SRMJEEE 2016 Question Paper with Answer Key

SRM Joint Engineering Entrance Examination – SRMJEEE

B.Tech and Health Sciences UG programs

Part 1 – Physics

1. The dimensional formula for impulse is
(a) MLT^{-1}
(b) ML^2T^{-1}
(c) ML^2T^{-2}
(d) ML^oT^{-2}

2. The mean time period of a simple pendulum is 1.92 s. Mean absolute error in the time period is 0.05 s. To express the maximum estimate of error, the time period should be written as:
(a) T = (1.92 ±0.01)s
(b) T = (1.92 ±0.25)s
(c) T = (1.92 ±0.05)s
(d) T = (1.92 ±0.10)s

3. A motor boat moves at a steady speed of 8m/s. If the water resistance to the motion of the boat is 2000W, calculate the power of the engine.
(a) 16000 W
(b) 1600 W
(c) 160 W
(d) 16 W

4. An aeroplane travelling at a speed of 500 kmph tilts at an angle of 30º as it makes a turn. What is the radius of the curve?
(a) 341 km
(b) 3.41 km
(c) 0.341 km
(d) 34.1 km

5. A body of mass 500gm is tied to one end of a string of length 1m and is whirled round in a horizontal circle making 2 revolutions per second. Calculate the tension in the string.
(a) 78.88 N
(b) 7.888 N
(c) 0.7888 N
(d) 7888 N

6. A bullet of mass 10gm moving with a speed of 500 m/s gets embedded in a tree after penetrating 5cm into it. Calculate the average retarding force exerted by the wood on the bullet and the work done by the wood in bringing the bullet to stop.
(a) 25 N, 12.50 joule
(b) 250 N, 1250 joule
(c) 25 KN, 1.250 joule
(d) 25 KN, 1250 joule

7. The acceleration due to gravity g on earth in 9.8 ms^{-2}. What would be the value of g for a planet whose size is the same as that of earth but the density in twice that of earth?
(a) 19.6 ms^{-2}
(b) 9.8 ms^{-2}
(c) 4.9 ms^{-2}
(d) 2.45 ms^{-2}

8. When a capillary tube of radius r is immersed in a liquid of density ρ the liquid rises to a height h in it. If m is the mass of the liquid in the capillary tube, the potential energy of this mass of the liquid in the tube is

(a) $\dfrac{mgh}{4}$

(b) $\dfrac{mgh}{2}$

(c) mgh

(d) 2mg h

9. In which one of the following cases will the liquid flow in a pipe be most stream lined?
(a) Liquid of high viscosity and high density flowing through a pipe of small radius.
(b) Liquid of high viscosity and low density flowing through a pipe of small radius.
(c) Liquid of low viscosity and low density flowing through a pipe of large radius
(d) Liquid of low viscosity and high density flowing through a pipe of large radius

10. A stone is dropped into a lake by a person from a 500 m high tower. He would hear the sound of after approximately.
(a) 10 s
(b) 11.5 s
(c) 14 s
(d) 21 s

11. For the same pressure and density, the speed of sound is highest in a
(a) Monoatomic gas
(b) Diatomic gas
(c) Triatomic gas
(d) Polyatomic gas

12. The number of Beats produced / sec by the vibrations x_1 = a sin 320 π t & x_2 = a sin 326 πt is
(a) 6
(b) 4
(c) 3
(d) 2

13. Determine the volume occupied by 3.2grams of oxygen at 76cm of Hg and 27°C. (R=8.314x10^7 ergs/g mol-k)
(a) 2.461 cm^3
(b) 2461 cm^3
(c) 246.1 cm^3
(d) 24.61 cm^3

14. Calculate the universal gas constant for one gram molecule of gas.
(a) 8.31 J/mol-K
(b) 83.1 J/mol-K
(c) 8.31 x10^{-7} J/mol-K
(d) 83.1 x10^{-7} J/mol-K

15. Number of molecules per unit volume of an ideal gas is _____

(a) PRT
(b) PN/RT
(c) PT/RN
(d) RN/KT

16. Calculate the temperature at which the RMS velocity of a hydrogen molecule will be equal to the orbital velocity of earth's satelite (i.e., 8 km/s)
(a) 514×10^3 k
(b) 5.14×10^3 k
(c) 51.4×10^3 k
(d) 514 k

17. Ordinary light is
(a) plane polarised
(b) circularly polarised
(c) alliptically polarised
(d) unpolarised

18. The force between two bar magnets whose centers are d metres apart is 4.8N. When the separation is made 2d the force is reduced to
(a) 2.4 N
(b) 1.2 N
(c) 0.6 N
(d) 0.3 N

