Monthly Progressive Test

Class: XII

Subject: PCMB

Academic Excellence Programme
TECHNO ACE

Test Booklet No.: MPT09 **Test Date: 2 0 0 1 2 0 2 5**

Time: 120 mins **Full Marks: 200**

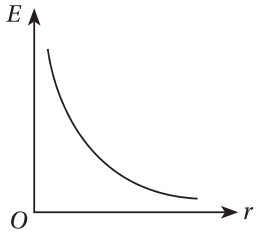
Important Instructions :

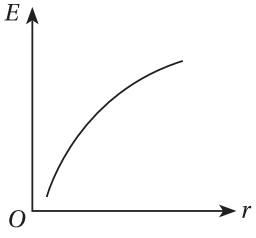
1. The Test is of 120 mins duration and the Test Booklet contains 100 multiple choice questions of single correct option only. There are four sections with four subjects. You have to attempt all 100 questions (Candidates are advised to read all 100 questions). Questions 1 to 25 contain Physics, Questions 26 to 50 contain Chemistry, Questions 51 to 75 contain Mathematics, Questions 76 to 100 contain Biology.
2. Each question carries 2 marks. For each correct response, the candidate will get 2 marks. There is no negative mark for wrong response. The maximum mark is 200.
3. Use Blue / Black Ball point Pen only for writing particulars marking responses on Answer Sheet.
4. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
5. On completion of the test, the candidate must handover the Answer Sheet to the invigilator before leaving the Room / Hall. The candidates are allowed to take away this Test Booklet with them.
6. The CODE for this Booklet is Off Line MPT09 20012025.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your UID No. anywhere else except in the specified space. Use of white fluid for correction is NOT permissible on the Answer Sheet. **Do not scrible or write on or beyond discrete bars of OMR Sheet at both sides**.
8. Each candidate must show on-demand his/her Registration document to the Invigilator.
9. No candidate, without special permission of the Centre Superintendent or Invigilator, would leave his/her seat.
10. Use of Electronic Calculator/Cellphone is prohibited.
11. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
12. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
13. There is no scope for altering response mark in Answer Sheet.

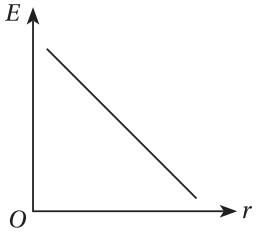
Space For Rough Works

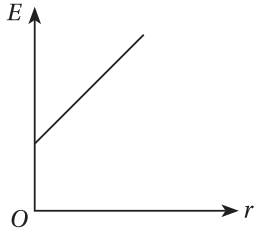
Physics

1. The variation graph of electric field intensity due to line charge or infinite long uniformly charged wire at point r distance from it is

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

2. A cylinder of radius r and length l is placed in an uniform electric field parallel to the axis of the cylinder. The total flux for the surface of the cylinder is given by

Ⓐ Zero Ⓑ πr^2 Ⓒ $E\pi r^2$ Ⓓ $2E\pi r^2$

3. An electric dipole placed in an uniform electric field intensity 2×10^5 N/C at an angle of 30° experiences a torque equal to 4 N.m. The charge on the dipole of dipole length 2 cm is

Ⓐ 7 μc Ⓑ 8 mc Ⓒ 2 mc Ⓓ 5 mc

Assertion and Reason :

Directions: Read the following questions and choose any one of the following four responses.

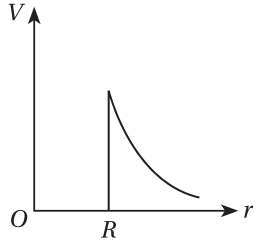
A: Assertion and Reason both are correct and Reason is the correct explanation of Assertion.
B: Assertion and Reason both are correct and Reason is not the correct explanation of Assertion.
C: Assertion is correct but Reason is wrong.
D: Assertion is wrong but Reason is correct.

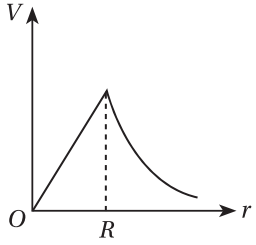
4. **Assertion (A) :** If there exists coulomb attraction between two bodies, both of them may not be charged.

