AJMAL SUPER 40

ADMISSION CUM SCHOLARSHIP TEST : 2026

AJMAL FOUNDATION

Challenger Batch (Complete Syllabus of Class XII**)**

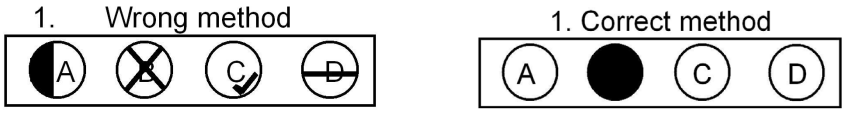
Conducted by : **AJMAL FOUNDATION, Hojai**

AJMAL GROUP OF INSTITUTIONS

TEST BOOKLET SERIES A

INSTRUCTIONS TO CANDIDATES

1. Candidates are to use the OMR Answer Sheet provided.
2. It is the candidate's responsibility to write and fill in the **Application Number** (from Admit Card) and **Test Booklet Series** (from Question Paper) carefully and without any omission or discrepancy at the appropriate place in the **OMR Answer Sheet.**
3. Candidates are required to mark the correct answer choice by **shading** the circle completely with **blue** or **black** ball point pen. (Pen of any other colour or pencil is not allowed). For example, if the correct answer to question no. 1 is 'B' then the marking should be:



4. Write your details on the OMR Answer Sheet which are asked for.
5. Only one circle, i.e. the correct one should be shaded. Shading more than one circle will render the answer invalid.
6. A candidate having completed his/her **OMR ANSWER SHEET** must hand it over, even if blank, to the invigilator.
7. An examinee must not bring any loose paper, book, etc. to the Examination Hall. Any examinee found in possession of even loose papers will be EXPELLED.
8. An examinee must not talk to, disturb or seek help from a fellow examinee during the examination.
9. Any mechanical or digital calculating device (Smart Watch, Mobile,calculator etc.) shall not be used by the examinee during the examination.
10. No candidate will be allowed to leave the Examination Hall before completion of 3 hours.
11. For each correct answer **4** marks will be awarded and for each incorrect answer **-1** mark will be deducted.
12. Duration of the exam is **03 hours from 11:00 AM to 02:00 PM.**

For Medical			For Engineering		
Subject	Questions	Marks	Subject	Questions	Marks
Physics	01 to 30	120	Physics	01 to 30	120
Chemistry	31 to 60	120	Chemistry	31 to 60	120
Biology	61 to 100	160	Mathematics	61 to 100	160
Total	**100**	**400**	**Total**	**100**	**400**

13. Contravention of any of the instruction mentioned above shall render a candidate liable for disciplinary action as per rule.
14. **Date of Result Declaration : 14 - 01- 2026 (After 9.00 PM on www.ajmalsuper40.in)**

SPACE FOR ROUGH WORK

ADMISSION CUM SCHOLARSHIP TEST – 2026

CHALLENGER BATCH (Complete Syllabus of Class XII**)**

PHYSICS

1. A plano convex lens is made of a material having refractive index 1.6. The radius of curvature of the curved surface is 60 cm. The focal length of the lens is

   (1) 50 cm (2) 100 cm (3) 200 cm (4) 400 cm

2. Maxwell's modified form of Ampere's circuital law in free space is

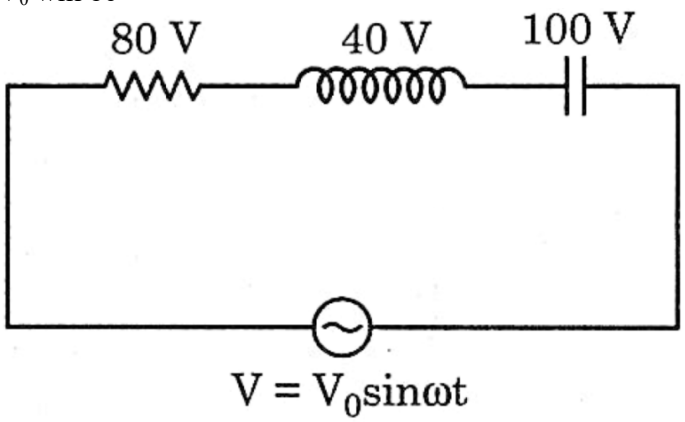
   (1) $\oint_s \vec{B}\cdot\vec{ds} = 0$ (2) $\oint_{loop} \vec{B}\cdot\vec{dl} = \mu_0 I$

   (3) $\oint_{loop} \vec{B}\cdot\vec{dl} = \mu_0 I + \frac{1}{\varepsilon_0}\frac{dq}{dt}$ (4) $\oint_{loop} \vec{B}\cdot\vec{dl} = \mu_0 I + \mu_0\varepsilon_0\frac{d\phi_E}{dt}$

3. The electric field component of an electromagnetic wave in a medium is represented by $E_x = 0$; $E_y = 2.5\cos\left[\left(2\pi\times10^6\right)t - \left(\pi\times10^{-2}\right)x\right]$ N/C ; $E_z = 0$. The wave is (x is in metre & t is in secs)

   (1) moving along +x direction with frequency 10^6 Hz and wavelength 100 m.
   (2) moving along +x direction with frequency 10^6 Hz and wavelength 200 m.
   (3) moving along –x direction with frequency 10^6 Hz and wavelength 200 m.
   (4) moving along +y direction with frequency $2\pi\times10^6$ Hz and wavelength 200 m.

4. In the given LCR circuit, V_0 will be

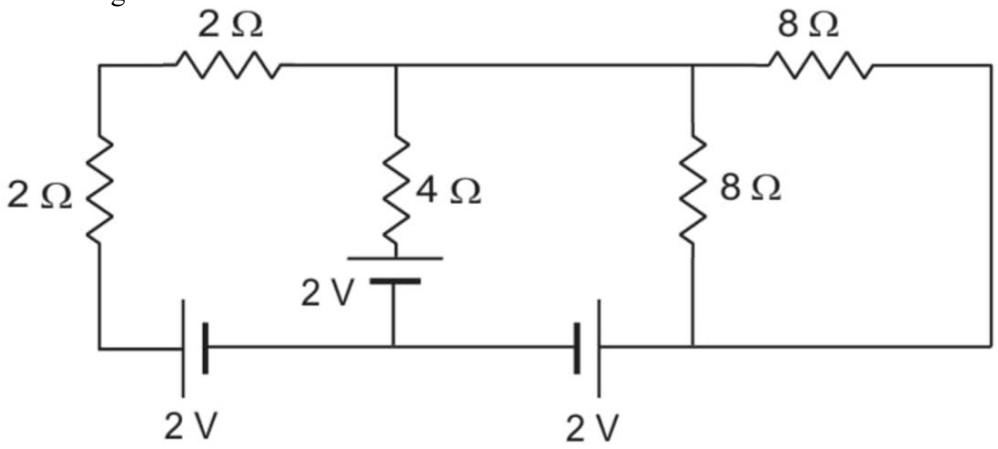


   (1) 70 V (2) 50 V (3) $100\sqrt{2}$ V (4) 100 V

5. The turns ratio of a step-up transformer is 1 : 20. If the input A.C. voltage and power are 5V and 100 W respectively, then output current will be