19. In Young's double slit experiment, the seventh maxima with light of wavelength λ_1 is at d_1 and the same maxima with same light of wavelength λ_2 is at d_2, then d_1/d_2 equals,
(a) λ_1/λ_2
(b) λ_2/λ_1
(c) λ_1^2/λ_2^2
(d) λ_2^2/λ_1^2

20. Which of the following undergo maximum diffraction?
(a) radio waves
(b) αrays
(c) x-rays
(d) light waves

21. Electric flux in an electric field $\vec{E}$ through area $\vec{ds}$ is given by

(a) $\vec{E}.\vec{ds}$

(b) $\epsilon_o \vec{E}.\vec{ds}$

(c) $\dfrac{\vec{E}.\vec{ds}}{\epsilon_o}$

$$\vec{E} \times \vec{ds}$$
(d)

22. A soap bubble is charged to a potential of 16V. Its radius is then doubled. The potential of the bubble now will be:
(a) 16V
(b) 8V
(c) 4V
(d) 2V

23. A bar magnet of magnetic moment p_m is divided into two equal parts by cutting it perpendicular to its length. The magnetic moment of either piece will be:
(a) zero
(b) $P_m / 2$
(c) P_m
(d) 2 P_m

24. What is the angle of dip at the magnetic poles?
(a) 0°
(b) 30°
(c) 45°
(d) 90°

25. What determines the penetrating power of X-rays?
(a) velocity
(b) frequency
(c) intensity
(d) density

26. A source of light is placed at a distance x from a photocell and the cut off potential is V. If the distance of the same source from the photocell is doubled, then cut off potential will be:
(a) $\dfrac{V}{4}$
(b) $\dfrac{V}{2}$
(c) V
(d) 2V

27. The orbital radius of the electron in the hydrogen atom changes from r to 4r. The energy of the orbital electron will change from E to:
(a) 4E
(b) 2E
(c) E/2
(d) E/4

28. The mass of photon at rest is:
(a) zero
(b) 1.67×10^{35} kg
(c) 1 amu
(d) 9×10^{31} kg

29. An electron and a proton possess same kinetic energy. Then $\dfrac{\lambda_e}{\lambda_p} =$
(a) 1
(b) 1840
(c) $\sqrt{1840}$
(d) $\dfrac{1}{\sqrt{1840}}$

30. What amount of energy is released in the fission of $_{92}U^{235}$?
(a) 20eV
(b) 200eV
(c) 200KeV
(d) 200MeV

31. The helium atom does not contain
(a) 2 protons
(b) 2 electrons
(c) 2 neutrons
(d) 6 nucleons

32. A radioactive substance has half life of four months. Three fourth of the substance will decay in
(a) 3 months
(b) 4 months
(c) 12 months
(d) 8 months

33. NOR gate is a combination of
(a) OR gate and NOT gate
(b) Or gate and AND gate
(c) OR gate and OR gate
(d) AND gate only

34. The only function of a NOT gate is to
(a) stop a signal
(b) recomplement a signal

(c) invert an input signal
(d) act as a universal gate

35. When two semiconductors of p-type and N-type are brought in contact with each other the PN junction formed behaves like
(a) an oscillator
(b) a condenser
(c) an amplifier
(d) a conductor

Part 2 – Chemistry

36. Azidothymidine drug is used for treating _____ patients
(a) Diabetes
(b) AIDS
(c) Jaundice
(d) Tuberculosis

37. Which of the following weight the least?
(a) 2.0 gram mole of CO_2
(b) 0.1 mole of sucrose ($C_{12} H_{22} O_{11}$)
(c) 1 gram atom of calcium
(d) 1.5 mole of water

38. What is the value of gas constant R in $Jmol^{-1} K^{-1}$
(a) 82.1
(b) 8.314×10^2
(c) 8.314
(d) 0.0821

39. Which process can be explained by the kinetic-molecular theory?
(a) combustion
(b) oxidation
(c) condensation
(d) displacement reaction

40. Which is an example of effusion?
(a) air slowly escaping from a pinhole in a tire
(b) the aroma of a cooling pie spreading across a room
(c) helium dispersing in to a room after a ballon pops
(d) oxygen and gasoline fumes mixing in an automobile carburetor

41. In each period, the strongest oxidising behaviour is of a/an
(a) Alkali metal
(b) Nobel gas
(c) Halogens

(d) Chalcogen

42. The most electronegative and electropositive elements of the first period is/are
(a) H and He
(b) Na and Cl
(c) Li and F
(d) H and H

