Brilliant
STUDY CENTRE
Puliyannoor P.O., PALA
Ph - 04822 206416, 206516, 206459
www.brilliantpala.org

REPEATERS 2025
SCREENING TEST SAMPLE QUESTIONS

PHYSICS + CHEMISTRY + BIOLOGY + MATHS

PHYSICS (Qns. 1 to 30)

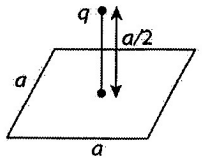
[SYLLABUS :- Electrostatics, Current electricity, Moving charges and magnetism, Magnetism and matter, EMI and AC, EM waves, Ray optics and optical instruments, Wave optics, Dual nature of radiation and matter, Atoms and nuclei, Semiconductor electronics]

1. A charged particle of mass m and charge q is released from rest in an electric field of constant magnitude The kinetic energy of the particle after time t is

1) $\frac{E^2q^2t^2}{m}$ 2) $\frac{2E^2q^2t^2}{m}$

3) $\frac{E^2q^2t^2}{2m}$ 4) $\frac{4E^2q^2t^2}{m}$

2. A charge q is placed at a distance a/2 above the centre of a horizontal square surface of edge a as shown in figure. The electric flux through the square surface is



1) $q / 2\varepsilon_0$ 2) q / ε_0

3) $q / 6\varepsilon_0$ 4) $q / 8\varepsilon_0$

3. What is the resistance of a carbon resistor which has bands of colours brown, black and brown

1) 100 Ω 2) 1000 Ω 3) 10 Ω 4) 1 Ω

4. There are n similar conductors each of resistance R. The resultant resistance comes out to be x when connected in parallel. If they are connected in series, the resistance comes out to be

1) x / n^2 2) n^2x 3) x / n 4) nx

5. When a long wire carrying a steady current is bent into a circular coil of one turn, the magnetic induction at its centre is B. When the same wire carrying the same current is bent to form a circular coil of n turns of a smaller radius, the magnetic induction at the centre will be

1) B/n 2) nB 3) B/n^2 4) n^2B

6. Two thin long parallel wires separated by a distance b are carrying a current I A each. The magnitude of the force per unit length exerted by one wire on the other is

1) $\frac{\mu_0 I^2}{b^2}$ 2) $\frac{\mu_0 I^2}{2\pi b}$

3) $\frac{\mu_0 I}{2\pi b}$ 4) $\frac{\mu_0 I}{2\pi b^2}$

7. A magnetic needle lying parallel to a magnetic field requires W units of work to turn it through 60^0. The torque required to maintain the needle in this position is

1) $\sqrt{3}W$ 2) W 3) $\frac{\sqrt{3}}{2}W$ 4) 2W

8. Lenz's law is a consequence of the law of conservation of

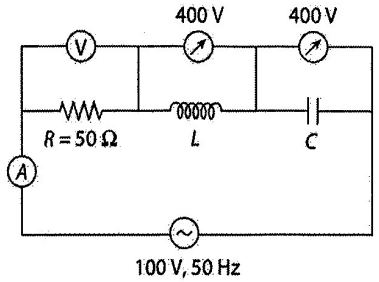
1) charge 2) momentum

3) mass 4) energy

9. What is the coefficient of mutual inductance when the magnetic flux changes by 2×10^{-2} Wb and change in current is 0.01 A

1) 2 H 2) 3H 3) $\frac{1}{2}$H 4) Zero

10. In the series LCR circuit, the voltmeter and ammeter readings are, respectively,



1) V = 100V, I = 2A 2) V = 1000V, I = 5A

3) V = 1000V, I = 2A 4) V = 300V, I = 1A

11. If ε_0 and μ_0 represent the permittivity and permeability of vacuum, respectively, and ε and μ represent the permittivity and permeability of medium, respectively, then refractive index of the medium is given by

1) $\sqrt{\frac{\varepsilon_0\ \mu_0}{\varepsilon\mu}}$ 2) $\sqrt{\frac{\varepsilon\mu}{\varepsilon_0\mu_0}}$ 3) $\sqrt{\frac{\varepsilon}{\varepsilon_0\mu_0}}$ 4) $\sqrt{\frac{\varepsilon_0\mu_0}{\varepsilon}}$

12. When light travels from one medium to the other of which the refractive index is different, then which of the following will change?

1) Frequency, wavelength and velocity

2) Frequency and wavelength

3) Frequency and velocity

4) Wavelength and velocity

13. If yellow light in the Young's double-slit experiment is replaced by red light, the fringe width will

1) decrease

2) remain unaffected

3) increase

4) first increase and then decrease

14. A photocell is illuminated by a small bright source placed 1 m away. When the same source of light is placed half metre away, the number of electrons emitted by photo cathode would be

1) increased by a factor of 4

2) decreased by a factor of 4

3) increased by a factor of 2

4) increased by a factor of 2

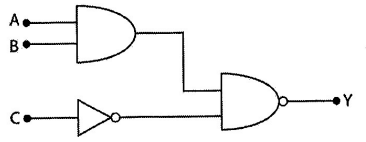
15. A proton has kinetic energy E = 100 keV which is equal to that of a photon. The wavelength of photon is λ_2 and that of proton is λ_1. The ratio of λ_2 / λ_1 is proportional to

1) E^2 2) $E^{1/2}$ 3) E^{-1} 4) $E^{-1/2}$

16. An energy of 24.6 eV is required to move one electron from a neutral Helium atom. The energy (in eV) required to remove both the electrons from a neutral He atom is