   (1) 100 A (2) 20 A (3) 1 A (4) 400 A

6. Find the current through the 4 Ω resistor.



   (1) Zero (2) 1 A (3) 2 A (4) 3 A

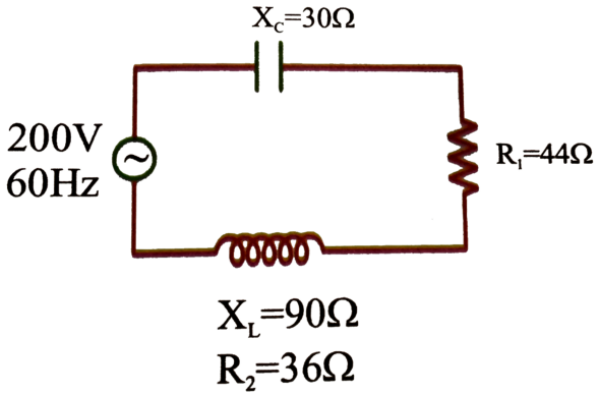
7. **Statement I:** If two unlike charges are brought nearer, then potential energy of system increases.
   Statement II: If two charges q_1 and q_2 are separated by a distance r, then potential energy of the system is given by $U = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r}$

   (1) Both Statement I and Statement II are correct
   (2) Both Statement 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

8. A square of side L metre lies in the XY-plane in a region where the magnetic field is given by $\vec{B} = B_0(2\hat{i} + 3\hat{j} + 4\hat{k})$T, where B_0 is a constant. The magnitude of magnetic flux passing through the square is

(1) $4B_0L^2$ Wb (2) $3B_0L^2$ Wb (3) $\sqrt{29}B_0L^2$ Wb (4) $2B_0L^2$ Wb

9. A series circuit consists of a capacitor of capacitive reactance 30 Ω, a non-inductive resistor of 44 Ω and a coil of inductive reactance 90 Ω and a resistance of 36 Ω connected across a 200 V, 60 Hz line as shown in the figure. Find the power dissipated in the coil.

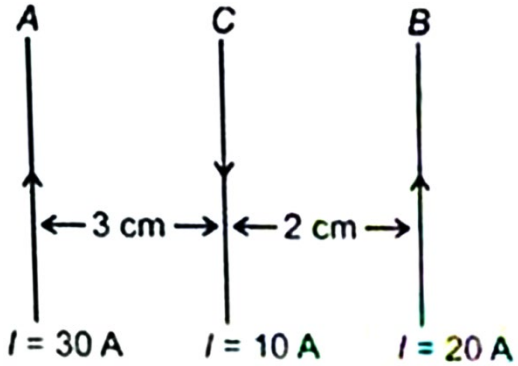


(1) 0 W (2) 176 W (3) 144 W (4) 320 W

10. In a series L-R circuit, the value of L is $\frac{\sqrt{3}}{\pi}$ H and frequency of applied AC source is 50 Hz. If the phase difference between applied emf and current is 60°, then the value of resistance R is

(1) 100 Ω (2) $100\sqrt{3}$ Ω (3) $\frac{100}{\sqrt{3}}$ Ω (4) $50\sqrt{3}$ Ω

11. Three long, straight parallel wires carrying currents are placed in a plane as shown in the fig. The force acting on half metre length of wire C will be



(1) 2.5×10^{-4} N (2) 1.4×10^{-5} N (3) 3.7×10^{-3} N (4) Zero

12. A free nucleus of mass 2 amu at rest emits a gamma photon. The wavelength of the gamma photon is 0.01 Å. Find the recoil speed of the nucleus.

(1) 2×10^5 m/s (2) 5×10^4 m/s (3) 6×10^4 m/s (4) 12×10^5 m/s

13. An electron is orbiting in the 4th orbit of a H-atom. If radius of this orbit is r, then de-Broglie wavelength associated with the electron is

(1) $\frac{\pi r}{2}$ (2) $2\pi r$ (3) $8\pi r$ (4) $12\pi r$

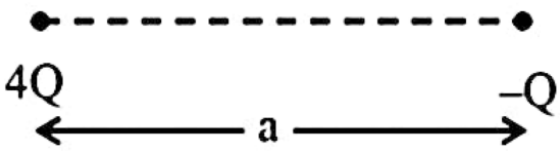
14. The total external work done to charge a spherical shell of radius R uniformly with charge Q is

(1) $\frac{Q^2}{8\pi\varepsilon_0 R}$ (2) $\frac{Q^2}{4\pi\varepsilon_0 R}$ (3) $\frac{Q^2}{15\pi\varepsilon_0 R}$ (4) None of these

15. An air capacitor of capacity C = 10 μF is connected to a constant voltage battery of 12 V. Now the space between the plates is filled with a liquid of dielectric constant 5. The charge that flows now from battery to the capacitor is

(1) 120 μC (2) 699 μC (3) 480 μC (4) 24 μC

16. The point where net electric field will be zero is at a distance of



(1) 2a from 4Q (2) a/2 from –Q
(3) a from 4Q (4) Neutral point not possible

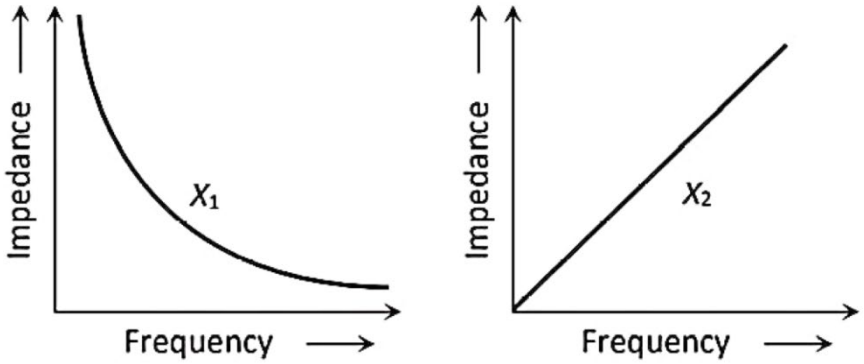
17. Potential in the x-y plane is given as $V(x,y)= 5 (x^2 + xy)$ volts. The electric field at the point (1 m, –2 m) will be

(1) $3\ \hat{j}$ V/m (2) $-5\ \hat{j}$ V/m (3) $5\ \hat{j}$ V/m (4) $-3\ \hat{j}$ V/m

18. An electric dipole of length 2 cm is placed with its dipole moment making an angle of 30° with a uniform electric field of 10^5 N/C. If it experiences a torque of $10\sqrt{3}$ Nm, then potential energy of the dipole is

(1) –10 J (2) –20 J (3) –30 J (4) –40 J

19. The graphs given below depict the dependence of two reactive impedances X_1 and X_2 on the frequency of the alternating e.m.f. applied individually to them. We can then say that



(1) X_1 is an inductor and X_2 is a capacitor (2) X_1 is a resistor and X_2 is a capacitor

(3) X_1 is a capacitor and X_2 is an inductor (4) X_1 is an inductor and X_2 is a resistor

20. The electron in a hydrogen atom jumps from excited state (n = 3) to its ground state (n = 1) and the photons thus emitted irradiate a photosensitive material. If the work function of the material is 5.1 eV, the stopping potential is estimated to be (the energy of the electron in n^{th} state, $E_n = \frac{-13.6}{n^2}$ eV)

