A < 1$
3	What may be the consequence of the uncontrolled vinyl polymerization with excessive rise in temperature?	
	a	Discolouration
	b	Thermal degradation
	c	Branching or cross-linking
	d	All of the above
4	Solution polymerization overcome the disadvantages of bulk polymerization via	
	a	Solvent reduces the viscosity gain
	b	Solvent increases the rate of reaction
	c	Solvent leads to freequent chain transfer
	d	All the above
5	Which is a stabilizer in suspension polymerization ?	
	a	Gelatin
	b	Sodium dodecyl sulfate
	c	Water
	d	Peroxides
6	Presence of volatile plasticizers and other additives can be analysed using	
	a	Thermogravimetric analysis (TGA)
	b	Differencial scanning calorimetry (DSC)
	c	Scanning elctron microscopy

	d	Atomic force microscopy
7	Absolute measure of average molecular weight of a polymer is possible using	
	a	Viscometry
	b	Ultra centrifugation
	c	Light scattering
	d	Osmometry
8	Drug release kinetics in a medical device can be studied using	
	a	Gel Permeation Chromatigraphy
	b	High Pressure Liquid Chromatography
	c	Differencial scanning calorimetry
	d	All the above
9	Which polymer have strong intermolecular hydrogen bonding	
	a	Teflon
	b	Nylon 6,6
	c	Polystyrene
	d	Natural rubber
10	Natural polymers in the synthesis of hydrogels include proteins and	
	a	Lipids
	b	Nucleic acids
	c	Polysaccharides
	d	Synthetic polymers
11	Which one of the following plays a major role in Biomaterial Tissue interactions	
	a	Bioavailability
	b	Mechanical properties
	c	Translucency
	d	Biocompatibility
12	The main part of acrylic resin among the following is	
	a	Poly (methyl methacrylate)
	b	Benzoyl peroxide
	c	Hydroquinone
	d	D-methyl para toluedine
13	Incorporation of excess monomer into an acrylic resin mixture leads to ------ during polymerisation	
	a	Expansion
	b	Low impact strength
	c	Shrinkage stess
	d	Brittleness
14	Non-desirable porosity in an acrylic denture is the result of	
	a	A prolonged curing cycle
	b	Lack of sufficient pressure applied to the flask
	c	Low curing
	d	Insufficient acrylic resin monomer
15	which of the following statement is true in Amalgum	
	a	A metallic powder composed of siver, tin, copper and Zinc
	b	An alloy of two or more metals and one of which is mercury
	c	An alloy of one of more metals that have been dissolved in each other in the molten state
	d	A powder mixed with mercury

16	Non-crystalline polymers are called	
	a	Soft polymer
	b	Micelle
	c	Amorphous polymer
	d	Hard polymer
17	Commercial blood bags are predominantly made of	
	a	Plasticized polyvinyl chloride (PVC-P)
	b	Polytetrafluroethylene (PTFE)
	c	Unplasticized polyvinyl chloride (uPVC)
	d	Expanded polytetrafluroethylene
18	Compound used in permanent filling of root canal	
	a	Chloroprene
	b	Cis- polyisoprene
	c	Trans -polyisoprene
	d	Neoprene
19	An example for surface eroding polymer is	
	a	Polycaprolactone
	b	Polylactic acid
	c	Polyanhydrides
	d	Polyethylene
20	Example of bioactive ceramic is	
	a	Alumina
	b	Hydroxyapatite
	c	Zirconia
	d	Silicon Nitride
21	Dacron is the trade name for	
	a	Polyamide
	b	Polypropene
	c	Polyacylonitrile
	d	Polyester
22	Silk Polymer consists of proteins fibroin and	
	a	Lecithin
	b	Pectin
	c	Keratin
	d	Sericin
23	Type II collagen is prevalently found in	
	a	Bone
	b	Cartilage
	c	Heart
	d	Liver
24	Chitosan is a linear polysaccharide composed of randomly distributed	
	a	Mannuronic and guluronic acid
	b	Maltose and galactose
	c	Glucosamine and N-acetylglucosamine
	d	Sucrose and glucose
25	Alginate is a naturally occuring anionic polymer typically obtained from	
	a	Laminaria spp
	b	Botyrocladia spp
	c	Dinobryon spp
	d	None of the above