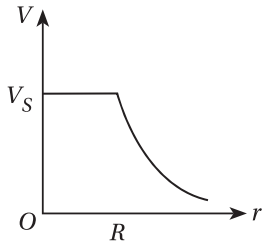
Reason (R) : In coulomb attraction, two bodies are oppositely charged.

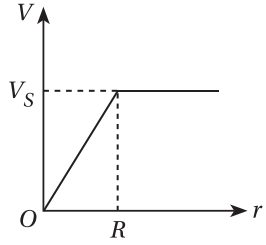
Ⓐ A Ⓑ B Ⓒ C Ⓓ D

5. The variation of potential (V, Volt) with r, a distance from the centre of uniformly charged spherical shell is shown below, select the correct pattern of graph (R is radius of shell)

Ⓐ 

Ⓑ 

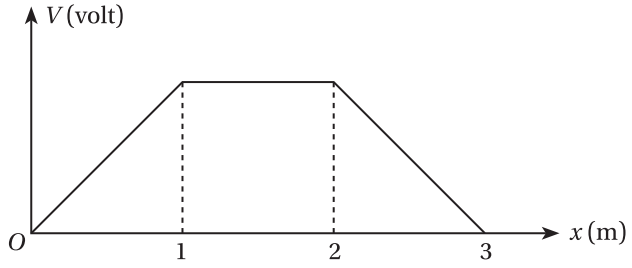
Ⓒ 

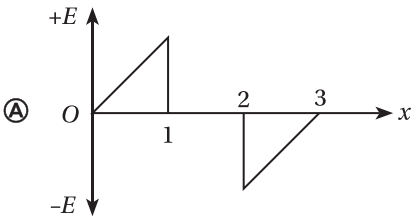
Ⓓ 

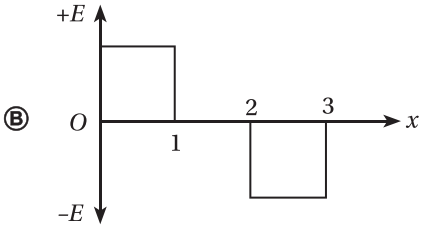
6. When a metallic conductor of thickness t is introduced between the plates, then capacitance of a parallel plate capacitor is given by (separation between the plates)

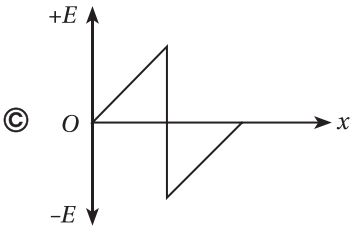
Ⓐ $\frac{A\varepsilon_0}{d}$ Ⓑ $\frac{A\varepsilon_0}{t}$ Ⓒ $\frac{A\varepsilon_0}{d+t}$ Ⓓ $\frac{A\varepsilon_0}{d-t}$

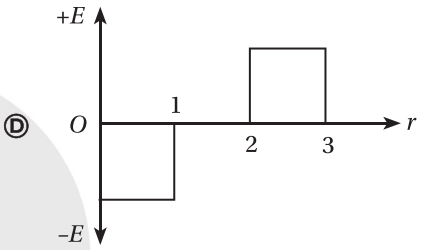
7. The electric potential (V, volt) as a function of distance x is shown in figure below. Select the correct graph of the electric field E as a function of x.



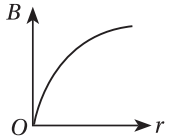
Ⓐ 

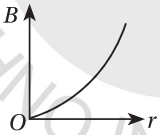
Ⓑ 

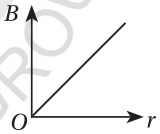
Ⓒ 

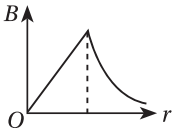
Ⓓ 

8. A thick current carrying cable of radius R carries current I uniformly distributed across its cross-section. The variation of magnetic field $B(r)$ due to the cable with the distance r from the axis of cable is represented by

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

9. A galvanometer can be converted into a voltmeter by connecting a

Ⓐ high resistance in parallel with its coil
Ⓑ low resistance in series with its coil
Ⓒ high resistance with its coil in series
Ⓓ low resistance in parallel with its coil