43. Beryllium has diagonal relationship with
(a) Li
(b) B
(c) Na
(d) Al

44. Mean distance between atoms is in the range of
(a) 25 nm
(b) 2.5 nm
(c) 0.25 nm
(d) 0.025 nm

45. What is the meaning of the word 'atom'?
(a) dividable
(b) invisible
(c) hard particles
(d) not able to be divided

46. Dipole moment of BeF_2 is
(a) very low
(b) very high
(c) zero
(d) not definite

47. Which molecule has the largest dipole moment?
(a) HCl
(b) HI
(c) HBr
(d) HF

48. C (dimond) $\rightarrow$ C (graphite), ΔH = -ve. This shows that
(a) Graphite is more stable than diamond
(b) Diamond is more stable than graphite
(c) Both are equally stable
(d) Stability cannot be predicted

49. When Fe(s) is dissolved in aqueous hydrocholoric acid in a closed vessel, the work done is
(a) zero

(b) infinity
(c) extensive
(d) intensive

50. The sign convention for work done by the system is _____
(a) zero
(b) positive
(c) negative
(d) either positive or negative

51. In the solubility expression p = K_H x. the term 'K_H' infers
(a) Dalton's constant
(b) Henry's law constant
(c) Boltzmann constant
(d) Partial pressure of H_2

52. The molal boiling point elevation constant for water is 0.510 K mol^{-1} kg. The boiling point of a solution made by dissolving 6.0g urea in 200g water is
(a) 100.255°C
(b) 100°C
(c) 0.255°C
(d) 99.1°C

53. What is the conjugate base of OH^- ?
(a) O^{2-}
(b) O^-
(c) H_2O
(d) O_2

54. The reason for addition of catalyst in a reversible reaction at the beginning is
(a) to get the max concentration of reactants
(b) to increase the speed of attainment of equilibrium
(c) to alter the product concentration
(d) favour of forward reaction

55. The chemical formula of rust is
(a) $Fe_2O_3.xH_2O$
(b) FeO
(c) $Fe(OH)_2$
(d) $FeO_2.H_2O$

56. The sum of the powers of the exponentials to which each concentration term is raised is defined as
(a) rate of the reaction
(b) molecularity of the reaction
(c) order of the reaction
(d) half life period

57. A reaction was found to be second order with respect to the concentration of carbonmonoxide. If the concentration of carbonmonoxide is doubled with everythig else kept the constant, the rate of reaction will
(a) increase by a factor of 4
(b) double
(c) remain unchanged
(d) triple

58. In molisch test the presence of carbohydrates is confirmed by the formation of
(a) yellow precipitate
(b) scarlet red solution
(c) greenish yellow fluorescence
(d) red ring at the junction of two layers of liquids

59. The molecular mass of compound A is 168 g/mol. Its empirical formula is C_4H_4S. Find its molecular formula
(a) C_4H_4S
(b) C_2H_2S
(c) $C_8H_8S_2$
(d) C_2H_4S

60. The isomerism exhibited by $CH_3\ CH_2\ O\ CH_2\ CH_3$ and $CH_3\ CH_2\ CH_2\ CH_2\ OH$ is
(a) Structural isomerism
(b) Position Isomerism
(c) Optical isomerism
(d) Functional isomerism

61. A bond that undergoes heterolytic cleanage most readily is
(a) C-C
(b) O-H
(c) C-O
(d) C-H

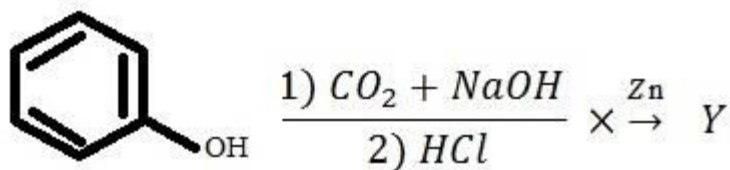62. The major product obtained when 3-phenyl propene reacts with HBr
(a)
$$C_6H_5\ \underset{\underset{Br}{|}}{CH} - CH = CH_2$$
(b) $C_6\ H_5$ - CH_2 - CH_2 - CH_2 - Br
(c)
$$C_6H_5\ \underset{\underset{Br}{|}}{CH} - CH_2 - CH_3$$
(d)
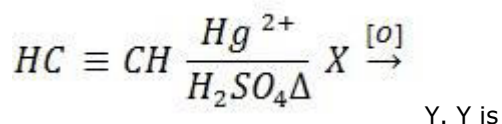$$C_6H_5 - CH_2 - \underset{\underset{Br}{|}}{CH} - CH_3$$

63. The reactions of alkenes are mainly
(a) Nucleophilic addition
(b) Nucleophilic substitution
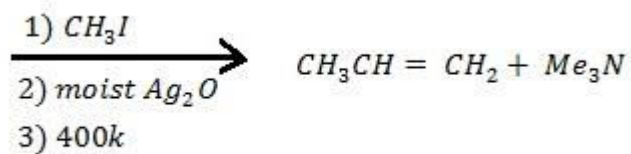(c) Free radical reactions