26	The glass transition temperature of polycaprolactone is	
	a	60 °C
	b	120 °C
	c	minus 120 °C
	d	minus 60 °C
27	An absoprtion at 3650 cm-1 in the IR spectrum of a compound X has been assigned to an o-H stretching mode. To what wave number is this bond expected to shift upon deuteration	
	a	2656cm-1
	b	2400cm-1
	c	1789cm-1
	d	2856cm-1
28	Among tghe following which molecule containts a 4 fold principal rotation axis.	
	a	XeF_4
	b	CF_4
	c	SF_4
	d	$[BF_4]$-1
29	The number of degrees of freedom possessed by $SiCl_4$, BrF_3, $PoCl_3$ and O_3	
	a	9,6,9,3
	b	9,3,9,6
	c	9,9,9,3
	d	3,9,9,3
30	The element which promotes the formation of ferrite structure in stainless steel is	
	a	Fe
	b	Cr
	c	Ni
	d	Mo
31	Which among the following processes is used for refining of silicon	
	a	Zone melting
	b	Van Adseel Method
	c	Liquation
	d	Electrolysis
32	$NaNbO_3$ crystallizes with a perovskite latticle with Na+ as a ___ co-ordinate	
	a	12
	b	8
	c	6
	d	4
33	H_3PO_2 is a _____ acid	
	a	Tribasic
	b	Monobasic
	c	Dibasic
	d	None of the above
34	The estimated pKa value of $HCLO_4$ using Bell's rule is	
	a	7
	b	minus 7
	c	minus 8
	d	1
35	The bond orders in [N2}- and [N2}+ are respectively	

	a	2,2.5
	b	2.5,2.5
	c	2.5,2
	d	2.25,2.5
36	Glass ionomer cements are composed of	
	a	Alumino silicate powder and phosphoric acid
	b	Aluminosillicate powder and polyacrylate
	c	Zinc oxide powder and phosphoric acid
	d	Zinc oxide powder and polyacrylate liquid
37	Use of dimethyl-P-toluidine is indicated for:	
	a	Thermal polymerization of acrylic
	b	Chemical polymerization
	c	Retarding the polymerization reaction
	d	To inhibit the action of benzoyl peroxide
38	Hydroquinone is added to methyl methacrylate monomer	
	a	To prevent polymerization during storage
	b	To initiate release of free radicalls
	c	To enable polymerization reaction at room temperature
	d	All the above
39	Radio opacity to composite resins is rendered by:	
	a	Silica glass
	b	Organic matrix
	c	Barium glass and strontium glasses
	d	Fluoride particles
40	Strain is defined as	
	a	An applied load or force
	b	A deformation resulting from an applied load
	c	An external force opposing an applied load
	d	An internal force opposing an applied load
41	Non-metal used in the vulcanization of rubber is	
	a	Sulphur
	b	Phosphorus
	c	Graphite
	d	Iodine
42	The polymer that is used as a substitute for wool in making commercial fiber is	
	a	Polyacrylonitile
	b	Buna-N
	c	Melamine
	d	Nylon-6,6
43	Delivery of a drug through the skin is known as:	
	a	Oral
	b	Sublingual
	c	Inhalation
	d	transdermal
44	_____are devices used to detect the presence or concentration of a biological analyte, such as a biomolecule, a biological structure or a microorganism.	
	a	Transducers
	b	Biosensors
	c	Optic fiber