1) 38.2 2) 49.2 3) 51.8 4) 79.0

17. In the following circuit, the output Y becomes zero for the input combinations



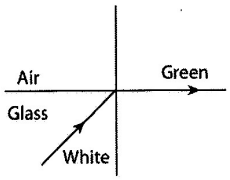
1) $A = 1, B = 0, C = 0$

2) $A = 0, B = 1, C = 1$

3) $A = 0, B = 0, C = 0$

4) $A = 1, B = 1, C = 0$

18. White light is incident on the interface of glass and air as shown in the figure. If green light is just totally internally reflected then the emerging ray in air contains



1) yellow, orange, red
2) violet, indigo, blue
3) all colours
4) all colours except green

19. The charge on a parallel-plate capacitor is varying as $q = q_0 \sin 2\pi nt$. The plates are very large and close together. Neglecting the edge effects, the displacement current through the capacitor is

1) $\frac{q}{\varepsilon_0 A}$
2) $\frac{q_0}{\varepsilon_0}\sin 2\pi nt$
3) $2\pi n q_0 \cos 2\pi nt$
4) $\frac{2\pi n q_0}{\varepsilon_0}\cos 2\pi nt$

20. A transformer is employed to reduce 220-11V. The primary draws a current of 5A and the secondary 90A. The efficiency of the transformer is

1) 20%
2) 40%
3) 70%
4) 90%

21. If specific resistance of a potentiometer wire is $10^{-7}\,\Omega m$, and current flow through it is 0.1 A, cross-sectional area of wire is $10^{-6}\,m^2$, then potential gradient will be:

1) 10^{-2} volt/m
2) 10^{-4} volt/m
3) 10^{-6} volt/m
4) 10^{-8} volt/m

22. A current of 5A passes through a copper conductor (resistivity = $1.7\times10^{-8}\,\Omega m$) of radius of cross-section 5mm. Find the mobility of the charges if their drift velocity is $1.1\times10^{-3}\ m/s$.

1) 1.5 m^2/Vs
2) 1.3 m^2/Vs
3) 1.01 m^2/Vs
4) 1.8 m^2/Vs

23. The De Broglie wavelength of an electron moving with a velocity $1.5\times10^{8}\,m/s$ is equal to that of a photon. The ratio of the kinetic energy of the electron to the energy of the photon is :

1) $\frac{1}{4}$
2) $\frac{1}{2}$
3) 2
4) 4

24. The barrier potential of a p-n junction depends on:

a) Type of semiconductor material

b) Amount of doping

C) Temperature

Which one of the following is correct ?

1) (a) and (b) only 2) (b) only

3) (b) and (c) only 4) (a), (b) and (c)

25. At any point on the perpendicular bisector of the line joining two equal and opposite charges:

1) The electric field is zero

2) The electric potential is zero

3) The electric potential decreases with increasing distance from their mid point

4) The electric field is perpendicular to the line joining the charges

26. The magnetic field at the centre of a circular current carrying conductor of radius r is B_c. The magnetic field on its axis at a distance r from the centre is B_a. The value of $B_c : B_a$ will be

1) $1 : \sqrt{2}$ 2) $1 : 2\sqrt{2}$ 3) $2\sqrt{2} : 1$ 4) $\sqrt{2} : 1$

27. A single slit diffraction pattern is obtained using a violet colour. What happens if the violet light is replaced by the red light?

1) Diffraction fringes becomes narrower and crowded together

2) Diffraction fringes becomes broader and farther apart

3) There is no change in the diffraction pattern

4) The diffraction pattern disappears

28. In an electromagnetic wave, the electric field oscillates sinusoidally with amplitude 48 Vm^{-1}, the rms value of oscillating magnetic field will be

1) 1.6×10^{-8} T 2) 1.6×10^{-9} T 3) 144×10^{-8} T 4) 11.3×10^{-8} T

29. A diver at a depth of 12 m in water $\left(\mu = \frac{4}{3}\right)$ sees the sky in a cone of semivertical angle

1) $\sin^{-1}\left(\frac{4}{3}\right)$ 2) $\tan^{-1}\left(\frac{4}{3}\right)$ 3) $\sin^{-1}\left(\frac{3}{4}\right)$ 4) 90^{o}

30. Choose the incorrect statement

1) Mass of products formed is less than the original mass in nuclear fission and nuclear fusion reactions.

2) Binding energy per nucleon increases in α -decay and β -decay.

3) Mass number is conserved in all nuclear reactions.

4) Atomic number of nuclei is conserved in all nuclear reactions.

CHEMISTRY(Qns 31 to 60)

[SYLLABUS :-Solutions, Electro chemistry, Chemical kinetics, d and f - block elements, Co-ordination compounds and organometallics, Halo alkanes , Halo arenes & Stereochemistry, Alcohol, phenols and ethers, Aldehydes and ketones, Carboxylic acid and its derivatives, Nitrogen compounds, Biomolecules]

31. Van't Hoff factor for $MgSO_4$ in water with complete dissociation is

1) 1 2) 1.5 3) 2 4) ∞

32. Best reducing agent among the following is

1) Li 2) F_2 3) K 4) Mg

33. $t_{1/2}$ for a first order reaction having K = 1.386 s^{-1} is

1) 2 sec 2) 0.5 sec 3) 4 sec 4) 3 sec

34. Which of the following transition element does not show variable oxidation state?

1) Sc 2) Mn 3) Cu 4) Cr

35. Shape of $Fe(CO)_5$ is

1) Tetrahedral 2) Octahedral

3) Trigonal bypyramidal 4) Square planar

36. Phosgene is common name for

1) Phosphoryl chloride

2) Thionyl chloride

3) CO_2 and phosphene

4) Carbonyl chloride

37. When phenol is treated with $CHCl_3$ and NaOH, the product formed is

1) Benzaldehyde 2) Salicylaldehyde

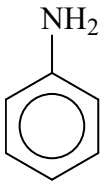
3) Salicylic acid 4) Benzoic acid

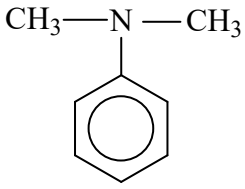
38. Most acidic compound among the following is .....

