



श्री चित्रा तिरुनाल आयुर्विज्ञान और प्रौद्योगिकी संस्थान, त्रिवेंद्रम , केरल- 695 011
(एक राष्ट्रीय महत्व का संस्थान, विज्ञान एवं प्रौद्योगिकी विभाग, भारत सरकार)
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Entrance Examination 2020- PhD _ Chemical Sciences

Sl No	Question	Answer	OptionA	OptionB	OptionC	OptionD
1	Emmanuelle Charpentier and Jennifer A. Doudna received Nobel prize in the year 2020 for the development of a method for genome editing in the field of:	B	Physics	Chemistry	Physiology	Medicine
2	Due to an increase in taxes on electronic devices, the price of a cooler has increased to Rs. 8450, which is 30% increase of the original price. What was the original price of the cooler prior to its increase?	C	5154.5	5915.0	6500	6760
3	One-tenth of one bag of potatoes weighs the same as one-seventh of one bag of small pebbles. What is the ratio of the weight of 2 bags of potatoes to 3 bags of pebbles?	B	7:15	20:21	21:20	3:2
4	A and B started a business by investing Rs. 36,000 and Rs. 63,000 each. Find the share of each, out of the annual profit of Rs. 5500.	A	Rs. 2000, Rs. 3500	Rs. 2500, Rs. 3500	Rs. 3500, Rs. 2500	None of these
5	A sum of Rs. 13,950 should be divided among three persons A, B and C. B must get the double of A's share and C must get Rs. 50 less than the double of B's share. The share of A will be:	C	Rs. 1950	Rs. 1981.25	Rs. 2000	Rs. 2007.75
6	GENEALOGY: ANCESTRY, ENTOMOLOGY: _____	B	Words	Insects	Fossils	Inscriptions
7	Which number comes next in this sequence? 1, 1.5, 2.5, 4, ___?	D	9	8	7	6
8	If 3 less than twice a certain number is equal to 2 more than 3 times the number, then 5 less than 5 times the number is:	A	-30	-20	-5	0
9	_____ helps in viewing objects at the surface of water from a submarine under water	A	Periscope	Kaleidoscope	Telescope	Spectroscope
10	A person has the capability of thinking 100 lines of code in five minutes and can type 100 lines of code in 10 minutes. He takes a break for five minutes after every ten minutes. How many lines of codes will he complete typing after an hour?	B	100	250	350	600
11	A pescatarian is someone who eats	C	Egg	Chicken	Fish	Clams
12	If 'a' is the smallest prime number greater than 50 and 'b' is the largest prime number less than 10, then ab =	B	299	371	229	261
13	According to the Centre for Disease Control (CDC), what does 'N' in the N95 respirator stand for?	A	Not resistant to oil	Not resistant to water	Number of particles	Not resistant to bacteria
14	What is the greatest value of x for which $(3x-2)(x+1) = 0$?	C	-1	-2/3	2/3	1
15	For safety, the fuse wire used in the mains for household supply of electricity must be made of metal having	B	high resistance	low melting point	low specific heat	high melting point
16	The radius as well as the height of a circular cone increases by 10%. The percentage increase in its volume is _____.	C	17.1	21	33.1	72.8
17	The perimeters of a circle, a square and an equilateral triangle are equal. Which one of the following statements is true?	A	The circle has the largest area.	The square has the largest area.	The equilateral triangle has the largest area.	All the three shapes have the same area.