(d) Electrophilic additions

$$\text{Phenol} \xrightarrow[\text{2) } HCl]{\text{1) } CO_2 + NaOH} X \xrightarrow{Zn} Y$$

64.
(a) Benzene
(b) Phenol
(c) Benzoic acid
(d) Salicylic acid

$$HC \equiv CH \xrightarrow[H_2SO_4\Delta]{Hg^{2+}} X \xrightarrow{[O]} Y$$

65. Y. Y is
(a) acid
(b) aldehyde
(c) kitone
(d) ethanol

$$\xrightarrow[\substack{\text{2) } moist \ Ag_2O \\ \text{3) } 400k}]{\text{1) } CH_3I} CH_3CH = CH_2 + Me_3N$$

66. A   . A is
(a) CH₃ - NH - CH₃
(b) (CH₃ CH₂)₂ NH
(c) (CH₃ CH₂)₂ N-CH₃
(d) CH₃ CH₂ CH₂ NH CH₃

67. Schiffs base is formed when aniline is heated with
(a) C₆ H₅ CHO
(b) C₆ H₅ CH₂ OH
(c) C₆ H₅ CH₂ Cl
(d) C₆ H₆

68. Styrene dissolves well in
(a) Water
(b) Benzene
(c) Methanol
(d) Ethylacetate

69. Fissuring at corners of mouth and lips due to the deficiency of Vitamin B2 is called
(a) Pernicious anaemia

(b) Xerophthalmia
(c) Cheilosis
(d) Rickets

70. _____ is the first artificial sweetening agent discovered.
(a) sucrose
(b) fructose
(c) glucose
(d) saccharine

Part 3 – Mathematics

71. If (y - 2, x + 1) = (x - 1, 2) then the values of x and y are
(a) 1,2
(b) 2,3
(c) -1,-2
(d) 1,-2

72. The domain of definition of the function $f(x) = \dfrac{3}{4 - x^2} + \log_{10}(x^3 - x)$ is
(a) (1,2)
(b) (-10) $\cup$ (1,2)
(c) (1,2) $\cup$ (2,∞)
(d) (-1,1) $\cup$ (1,2) $\cup$ (2,∞)

73. What is the modulus and the principal value of the argument $(-\pi < \theta < \pi)$ of $1+\sqrt{2}+i$

(a) $\sqrt{4 + 2\sqrt{2}}\,,\,{}^{\pi}/_{8}$

(b) $\sqrt{4 + \sqrt{2}}\,,\,{}^{\pi}/_{8}$

(c) $\sqrt{4 + \sqrt{2}}\,,\,{}^{\overline{\wedge}}/_{4}$

(d) $\sqrt{4 + 2\sqrt{2}}\,,\,{}^{\pi}/_{4}$

74. The conjugate of a complex number is $\dfrac{1}{i - 1}$. Then the complex number is

(a) $\dfrac{-1}{i-1}$

(b) $\dfrac{1}{i+1}$

(c) $\dfrac{-1}{i+1}$

(d) $\dfrac{1}{i-1}$

75. Let A be 2 X 2 matrix with real entries. Let 3 be 2 X 2 identity matrix. Remote by tr(A) the sum of the diaganal entries of A. Assume that $A^2 = 1$

Statement 1: If $A \neq 1$ and $A \neq -1$ then det A = -1

Statement 2: If $A \neq 1$ and $A \neq -1$ then tr (A) $\neq 0$

(a) Statement 1 is false, statement 2 is true
(b) Statement 1 is true, statement 2 is true, statement 2 is a correct explanation for statement 1
(c) Statement 1 is true, statement 2 is true, statement 2 is not a connect explanation for statement 1
(d) Statement 1 is true, statement 2 is false

76. In a third order square matrix (aij) it is given that aij = 2i - 3j then the matrix is given by

(a) $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

(b) $\begin{pmatrix} -1 & -4 & -7 \\ 1 & -2 & -5 \\ 3 & 0 & -3 \end{pmatrix}$

(c) $\begin{pmatrix} 1 & 4 & 7 \\ -1 & 2 & 5 \\ -3 & 0 & 0 \end{pmatrix}$

(d) $\begin{pmatrix} -1 & -4 & -7 \\ 1 & -2 & -5 \\ 0 & 0 & -3 \end{pmatrix}$

77. If $y = \begin{pmatrix} 4 & 3 \\ 2 & 5 \end{pmatrix}$ and $2x - y = \begin{pmatrix} 6 & 7 \\ 8 & 1 \end{pmatrix}$ then x=

(a) $\begin{pmatrix} 5 & 5 \\ 3 & 5 \end{pmatrix}$

(b) $\begin{pmatrix} 5 & 5 \\ 5 & 3 \end{pmatrix}$

(c) $\begin{pmatrix} 3 & 3 \\ 3 & 5 \end{pmatrix}$

(d) $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

78. If A is a square matrix of order 3 then the true statement is
(a) det(-A) = -det A
(b) det A = 0
(c) det (A+I) = I + det A
(d) det (2A) = 2 det A