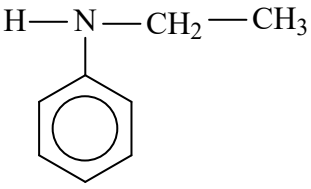
1) CH_3COOH 2) HCOOH

3) CCl_3COOH 4) CF_3COOH

39. Which of the following answer for carbylamine reaction?

1) $CH_3CH - NH - CH_3$ 2) 

3) 

4) 

40. Non essential amino acid among the following is

1) Lysine 2) Valine 3) Leucine 4) Alanine

41. The pressure of H_2 required to make the potential of H_2 electrode zero in pure water at 298 K is

1) 10^{-10} atm 2) 10^{-4} atm

3) 10^{-14} atm 4) 10^{-12} atm

42. $3A \rightarrow 2B$, rate of reaction, $\frac{+d[B]}{dt}$ is equal to

1) $\frac{-3}{2}\frac{d[A]}{dt}$ 2) $\frac{-2}{3}\frac{d[A]}{dt}$ 3) $\frac{-1}{3}\frac{d[A]}{dt}$ 4) $+2\frac{d[A]}{dt}$

43. Which of the following has more unpaired electrons

1) N^{3+} 2) Fe^{2+} 3) Zn^{+} 4) Cu^{+}

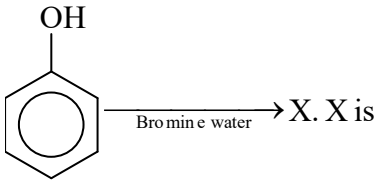
44. Name the gas that cannot readily decolourise acidified $KMnO_4$ solution

1) SO_2 2) NO_2 3) P_2O_3 4) CO_2

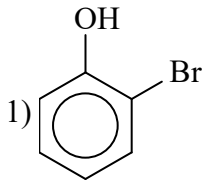
45. $CH_3-\underset{\underset{Br}{|}}{CH}-CH_2-CH_3 \xrightarrow{alc.KOH} CH_3-CH=CH-CH_3$. This product is based on

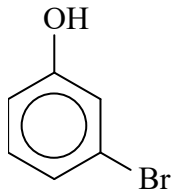
1) Saytzeff's rule 2) Hund's rule

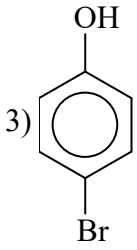
3) Hoffmann rule 4) Markovnikov's rule

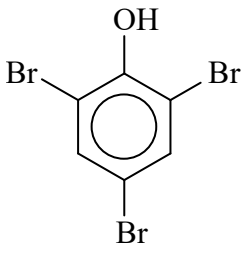
46. 

X. X is

1) 

2) 

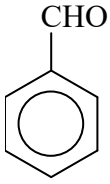
3) 

4) 

47. $CH_3CH_2CONH_2 \xrightarrow{KOH/Br_2} A$. A is

1) Ethanamine 2) Propanamine 3) Ethane nitrile 4) Acetamide

48. Which of the following oxidise Fehling's reagent

1)  2) CH_3CHO 3) CH_3COCH_3 4) Both 1 and 2

49. The branched chain polymer of glucose, which contain $C_1 - C_4$ glycosidic linkage and branching occur via $C_1 - C_6$ glycosidic linkage is

1) Amylose 2) Amylopectin

3) Lactose 4) Both 1 and 2

50. Which of the following is a colligative property

1) Vapour pressure 2) Boiling point

3) Osmotic pressure 4) Freezing point

51. Deficiencydisease Xerophthalmia is due to the scarcity of

1) Vitamin A 2) Vitamin B

3) Vitamin D 4) Vitamin E

52. $Zn \mid Zn^{2+}_{(1M)} \parallel Cu^{2+} \mid Cu.$ $E^0_{Zn^{2+}/Zn} = -0.76$ V, $E^0_{Cu^{2+}/Cu} = 0.34$ V. Find E^0_{cell} ?

1) 0.42 V 2) –0.42 V 3) 1.1 V 4) –1.1 V

53. $R - X + NaI \longrightarrow R - I + NaX$. This reaction is .....

1) Finkelstein reaction

2) Swartz reaction

3) Wurtz reaction

4) Fittig reaction

54. The product obtained during oxidation of cumene in presence of air and dilute acid is

1) Phenol 2) Aniline

3) Toluene 4) Cyanobenzene

55. Given below are two statements:

Statement-I : In Lucas test, primary, secondary and tertiary alcohols are distinguished on the basis of their reactivity with conc. $HCl + ZnCl_2$, known as Lucas Reagent.

Statement-II : Primary alcohols are most reactive and immediately produce turbidity at room temperature on reaction with Lucas reagent.

In the light of the above statements, choose the most appropriate answer from the options given below:

1) Both Statement-I and Statement-II are correct

2) Both Statment-I and Statement-II are incorrect

3) Statement-I is correct but Statement-II is incorrect

4) Statement-I is incorrect but Statement-II is correct

56. The boiling point of water is 373.15 K and freezing point 273.0 K. The K_b value and K_f value in $K.Kg\ mol^{-1}$ are respectively

1) 0.52, 1.99 2) 0.52, 1.86 3) 1.20, 1.99 4) 2.79, 20.00

57. E^0_{cell} of Daniell cell, $Zn + Cu^{2+} \longrightarrow Zn^{2+} + Cu$, if $E^0_{Cu^{2+}/Cu} = +0.34\ V$ and $E^0_{Zn^{2+}/Zn} = -0.76$ is