	d	Regulator
45	PVC tubing is being used for transporting water. If organic solvents are run through this tubing it becomes stiff and somewhat brittle. This is because	
	a	The solvent plasticizes the tubing, raising the Tg
	b	The solvent removes plasticizer, lowering the Tg
	c	The solvent removes plasticizer, raising the Tg
	d	None of the above
46	Which of the following method provide an absolute measure of molecular weight of polymer	
	a	Viscometry
	b	Ultra centrifugation
	c	Light scattering
	d	Osmometry
47	When solid get wet completely, contact angle is	
	a	90 degree
	b	0 degree
	c	Between 0 and 90 degree
	d	Greater than 90 degree
48	Which of the following has highest modulus of elasticity	
	a	Dentin
	b	Enamel
	c	Composite resin
	d	Amalgum
49	Which of the following hardness test is a micro hardness test ?	
	a	Brinnel
	b	Knoop
	c	Shore-A
	d	Rockwell
50	PH of polycarboxylate liquid is_____?	
	a	5
	b	7
	c	8
	d	1.7
51	The area under the stress - strain curve gives the measure of _____	
	a	Modulus
	b	Ablation
	c	Compression
	d	Toughness
52	The first step in Biomaterial - tissue interactions is _____	
	a	Cell Adhesion
	b	Protein Adsorption
	c	Cell - Development
	d	Cell migration
53	What kinds of resins are used in tooth fillings?	
	a	Polyethylene resins
	b	Composite resins
	c	Polystyrene resins
	d	Polypropylene resins
54	_____ is an example of disposable medical device.	
	a	Hypodermic needles

	b	Surgical forceps
	c	Endoscopes
	d	Laryngoscopes
55	The surgical gloves are made of _____	
	a	Polylactic acid
	b	Polycaprolactone
	c	Collagen
	d	Polyvinylalcohol
56	Which polymer is used to make Medical gloves?	
	a	Latex
	b	PVC
	c	Neoprene
	d	All the above
57	The plasticizer used in the PVC blood bags is _____	
	a	Stearic acid
	b	Wax
	c	Phthalate
	d	Paraffin
58	What is the contrast dye used in MRI scans?	
	a	Iodine
	b	Gadolinium
	c	Methylene blue
	d	Gentian violet
59	Wollastonite is an example of	
	a	Metal
	b	Polymer
	c	Bioceramic
	d	Composite
60	Crystallinity of a polymers is determined using	
	a	XRD
	b	DSC
	c	ESCA
	d	XPS
61	Autogamy refers to	
	a	Self destruction of gametes
	b	Self polliation in flowers
	c	Flower withering
	d	Cross pollination of flowers
62	Which of the following is not used to describe variability in the data	
	a	Range
	b	Standard deviation
	c	Mode
	d	Quartiles
63	What day of the week will it be 53 days from a Monday?	
	a	Wednesday
	b	Friday
	c	Saturday
	d	Sunday
64	The part of root which is involved in perceiving gravity is	
	a	Root cap

	b	Endodermis
	c	Elongation zone
	d	Quiescent center
65	The illuminating source used as a source of excitation of fluroscent dyes in a confocal microscope?	
	a	Electron beam
	b	Masers
	c	Mercury lamp
	d	Lasers
66	The regionally localized proteins or mRNAs within the unfertilized egg that regulate development are called	
	a	Cytoplasmic determinants
	b	Morphometric determinants
	c	Gene regulators
	d	Mosaic forming factors
67	Which of the following analytical technique does not use optical measurement?	
	a	ELISA
	b	Spectrometry
	c	Flow cytometry
	d	Differential Scanning Calorimetry
68	The tetanus vaccine given to humans in the case of a deep cut is a	
	a	DNA vaccine
	b	Toxoid vaccine
	c	Subunit vaccine
	d	Recombinant vector vaccine
69	The sum of digits of a two-digit numbers is 6. If the fraction formed by taking 3 less than the number as numerator and 4 more than the number as denominator is 3/4 , what is the	
	a	36
	b	24
	c	45
	d	54
70	The dye used in Gram staining is	
	a	Giemsa
	b	Crystal violet
	c	Methylene blue
	d	Rhodamine
71	A train of length 110 m is moving at a rate of 180 kmph. How long it will take to cross a platform of 165m?	
	a	5.5 s
	b	1.53 s
	c	6.2 s
	d	4.4 s
72	The cost of 10 books, 8 pens and 12 pencils is 240 rupees. If 8 books, 6 pens and 10 pencils costs 180 rupees, what would be the cost for 1 book, 1 pen and 1 pencil?	
	a	25
	b	30
	c	35
	d	40