79. For the equation $3x^2+px+3=0$, p>0, if one of the roots is square of the other, then p is equal to
(a) 1/3
(b) 1
(c) 3
(d) 2/3

80. The least value of n for which (n - 1 C_4 + n - 1 C_3) > n C_3 is
(a) 7
(b) 9
(c) 10
(d) 8

81. By induction, value of the expression $\cos \theta \cos 2\theta \cos 4\theta$ ...... $\cos (2^{n-1}\theta)$ is equal to

(a) $\dfrac{Sin\ (2^n\theta)}{2^n\ Sin\ \theta}$

(b) $\dfrac{Cos\ (2^n\theta)}{2^n\ Cos\theta}$

(c) $\dfrac{Sin\ (2n\theta)}{Sin\theta}$

(d) $\dfrac{Cos(2n\theta)}{Cos\ \theta}$

82. If a,b,c,d $\in \mathbb{R}^+$ and a,b,c,d are in H.P then
(a) a+d > b+c
(b) a+c > b+d

(c) a+b > c+d
(d) a-b > c-d

83. The 99th term of the sequence 2,7,14,23,34,.... is
(a) 9998
(b) 9999
(c) 10000
(d) 10001

84. If
$$f(x) = \begin{cases} \dfrac{\log(1+2ax) - \log(1-bx)}{x}, & x \neq 0 \\ k, & x = 0 \end{cases}$$
is continuous at x = 0, then the value of k is
(a) b + a
(b) b - 2a
(c) 2a - b
(d) 2a + b

85. The range of the function f(x) = sin $\left[\log \dfrac{\sqrt{4-x^2}}{1-x} \right]$ is

(a) $(-\infty, \infty)$
(b) [-2,2]
(c) [-1,1]
(d) $\left[\dfrac{-\pi}{2}, \dfrac{\pi}{2} \right]$

86. For the curve x=t^2-1, y=t^2-t, the tangent line is perpendicular to x-axis where
(a) t=0
(b) t$\rightarrow \infty$
(c) t = 1/$\sqrt{3}$
(d) t = -1/$\sqrt{3}$

87. Rolle's theorem holds for the function x^3+bx^2+cx, $1 \leq x \leq 2$ at the point 4/3, the value of b and c are
(a) 8, -5
(b) -5, 8
(c) 5, -8

(d) -5, -8

88. $\displaystyle\int_{1}^{2}\frac{dx}{(x+1)\sqrt{x^2-1}}$ is equal to

(a) $\dfrac{1}{2}$

(b) $\dfrac{1}{\sqrt{2}}$

(c) $\dfrac{1}{3}$

(d) $\dfrac{1}{\sqrt{3}}$

89. The area bounded by the loop of the curve $4y^2 = x^2(4-x^2)$ is
(a) 7/3 square units
(b) 8/3 square units
(c) 11/3 square units
(d) 16/3 square units

90. The integrating factor of the linear differential equation $x^2(x^2-1)\dfrac{dy}{dx} + x(x^2+1)y = x^2-1$ is

(a) $\displaystyle\int_{e}^{1}\frac{x(x^2+1)}{x^2-1}\,dx$

(b) $\dfrac{x}{x^2-1}$

(c) $\dfrac{x}{e^x-1}$

(d) $\dfrac{x^2-1}{x}$

91. A particle moves in a straight line with velocity given by $\dfrac{dx}{dt} = x+1$ (x being the distance described). The time taken by the particle to describe 99 metres is

(a) $\log_{10} e$

(b) $2\log_e 10$

(c) $2\log_{10} e$

(d) $\dfrac{1}{2}\log_{10} e$

92. The number of integer values of m, for which the x-co-ordinate of the point of intersection of the lines 3x + 4y = 9 and y = mx + 1 is also an integer is
(a) 2
(b) 0
(c) 4
(d) 1

93. Equations of the bisectors of the lines 3x-4y+7=0 and 12x+5y-2=0 are given by
(a) 21x+77y-101=0, 11x-3y+9=0
(b) 11x-6y+111=0, 22x-13y+104=0
(c) 15x-9y+67=0, 15x+4y+33=0
(d) 20x+72y-109=0, x+5y=2

94. The circles $x^2 + y^2 - 4x - 6y - 12 = 0$ and $x^2 + y^2 + 6x - 8y + 21 = 0$
(a) intersect at two points
(b) touches each other externally
(c) touches each other internally
(d) neither touches nor intersects