1) –1.1 V 2) 1.1 V 3) –1.5 V 4) 1.5 V

58. For a first order reaction, the time required for completion of 90% reaction is 'x' times the half life of the reaction. The value of 'x' is
(Given: ln 10 = 2.303 and log 2 = 0.3010)

(1) 1.12 (2) 2.43

(3) 3.32 (4) 33.31

59. Potassium hexacyanido-ferrate(II) is

1) $Fe_4\left[Fe(CN)_6\right]_3$ 2) $K_3\left[Fe(CN)_6\right]$ 3) $K_4\left[Fe(CN)_6\right]$ 4) $K_4\left[Fe(NC)_6\right]$

60. Williamson's synthesis is used for the preparation of

1) Alcohols 2) Esters 3) Ethers 4) Phenols

BIOLOGY(Qns. 61 to 90)

[SYLLABUS :- Sexual in reproduction in flowering plants, Biotechnology - Principles and process, Biotechnology and its applications, Organism and population, Ecosystem, - Principles of inheritance and variation, Microbes in human welfare, Human reproduction, Reproductive health , Molecular basis of inheritance, Biodiversity and its conservation, Evolution, Human health and diseases]

61. The DNA polymerase which is used in PCR is isolated from

1) *Bacillus thuringiensis* 2) Clostridium sps

3) Salmonella sps 4) *Thermus aquaticus*

62. The rate of formation of new organic molecules by consumer is called as:

1) Gross primary productivity

2) Net primary productivity

3) Secondary productivity

4) Primary productivity

63. Which of the following is wrongly matched

1) DNA ligase-joins DNA pieces

2) Restriction endonuclease-cuts DNA

3) Chitinase - DNA isolation from plant cell

4) DNA polymerase - replicates DNA

64. Find the wrong matching :

1) Cattle egret and cattle - Commensalism

2) *Penicillium* and bacteria - Amensalism

3) Fig tree and wasp - Mutualism

4) Phytophagous and plant - Competition

65. What causes the inactive form of Bt toxin to be converted into the active form in the insect body

1) Temperature of the gut 2) Acidic pH of the gut

3) Alkaline pH of the gut 4) Enzymes present in the saliva

66. Which technique can we used to separate DNA fragment generated by the restriction endonuclease in a chemical reaction

1) PCR 2) ELISA 3) Gel electrophoresis 4) Spooling

67. Read the following statement about insulin and choose the option that correctly fills the blank X and Y:

a) Insulin consist of two short polypeptide chains : Chain A and B that are linked together by ___X___ bonds

b) The proinsulin has an extra peptide called ___Y___

	X	**Y**
1)	Disulphide	E-peptide
2)	Hydrogen	C-peptide
3)	Disulphide	C-peptide
4)	Hydrogen	E- peptide

68. When resources in the habitat are unlimited?

1) Population grows in an exponential or geometric fashion

2) Impact of natality and mortality becomes zero

3) Species exhibits sigmoid growth model

4) Population shows verhulst Pearl-logistic growth

69. Match the columns.

	Column I		**Column II**
a)	Copepods	1)	Camouflage
b)	Praying mantis	2)	Resource partitioning
c)	Warblers living on same tree	3)	Ectoparasite
d)	Sea anemone and clown fish	4)	Commensalism

1) a - 4, b - 2, c - 1, d - 3 2) a - 3, b - 1, c - 2, d - 4

3) a - 1, b - 2, c - 3, d - 4 4) a - 2, b - 3, c - 4, d - 4

70. One of the most resistant organic material present in the exine of pollen grain is

1) Pectocellulose
2) Sporopollenin
3) Suberin
4) Cellulose

71. Select the correct option regarding the ploidy level of different structures of an angiosperms ovule.

	Nucellus	**MMC**	**Megaspore**
1)	n	2n	2n
2)	2n	n	n
3)	2n	2n	n
4)	n	2n	n

72. A particular species of plant produces light, non-sticky pollen in large numbers and its stigmas are large and feathery. These modifications facilitate pollination by

1) Insects
2) Water
3) Wind
4) Animals

73. The milk of Rosie cow contained human specific protein known as

1) Alpha - lactalbumin
2) Beta - lactalbumin
3) Insulin
4) α -1-antitrypsin

74. Biolistic gun is used for

1) Disarming pathogen vector
2) Construction of rDNA
3) DNA fingerprinting
4) Transformation of plant cells

75. The age pyramid with broad base indicates

1) High percentage of old individuals
2) Low percentage of young individuals
3) A stable population
4) High percentage of young individuals

76. From the following which ones are haploid?

i) 1^{o} oocyte ii) 2^{o} oocyte iii) 1^{o} spermatocyte iv) 2^{o} spermatocyte
v) 1^{st} polarbody vi) ootid vii) spermatogonium viii) spermatozoans

1) i, ii, iv, v, vi, viii
2) ii, iv, v, vi, vii
3) ii, iv, v, vi, viii
4) ii, iv, vi, viii

77. Parturition is induced by a complex neuroendocrine mechanism involving a group of hormones. Select the correct set of hormones involved in this mechanism

1) hcG, hpL, Relaxin

2) Progestrogens, Cortisol, PRL, Thyroxine

3) Cortisol, estrogen, oxytocin, prostaglandin

4) Cortisol, estrogen, PRL, relaxin

78. Following are some of the **contraceptive methods** for avoiding unwanted pregnancies. Select the correctly matched option with respect to their **mode of action** with **suitable examples**.