10. A charge is accelerated through a potential difference V. It is then passed normally through a uniform magnetic field, where it moves in a circle of radius r. The potential difference required to move it in a circle of radius $2r$ is

Ⓐ V Ⓑ $2V$ Ⓒ $3V$ Ⓓ $4V$

Assertion and Reason : (Q. No. 11)

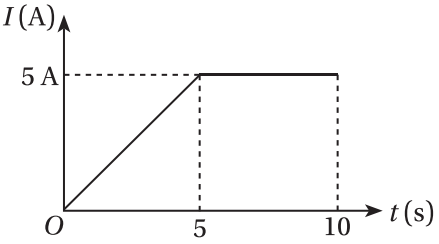
Directions: Read the following questions and choose any one of the following four responses.

A: Assertion and Reason both are correct and Reason is the correct explanation of Assertion.
B: Assertion and Reason both are correct and Reason is not the correct explanation of Assertion.
C: Assertion is correct but Reason is wrong.
D: Assertion is wrong but Reason is correct.

11. **Assertion (A) :** When a steady current flows in a metallic conductor of non-uniform cross-section, the current flowing through the conductor is constant.

Reason (R) : To maintain a constant current charges slow down at thin cross-section of a wire

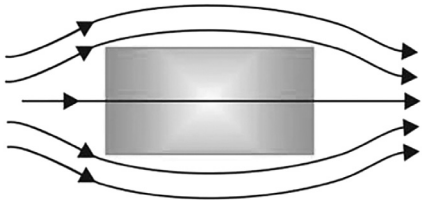
Ⓐ A Ⓑ B Ⓒ C Ⓓ D

12. 

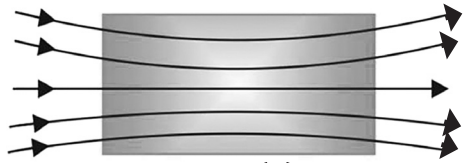
The charge flowing in 10 s through the wire is

Ⓐ 20 C Ⓑ 30 C Ⓒ 35 C Ⓓ 37.5 C

13. A uniform magnetic field gets modified as shown in figure when two specimen *A* and *B* are placed in it.



(A)



(B)

Ⓐ Specimen *A* is diamagnetic in nature Ⓑ Specimen *B* is paramagnetic in nature

Ⓒ Both *A* and *B* are correct Ⓓ None of the above

14. The expression for the magnetic field at an external point lying on its axis at a distance *r* from the centre of solenoid (of length 2*l* with *n* turns per unit length, and *a* is the radius of coil of solenoid) is

Ⓐ $\frac{(\mu_0 ni)a^2 l}{2r^3}$ Ⓑ $\frac{\mu_0 ni a^2 l}{r^3}$ Ⓒ $\mu_0 ni$ Ⓓ None of these

15. Above Curie temperature

Ⓐ ferromagnetic becomes diamagnetic Ⓑ ferromagnetic becomes paramagnetic

Ⓒ paramagnetic becomes ferromagnetic Ⓓ paramagnetic becomes diamagnetic

16. The magnetic susceptibility of a given material is –0.5. Identify the material.

Ⓐ Diamagnetic Ⓑ Paramagnetic Ⓒ Ferromagnetic Ⓓ Insufficient data

17. The coil of an ac generator consists of 100 turns of wire, each of area 0.5 m^2. The resistance of the wire is 100 Ω. The coil is rotating in a magnetic field of 0.8 T perpendicular to its axis of rotation at a constant angular speed of 60 radian per second. The maximum power dissipated in the coil

Ⓐ 5.76 watt Ⓑ 576 watt Ⓒ 5.76×10^4 watt Ⓓ 5.76×10^3 watt

18. The average value of alternating voltage over any half cycle is [$V = v_0 \sin \omega t$]

Ⓐ 0.637 v_0 Ⓑ 0.707 v_0 Ⓒ 0.5 v_0 Ⓓ 0.75 v_0

19. In compound microscope, for normal adjustment when the final image is formed at infinity, the magnifying power is $M =$ (L is tube length)