95. The length of the intercept made by the line y = 2x + 1 on the circle $x^2 + y^2 = 2$ is

(a) $\dfrac{6}{\sqrt{5}}$

(b) $6\sqrt{5}$

(c) $6\sqrt{2}$

(d) $\dfrac{6}{\sqrt{2}}$

96. The orthocentre of the triangle formed by the points t1,t2, t3 on the parabola $y^2=4ax$ is
(a) vertex
(b) focus
(c) origin
(d) (1,0)

97. The equation of tangent to the ellipse $x^2+4y^2=25$ at the point whose ordinate is 2, is
(a) x+2y=5 or 2x-y=5
(b) 3x+8y=25 or 8y-3x=25
(c) 3x+2y=15 or 3y-2x=15
(d) x+y=1 or 2x-y=5

98. The vector that should be added to $\vec{a} = 3\hat{\imath} + 4\hat{\jmath} - 2\hat{k}$ so that restultant is the unit vector $\hat{\imath}$ is

(a) $-2\hat{\imath} - 4\hat{\jmath} + 2\hat{k}$

(b) $2\hat{\imath} - 4\hat{\jmath} + 2\hat{k}$

(c) $2\hat{\imath} + 4\hat{\jmath} + 2\hat{k}$

(d) $\hat{\imath} - \hat{\jmath} + 2\hat{k}$

99. If the vectors $\vec{a}$ and $\vec{b}$ are non collinear and the vectors $\vec{c} = (x-2)\vec{a} + \vec{b}$ and $\vec{d} = (2x+1)\vec{a} - \vec{b}$ are collinear then x is equal to

(a) x = -1/3
(b) x = 2/3
(c) x = 0
(d) x = 1/3

100. In an experiment with 15 observations on x the following results were available $\sum x^2 = 2830$, $\sum x = 170$. One observation 20 found to be wrong was replaced by the correct value 30. Then, the corrected variance is

(a) 188.66
(b) 177.33
(c) 8.33
(d) 78.00

101. Let u_1 and u_2 be two wins such that u_1 contains 3 white and 2 red balls and u_2 contains only one white ball. A fair coin is tossed. If head appear then one ball is drawn at random from u_1 and put into u_2. However if tail appears then 2 balls are drawn at random from u_1 and put into u_2. Now one ball is drawn at random from u_2. Then the probability of the drawn ball from u_2 being white is

(a) 13/30
(b) 23/30
(c) 19/30
(d) 11/30

102. Let $\cos(\alpha + \beta) = \dfrac{4}{5}, \sin(\alpha - \beta) = \dfrac{5}{13}, 0 \le \alpha, \beta \le \dfrac{\pi}{4}$ then tan 2α is

(a) $\dfrac{20}{7}$

(b) $\dfrac{25}{16}$

(c) $\dfrac{56}{33}$

(d) $\dfrac{19}{12}$

103. If $1 + \sin x + \sin^2 x + \sin^3 x + \cdots \infty = 4 + 2\sqrt{3}, 0 < x < \pi$ then x is equal to,

(a) $\pi/6$

(b) $\pi/4$
(c) $\pi/3$ or $\pi/6$
(d) $\pi/3$ or $2\pi/3$

104. If $f(x) = x^n$, then the value of $f(1) + \dfrac{f^1(1)}{1!} + \dfrac{f^2(1)}{2!} + \cdots\cdots + \dfrac{f^n(1)}{n!}$ Where $f^r(x)$ denotes the rth order derivative of $f(x)$ with respect to x is
(a) n
(b) 2^n
(c) 2^{n-1}
(d) $n2^{n-1}$

105. The value of $\displaystyle\sum_{r=1}^{10} r\,\dfrac{nC_r}{nC_{r-1}}$ is equal to
(a) 5(2n-9)
(b) 10n
(c) 9(n-4)
(d) 10(n-1)

Part 4 – Biology

71. The Human Genome Project officially began in
(a) 1988
(b) 1990
(c) 1992
(d) 1998

72. What is an argument in favor of using embryonic stem cells over adult stem cells?
(a) Embryonic stem cells are never really living.
(b) Embryonic stem cells can differentiate into many more types of cells.
(c) Adult stem cells cannot be cultured.
(d) Adult stem cells reproduce much faster than embryonic stem cells.