	Contraceptive Methods		**Mode of Action**		**Examples**
A)	IUCDs	i)	Block the transport of gametes	P)	Saheli
B)	Non-Steroidal oral pill	ii)	Suppress sperm motility and fertilising capacity of sperm	Q)	Cu-T and Cu-7
C)	Barriers	iii)	Block estrogen receptors on endometrium to prevent implantation	R)	Vaults and Cervical caps
D)	Surgical intervention	iv)	Prevent the meeting of sperm with ovum	S)	Tubectomy

1) A-ii-P; B-iii-Q; C-iv-S; D-i-R

2) A-ii-Q; B-iii-P; C-iv-R; D-i-S

3) A-ii-Q; B-iii-P; C-i-S; D-iv-R

4) A-ii-P; B-i-Q; C-iv-R; D-iii-S

79. Infertility may be due to inability of the male partner to inseminate the female or due to very low sperm count in the ejaculates.

Which of the following ART could be applied to solve this problem ?

1) Gamete Intra fallopian transfer

2) Either artificial insemination or intra uterine insemination

3) Zygote intrafallopian transfer

4) Intra uterine transfer

80. "Evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography". All the following examples will exemplify the above statement, except:

1) Origin of many varieties of finches in Galapagos islands.

2) Evolution of different types of marsupials from an ancestral stock

3) Placental wolf and Tasmanian wolf in similar habitat of Australia.

4) Evolution of Mole, Anteater and Lemur in Australia

81. Select the **incorrect** match with regards to genes and their functions in *lac* operon

1) *Lac Z* - Permease

2) Promoter gene - Provides attachment site for RNA polymerase

3) Regulator gene - Repressor protein

4) *Lac a* - Transacetylase

82. Which of the given cross will result in 9 : 3 : 3 : 1 phenotypic ratio

1) RrYy × rryy

2) RRYy × RsYY

3) RRyy × rrYY

4) RrYy × RrYy

83. Choose the correctly matched one

i) In-situ conservation - National park

ii) Ex-situ conservation - Sanctuary

iii) Hot spot - Indo-Burma

1) i, ii and iii

2) Only ii

3) i and iii

4) ii and iii

84. How many of given below characters selected by Mendel **do not** express in heterozygous state?

Terminal flower, violet flower, constricted pod, Green seeds and Wrinkled seeds present in yellow pods , Tall plants

1) 7 2) 4 3) 3 4) 5

85. Match the column- I (codons) with column - (II) (Amino acids). Find out the correct match:

	Column - I (Codons)		Column II (Amino acids)
a	UGG	i	Glycine
b	UAG	ii	Start codon
c	AUG	iii	Stop codon
d	GGU	iv	Tryptophan

	a	**b**	**c**	**d**
1)	iv	ii	iii	i
2)	iv	iii	ii	i
3)	i	ii	iv	iii
4)	i	iv	iii	iv

86. Due to genetic and other unknown reasons the body attacks self cells, results in damage of body. Which one of the following will come under this category?

1) Addison's disease 2) Osteoarthritis

3) Muscular dystrophy 4) Rheumatoid arthritis

87. Which one of the following is incorrect about spleen in human body?

1) Acts as a reservoir of erythrocytes

2) It mainly contains lymphocytes and phagocytes

3) Provide micro-environment for the development and maturation of T-lymphocytes

4) Acts as a filter of the blood by trapping blood borne-micro-organisms

88. Match the following column and select the correct option

a) Lady bird i) Aphids

b) Bacillus thuringiensis ii) Butterflies caterpillars

c) Dragonflies iii) Mosquitoes

d) Trichoderma iv) Effective against several plant pathogen

1) a-i, b-ii,c-iii,d-iv 2) a-i, b -iii, c-iv, d-ii

3) a-i, b-iv, c-iii, d-ii 4) a-ii, b-iv, c-i, d-iii

89. Choose the correct equation for 'Species-area relationship'

1) Log A = Log C + Z log S 2) Log C = Log S + Z log A

3) Log Z = A log C + log S 4) LogS = Log C + Z log A

90. Blood group of father is B and that of daughter is AB. The genotype of the mother would be :-

1) I^AI^A or I^0I^0 2) I^AI^B Only 3) I^AI^A or I^AI^B 4) I^AI^0 Only

MATHEMATICS: (Qns 91 - 120)

[Syllabus: Relation and Functions, Inverse Trigonometry, Matrices and Determinants, Continuity, Differentiability and Application of Derivatives, Integration, Differential Equation, Vector, Three Dimensional Geometry, Probability]

91. Let $A = \{0,1,2,3\}$ and define a relation R on A as follows

$R = \{(0,0),(0,1),(0,3),(1,0),(1,1),(2,2),(3,0),(3,3)\}$ then R is

1) reflexive and symmetric
2) symmetric and transitive
3) reflexive and transitive
4) a equivalence relation

92. For real x, let $f(x) = x^3 + 5x + 1$ then

1) f is one-one but not onto
2) f is onto but not one-one
3) f is bijective
4) f is neither one-one nor onto

93. If $A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$ then the value of K so that $A^2 = KA - 2I$ is

1) 1
2) –1
3) 2
4) none

94. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and det $A^3 = 125$, then α is equal to

1) ± 1
2) ± 2
3) ± 3
4) ± 5

95. The determinant $\begin{vmatrix} b^2 - ab & b - c & bc - ac \\ ab - a^2 & a - b & b^2 - ab \\ bc - ac & c - a & ab - a^2 \end{vmatrix}$ is equal to

1) abc
2) (b-c) (c-a) (a-b)
3) 0
4) 1

96. If $\tan^{-1} \dfrac{\sqrt{1+x^2} - 1}{x} = 4$ then x is equal to

1) tan 2
2) tan 4
3) $\tan\left(\dfrac{1}{4}\right)$
4) tan 8

97. If $\cos^{-1} x + \cos^{-1} y = \dfrac{\pi}{2}$ and $\tan^{-1} x - \tan^{-1} y = 0$ then $x^2 + xy + y^2$ is equal to