Ⓐ $\frac{L}{f_0 f_e}$ Ⓑ $\frac{LD}{f_0 \cdot f_e}$ Ⓒ $\frac{Lf_0}{Df_e}$ Ⓓ $\frac{Lf_e}{Df_0}$

20. For astronomical telescope, in normal adjustment, image formed at infinity, magnification *M* is given by

Ⓐ $\left|\frac{f_e}{f_0}\right|$ Ⓑ $f_0 + f_e$ Ⓒ $\left|\frac{f_0}{f_e}\right|$ Ⓓ $2f_e$

21. If A is the angle of prism, r is angle of refraction, then the condition for minimum deviation is

Ⓐ $A = r^2$ Ⓑ $A = 2r$ Ⓒ $A = \frac{r}{2}$ Ⓓ $A = r$

Assertion and Reason : (Q. no. 22)

Directions: Read the following questions and choose any one of the following four responses.

A: Assertion and Reason both are correct and Reason is the correct explanation of Assertion.

B: Assertion and Reason both are correct and Reason is not the correct explanation of Assertion.

C: Assertion is correct but Reason is wrong.

D: Assertion is wrong but Reason is correct.

22. **Assertion (A) :** In YDSE, if slit separation (d) as well as the distance (D) of the screen from the coherent sources both are reduced to $\left(\frac{1}{3}\right)$rd, then new fringe width remains the same.

Reason (R) : Fringe width is proportional to (d/D)

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

23. Select the correct statement:

Ⓐ For semiconductors $E_g < 3$ eV Ⓑ For Silicon $E_g = 1.1$ eV

Ⓒ For germenium $E_g = 0.7$ eV Ⓓ All the above are correct

24. Four nuclei of an element undergo fusion to form a heavier nucleus, with release of energy.

Ⓐ The parent nucleus has more binding energy per nucleon than daughter nucleus.

Ⓑ The daughter nucleus has more binding energy per nucleon than parent nucleus.

Ⓒ The average binding energy by is same for daughter as well as parent nucleus.

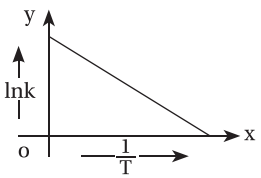
Ⓓ None of these.

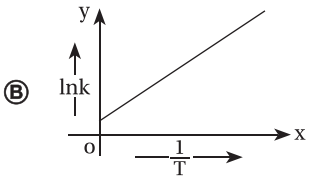
25. The potential energy of an electron in the second excited state in hydrogen atom is

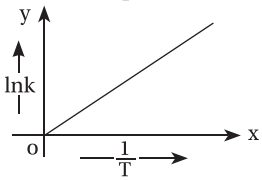
Ⓐ –3.4 eV Ⓑ –3.02 eV Ⓒ –1.51 eV Ⓓ –6.8 eV

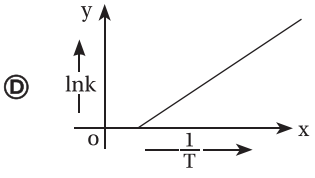
Chemistry

26. According to Arrhenius equation, rate constant K is equal to $A \cdot e^{-\frac{Ea}{RT}}$. Which of the following options represents the graph of lnk Vs $\frac{1}{T}$?

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

27. Select the correct statement regarding activation energy :

Ⓐ Activation energy may be greater than heat of reaction.

Ⓑ Activation energy is less than threshold energy.

Ⓒ Rate of reaction is inversely proportional to the activation energy

Ⓓ All of these

28. A current of 2.0 when passed for 5 hrs. through a molten salt, deposits 22.2 g of metal (of atomic weight 177). The oxidation state of metal in metal salt is :

Ⓐ +1 Ⓑ +2 Ⓒ +3 Ⓓ +4

29. The specific conductance of a saturated solutions of AgCl is k $\Omega^{-1}cm^{-1}$. The limiting ionic conductances of Ag^+ and Cl^- are x and y respectively. The solubility product of AgCl is :

Ⓐ $\frac{1000\,k}{x+y}$ Ⓑ $\left(\frac{1000\,k}{x+y}\right)^2$ Ⓒ $\frac{1000\times143.5\times k}{x+y}$ Ⓓ $\left(\frac{10^3\times143.5\times k}{x+y}\right)^2$