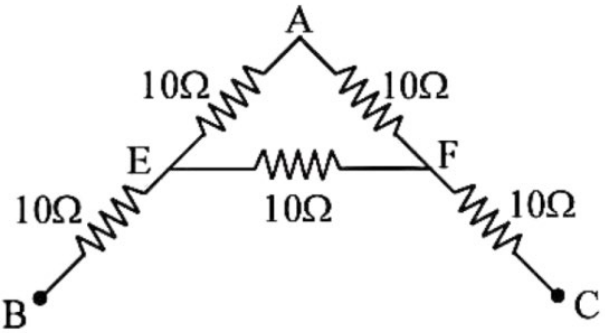
(1) 5.1 V (2) 12.1 V (3) 17.2 V (4) 7 V

21. If the wavelength λ of incident light falling on a photosensitive material decreases, then ($\lambda < \lambda_{threshold}$)

(1) Photoelectric current increases (2) Stopping potential decreases

(3) Stopping potential remains constant (4) Stopping potential increases

22. The effective resistance (in Ω) between points B & C is

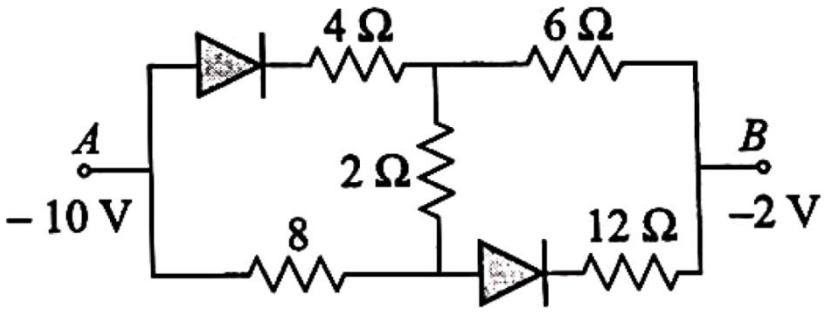


(1) 60 (2) 40 (3) 80 / 3 (4) 160 / 9

23. A coil of n turns and radius R carries a current I. It is unwound and rewound to make a new coil of radius $\frac{R}{2}$ and the same current is passed through it. What is the ratio of the magnetic moment of the new coil to that of the original coil?

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

24. In the following circuit, the equivalent resistance between A and B is



(1) $\frac{20}{3}\Omega$ (2) 10Ω (3) 16Ω (4) 20Ω

25. Pure Si at 500 K has equal number of electron (n_e) & hole (n_h) concentrations of $1.5\times10^{16}\,m^{-3}$. Doping by indium increases n_h to $4.5\times10^{22}\,m^{-3}$. The doped semiconductor is of

(1) p-type having electron concentration $n_e = 5\times10^{9}\,m^{-3}$

(2) n-type with electron concentration $n_e = 5\times10^{22}\,m^{-3}$

(3) p-type with electron concentration $n_e = 2.5\times10^{10}\,m^{-3}$

(4) n-type with electron concentration $n_e = 2.5\times10^{23}\,m^{-3}$

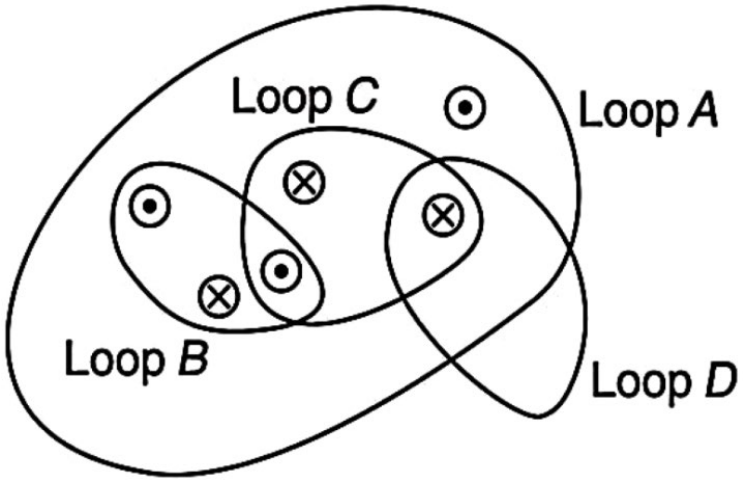
26. A magnetising field of 5000 A/m produces a magnetic flux of 5×10^{-5} weber in an iron rod. If the area of cross section of the rod is 0.5 cm^2, then the permeability of the rod will be $(\text{in } \frac{\text{Tm}}{\text{A}})$

(1) 1×10^{-3} (2) 2×10^{-4} (3) 3×10^{-5} (4) 4×10^{-6}

27. The de Broglie wavelength of a gas molecule of mass m at 27°C is λ. Its de Broglie wavelength at 327 °C will be

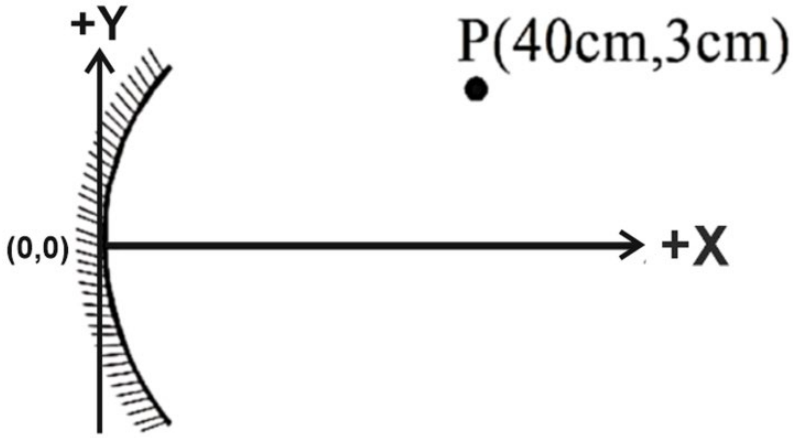
(1) $\sqrt{2}\lambda$ (2) $\frac{\lambda}{2}$ (3) $\frac{\lambda}{\sqrt{2}}$ (4) 2λ

28. Consider six wires going into or coming out of the page as shown in figure, all with the same current. Rank the line integral of the magnetic field from most positive to most negative taken counter clockwise around each loop shown in figure.



(1) B > C > D > A (2) B > C = D > A (3) B > A > C = D (4) C > B = D > A

29. The co-ordinates of the image of point P formed by a concave mirror of radius of curvature 20 cm as shown in figure is



(1) (13.33 cm, –1 cm) (2) (13.33 cm, +1 cm)

(3) (–13.33 cm, +1 cm) (4) (–13.33 cm, –1 cm)

30. In a compound microscope the focal length of the objective lens is 0.5 cm and the focal length of the eye-piece is 5 cm. The real image of the object is formed at a distance of 15.5 cm from the objective lens. If the final image is formed at a distance of 25 cm from the eye-piece, what is the magnitude of the magnifying power of the microscope?

