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

ENTRANCE EXAMINATION - ACADEMIC SESSION AUGUST 2019

PROGRAMME: MPHIL Biomedical Technology-PHYSICS

Time:60 Minutes **Max. Marks: 60**

(Select the most appropriate answer)
(There are **no negative** marks for wrong answers)

Sl. No	Questions	Answer
1	The number of zeroes in the probability of finding the electron as a function of distance from the nucleus in the hydrogen atom in a quantum state n1 is a) n b) B. l c) C. n+l d) n-l-1	
2	The wavelength of a wave with propagation constant $(0.1\ \pi+j\ 0.2\pi)m^{-1}$ is a) $2/\sqrt{0.05}$ m b) 10m c) 20m d) 30m	
3	Which of the following instrument can be used for measuring the expansion of bodies by heat a) Thermometer b) Thermocouple c) Thermoscope	

	d) Pyrometer	
4	An electronic impulse measurement system has an intrinsic rms noise level of 3mV. The input pulse is of 1V magnitude and has an rms noise level of 4mV. What is the rms noise level in the output a) 1mV b) B. 7mV c) 5mV d) 25mV	
5	Half life of a radioactive materials is 4 days. After 20 days, the fraction remaining undecayed will be a) 1/32 b) 1/20 c) 1/16 d) 1/8	
6	When an electron and positron annihilate a) Nothing is created b) One photon created c) Two photons are created d) Two neutrons are created	
7	A second pendulum is placed in a space laboratory orbiting around the earth at a height 3R from the earth's surface where R is earth's radius. The period of the pendulum will be a) Zero b) $2\sqrt{3}s$ c) 4s d) Indefinite	
8	The potential energy of a particle in simple harmonic motion at a distance of x from the equilibrium position is a) $1/2\ mw^2x^2$ b) $1/2\ mw^2a^2$ c) $1/2\ mw^2(a^2-x^2)$ d) zero	

9	The absolute temperature of a gas is increased 3 times. The root mean square velocity of the molecules will be a) 3 times b) 9 times c) 1/3 times d) $\sqrt{3}$ times	
10	Unpolarised light can be converted into a partially polarized or plane polarized light by several processes. Which of the following does not do that a) Reflection b) Diffraction c) Double refraction d) Scattering	
11	The differential form of Gauss's law in CGS system is a) $\nabla . E = \rho / \in o$ b) $\in odivE = \rho$ c) $\nabla . E = 4\pi\rho$ d) $divE = 4\pi\sigma$	
12	The electric flux density is D is a) Normal b) Tangential c) Opposite d) Unrelated to electric flux	
13	In an isothermal change the internal energy of molecules a) May increase or decrease b) Does not change c) Increases d) Decreases	
14	An oscillator differs from an amplifier because a) It has more gain b) It requires no input signal c) It requires no dc supply d) It always has the same output	

15	For operation as an amplifier, the base of an npn transistor must be a) Positive with respect to emitter b) Negative with respect to emitter c) Positive with respect to collector d) 0V	
16	A vector $\vec{A}$ is solenoidal if its a) Divergence is zero b) Gradient is zero c) Divergence is non-zero d) Gradient is non-zero	
17	In order to study internal structure of crystals, we use a) X-rays b) Ultraviolet rays c) Infrared radiations d) Yellow light	
18	The line on the earth's surface joining the points, where the field is horizontal, is called a) Magnetic meridian b) Magnetic axis c) Magnetic line d) Magnetic equator	
19	If the matrix is $A = \begin{matrix} -1 & 2 & 3 \\ 0 & 3 & 5 \\ 0 & 0 & -2 \end{matrix}$ then the eigen values of $A^3+5A+8I$ are: a) -1,27,-8 b) -1,3,-2 c) 2,50,-10 d) 2,50,10	