30. Van't Hoff factor of aqueous acetic acid solution is :

Ⓐ < 1 Ⓑ > 1 Ⓒ = 1 Ⓓ 0

31. 2 millimolar solution of sodium ferrocyanide is 60% dissociated at 27°C. Osmotic pressure of the solution is :

Ⓐ 2.14 atm Ⓑ 1.02 atm Ⓒ 0.167 atm Ⓓ 0.0234 atm

32. When mercuric iodide is added to an aqueous solution of KI the :

Ⓐ Boiling point increases Ⓑ Boiling point decreases

Ⓒ Freezing point decreases Ⓓ Osmotic pressure increases.

33. Among he following solutions :

(a) 0.01 M NaCl (b) 0.05 M Glucose (c) 0.01 M $CaCl_2$ (d) 0.02 M KCl.

The correct order of decreasing boiling point can be given as (assuming same dissociation).

Ⓐ a > b > c > d Ⓑ b > d > c > a Ⓒ a > c > d > b Ⓓ d > c > b > a

34. How many optically active stereoisomerism are possible for butane –2, 3 – diol ?

Ⓐ 1 Ⓑ 2 Ⓒ 3 Ⓓ 4

Assertion Reason Type Question (35-38):

Read the two statements carefully and select the correct option given below.

A: Assertion and Reason both are correct and Reason is the correct explanation of Assertion

B: Assertion and Reason both are correct and Reason is not the correct explanation of Assertion

C: Assertion is correct but Reason is wrong

D: Assertion is wrong but Reason is correct

35. **Assertion (A):** Nitration of chlorobenzene leads to the formation of m–nitro chlorobenzene.

Reason (R): $-NO_2$ group is a m-directing group.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

36. **Assertion (A):** It is difficult to replace chlorine by –OH in chlorobenzene in comparison to in chloroethane.

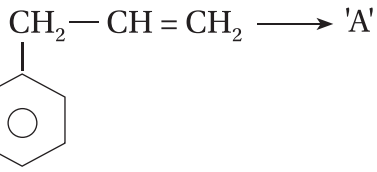
Reason (R): Chlorine- carbon (Cl — C) bond in chlorobenzene has a partial double bond character due to resonance.

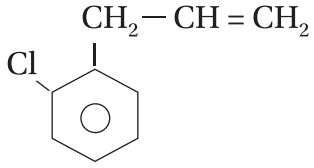
Ⓐ A Ⓑ B Ⓒ C Ⓓ D

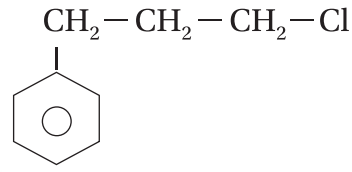
37. **Assertion (A):** p-nitrophenol is more acidic than phenol.
Reason (R): Nitro group helps in the stabilisation of the phenomide ion by dispersal of negative charge due to resonance.
Ⓐ A Ⓑ B Ⓒ C Ⓓ D

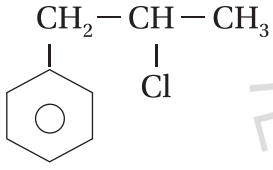
38. **Assertion (A):** Phenol forms 2, 4, 6 tribromophenol on treatment with Br_2 in carbondixulphide at 273 k.
Reason (R): Bromine polarises in carbon disulphide.
Ⓐ A Ⓑ B Ⓒ C Ⓓ D

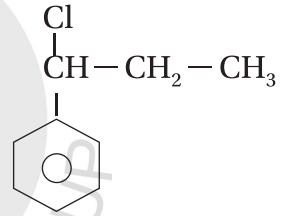
39. What is 'A' in the following reaction ?