73. The analysis and storage of the massive amount of data generated from sequence maps has led to the growth of what new disciplines?
(a) Bioinformatics and medical microbiology
(b) Genomics and genetic engineering
(c) Genomics and bioinformatics
(d) Proteomics and environmental microbiology

74. Which technique is not used in the transfer of gene into fertilized egg or embryo?
(a) Fusion using polyethylene glycol
(b) Hypotonic lysis
(c) Microinjection
(d) Polymerization

75. The DNA molecule to which the gene of interest is integrated for cloning is called
(a) Carrier
(b) Vector

(c) Transformant
(d) cDNA

76. Totally unrelated plants are brought together in a single group and those that are closely related are placed in widely separated groups in the system of classification given by _____.
(a) Bentahm and Hooker
(b) Carolus Linnaeus
(c) Engler and Prantl
(d) Charles Darwin

77. In Pavonia odorata the inflorescence is _____.
(a) terminal head
(b) axillary cyathium
(c) terminal or axillary cyme
(d) axillary cyme

78. Leaves are simple and whorled in _____.
(a) *Ixora*
(b) *Galium*
(c) *Gardeni*
(d) *Rubia*

79. Morphologically, a _____ is a group of cells, which are similar in origin, form and function.
(a) tissue
(b) tissue system
(c) organ
(d) organ system

80. Differentiation is change of tissues from_____.
(a) meristematic to permanent
(b) simple to complex
(c) complex to simple
(d) permanent to meristematic

81. Procambium gives rise to _____
(a) primary vascular tissues
(b) epidermis
(c) cortex
(d) pith

82. Cellulose is a polymer of D-glucose units joined by
(a) α1-4 linkage
(b) α1-6 linkage
(c) β1-4 linkage
(d) β1-6 linkage

83. The most accepted theory of origin of life is
(a) Special creation theory
(b) Theory of abiogenesis
(c) Oparin haldane theory
(d) Theory of spontaneous generation

84. One of the following structure of Cockroach is responsible for water conservation.
(a) Spiracles
(b) Hepatic caeca
(c) Malpighian tubules
(d) short midgut

85. A DNA strand with the sequence AACGTAACG is transcribed.What is the sequence of the mRNA molecule synthesized?
(a) AACGTAACG
(b) UUGCAUUGC
(c) AACGUAACG
(d) TTGCATTGC

86. Which of the following is not a component of cell membrane?
(a) Lipid
(b) Nucleic acids
(c) Carbohydrate
(d) Proteins

87. Golden rice is a transgenic crop of the future with the following improved trait
(a) High lysine content
(b) Insect resistance
(c) High protein content
(d) High Vitamin-A content

88. When the genotype of an organism is improved by the addition of foreign gene, the process is called
(a) Tissue culture
(b) Genetic diversity
(c) Genetic engineering
(d) Plastic surgery

89. An example for transferase is
(a) transaminase
(b) pyruvic carboxylase
(c) histidine decarboxylase
(d) G-3-P dehydrogenase

90. The Non-cyclic photophosphorylation is associated with
(a) PS-I
(b) PS-II
(c) PS-I & II
(d) PIS

91. In C3 plants, photosynthesis occurs in
(a) Mesophyll cells
(b) Bundle sheath cells
(c) Both mesophyll and bundle sheath cells
(d) Cortex cells

92. Which of the following is an ephyphitic plants?
(a) Rice
(b) Vanda

(c) Cuscuta

(d) Viscum

93. Which of the following is the common respiratory substrate?

(a) Proteins

(b) Lipids

(c) Carbohydrates

(d) Vitamins

94. In order to obtain disease-free plants through tissue culture techniques, the best method is

(a) Protoplast culture

(b) Anther culture

(c) Embryo rescue

(d) Meristem culture

95. Consider the following statements (A-D) about organic farming

A. Utilizes genetically modified crops like Bt cotton

B. Uses only naturally produced inputs like compost

C. Does not use pesticides and urea

D. Produces vegetables rich in vitamins and minerals
Which of the above statements are correct?

(a) (B) and (C) only

(b) (A) and (B) only

(c) (B), (C) and (D)

(d) (C) and (D) only

96. Which one of the following is linked to the discovery of Bordeaux mixture as a popular fungicide?

(a) Black rust of wheat

(b) Bacterial leaf blight of rice

(c) Downy mildew of grapes

(d) Loose smut of wheat

97. The method of producing thousands of plants through tissue culture is called

(a) Micropropagation

(b) Somatic hybridization

(c) Biofortification

(d) Biomagnification

98. Saffron is produced from

(a) Roots of *Indigofera*

(b) Petals of *Rosa*

(c) Stamens of *Hibiscus*

(d) Style and stigma of *Crocus*

99. Joint dislocation caused by poliomyelitis is

(a) Congenital

(b) Traumatic

(c) Pathological

(d) Paralytic

100. Which of the following is not a regulatory function of lungs?
(a) Water balance
(b) Acid - base
(c) Body temperature
(d) Heart rate

101. The inhibitory process of respiratory centre in brain that regulates the extent of inspiration is known as
(a) Pavlov reflex
(b) Spinal reflex
(c) Neuro - endocrine reflex
(d) Herring - Breuer reflex