(1) 180 (2) 0.2 (3) 20 (4) 150

CHEMISTRY

31. If the density of 1M aqueous $CaCO_3$ solution is 1g ml^{-1} then its molality will be –
(1) Greater than 1 molal (2) Less than 1 molal (3) Equal to 1 molal (4) Data insufficient

32. $Cu^{\oplus}(aq)$ is unstable in aquous solution and undergoes simultaneous oxidation and reduction according to the Equation
$2Cu^{\oplus}(aq) \rightarrow Cu^{2+}(aq) + Cu(s)$.
The E° value for this reaction is $\left(E^{\circ}_{Cu^{2+}/Cu} = 0.34\,V \text{ and } E^{\circ}_{Cu^{2+}/Cu^{+}} = 0.15\,V\right)$
(1) +0.49 V (2) 0.38 V (3) –0.19 V (4) –0.38 V

33. At infinite dilution and 25°C, which of the following ion has the highest conducting power in aquous solution?
(1) Ca^{2+} (2) Mg^{2+} (3) $OH^{\ominus}$ (4) SO_4^{2-}

34. By passing 0.1F of charge through aqueous $CuSO_4$ solution, mass of Cu metal deposited at cathode is (Atomic mass of Cu = 63g mol^{-1})
(1) 31.5g (2) 63 g (3) 3.15 g (4) 6.3 g

35. The energies of activation for the forward and the backward reactions for $A_2 + B_2 \rightleftharpoons 2AB$ are 180 Kj mol^{-1} and 200 Kj mol^{-1} respectively. The enthalpy change for the forward reaction is –
(1) +20 Kj (2) –20 Kj mol^{-1} (3) +380 Kj mol^{-1} (4) –380 Kj mol^{-1}

36. Which of the following transition elements has the highest enthalpy of atomization?
(1) Mn (2) Cr (3) V (4) Co

37. The purple colour of $MnO_4^{\ominus}$ ion is due to
(1) d – d transition (2) Polarisation
(3) Ligand to metal charge transfer (4) Metal to ligand charge transfer

38. $KMnO_4$ solution in acidic medium is not decolorized by -
(1) SO_2 (2) $C_2O_4^{2-}$ (3) CO_2 (4) $I^{\ominus}$

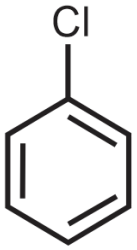
39. The cationic complex from the following is -
(1) $K_2[H_gI_4]$ (2) $[Pt(NH_3)_2Cl_2]$ (3) $[Fe(H_2O)_5(NO)]SO_4$ (4) $K_3[Cr(OX)_3]$

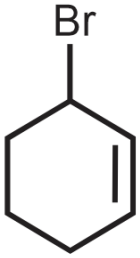
40. The π-acid ligand from the following is -
(1) $C_2O_4^{2-}$ (2) $(CH_2)_2(NH_2)_2$ (3) $CN^{\ominus}$ (4) $EDTA^{4-}$

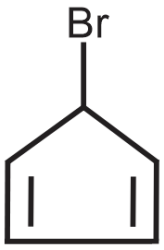
41. Which of the following complex satisfy EAN rule?
(1) $K_3[Fe(CN)_6]$ (2) $[Fe(NH_3)_6]SO_4$ (3) $[Ni(CO)_4]$ (4) Both (2) and (3)

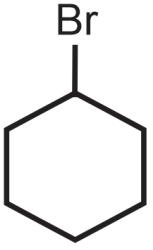
42. The number of bridging ligands in $[Fe_2(CO)_9]$ complex is
(1) 2 (2) 3 (3) 0 (4) 1

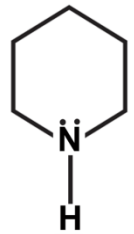
43. The correct nucleophilicity order is –
(1) $\overset{\ominus}{S}H > HO^{\ominus} > CH_3CH_2O^{\ominus} > C_6H_5O^{\ominus}$ (2) $\overset{\ominus}{S}H > CH_3CH_2O^{\ominus} > HO^{\ominus} > C_6H_5O^{\ominus}$
(3) $HO^{\ominus} > \overset{\ominus}{S}H > C_6H_5O^{\ominus} > CH_3CH_2O^{\ominus}$ (4) $CH_3CH_2O^{\ominus} > HO^{\ominus} > C_6H_5O^{\ominus} > HS^{\ominus}$

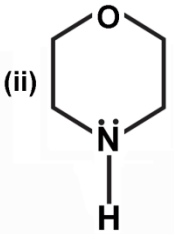
44. Which of the following compound is the most reactive towards SN^1 reaction?
(1) 

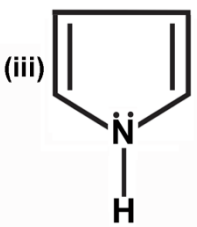
(2) 

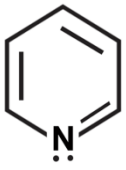
(3) 

(4) 

45. The Lewis basic strength of the following compounds is
(i) 

(ii) 

(iii) 

(iv) 

(1) (i) > (ii) > (iv) > (iii) (2) (ii) > (i) > (iii) > (iv)
(3) (iii) = (iv) < (ii) < (i) (4) (i) > (iv) > (ii) > (iii)

46. Which of the following amine will give insoluble product in alkaline medium by reacting with benzenesulfonyl chloride?

(1) $CH_3CH_2-NH_2$ (2) $(CH_3)_2NH$ (3) $(C_2H_5)_3N$ (4) All of these

47. The carbohydrate which will not show mutarotation in aqueous medium is -

(1) Glucose (2) Sucrose (3) Maltose (4) Lactose

48. Which will form maximum boiling point azeotrope

(1) $HNO_3 + H_2O$ solution (2) $C_2H_5OH + H_2O$ solution

(3) $C_6H_6 + C_6H_5CH_3$ solution (4) None of these

49. Which of the following pairs of solution are isotonic at the same temperature?

(1) 0.1M $Ca(NO_3)_2$ and 0.1M Na_2SO_4 (2) 0.1M $NaCl$ and 0.1M Na_2SO_4

(3) 0.1M urea and 0.1M $MgCl_2$ (4) 0.1M urea and 0.1M $NaCl$

50. Match the laws given in the Column-I with expression given in Column-II.

Column – I	Column – II
(A) Henry's law	(p) $\Delta T_f = K_f m$
(B) Elevation of boiling point	(q) $\pi = CRT$
(C) Depression in freezing point	(r) $\Delta T_b = K_b m$
(D) Osmotic pressure	(s) $P = K_H x$

(1) A – (s), B – (r), C – (p), D – (q) (2) A – (q), B – (r), C – (q), D – (s)

(3) A – (p), B – (s), C – (r), D – (q) (4) A – (s), B – (p), C – (q), D – (r)

51. Which of the following expressions correctly represents the equivalent conductance at infinite dilution of $Al_2(SO_4)_3$, Given that $\Lambda^\circ_{Al^{3+}}$ and $\Lambda^\circ_{SO_4^{2-}}$ are the equivalent conductances at in finite dilution of the respective ions?

(1) $\frac{1}{3}\Lambda^\circ_{Al^{3+}} + \frac{1}{2}\Lambda^\circ_{SO_4^{2-}}$ (2) $2\Lambda^\circ_{Al^{3+}} + 3\Lambda^\circ_{SO_4^{2-}}$

(3) $\Lambda^\circ_{Al^{3+}} + \Lambda^\circ_{SO_4^{2-}}$ (4) $\left(\Lambda^\circ_{Al^{3+}} + \Lambda^\circ_{SO_4^{2-}}\right)\times 6$

52. During the kinetic study of the reaction, $2A + B \rightarrow C + D$, following results were obtained:

Run	$[A]\left(molL^{-1}\right)$	$[B]\left(molL^{-1}\right)$	Initial rate of formation of D $\left(molL^{-1}\,\text{min}^{-1}\right)$
I	0.1	0.1	6.0×10^{-3}
II	0.3	0.2	7.2×10^{-2}
III	0.3	0.4	2.88×10^{-1}
IV	0.4	0.1	2.40×10^{-2}

Based on the above data which one of the following is correct?