18	In doing action research what is the usual sequence of steps?	B	Reflect, observe, plan, act	Plan, act, observe, reflect	Plan, reflect, observe, act	Act, observe, plan, reflect
19	Escape velocity of a rocket fired from the earth towards the moon is a velocity to get rid of the	C	Centripetal force due to the earth's rotation	Moon's gravitational pull	Earth's gravitational pull	Pressure of the atmosphere
20	A, B and C are intelligent, A, D and E are laborious and D, C and E are honest and A, B and E are ambitious. Who is neither laborious nor honest?	B	A and D	B only	E only	C only
21	Which is the odd number in the series: 81, 121, 169, 289, 361	A	81	169	289	361
22	Which pair of words among the following are odd ones Crime and Punishment, Exercise and Health, Judgement and Advocacy, Hardwork and Success, Slowth and Failure	C	Slowth and Failure	Hardwork and Success	Judgement and Advocacy	Exercise and Health
23	Select the lettered pair that best expresses a relationship similar to that expressed in the original pair COLOR : SPECTRUM	A	tone : scale	sound : waves	dimension : space	cell : organism

24	Frederick Sanger is a twice recipient of the Nobel Prize for	C	Chemistry in 1954 and Peace in 1962	Physics in 1956 and 1972	Chemistry in 1958 and 1980	Physics in 1903 and Chemistry in 1911
25	Fill up the blanks in the following sentence "Early _____ of hearing loss is _____ by the fact that the other senses are able to compensate for moderate amounts of loss, so that people frequently do not know that their hearing is imperfect."	C	discovery . . Indicated	development . . prevented	detection . . complicated	treatment . . facilitated
26	Choose word or phrase that is most nearly opposite in meaning to the word DIFFUSE	A	concentrate	contend	imply	pretend
27	Select the lettered pair that best expresses a relationship similar to that expressed in the original pair Antidote: Poison	B	Cure: recovery	Tonic: lethargy	Narcotic: sleep	Stimulant: relapse
28	The corporation expects only _____ increases in sales next year despite a yearlong effort to revive its retailing business.	D	dynamic	predictable	expanding	modest
29	Although it does contain some pioneering ideas, one would hardly characterize the work as _____.	C	orthodox	eccentric	original	trifling
30	NITI Aayog was established in?	B	03-Jan-19	01-Jan-15	01-Sep-15	26-Jan-19
31	Choose word or phrase that is most nearly opposite in meaning to the word AMALGAMATE	D	Circulate	Reduce	Endure	Separate
32	Choose word or phrase that is most nearly opposite in meaning to the word ENERVATE	C	Recuperate	Resurrect	Strengthen	Gather
33	A rectangle becomes a square when its length and breadth are reduced by 10 m and 5 m, respectively. During this process, the rectangle loses 650 sq.m of area. What is the area of the original rectangle in square meters?	B	1125	2250	2500	4500
34	A set of 4 parallel lines intersect with another set of 5 parallel lines. How many parallelograms are formed?	C	20	48	60	72
35	Which metal is used for galvanizing iron?	D	Lead	Copper	Aluminium	Zinc
36	This simple discovery led to a population boom in 1900	B	Pencillin	Haber-Bosch Process	Small pox vaccine	none of the above
37	A wire would enclose an area of 1936 sq.m, if it is bent into a square. The wire is cut into two pieces. The longer piece is thrice as long as the shorter piece. The long and the short pieces are bent into a square and a circle, respectively. Which of the following choices is closest to the sum of the areas enclosed by the two pieces in square meters?	C	1096	1111	1243	2486
38	Whose autobiography is the book " My Music, My Life"	B	Pandit Shiv kumarsharma	Pandit Ravi Shankar	Ustad Zakir Hussain	ustad Amjad Ali Khan
39	In which one of the following countries, is Tamil a major language?	A	Singapore	Indonesia	Mauritius	Myanmar
40	Biotic index gives us an idea about the pollution of:	A	water	air	sound	all the above