20	When a rigid body rotates about a given axis, the degrees of freedom it will have is a) 1 b) 2 c) 3 d) 4	
21	The force which is always directed away or towards a fixed centre and magnitude of which is a function only of the distance from the fixed centre is known as a) Central force b) Coriolis force c) Centrifugal force d) Centripetal force	
22	According to special theory of relativity a particle cannot travel with the speed of light because its a) Velocity will soon be infinite b) Mass will be infinite c) Mass will reduce to zero d) None of these	
23	The continuous x-ray spectrum is the result of the a) Photoelectric effect b) Inverse photoelectric effect c) Compton effect d) Auger effect	
24	The effect used to study the energy levels of homonuclear molecule is a) Stark effect b) Zeeman effect c) Paschen-Back effect d) Raman effect	

25	Transition rules for the vibrational- rotational spectra are a) $\Delta n = 0, \Delta j = 0$ b) $\Delta n = 0, \Delta j = \pm 1$ c) $\Delta n = \pm 1, \Delta j = \pm 1$ d) $\Delta n = \pm 1, \Delta j = 0$	
26	Which of the following electronic configurations corresponds to a noble gas a) 2,8,4 b) 2,8,18,8 c) 2,8,18,7 d) 2,8,3	
27	Lorentz transformations assume: a) Space and time are both relative b) Space is relative but time is absolute c) Space is absolute but time is relative d) Space and time are both absolute	
28	According to Debye theory of specific heat, at high temperature, specific heat is proportional to a) T b) T^2 c) T^3 d) Independent of T	
29	The magnetic material in which permanent magnetic dipoles (due to electron spin) arealigned due to bonding forces are known as a) paramagnetic materials b) ferromagnetic materials c) ferrimagnetic materials d) diamagnetic materials	
30	The mechanical equivalent of an LCR series circuit with a voltage source is a) Damped harmonic oscillator b) Forced harmonic oscillator c) Free linear harmonic oscillator d) Damped and forced harmonic oscillator	

31	The Miller indices of the plane parallel to the x and y axes are a) (10 0) b) (0 10) c) (0 0 1) d) (1 1 1)	
32	The wave length associated with a moving particle a) depends upon the charge associated with it. b) depends upon the medium in whichthe particle travels. c) does not depend upon the charge associated with it. d) none of these	
33	4.4 electron volt of energy is required to break one H-Cl bond. This is equal to a) 42 x 10^3 kJ/kmol b) 420 x 10^3 kJ/kmol c) (c)42 J/kmol d) (d)420 kJ/kmol	
34	A proton and an α-particle has the same kinetic energy. How do their de Broglie wave length (λ_p for proton and λ_α for α-particle) compare? a) $\lambda_p = 2\lambda_\alpha$ b) $\lambda_p = \lambda_\alpha/4$ c) $\lambda_p = \lambda_\alpha/2$ d) $\lambda_p = 4\lambda_\alpha$	
35	In a junction diode, (where X is the width of the depletion layer) the transition capacitance is proportional to a) X b) X^2 c) $1/X^2$ d) 1/X	

36	The forbidden energy gap of carbon in diamond structure is a) 0.7 electron volt b) 1 electron volt c) 1.4 electron volt d) none of these	
37	The flux density is related to the electric field as a) $D = \varepsilon + E$ b) $D = \varepsilon - E$ c) $D = \varepsilon / E$ d) $D = \varepsilon E$	
38	The temperature dependence of the classical expression for electrical resistivity of a metal is: a) $\rho \alpha T^2$ b) $\rho \alpha (1/T^2)$ c) $\rho \alpha T^{1/2}$ d) $\rho \alpha (1/T)$	
39	When a monoatomic gas atom is placed in a uniform electric field E, the displacement of the nucleus is proportional to a) E^2 b) E c) E^3 d) independent of E	
40	If 0.28 nm is the inter-ionic distance is NaCl crystal, the lattice parameter is a) 0. 14 nm b) 0.56 nm c) 0.08 nm d) none of these	