1) 0
2) $\dfrac{1}{\sqrt{2}}$
3) $\dfrac{3}{2}$
4) $\dfrac{1}{8}$

98. The number of triplets (x,y,z) satisfying $\sin^{-}{}^{`} x + \cos^{-1} y + \sin^{-1} z = 2\pi$ is

1) 0 2) 1 3) 2 4) infinite

99. For what value of K, $f(x) = \begin{cases} \dfrac{2^{x+2}}{4^x - 16} & x \neq 2 \\ k & x = 2 \end{cases}$ is continuous at $x = 2$

A) 1 B) $\frac{3}{2}$ C) 2 D) $\frac{1}{2}$

100. $f(x) = x|x|$ is

1) discontinous at $x = 0$ 2) not differentiable at $x = 0$

3) differentiable at $x = 0$ 4) none

101. If $f'(x) = \phi(x)$ and $\phi'(x) = f(x)$ for all x then the value of $\frac{d}{dx}\left\{\left[f(x)\right]^2 - \left[g(x)\right]^2\right\}$

1) 0 2) 9 3) 41 4) none

102. Derivative of $\sqrt{e^{\sqrt{x}}}$ w.r.t x

1) $\frac{e^{\sqrt{x}}}{2\sqrt{xe^{\sqrt{x}}}}$ B) $\frac{4e^{\sqrt{x}}}{\sqrt{xe^{\sqrt{x}}}}$ 3) $\frac{e^{\sqrt{x}}}{4\sqrt{xe^{\sqrt{x}}}}$ 4) $\frac{e^{\sqrt{x}}}{\sqrt{e^{\sqrt{x}}}}$

103. If $f(x) = e^x$ and $g(x) = \sin^{-1} x$ and $h(x) = f(g(x))$ then $\frac{h'(x)}{h(x)}$ is equal to

1) $e^{\sin^{-1} x}$ 2) $\frac{1}{\sqrt{1-x^2}}$ 3) $\sin^{-1} x$ 4) $\frac{1}{1-x^2}$

104. The interval in which the function $y = x^3 + 5x^2 - 1$ is decreasing is

1) $\left(0, \frac{10}{3}\right)$ 2) $(0,10)$ 3) $\left(-\frac{10}{3}, 0\right)$ 4) none

105. $\int \frac{e^{6\log x} - e^{5\log x}}{e^{4\log x} - e^{3\log x}} dx$ equals to

1) $\frac{x}{2} + c$ 2) $\frac{x^2}{2} + c$ 3) $\frac{x^3}{3} + c$ 4) $\frac{x^4}{2} + c$

106. $\int \frac{1}{e^x + e^{-x}} dx$ is equal to

1) $\tan^{-1} e^x + c$ 2) $\tan^{-1} e^{-x} + c$ 3) $\log\left(e^x - e^{-x}\right) + c$ 4) none

107. $\int_0^2 [x^2] dx$ is equal to

1) $2 - \sqrt{2}$ 2) $2 + \sqrt{2}$ 3) $\sqrt{2} - 1$ 4) $-\sqrt{2} - \sqrt{3} + 5$

108. $100\int_0^1 \{x\} dx,$ where $\{x\}$ denotes the fractional part of x

1) 100 2) 25 3) 75 4) 50

109. The area bounded by x=1, x= 2, xy = 1 and x-axis is

1) (log 2) sq unit 2) 2 sq units 3) 1 sq units 4) none

110. The differential equation of the rectangular hyperbola whose axes are the asymptotes of the hyperbola is

1) $y\frac{dy}{dx} = x$ 2) $x\frac{dy}{dx} = -y$ 3) $x\frac{dy}{dx} = y$ 4) $xdx + ydy = c$

111. The differential equaiton $\frac{d^2y}{dx^2} = 2$ represents

1) a parabola whose axis is parallel to x-axis

2) a parabola whose axis is parallel to y-axis

3) a circle

4) none

112. The solution of $xdy - ydx + x^2e^x dx = 0$ is

1) $\frac{y}{x} + e^x = c$ 2) $\frac{x}{y} + e^x = c$ 3) $x + e^y = c$ 4) $y + e^x = c$

113. a,b and c are mutually perpendicular unit vectors then $|a + b + c|$ is equal to

1) $\sqrt{3}$ 2) 3 3) 1 4) 0

114. If a+b+c=0 and $|a| = \sqrt{37}, |b| = 3, |c| = 4$ then the angle between b and c is

1) 30° 2) 45° 3) 60° 4) 90°

115. If $|a \times b| = 4$ and $|a.b| = 2$ then $|a|^2 |b|^2$ is equal to

1) 2 2) 6 3) 8 4) 20

116. The distance of the point (–2,4,–5) from the line $\frac{x+3}{3}=\frac{y-4}{5}=\frac{z+8}{6}$ is

1) $\sqrt{\frac{37}{10}}$ 2) $\frac{37}{\sqrt{10}}$ 3) $\frac{\sqrt{37}}{10}$ 4) none

117. Lines $\frac{x-2}{1}=\frac{y-3}{1}=\frac{z-4}{-k}$ and $\frac{x-1}{k}=\frac{y-4}{2}=\frac{z-5}{1}$ are coplanar if

1) k=0 2) k = –1 3) k = 2 4) k = 3

118. For two events A and B if $P(A)=P\left(\frac{A}{B}\right)=\frac{1}{4}$ and $P\left(\frac{B}{A}\right)=\frac{1}{2}$ then

1) A and B are independent 2) $P\left(\frac{A'}{B}\right)=\frac{3}{2}$

3) $P\left(\frac{B'}{A'}\right)=\frac{3}{4}$ 4) none

119. One function is selected from all the functions $F:s\to s$ where $S=\{1,2,3,4,5,6\}$. The probability that it is onto function is