41	Which electromagnetic radiations are employed in the Nuclear magnetic resonance (NMR) spectroscopy of organic materials?	C	Micro wave	Ultraviolet rays	Radio waves	Infrared rays
42	Tauc plot used for the determination of optical band gap of materials connects $(\alpha h\nu)^{1/2}$ with	D	Wavelength	Wave number	Number of photons	Photon energy
43	On increasing the number of layers, the intensity of 2D band in the Raman spectrum of graphene.....	B	Increases	Decreases	Stays the same	Doubles
44	FTIR spectrum of gelatin shows a characteristic peak at 1650 cm ⁻¹ corresponding to the.....	B	aliphatic C=C bond	Amide C=O bond	Amide C-N bond	Amide N-H bond
45	FTIR spectrum of an amino acid displayed a peak around 2550 cm ⁻¹ . Identify the amino acid among the following	A	Cysteine	Methionine	Proline	Arginine
46	The crystal formed by a molecule A adopts a FCC lattice. If d is the atomic diameter, what will be the volume of FCC unit cell?	D	d ³	3d ³	$\sqrt{2}d^3$	$2\sqrt{2} d^3$
47	Which crystal system has the least symmetry?	B	Cubic	Triclinic	Rhombohedral	Monoclinic
48	The ratio of lateral and axial strains is called	C	Fick's constant	Hooke's ratio	Poisson's ratio	Pauli's constant
49	Austenite to Martensite phase transitions of alloys are responsible for their.....	A	Shape memory	Biocompatibility	Corrosion	Toughness
50	A particle is associated with a de-Broglie wavelength of λ when accelerated through a vacuum tube. Its kinetic energy is calculated as K. If the wavelength is doubled, the kinetic energy will be.....	C	4K	K^2	K/4	K/2
51	1 MPa =N/m ²	C	145	1.45×10^3	1.00×10^6	1.00×10^3

52	A material having a mass of 100 g was pressed against the tip of a nail having an area of $10 \times 10^{-2} \text{ mm}^2$ at the Earth's surface. What will be the pressure exerted by the material?	D	10 MPa	10 Gpa	9.8 Pa	9.8 Mpa
53	Nitrogen gas is heated in a constant volume vessel to a temperature of 400 K. If the initial pressure of the gas was 1 atm when filled in the vessel at 273 K, what will be the pressure of the gas at the current working condition, provided nitrogen behaves ideally?	C	1.55 atm	2.45 atm	1.46 atm	1.56 atm
54	The relationship between thermal and electrical conductivities of metals is governed by.....	B	Frank-Condon Principle	Wiedemann-Franz law	Woodward-Fischer rule	Gogotsi principle
55	$3.33564 \times 10^{-30} \text{ C.m}$ is equal to	C	One Gauss	One Candela	One Debye	One Joule
56	The negative end of the dipole of the molecule CO is situated on the carbon atom because,	B	Carbon is more electronegative	Antibonding orbitals are occupied ☒	Oxygen is less electronegative	None of these
57	The interaction potential energy due to the London dispersive force between two molecules is related to the distance between them, r as.....	B	$1/r^3$	$1/r^6$	$1/r$	$1/r^2$
58	Permanent waving of hair results in the unraveling and re-forming of the structure of Keratin.	D	Primary	Secondary	Tertiary	Quaternary
59	If the diffusion coefficient of H_2O molecules in water is $2.26 \times 10^{-9} \text{ m}^2/\text{s}$ at 25 °C, how long one molecule of water will take to travel 1 mm of distance at the same conditions?	B	3.68 hours	3.68 minutes	7.36 hours	7.36 minutes
60	Kraft temperature is associated with	C	Magnetic conversion of poles	Conversion of gases from ideal to real	Micelle formation	Superconductivity
61	In an exciton, if the electron and hole are present on different molecules, it is called.....	B	Frenkel Exciton	Wannier Exciton	Fermi Exciton	Dirac Exciton
62	In diode lasers, the laser action is due to	C	Optical pumping	Optical exultation	electron-hole recombination	Vibrational cascading
63is the change in refractive index of a medium when exposed to intense laser pulses.	A	Kerr effect☒	Wien effect☒	Corey effect☒	Stokes effect
64	A Cooper Pair composed of.....	C	Protons☒	Neutrons	Electrons	One proton and a neutron