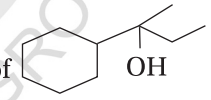


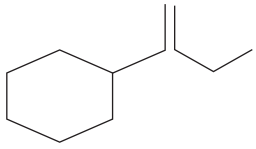
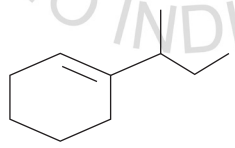
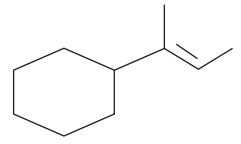
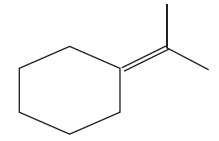
Ⓐ 

Ⓑ 

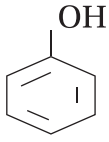
Ⓒ 

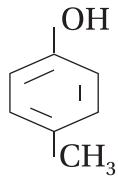
Ⓓ 

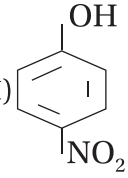
40. Which of the following is not the product of dehydration of 

Ⓐ  Ⓑ  Ⓒ  Ⓓ 

41. The correct acidic order of the following is :

(I) 

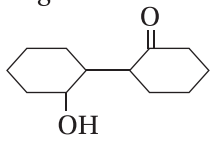
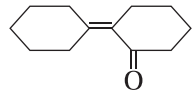
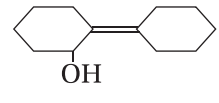
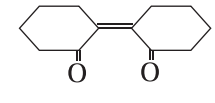
(II) 

(III) 

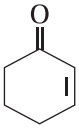
Ⓐ I > II > III Ⓑ III > I > II Ⓒ II > III > I Ⓓ I > III > II

42. The heating of phenyl methyl ethers with HI produces.
Ⓐ ethyl chlorides Ⓑ iodo benzene Ⓒ phenol Ⓓ benzene

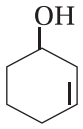
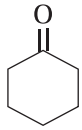
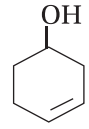
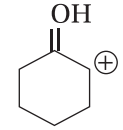
43. Of the following which is the product formed when cyclohexanone undergoes aldol. Condensation followed by heating ?

Ⓐ  Ⓑ  Ⓒ  Ⓓ 

44. The correct structure of the product 'A' formed in the reaction.



$\xrightarrow[\text{Pd/Carbon ethanol}]{H_2\,(\text{gas, 1 atom})}$ 'A' is.

Ⓐ 
Ⓑ 
Ⓒ 
Ⓓ 

45. Reaction of phenylacetylene with dilute H_2SO_4 and $HgSO_4$ gives :

Ⓐ Acetophenone
Ⓑ 2-phenylethanol
Ⓒ phenylacetaldehyde
Ⓓ phenylacetic acid

Case Based Questions (46-47):

Monosaccharides can be either aldoses or ketoses. Whereas glucose and galactose are aldoses, fructose is a ketose. All monosaccharides are reducing ie. they reduce Tollen's reagent and Fehling's solution, undergo mutarotation and form osazones. However, glucose does not give some of the characteristic reactions of aldehydes.

46. Glucose does not react with :

Ⓐ hydroxylamine
Ⓑ acetic anhydride
Ⓒ sodium bisulphite
Ⓓ Br_2 / H_2O

47. Fructose reduces Tollen's reagent due to :

Ⓐ asymmetric carbons
Ⓑ primary alcoholic group
Ⓒ secondary alcoholic group
Ⓓ enolisation of fructose followed by conversion to aldehyde by base

48. During mutarotation of β-D glucose in aqueous solution angle of optical rotation

Ⓐ Remains constant value of +111°
Ⓑ Remains constant value of +19.2°
Ⓒ Changes from an angle of +112° to a constant value of +52.5°
Ⓓ Changes from an angle of +19.2° to a constant value of +52.5°.