(1) $rate = k[A]^2[B]$ (2) $rate = k[A][B]$

(3) $rate = k[A]^2[B]^2$ (4) $rate = k[A][B]^2$

53. The rate constant for the reaction $2N_2O_5 \longrightarrow 4NO_2 + O_2$ is $3.10\times10^{-5}\,\text{sec}^{-1}$. If the rate is 2.4×10^{-5} mol liter^{-1} sec^{-1} then the concentration of N_2O_5 (in mol litre^{-1}) is:

(1) 0.04 (2) 0.8 (3) 0.07 (4) 1.4

54. On dissolving sugar in water at room temperature, the solution feels cool to touch. Under which of the following cases dissolution of sugar will be most rapid?

(1) Sugar crystal in cold water
(2) Sugar crystal in hot water
(3) Powdered sugar in cold water
(4) Powdered sugar in hot water

55. The EMF of which of the following cell remains constant through out its life time?

(1) Lechlanche Cell (2) Mercury Cell

(3) Lead storage battery (4) Both 1 and 2

56. Among the following series of transition metal ions, the one where all metal ions have $3d^2$ electronic configuration is (At. nos. Ti = 22; V = 23; Cr = 24; Mn = 25)

(1) $Ti^{3+}, V^{2+}, Cr^{3+}, Mn^{4+}$ (2) $Ti^{+}, V^{4+}, Cr^{6+}, Mn^{7+}$

(3) $Ti^{4+}, V^{3+}, Cr^{2+}, Mn^{3+}$ (4) $Ti^{2+}, V^{3+}, Cr^{4+}, Mn^{5+}$

57. The correct order of energy of absorption for the following metal complexes is:

$A:\left[Ni(en)_3\right]^{2+}$, $B:\left[Ni(NH_3)_6\right]^{2+}$, $C:\left[Ni(H_2O)_6\right]^{2+}$

(1) C < B < A (2) B < C < A

(3) C < A < B (4) A < C < B

58. Match Column I with Column II

Column – I	Column – II
(A) $C_2H_6 \xrightarrow{Cl_2/UV\ light} C_2H_5Cl$	(p) Finkelstein reaction
(B) $C_6H_5NH_2 \xrightarrow[273-278K]{NaNO_2+HCl/Cu_2Cl_2} C_6H_5Cl$	(q) Free radical substitution
(C) $CH_3Cl + NaI \longrightarrow CH_3I + NaCl$	(r) Swarts reaction
(D) $CH_3 - Br + AgF \longrightarrow CH_3F + AgBr$	(s) Sandmeyer's reaction

(1) A – (q), B – (s), C– (p), D – (r) (2) A – (q), B – (r), C – (p), D – (s)

(3) A – (r), B – (p), C – (s), D – (q) (4) A – (s), B – (r), C – (p), D – (q)

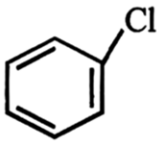
59. $C_6H_5 - CH = CHCHO \xrightarrow{X} C_6H_5CH = CHCH_2OH$

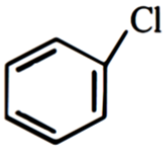
In the above sequence, X can be:

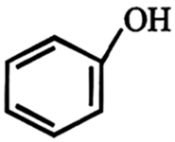
(1) H_2 / Ni (2) $NaBH_4$ (3) $K_2Cr_2O_7$ / H^+ (4) Both (1) and (2)

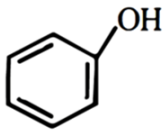
60. $A + CH_3CH_2OH \longrightarrow$  $\xrightarrow[(ii)\ NaOH]{(i)\ H_2SO_4\ (oleum),\ \Delta} B$ (iii) HCl

Consider the above reaction sequence. Identify the component A and component B:

(1) $A = C_6H_5NH_2$ B = 

(2) A =  $B = C_6H_5NH_2$

(3) $A = C_6H_5N_2^+Cl^-$ B = 

(4) A =  $B = C_6H_5N_2^+Cl^-$

BIOLOGY

61. In RNA, every nucleotide residue has an additional – OH group at which of the following position?

(1) 2' position of deoxyribose (2) 1' position of ribose sugar

(3) 3' position of ribose sugar (4) 2' position of ribose sugar

62. The embryo with 8 to 16 blastomere is called

(1) Blastula (2) Morula (3) Gastrula (4) Blastocyst

63. Commonly used vectors for human genome sequencing are

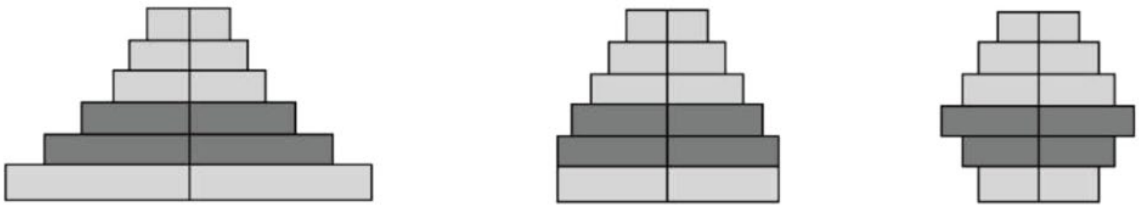
(1) T – DNA (2) BAC and YAC

(3) Expression Vectors (4) T / A Cloning Vectors

64. Hormone releasing IUD is:

(1) LNG – 20 (2) Cu7 (3) Multiload 375 (4) Lippes loop

65. Select the correct statement for the given diagram



(1) Representation of age pyramids for human population

(2) Representation of adaptation for human population

(3) Representation of energy pyramid

(4) Representation of pyramid of number

66. Which contraceptive method is one of the most widely accepted method in India?
(1) Periodic abstinence (2) Coitus interruptus
(3) Lactational amenorrhea (4) IUDs

67. Greater number of Amphibian species are present in
(1) Eastern ghats (2) Western ghats
(3) Deserts (4) Himalayan region

68. Select the correct set of drugs which are extracted from the same plant.
(1) Morphine, Heroin, coke (2) Hashish, charas, morphine
(3) Crack, cocaine, marijuana (4) Ganja, Hashish, marijuana

69. Common name of *Eichhornia* and *Parthenium* are
(1) sea cow and carrot grass (2) water hyacinth and sea cow
(3) water hyacinth and carrot grass (4) water hyacinth and potato plant

70. Malignant tumor differ from Benign tumor's
(1) Former is less invading
(2) Latter remains confined to the original location
(3) Latter show metastasis
(4) Former show contact innibition

71. Which one of the following is the correct match?

(a) Microsporangia	(i) Anther
(b) Megasporangia	(ii) Ovule
(c) Chronic respiratory disorder	(iii) Asthma disorder
(d) Germpore	(iv) Pollen tube

(1) a-i, b-ii, c-iii, d-iv (2) a-ii, b-i, c-iii, d-iv
(3) a-ii, b-iii, c-iv, d-i (4) a-ii, b-iv, c-iii, d-i