65	Average velocity of the molecules of a gas at a temperature of T K is V. What will be the RMS velocity and most probable velocity of the gas at the same conditions?	B	πV and $\pi V/4$	$\sqrt{3\pi/8} V$ and $\sqrt{\pi/4} V$	$\sqrt{\pi/8} V$ and $\sqrt{\pi/2} V$	$\sqrt{3\pi/4} V$ and $\sqrt{2\pi/4} V$
66	Knudsen method is used for the determination of of solids and liquids	D	Density	Optical activity	Heat capacity	Vapor pressure
67	Radiations with a wavelength in between 290 and 320 nm are called.....	B	UVA☒	UVB	UVC	UVD
68	A viral RNA is present just inside the cell wall of a cell. If the diffusion coefficient of it through the cell medium is $1.0 \times 10^{-12} \text{ m}^2/\text{s}$, how long it will take to reach the nucleus of the cell present at a distance of 2.0 μm .	C	20 seconds	2 minutes	2 seconds	200 seconds
69	Which of the following molecules possess identity element as one of its symmetry elements? NH_3 , H_2O , CO_2 , C_2H_4 , C_6H_6 , HCl	C	NH_3 and H_2O	C_2H_4 and C_6H_6	All	None
70	As per Franck-Condon principle, there is no change in the during an electronic transition.	D	Energy☒	Wavelength	Vibrational level	Internuclear distance
71	Which type of electromagnetic radiation is used for the electron spin resonance (ESR) spectroscopic analysis?	B	Infrared☒	Microwave	Ultraviolet	Gamma
72	If the C-CO-C bond angle of ketones reduced below 120° , the carbonyl stretching frequency.....	B	Decreases	Increases	remains the same	becomes zero
73	Globar is commonly used as a source for Infrared radiations. What is the chemical component of Globar?	C	Tungsten carbide	Titanium chloride	Silicon carbide	Gallium arsenide
74	How many peaks are present in the proton NMR spectrum of methylbenzene?	B	8	2	1	4
75	A polymer has a number average molecular weight of 50 kDa what will be its Weight averaged molecular weight if the PDI is 1.5?	B	60 kDa	75 kDa	33.33 kDa	50 kDa

76	Solution of an organic compound having a molar weight of 180 g/mol gave an absorbance $A=1.0$ at 230 nm ($\epsilon = 5000$) when subjected to UV-visible absorbance analysis using a Cuvette of 1 cm path length. What will be the concentration of the solution?	C	18 mg/l	18 g/l	36 mg/l	36 g/l
77	Predict the wavelength corresponding to an energy of 2 eV	A	620 nm	353 nm	480 nm	673 nm
78	Thermogravimetric analysis of Calcium oxalate pentahydrate under nitrogen atmosphere yields a three step degradation profile. What will be the product remained after the final degradation?	C	Ca_2C	Ca_3N_2	CaO	CaH_2
79	A radioactive substance has a half life of 150 days; three-fourth of the substance would decay in	C	200 days	175 days	300 days	350 days
80	In the HPLC analysis of Alanine, analyst doubled the flow rate of mobile phase unknowingly. How will it affect the elution?	A	Retention time will decrease	Retention time will increase	Peak area will increase	Peak area will decrease
81	Aqueous solution of a hydrophilic protein has a transmittance of 30 %. What will be its absorbance?	B	0.4771	0.5229	0.33	0.67
82	On a 15 cm length reverse phase column, two analytes A1 and A2 have their retention times at 4.85 and 5.79 minutes. If their peak widths at the baseline are 0.91 and 0.83 minutes respectively, what's the column resolution?	A	1.08	2.35	1.65	0.98
83	In a crystal the atom P occupies all the corners of the unit cell, atom Q occupy the centre of the unit cell and atom R occupies half of the face centers. Predict the formula of the compound.	D	PQR_2	$\text{P}_2\text{Q}_2\text{R}$	PQR	$\text{P}_2\text{Q}_2\text{R}_3$
84	X-H protons of a specific protein resonate at a frequency 1450 Hz greater than that of TMS when analyzed in 300 MHz equipment. What will be the chemical shift of the proton?	A	4.83 ppm	0.4 ppm	3.83 ppm	5.83 ppm
85	TGA analysis of 150 mg of a magnesium compound yielded 54 mg of residue. Identify the compound.	A	MgC_2O_4	MgNO_3	MgCO_3	MgO