49. The Complex, [Pt (Py) (NH_3) (Br) (Cl)] will have how many geometrical isomers ?

Ⓐ 4 Ⓑ 0 Ⓒ 2 Ⓓ 3

50. Match the compounds of Xe in Column I with the molecular structure in Column II.

Column I	Column II
a. XeF_2	I. Square planar
b. XeF_4	II. Linear
c. XeO_3	III. Square pyramidal
d. $XeOF_4$	IV. Pyramidal

	a	b	c	d
Ⓐ	II	I	IV	III
Ⓑ	II	IV	III	I
Ⓒ	II	III	I	IV
Ⓓ	II	I	III	IV

Mathematics

51. Which of the following relations is symmetric but neither reflexive nor transitive for a set A = {1, 2, 3}.

Ⓐ R = {(1, 2), (1, 3), (1, 4)} Ⓑ R = {(1, 2), (2, 1)}

Ⓒ r = {(1, 1), (2, 2), (3, 3)} Ⓓ R = {(1, 1), (1, 2), (2, 3)}

52. A function f : N → N is defined by $f(x) = x^2 + 12$. What is the type of function here ?

Ⓐ bijective Ⓑ surjective

Ⓒ injective Ⓓ neither surjective nor injective

53. What is the value of $\sin^{-1}(\sin 6)$?

Ⓐ $-2\pi - 6$ Ⓑ $2\pi + 6$ Ⓒ $-2\pi + 6$ Ⓓ $2\pi - 6$

54. What is the value of $5\cos^{-1}(\frac{1}{2}) + 7\sin^{-1}((\frac{-1}{2})$?

Ⓐ $\frac{(-\pi)}{2}$ Ⓑ π Ⓒ $\frac{\pi}{2}$ Ⓓ $\frac{17\pi}{6}$

55. $\begin{bmatrix} 2+x & 3 & 4 \\ 1 & -1 & 2 \\ x & 1 & -5 \end{bmatrix}$ is a singular matrix, then x is

Ⓐ $\frac{13}{25}$ Ⓑ $-\frac{25}{13}$ Ⓒ $\frac{5}{13}$ Ⓓ $\frac{25}{13}$

56. Given that A is a square matrix of order 3 and $|A| = -4$, then $|\text{adj } A|$ is equal to

Ⓐ −4 Ⓑ 4 Ⓒ −16 Ⓓ 16

57. Differentiate $\log(\log x^5)$ w.r.t x.

Ⓐ $\frac{-5}{x \log x^5}$ Ⓑ $\frac{1}{\log x^5}$ Ⓒ $\frac{5}{x \log x^5}$ Ⓓ $\frac{-1}{x \log x^5}$

58. find $\frac{dy}{dx}$, if $x = 6\sin^{-1} 2t$ and $y = \frac{1}{\sqrt{1-4t^2}}$

Ⓐ $\frac{t}{1-4t^2}$ Ⓑ $-\frac{1}{3(1-4t^2)}$ Ⓒ $-\frac{t}{3(1-4t^2)}$ Ⓓ $\frac{t}{3(1-4t^2)}$

59. The function f, given by $f(x) = \begin{cases} \frac{\sin x^2}{x}, & x \neq 0 \\ o, & x = 0 \end{cases}$ is

Ⓐ continuous and derivable at x = 0 Ⓑ neither continuous nor derivable at x = 0

Ⓒ continuous but not derivable at x = 0 Ⓓ limit does not exist

60. A ladder 20 ft long leans against a vertical wall. If the top end slides downwards at the rate of 2ft per second, what will be the rate at which the slope of the ladder changes when the lower end of the ladder is 12 ft away from the wall ?

Ⓐ $\frac{-19}{54}$ Ⓑ $\frac{-21}{54}$ Ⓒ $\frac{-23}{54}$ Ⓓ $\frac{-25}{54}$

61. What will be the point of minimum of the function $2x^3 + 3x^2 - 36x + 10$?

Ⓐ 1 Ⓑ 2 Ⓒ 3 Ⓓ 4

62. Find $\int_1^2 x^2 \log x \, dx$

Ⓐ $\log 2 - \frac{7}{3}$ Ⓑ $\frac{8}{3}\log 2 - 5$ Ⓒ $\frac{8}{3}\log 2 - \log 3$ Ⓓ $\frac{8}{3}\log 2 - \frac{7}{9}$