102. Atrophy of cerebral cortex leads to
(a) Stroke
(b) Meningitis
(c) Alzheimers
(d) Parkinsons

103. Synthesis and secretion of testosterone is regulated by
(a) ACTH
(b) FSH
(c) LH
(d) LTH

104. Largest organ in human system is
(a) Liver
(b) Brain
(c) Lungs
(d) Skin

105. Which of the following hormone has metabolic effects opposite to that of insulin?
(a) Calcitonin
(b) Testosterone
(c) Mineralocorticoid
(d) Glucocorticoid

106. Which of the following does not belong to lower respiratory tract?
(a) Larynx
(b) Trachea
(c) Bronchi
(d) Lungs

107. Testosterone is produced by _____ cells in testes.
(a) Interstitial
(b) Sertoli
(c) Nurse
(d) vas deferens

108. A protozoan is generally called as
(a) motile procaryotic unicellular protest
(b) motile eucaryotic unicellular protest
(c) motile eucaryotic unicellular photosynthetic protist

(d) motile eucaryotic multicellular protest.

109. Which is the most widely used physical method for microbial control?
(a) Filtration
(b) Ionization
(c) Radiation
(d) Sterilization

110. A genetically engineered microorganism used successfully in bioremediation of oil spills is a species of
(a) *Trichoderma*
(b) *Bacillus*
(c) *Xanthomonas*
(d) *Pseduomonas*

111. The following organisms have been proposed as a best source of single cell protein.
(a) Cyanobacteria
(b) Aspergillus
(c) Bacillus
(d) Pseudomonas

112. Which of the following does not protect body surfaces?
(a) Skin
(b) Mucus
(c) Gut microflora
(d) Salivary amylase

113. The basic Ig unit is composed of :
(a) Two identical heavy and two identical light chains
(b) Two identical heavy and two different light chains
(c) Two different heavy and two identical light chains
(d) Two different heavy and two different light chains

114. Which of the following is NOT causing the net CO_2 in the atmosphere to increase?
(a) photosynthesis
(b) burning gasoline
(c) deforestation
(d) burning coal

115. Endemic species are
(a) rare species
(b) species localized in a specific region
(c) cosmopolitan in distribution
(d) critically endangered species

116. The law which ensures environmental stability and maintenance of ecological balance is
(a) Forest Act 1927
(b) Wildlife Act1972
(c) Wild life protection Act 1991
(d) National forest policy 1988

117. Animal pharming can be defined as

(a) Growing animals for farming
(b) Generating transgenic animals for farming
(c) Programming animals to produce novel products
(d) Treatment for farming animals

118. The accuracy of estimating breeding value of a sire increased by ---------
(a) Decreasing the number of sires under test
(b) Decreasing the number of progeny of sire
(c) Increasing the number of progeny of sire
(d) Remains constant number of progeny of sire

119. The raw material for evolution is
(a) Selection
(b) Genetic drift
(c) Mutation
(d) migration

120. One of the important consequences of geographical isolation is
(a) Preventing Speciation
(b) Random creation of new species
(c) No change in the isolated fauna
(d) Speciation through reproductive isolation

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Answers:

Part 1 - Physics		Part 2 - Chemistry		Part 3 - Maths		Part 4 - Biology	
Q.No	Ans Option	Q.No	Ans Option	Q.No	Ans Option	Q.No	Ans Option
1	A	36	B	71	A	71	B
2	C	37	D	72	D	72	B
3	A	38	C	73	A	73	C
4	B	39	C	74	C	74	D
5	A	40	A	75	D	75	B
6	D	41	C	76	B	76	B
7	A	42	D	77	B	77	C
8	B	43	D	78	A	78	B
9	B	44	C	79	C	79	A
10	B	45	D	80	D	80	A
11	A	46	C	81	A	81	A
12	C	47	D	82	A	82	C
13	B	48	A	83	A	83	C
14	A	49	A	84	C	84	C
15	B	50	C	85	C	85	B
16	B	51	B	86	A	86	B
17	D	52	A	87	B	87	D
18	D	53	A	88	D	88	C
19	A	54	B	89	D	89	A

20	A	55	A	90	D	90	C
21	B	56	C	91	B	91	A
22	B	57	A	92	A	92	B
23	B	58	D	93	A	93	C
24	D	59	C	94	A	94	D
25	B	60	D	95	A	95	A
26	C	61	B	96	B	96	C
27	D	62	D	97	B	97	A
28	A	63	D	98	A	98	D
29	C	64	C	99	D	99	D
30	D	65	A	100	D	100	D
31	D	66	D	101	B	101	D
32	D	67	A	102	C	102	C
33	A	68	B	103	D	103	C
34	C	69	C	104	B	104	D
35	B	70	D	105	A	105	D
						106	A
						107	A
						108	C
						109	B
						110	D
						111	A
						112	D
						113	A
						114	A
						115	B
						116	D
						117	C
						118	C
						119	C
						120	D