72. In which year the family planning programme started in our country?
(1) 1981 (2) 1938 (3) 1961 (4) 1951

73. Which one of the following is the correct statement?
(1) Brood parasitism occurs in birds
(2) *Cuscuta* has large green leaves
(3) The blood sucking female mosquito is considered a type of parasite
(4) Tick on dogs is the example of endoparasite

74. Complete the analogy by choosing the correct option w.r.t direct ancestors of plants.
Conifer : Psilophyton :: Seed fern : _____
(1) Rhynia type plant (2) Cycads (3) Chlorophyte (4) Psilophyton

75. Which one of the following is the incorrect match?
(1) Incomplete dominance – Snapdragon
(2) Codominance – AB blood group
(3) Linkage – *Drosophila*
(4) Polygenic inheritance – O blood group

76. Progesterone based contraceptives include all except
(1) Progestasert (2) LNG – 20 (3) Multiload 375 (4) Implant

77. If 120 Plants are produced on crossing pure red and pure white flowered pea plants, then the ratio of offsprings in F_1 will be :- (Red is dominant)
(1) 90 Red : 30 White (2) 30 Red : 90 White
(3) 60 Red : 60 White (4) All Red

78. If in a linear DNA of 12 kb size, two recognition site of Bam HI are present 4 kb distance apart and one of them is at 4 kb distance from one end. Then, how many band will be visible on separation of DNA fragments using agarose gel electrophoresis, assuming complete digestion by Bam HI?
(1) Three (2) One (3) Two (4) Four

79. Given below are two statements
Statement I: The rate of decomposition is controlled by chemical composition of detritus and climatic factors.
Statement II : Temperature and soil moisture are the most important climatic factors that regulate decomposition through their effects on the activities of soil microbes.
Choose the correct answer from the option given below
(1) Both Statement I and Statement II are incorrect
(2) Statement I is correct but Statement II is incorrect
(3) Statement I is incorrect but Statement II is correct
(4) Both Statement I and Statement II are correct

80. Identify a restriction endonuclease which makes cuts away from the centre of recognition sequence and select the correct option.
(1) Sma I (2) EcoR V (3) Hind II (4) EcoR I

81. In man, gene producing the disease phenylketonuria also produces a number of abnormal phenotypic traits, which are collectively syndrome. This gene results mental retardation, widely spaced incisors, pigmented patches on the \ skin and excessive sweating, such types of genes are called :-
(1) Polygene (2) Pleiotropic gene
(3) Lethal gene (4) Supplementary gene

82. When more individuals acquire peripheral character value at both ends of the distribution curve, this type of natural selection is called
(1) Stabilising selection (2) Directional selection
(3) Disruptive selection (4) Progressive selection

83. During transcription, the DNA site at which RNA polymerase binds is called-
(1) Promoter (2) Regulator
(3) Receptor (4) Enhancer

84. Change in frequency of alleles in a population indicates?
(1) Its an evolutionary population
(2) Population is non – evolutionary
(3) Nature support new phenotype
(4) None of the above

85. *Monascus purpureus* is a yeast used commercially in the production of:
(1) citric acid
(2) ethanol
(3) blood chlolesterol lowering statins
(4) streptokinase for removing clots from the blood vessels.

86. **Assertion (A)**: In human, all copulation cannot lead to fertilization and pregnancy.
Reason (R): Fertilisation can only occurs if the ovum and sperm are transported simultaneously to the ampullary region of oviduct.
(1) Both (A) and (R) are true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) (A) is false but (R) is true

87. "When two pairs of traits are combined in a hybrid, segregation of one pair of characters is independent of the other pair of characters". This explains :-
(1) Law of dominance (2) Law of segregation
(3) Law of independent assortment (4) Postulate of paired factors

88. Match the hominids with their correct brain size:
(a) *Homo habilis* (i) 900 cc
(b) *Homo neanderthalensis* (ii) 1350 cc
(c) *Homo erectus* (iii) 650 – 800 cc
(d) *Homo sapiens* (iv) 1400 cc
Select the correct option
(1) (a) – (iii) – (b) – (i) –(c) – (iv) – (d) – (ii) (2) (a) – (iii) – (b) – (ii) –(c) – (i) – (d) – (iv)
(3) (a) – (iii) – (b) – (iv) –(c) – (i) – (d) – (ii) (4) (a) – (iv) – (b) – (iii) –(c) – (i) – (d) – (ii)

89. Match the following columns and select the correct option :-

	Column-I		ColumnII
a	Dragonflies	i	Biocontrol agents of several plant
b	*Bacillus thuringiensis*	ii	Get rid of Aphids and mosquitoes
c	*Glomus*	iii	Narrow spectrum insecticidal applications
d	Baculoviruses	iv	Biocontrol agents of lepidopteran plant pests
		v	Absorb phosphorus from soil

(1) (a)-(iii), (b)-(v), (c)-(iv), (d)-(i) (2) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)
(3) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(v) (4) (a)-(ii), (b)-(iv), (c)-(v), (d)-(iii)

90. How many of the disease mentioned in the box require a vector for transmission of its causative pathogen?

Amoebiasis, Ascariasis, Ringworm, Diphtheria, Dengue, Malaria, Chikungunya, Filariasis

(1) Three (2) Seven (3) Four (4) Six

91. Advantage of cleistogamy is
(1) Higher genetic variability (2) More vigorous offspring
(3) No dependence on pollinators (4) Vivipary

92. Select the correct option to complete the analogy w.r.t cancer detection.
Computed tomography : X-Rays, MRI : _____
(1) Antibody (2) Magnetic field (3) Antigen (4) UV Ray

93. Which is not true for lac operon
(1) Discovered by Jacob & Monad
(2) Operates in catabolic pathway
(3) Example of inducible operon
(4) 5-structural genes are present

94. Benzodiazepines are –
(1) Sedative (2) Stimulants
(3) Narcotics (4) Hallucinogen

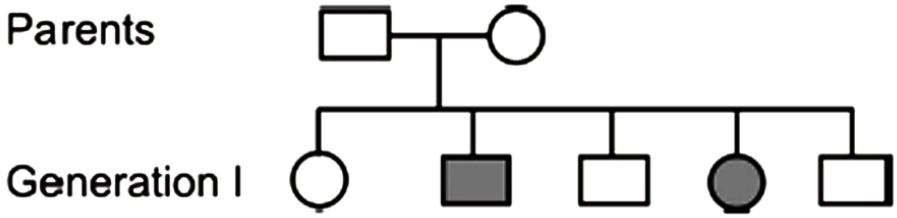
95. Assertion : Pyramid of energy may be upright or inverted.
Reason : Only 20% of energy goes to next trophic level
(1) Both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.
(2) Both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion.
(3) Assertion is true but Reason is false.
(4) Both Assertion and Reason are false.