1) $\frac{5}{324}$ 2) $\frac{7}{324}$ 3) $\frac{5}{162}$ 4) $\frac{5}{81}$

120. A second order determinant is written down at random using the numbers 1,–1 as elements. The probability that the value of the determinant is non-zero is

1) $\frac{1}{2}$ 2) $\frac{3}{8}$ 3) $\frac{5}{8}$ 4) $\frac{1}{3}$

REPEATERS 2025
SCREENING TEST SAMPLE QUESTIONS

P + C + B + M - ANSWER KEY

PHYSICS	CHEMISTRY	BIOLOGY
1. 3	31. 3	61. 4
2. 3	32. 1	62. 3
3. 1	33. 2	63. 3
4. 2	34. 1	64. 4
5. 4	35. 3	65. 3
6. 2	36. 4	66. 3
7. 1	37. 2	67. 3
8. 4	38. 4	68. 1
9. 1	39. 2	69. 2
10. 1	40. 4	70. 2
11. 2	41. 3	71. 3
12. 4	42. 2	72. 3
13. 3	43. 2	73. 1
14. 1	44. 4	74. 4
15. 4	45. 1	75. 4
16. 4	46. 4	76. 3
17. 4	47. 1	77. 3
18. 1	48. 2	78. 2
19. 3	49. 2	79. 2
20. 4	50. 3	80. 3
21. 1	51. 1	81. 1
22. 3	52. 3	82. 4
23. 1	53. 1	83. 3
24. 4	54. 1	84. 2
25. 2	55. 3	85. 2
26. 3	56. 2	86. 4
27. 2	57. 2	87. 3
28. 4	58. 3	88. 1
29. 3	59. 3	89. 4
30. 4	60. 3	90. 3

MATHEMATICS:

91. 1 R is reflexive and symmetric but not transitive, since for $(1,0) \in R$ and $(0,3) \in R$ whereas $(1,3) \notin R$

92. 3 Given $f(x) = x^3 + 5x + 1$

$f'(x) = 3x^2 + 5 > 0 \forall x \in R$

$\therefore$ f(x) is strictly increasing and continuous $\Rightarrow f(x)$ is bijective

93. 1 $A^2 = KA - 2I$

$$\Rightarrow \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}\begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix} = K\begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix} - 2\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 1 & -2 \\ 4 & -4 \end{bmatrix} = \begin{bmatrix} 3K-2 & -2K \\ 4K & -2K-2 \end{bmatrix}$$

$\Rightarrow K = 1$

94. 3 $125 = \det(A^3) = (\det A)^3 = (\alpha^2 - 4)^3$

$\Rightarrow \alpha^2 - 4 = 5$

$\Rightarrow \alpha = \pm 3$

95. 3 $$\begin{vmatrix} b(b-a) & b-c & c(b-a) \\ a(b-a) & a-b & b(b-a) \\ c(b-a) & c-a & a(b-a) \end{vmatrix}$$

$$= (b-a)^2 \begin{vmatrix} b & b-c & c \\ a & a-b & b \\ c & c-a & a \end{vmatrix}$$

$c_2 \to c_2 + c_1$

$$= (b-a)^2 \begin{vmatrix} b & b & c \\ a & a & b \\ c & c & a \end{vmatrix} = (b-a)^2 \times 0 = 0$$

96. 4 $x = \tan\theta$, we get

$$\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right) = \tan^{-1}\left(\frac{\sec\theta-1}{\tan\theta}\right)$$

$$= \tan^{-1}\left(\tan\frac{\theta}{2}\right) = \frac{\theta}{2}$$

$$= \frac{1}{2}\tan^{-1} x$$

$$\frac{1}{2}\tan^{-1} x = 4$$

$$\Rightarrow x = \tan 8$$

97. 3 $\tan^{-1} x - \tan^{-1} y = 0 \Rightarrow x = y$

also $\cos^{-1} x + \cos^{-1} y = \frac{\pi}{2} \Rightarrow 2\cos^{-1} x = \frac{\pi}{2}$

$$\Rightarrow \cos^{-1} x = \frac{\pi}{4} \Rightarrow x = \frac{1}{\sqrt{2}} \Rightarrow x^2 = \frac{1}{2}$$

$$\therefore x^2 + xy + y^2 = 3x^2 = \frac{3}{2}$$

98. 2 The given equation is satisfied $x = 1, y = -1, z = 1$

99. 4 $\underset{x\to 2}{\text{Lt}} \frac{4\left(2^x-4\right)}{\left(2^x\right)^2-4^2} = f(2)$ [continuous at $x = 2$]

$$\Rightarrow \underset{x\to 2}{\text{Lt}} \frac{4}{2^x+4} = K$$

$$\Rightarrow K = \frac{1}{2}$$

100. 3 $f(x) = \begin{cases} x^2 & \text{if } x \geq 0 \\ -x^2 & \text{if } x < 0 \end{cases}$

$\therefore f(x)$ is continuous and differentiable at $x = 0$

101. 1 $\frac{d}{dx}\left\{\left[f(x)\right]^2 - \left[\phi(x)\right]^2\right\} = 2\left[f(x)f'(x) - \phi(x)\phi'(x)\right]$

$$= 2\left[f(x)\phi(x) - \phi(x)f(x)\right] = 0$$

102. 3 $\dfrac{d}{dx}\sqrt{e^{\sqrt{x}}}-\dfrac{1}{2\sqrt{e^{\sqrt{x}}}}\times e^{\sqrt{x}}\times\dfrac{1}{2\sqrt{x}}=\dfrac{e^{\sqrt{x}}}{4\sqrt{xe^{\sqrt{x}}}}$