41	The ratio of the diffusion constant for hole (D_p) to the mobility for hole is proportional to a) temperature T b) T^2 c) 1/T d) independent of temperature	
42	According to Moseley's law, the frequency of the characteristic x-radiation is proportional to the square of a) atomic weight of the element b) atomic number of the element c) ionization potential of the element d) none of these	
43	In a dielectric, the polarization is related to the applied field as a a) linear function b) square function c) exponential function d) logarithmic function	
44	Einstein's theory concludes that at lower temperatures the specific heat a) drops linearly with increase of temperature b) drops linearly with decrease of temperature c) drops exponentially with decrease of temperature d) remains constant of temperature	
45	The total energy of an electron in the n^{th} orbit in a hydrogen atom a) $-(13.6/n^2)$ eV b) $13.6/n^2$ eV c) $-(13.6/n)$ eV d) 13.6/n eV	
46	At f = 2GHz a material has σ = 25 S/m, ϵ = 80. At this f, the material acts as– a) Insulator b) Conductor	

	c) Perfect dielectric d) None of the above	
47	An object of 12mm height is placed at a distance of 80 cm to the left of a lens of power +2.5 dioptre made of glass of refractive index 1.5. The size of the image is a) 3mm b) 6mm c) 12mm d) 18mm	
48	Germanium and silicon have diamond structure for which the molecules per unit cell are equal to ____ a) 1 b) 2 c) 4 d) 8	
49	In signal generators ___ a) Energy is created b) Energy is generated c) Energy is converted from a simple d.c. source into a.c. energy at some specific frequency d) all of the above	
50	A random noise generator produces a signal __ a) Whose amplitude varies randomly b) Which has no periodic frequency c) Has an unpredictable power spectrum d) All of the above	
51	In a certain code, '256' means 'red colour chalk', '589' means 'green colour flower' and '254' means 'white colour chalk'. The digit in the code that indicates 'white' is, a) 2 b) 4	

	c) 5 d) 8	
52	In a school, there are five teachers A, B, C, D and E. A and B teach Hindi and English. C and B teach English and Geography. D and A teach Mathematics and Hindi. E and B teach History and French. Who teaches maximum number of subjects? a) A b) B c) D d) E	
53	What is the total number of digits printed, if a book containing 150 pages is to be numbered from 1 to 150? a) 262 b) 450 c) 360 d) 342	
54	There is a milk sample with 50% water in it. If 1/3rd of this milk is added to equal amount of pure milk, then water in the new mixture will fall down to: a) 25% b) 30% c) 35% d) 40%	
55	. If second and fourth Saturdays and all the Sundays are taken as only holidays for an office, what would be the minimum number of possible working days of any month of any year?	

	a) 23 b) 22 c) 21 d) 20	
56	Four tests—Physics, Chemistry, Mathematics and Biology are to be conducted on four consecutive days, not necessarily in the same order. The Physics test is held before the test which is conducted after Biology. Chemistry is conducted exactly after two tests are held. Which is the last test held? a) Physics b) Biology c) Mathematics d) Chemistry	
57	A clock is started at noon. By 10 minutes past 5, the hour hand has turned through: a) 145° b) 150° c) 156° d) 160°	
58	A train running at the speed of 60 km/hr crosses a pole in 9 seconds. What is the length of the train? a) 120 metres b) 180 metres c) 324 metres d) 150 metres	
59	What will be the maximum sum of 44, 42, 40, ... ? a) 502 b) 504 c) 506 d) 500	

60	Consider the following logical inferences. LI-1: If it rains then the cricket match will not be played. The cricket match was played. Inference: There was no rain. LI-2: If it rains then the cricket match will not be played. It did not rain. **Inference**: The cricket match was played. Which of the following is TRUE? a) Both LI-1 and LI-2 are correct inferences b) LI-1 is correct but LI-2 is not a correct inference c) LI-1 is not correct but LI-2 is a correct inference d) (D) Both II and LI-2 are not correct inferences	

Answer Key Mphil Biomedical Technology Physics 2019

Sl. No	Key
1	D
2	B
3	D
4	C
5	A
6	C
7	D
8	A
9	D
10	B
11	C
12	B
13	B
14	B
15	A
16	A
17	A
18	D
19	C
20	A
21	A
22	B
23	B
24	D
25	C
26	B
27	A
28	D
29	B
30	A
31	C
32	C
33	B
34	A
35	D
36	D
37	D
38	C
39	B
40	B
41	A
42	B

43	A
44	C
45	A
46	B
47	C
48	D
49	C
50	A
51	B
52	B
53	D
54	A
55	B
56	C
57	C
58	D
59	C
60	B