96. Some strains of *Bacillus thuringiensis* produce proteins that kill certain insect such as:
(1) Lepidopterans like armyworm (2) Dipterans like beetles
(3) Coleopterans like tobacco bud worm (4) Lepidopterans like flies

97. In monohybrid cross what is the ratio of homozygous dominant and homozygous recessive individuals in F_2– generation :-
(1) 1 : 2 : 1 (2) 2 : 1 / 1 : 2 (3) 3 : 1 / 1 : 3 (4) 1 : 1

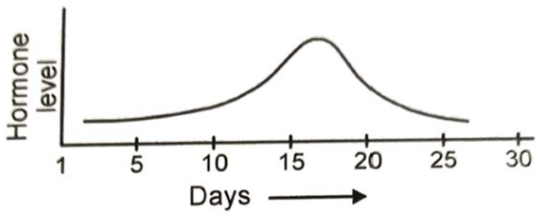
98. *Agrobacterium tumefaciens*
(a) Act as natural genetic engineer
(b) Contain Ti plasmid essential for insertion of T-DNA into host cells.
(c) Cause crown gall disease.
Select the option with correct statements only
(1) a only (2) b and c only (3) a and b only (4) a, b and c

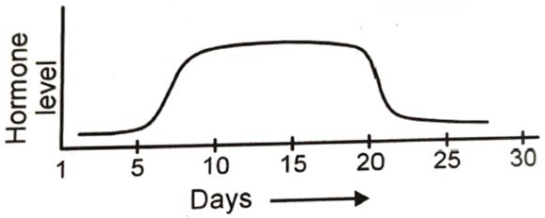
99. Study the given pedigree chart and choose correct statement.

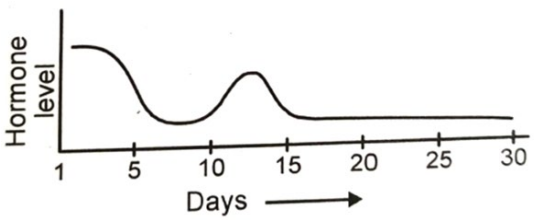


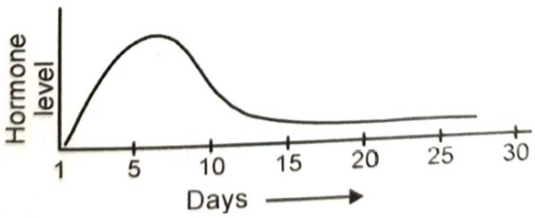
(1) The trait under study is recessive
(2) Only one parent is heterozygous
(3) The trait can be X linked recessive
(4) Trait can be autosomal dominant like cystic fibrosis

100. Which of the following graphs is the correct representation of the level of progesterone in a female who has been using Mala-D as a method of birth control.

(1)


(2)


(3)


(4)


MATHEMATICS

61. Let $f(x) = x^3 - 6x^2 + 12x - 3$. Then at $x = 2$, $f(x)$ has
(1) a maximum (2) a minimum
(3) both a maximum and a minimum (4) neither a maximum nor a minimum

62. If $x \in [-1, 1]$ then the minimum value of $f(x) = x^2 + x + 1$ is
(1) $\frac{3}{4}$ (2) -15 (3) $3 - 2\pi$ (4) None of these

63. A balloon is pumped at the rate of a cm^3/minute. The rate of increase of its surface area when the radius is b cm, is
(1) $\frac{2a^2}{b^4} cm^2/min$ (2) $\frac{a}{2b} cm^2/min$ (3) $\frac{2a}{b} cm^2/min$ (4) None of these

64. $\int_0^a \{f(x) + f(-x)\} dx$ is equal to
(1) $2\int_0^a f(x)dx$ (2) $\int_{-a}^a f(x)dx$ (3) 0 (4) $-\int_{-a}^a f(-x)\,dx$

65. $\int_{\pi/5}^{3\pi/10} \frac{\cos x}{\cos x + \sin x} dx$ is equal to
(1) π (2) $\frac{\pi}{2}$ (3) $\frac{\pi}{4}$ (4) None of these

66. If y(t) is a solution of the equation $(1 + t)\frac{dy}{dt} - ty = 1$ and $y(0) = -1$ then $y(1)$ is
(1) $-\frac{1}{2}$ (2) $e + \frac{1}{2}$ (3) $e - \frac{1}{2}$ (4) $\frac{1}{2}$

67. Let the position vectors of the points A, B, C be $\hat{i} + 2\hat{j} + 3\hat{k}, -\vec{i} - \vec{j} + 8\vec{k}$ and $-4\hat{i} + 4\hat{j} + 6\hat{k}$ respectively. Then the ABC is
(1) right angled (2) equilateral (3) isosceles (4) None of these

68. $(\vec{a}.\vec{i})\vec{i} + (\vec{a}.\vec{j})\vec{j} + (\vec{a}.\vec{k})\hat{k}$ is equal to
(1) $\vec{i} + \vec{j} + \vec{k}$ (2) $\vec{a}$ (3) $3\vec{a}$ (4) None of these

69. If $\vec{a}, \vec{b}$ are unit vectors such that $\vec{a} + \vec{b}$ is also a unit vector then the angle between the vectors $\vec{a}$ and $\vec{b}$ is
(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{4}$ (3) $\frac{\pi}{3}$ (4) $\frac{2\pi}{3}$

70. The direction cosines of a line whose equations are $\frac{x-1}{2} = \frac{y+3}{4} = \frac{z-2}{-3}$ are
(1) $\frac{1}{\sqrt{14}}, \frac{-3}{\sqrt{14}}, \frac{2}{\sqrt{14}}$ (2) $\frac{2}{\sqrt{29}}, \frac{4}{\sqrt{29}}, \frac{-3}{\sqrt{29}}$ (3) $\frac{1}{\sqrt{29}}, \frac{-3}{\sqrt{29}}, \frac{2}{\sqrt{29}}$ (4) 2, 4, – 3

71. If $A^2 = 8A + kI$, where $A = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then the value of k is –
(1) 7 (2) –7 (3) 1 (4) –1

72. The matrix $\begin{bmatrix} \lambda & 7 & -2 \\ 4 & 1 & 3 \\ 2 & -1 & 2 \end{bmatrix}$ is a singular matrix if λ is –
(1) $\frac{2}{5}$ (2) $\frac{5}{2}$ (3) –5 (4) None of these

73. If $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \begin{vmatrix} 1 & 1 & 1 \\ b_1 & b_2 & b_3 \\ a_1 & a_2 & a_3 \end{vmatrix}$, then the two triangles whose vertices are $(x_1, y_1), (x_2, y_2), (x_3, y_3)$ and $(a_1, b_1), (a_2, b_2), (a_3, b_3)$ are
(1) congruent (2) similar (3) equal in area (4) None of these

74. The system of equation $ax + 4y + z = 0, bx + 3y + z = 0, cx + 2y + z = 0$ has non-trivial solutions if a, b, c are in
(1) AP (2) GP (3) HP (4) None of these

75. If $f(x) = x^2 - 2x + 3$, find the number of elements in the range of f when domain = {–2, 0, 2, 4}.
(1) 2 (2) 3 (3) 4 (4) 1

76. Let $f(x) = \sin^{-1}(\sin x)$. For what value of x in $(0, 2\pi)$ is $f(x)$ maximum?
(1) $\pi/2$ (2) $3\pi/2$ (3) π (4) 2π

77. If $f(x) = e^{|x|}$, then the function is
(1) differentiable everywhere (2) non-differentiable at $x = 0$
(3) continuous but not differentiable at $x = 0$ (4) both 2 & 3