103. 2 $h(x)=e^{\sin^{-1}x}$

$h'(x)=e^{\sin^{-1}x}\dfrac{1}{\sqrt{1-x^2}}$

$\dfrac{h'(x)}{h(x)}=\dfrac{1}{\sqrt{1-x^2}}$

104. 3 $y=x^3+5x^2-1$

$\dfrac{dy}{dx}=3x^2+10x$

For function to be decreasing

$\dfrac{dy}{dx}<0$

$\Rightarrow x[3x+10]<0$

$=\dfrac{-10}{3}<x<0$

105. 3 $\int\dfrac{e^{6\log x}-e^{5\log x}}{e^{4\log x}-e^{3\log x}}dx=\int\dfrac{e^{\log x^6}-e^{\log x^5}}{e^{\log x^4}-e^{\log x^3}}dx$

$=\int\dfrac{x^6-x^5}{x^4-x^3}dx$

$=\int\dfrac{x^2[x^4-x^3]}{x^4-x^3}dx$

$=\int x^2dx=\dfrac{x^3}{3}+c$

106. 1 $I=\int\dfrac{1}{e^x+e^{-x}}dx=\int\dfrac{1}{e^x+\dfrac{1}{e^x}}dx=\int\dfrac{e^x}{\left(e^x\right)^2+1}dx$

Put $e^x=t\Rightarrow e^xdx=dt$

$\therefore I=\tan^{-1}t+c=\tan^{-1}e^x+c$

107. 4 $\int_0^2 \left[x^2\right] dx = \int_0^1 \left[x^2\right] dx + \int_1^{\sqrt{2}} \left[x^2\right] dx + \int_{\sqrt{2}}^{\sqrt{3}} \left[x^2\right] dx + \int_{\sqrt{3}}^{2} \left[x^2\right] dx$

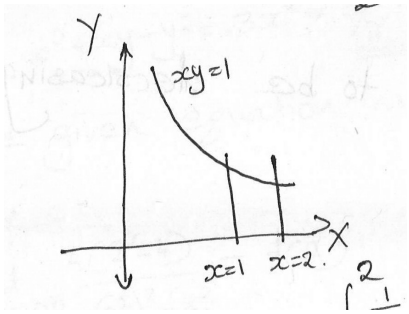
$= \int_0^1 0\, dx + \int_1^{\sqrt{2}} 1\, dx + \int_{\sqrt{2}}^{\sqrt{3}} dx + \int_{\sqrt{3}}^{2} 3 dx$

$= 5 - \sqrt{3} - \sqrt{2}$

108. 4 $100\int_0^1 \{x\}\, dx = 100\int_0^1 \{x\}\, dx$

$= 100\int \left(x - [x]\right) dx = \frac{100}{2} = 50$

109. 1



$\text{required area} = \int_1^2 \frac{1}{x} dx$

$= 1\log|x|\Big]_1^2 = \log 2$

110. 2 $xy = c^2$

$\Rightarrow y + x\frac{dy}{dx} = 0$

111. 2 $\frac{d^2y}{dx^2} = 2 \Rightarrow \frac{dy}{dx} = 2x + a$

$\Rightarrow y = x^2 + ax + b$

112. 1 Given equation is $\frac{xdy - ydx}{x^2} + e^x dx = 0$

$\Rightarrow d\left(\frac{y}{x}\right) + d\left(e^x\right) = 0$

$\Rightarrow \frac{y}{x} + e^x = c$

113. 1 Since a,b,c are mutually perpendicular unit vectors $|a| = |b| = |c| = 1$ and $a.b = b.c = c.a = 0$

$|a+b+c|^2 = (a+b+c).(a+b+c)$

$= |a|^2 + |b|^2 + |c|^2 + 2(a.b + b.c + c.a)$

$= 1+1+1 = 3$

$|a+b+c| = \sqrt{3}$

114. 3 $a+b+c = 0$ and $|a| = \sqrt{37}, |b| = 3$ and $|c| = 4$

$\Rightarrow a+b+c = 0;\ a = -(b+c)$

$|a|^2 = |-(b+c)|^2$

$\Rightarrow |a|^2 = |b^2| + |c|^2 + 2|b||c|\cos\theta$

$37 = 25 + 24\cos\theta$

$\Rightarrow \cos\theta = \frac{1}{2} \Rightarrow \theta = 60°$

115. 4 $|a \times b| = 4$

$\|a\| b|\sin\theta| = 4....(1)$

$|a.b| = 2$

$\Rightarrow \|a\| b|\cos\theta| = 2...(2)$

squaring and adding (1) & (2)

$|a|^2 |b|^2 = 20$

116. 1 any point Q on the line is given by $(3\lambda - 3, 5\lambda + 4, 6\lambda - 8)$

$\therefore PQ = (3\lambda - 1)\vec{i} + 5\lambda\vec{j} + (6\lambda - 3)\vec{k}$

since $PQ \perp (3\vec{i} + 5\vec{j} + 6\vec{k})$

$\Rightarrow \lambda = \frac{3}{10}$

$\therefore |PQ| = \frac{1}{10}\sqrt{1 + 225 + 144} = \sqrt{\frac{37}{10}}$

117. 1 $\begin{vmatrix} 2-1 & 3-4 & 4-5 \\ 1 & 1 & -K \\ K & 2 & 1 \end{vmatrix} = 0$

$\Rightarrow K^2 + 3K = 0$

$\Rightarrow K = 0, -3$

118. 1 $P(A \cap B) = P(A).P(B)$

$\therefore A \& B$ are independent

119. 1 Total number of functions = 6^6

Number of onto functions = 6!

$\therefore$ required probability $= \frac{6!}{6^6} = \frac{5}{324}$

120. 1 n(5) = 16, because each of the four places can be filled in 2 ways

$\therefore P(E) = \frac{8}{16} = \frac{1}{2}$ [Total 8 determinants got non zero values]