73	Two numbers are in the ratio 5:4. Gopal subtracts 15 from each so that they're now in the ratio 7:5. Find the smaller number.	
	a	30
	b	35
	c	40
	d	50
74	Find the odd one out in the series: 13, 19, 29, 39, 41, 53, 59	
	a	19
	b	39
	c	29
	d	59
75	Find the missing number: 4, 11, 22, 37, ...	
	a	43
	b	79
	c	56
	d	59
76	Find the odd one in the group: L, T, E, V, Q	
	a	L
	b	E
	c	V
	d	Q
77	Today is Monday. After 63 days it, will be:	
	a	Tuesday
	b	Saturday
	c	Monday
	d	Sunday
78	Three times the first of four consecultive even numbers is equal to the sum of double of third number and half of fourth number. Identify the second number	
	a	20
	b	24
	c	28
	d	32
79	When the digits of a two digit number interchanged it become double of its square root. Identify the number	
	a	64
	b	81
	c	16
	d	36
80	sum of squares of two numbers is 325 and their product is 150. The sum of the numbers is....	
	a	30
	b	15
	c	25
	d	20
81	Which property measure the resistance of a liquid to flow	
	a	Density
	b	Viscosity
	c	Volume
	d	Solubility

82	Mesons are found in	
	a	X-rays
	b	Gamma rays
	c	Cosmic rays
	d	Laser beam
83	In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?	
	a	1/3
	b	3/4
	c	7/19
	d	8/21
84	A person buys a shirt with marked price Rs.300/- at 20% discount. In order to make a profit of 20% the person should sell the shirt for	
	a	Rs. 288
	b	Rs. 300
	c	Rs. 240
	d	Rs. 360
85	Which one of the following number is a prime number	
	a	183
	b	157
	c	121
	d	161
86	A student received following marks in the five of the six courses, 91, 86, 81, 79 and 92. Average of his marks in six subject is 85.How may marks did he received in the sixth subject	
	a	83
	b	81
	c	85
	d	88
87	What is the sum of the factors of 4b2c2 – (b2 + c2 – a2) 2 ?	
	a	a+b+c
	b	2 (a+b+c)
	c	0
	d	1
88	A father said to his son, "I was as old as you are at the present at the time of your birth". If the father's age is 38 years now, the son's age five years back was:	
	a	14 years
	b	19 years
	c	33 years
	d	38 years
89	In a certain store, the profit is 320% of the cost. If the cost increases by 25% but the selling price remains constant, approximately what percentage of the selling price is the profit?	
	a	30%
	b	70%
	c	100%
	d	250%
90	What is the unit for measuring the amplitude of a sound?	
	a	Deceibel
	b	Coulomb

	c	Hum
	d	Cycles
91	Which of the following metals forms an amalgam with other metals?	
	a	Tin
	b	Mercury
	c	Lead
	d	Zinc
92	The sky appears blue because of:	
	a	Refraction
	b	Scattering
	c	Reflection
	d	Total Internal reflection
93	Why does a compact disc (CD) show a rainbow of colours with white light? It is due to:	
	a	Interference
	b	Diffraction
	c	Scattering
	d	Dispersion
94	A person is driving towards west. What sequence of direction should he follow so that he is driving towards South	
	a	Left,right,right
	b	Right,right,left
	c	Left,Left, Left
	d	Right, right,right
95	Earth, Saturn,Pluto,.....	
	a	Uranus
	b	Moon
	c	Galaxy
	d	Sun
96	Find the odd man out	
	a	RUX
	b	CFI
	c	BDG
	d	FIL
97	How many meaningful words can be formed from the letters of the word 'INDUSTRIAL'	
	a	Four
	b	Three
	c	Five
	d	Six
98	Taj Mahal is related Love in the same way Jallianwala bagh is related to ----	
	a	Amritsar
	b	Martyrdom
	c	War
	d	Punjab
99	2021 Nobel Prize for chemistry was given for the work on	
	a	Asymmetric organocatalysis
	b	Method for genome editing
	c	Lithium-ion batteries
	d	Evolution of enzymes

100	Atoms of an isotope has	
	a	Same mass number
	b	Same electronic configuration
	c	Same atomic number
	d	Different Mass number