78. The function $f(x) = |x|$ is
(1) one-one (2) onto
(3) neither one-one nor onto (4) Both

79. If $f(x) = x^3$ and $g(x) = \sqrt[3]{x}$, then $f(g(x)) = ?$
(1) x (2) x^3 (3) $\sqrt[3]{x}$ (4) None

80. $\tan^{-1}(1) + \tan^{-1}(2) + \tan^{-1}(3) = ?$
(1) $\pi/2$ (2) π (3) $\pi/4$ (4) 0

81. $\cos^{-1}\left(\frac{1}{2}\right) + \sin^{-1}\left(\frac{\sqrt{3}}{2}\right) = ?$
(1) $\pi/3$ (2) $\pi/2$ (3) $2\pi/3$ (4) 0

82. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, find $(\text{adj } A)^{-1}$.
(1) A (2) A^{-1} (3) adj(A) (4) None

83. If $|A| = 2$ and $|B| = 3$, find $|3A^{-1}B^T|$ for 3×3 matrices.
(1) 81/2 (2) 27/2 (3) 54 (4) None

84. If $f(x) = x^3 - 6x^2 + 12x - 8$, find the nature of $f(x)$.
(1) strictly increasing (2) strictly decreasing
(3) neither increasing nor decreasing (4) constant

85. Minimum value of $\frac{x^2+1}{x}$, $x > 0$ is
(1) 2 (2) 3 (3) $\sqrt{2}$ (4) None

86. If $I = \int_0^{\pi/2} \sin^4 x\,dx$, then $I = ?$
(1) $3\pi/16$ (2) $\pi/4$ (3) $\pi/8$ (4) None

87. The differential equation $\frac{dy}{dx} + y\tan x = \sin x$ is solved by integration factor
(1) $e^{\int \tan^2 x dx}$ (2) $e^{\int \tan x dx}$ (3) $e^{\int \sin x dx}$ (4) None

88. Solution of $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$ is
(1) $\tan^{-1} y = \tan^{-1} x + C$ (2) $y = x + C$ (3) $y = x^2 + C$ (4) None

89. $\frac{dy}{dx} = y\tan x,\ y(0) = 1 \Rightarrow y = ?$
(1) $e^{\sin x}$ (2) $\sec x$ (3) $\cos x$ (4) None

90. $|\vec{a}\times\vec{b}| = |\vec{a}||\vec{b}|\sin\theta$. If $|\vec{a}| = |\vec{b}| = 1$ and $|\vec{a}\times\vec{b}| = \sqrt{3}/2$, find θ.
(1) 30° (2) 60° (3) 120° (4) 150°

91. If $\vec{a} = \vec{i} + \vec{j} + \vec{k}$, $\vec{b} = 2\vec{i} + 3\vec{j} + 4\vec{k}$, then projection of $\vec{a}$ on $\vec{b}$ = ?
(1) $\frac{19}{\sqrt{29}}$ (2) $\frac{(2+3+4)}{\sqrt{29}}$ (3) $\frac{9}{29}$ (4) None

92. Area of parallelogram with diagonals along $\vec{a}$ and $\vec{b}$ is
(1) $\frac{1}{2}|\vec{a}\times\vec{b}|$ (2) $|\vec{a}\times\vec{b}|$ (3) $\frac{1}{4}|\vec{a}\times\vec{b}|$ (4) None

93. For LPP, feasible region is given by $x \ge 0,\ y \ge 0,\ x + y \le 10$.
Maximum of $Z = 3x + 4y$ occurs at
(1) (0, 10) (2) (10, 0) (3) (6, 4) (4) Both

94. If P (A) = 0.5, P (B) = 0.4, $P(A \cap B) = 0.1$, then find $P(A \cup B)$.
(1) 0.8 (2) 0.7 (3) 0.9 (4) None

95. If two dice are thrown, probability that sum is divisible by 4?
(1) 1/3 (2) 1/4 (3) 1/6 (4) 1/2

96. Conditional probability P (A|B) = 2/3, P (B) = 1/2, $P(A \cap B) = ?$
(1) 1/3 (2) 1/2 (3) 1/6 (4) None

97. $\lim_{x\to 0}\frac{e^{x^2}-1}{x^2}=?$

(1) 1 (2) 2 (3) 4 (4) None

98. The area between curves $y = x^2$ and $y = |x|$ is

(1) 2/3 (2) 4/3 (3) 8/3 (4) None

99. If $y = x^{\sin x}$, then find dy/dx.

(1) $x^{\sin x}\left(\cos x \ln x - \sin x / x\right)$ (2) $x^{\sin x}\left(\cos x \ln x + \frac{\sin x}{x}\right)$

(3) both 1 and 2 (4) None

100. If A and B are independent, P (A|B) = ?

(1) P (A) (2) P (B) (3) 1 (4) None

❐ ❐ ❐

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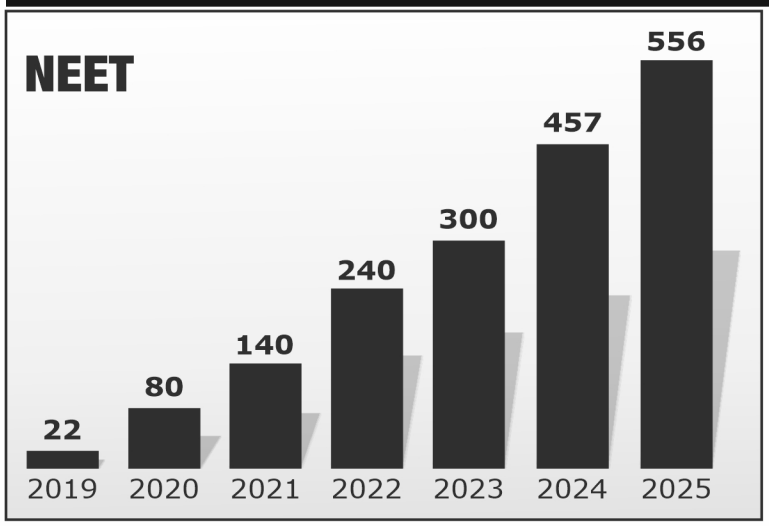

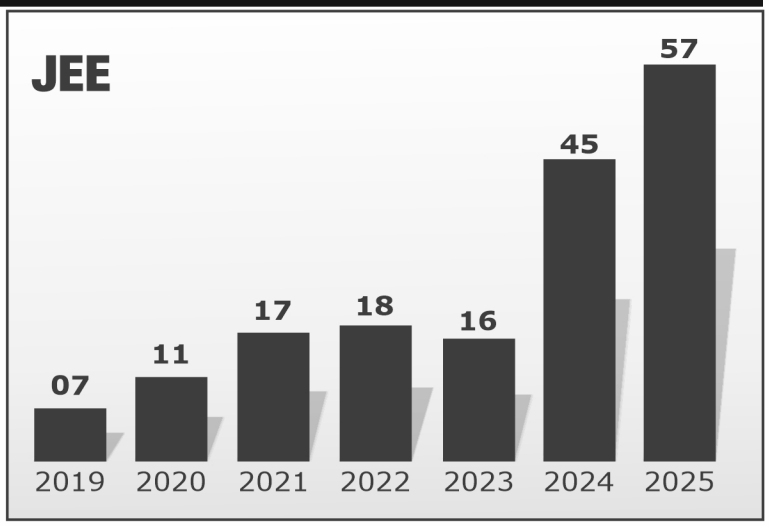

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