63. Find $\int 2x^3 e^{x^2} dx$

Ⓐ $-e^{x^2}(x^2+2)+C$ Ⓑ $e^{x^2}(x^2-1)+C$

Ⓒ $2e^{x^2}(x^2+1)+C$ Ⓓ $e^{x^2}(x-1)+C$

64. Area of the region in the first quadrant enclosed by the x-axis, the line $y = x$ and the circle $x^2 + y^2 = 32$ is

Ⓐ 16π sq.units Ⓑ 4π sq.units Ⓒ 32π sq.units Ⓓ 24π sq.units

65. Area bounded by the lines $y = |x| - 2$ and $y = 1 - |x-1|$ is equal to

Ⓐ 4 sq.units Ⓑ 6 sq.units Ⓒ 2 sq.units Ⓓ 8 sq.units

Case Study Based Questions (66-68):

Two motorcycles A and B are running at the speed more than allowed speed on the road along the lines $\vec{r} = \lambda(\hat{i} + 2\hat{j} - \hat{k})$ and $\vec{r} = 3\hat{i} + 3\hat{j} + \mu(2\hat{i} + \hat{j} + \hat{k})$ respectively.

Based on the above information, answer the following questions.

66. The cartesian equation of the line along which motorcycle A is running is

Ⓐ $\frac{x+1}{1} = \frac{y+1}{2} = \frac{z-1}{-1}$ Ⓑ $\frac{x}{1} = \frac{y}{2} = \frac{z}{-1}$

Ⓒ $\frac{x}{1} = \frac{y}{2} = \frac{z}{1}$ Ⓓ None of these

67. The shortest distance between the given lines is

Ⓐ 4 units Ⓑ $2\sqrt{3}$ units Ⓒ $3\sqrt{2}$ units Ⓓ 0 unit

68. The motorcycles will meet with an accident at the point

Ⓐ (–1, 1, 2) Ⓑ (2, 1, –1) Ⓒ (1, 2, –1) Ⓓ does not exist

Assertion-Reason type Questions (69-70) :

Direction : A statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

a. Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
b. Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A).
c. Assertion (A) is true but reason (R) is false.
d. Assertion (A) is false but reason (R) is true.

69. **Assertion (A) :** Consider the experiment of drawing a card from a deck of 52 playing cards, in which the elementary events are assumed to be equally likely.
If E and F denote the events 'the card drawn is a spade' and 'the card drawn is an ace' respectively, then $P(E|F) = \frac{1}{4}$, $P(F|E) = \frac{1}{13}$ and $P(E \cap F) = P(E)\,P(F)$.
Reason (R) : E and F are two events such that the probability of occurrence of one of them is not affected by occurrence of the other. such events are called independent events.
Ⓐ a Ⓑ b Ⓒ c Ⓓ d

70. **Assertion (A):** Let A and B be two independent events. Then $P(A \cap B) = P(A) + P(B)$
Reason (R) : Three events A, B and C are said to be independent if $P(A \cap B \cap C) = P(A)P(B)P(C)$
Ⓐ a Ⓑ b Ⓒ c Ⓓ d

71. Find the order and degree of the D.E $\left(\frac{d^3y}{dx^3}\right) - 3\left(\frac{d^2y}{dx^2}\right) + 2\left(\frac{dy}{dx}\right)^4 + y^3 = 0$
Ⓐ Order – 2, Degree– 4 Ⓑ Order – 2, Degree– 1 Ⓒ Order – 3, Degree– 1 Ⓓ Order – 1, Degree– 3

72. Find the particular solution of the differential equation $\frac{dy}{dx} + 8x = 16x^2 + 4$ given that $y = \frac{1}{3}$ when $x = 1$.
Ⓐ $y = \frac{(2x+1)^2}{3}$ Ⓑ $y = \frac{(4x+1)^2}{12}$ Ⓒ $y = \frac{(4x-2)^3}{3}$ Ⓓ $y = \frac{16}{3}x^3 + 4x - 4x^2 - 5$

73. The maximum value of the objective function $Z = 5x + 10y$ subject to the constraints $x + 2y \le 120$, $x + y \ge 60$, $x - 2y \ge 0$, $x \ge 0$, $y \ge 0$ is
Ⓐ 300 Ⓑ 600 Ⓒ 400 Ⓓ 800

74. $Z = 6x + 21y$, subject to $x + 2y \ge 3$, $x + 4y \ge 4$, $3x + y \ge 3$, $x \ge 0$, $y \ge 0$. The minimum value of Z occurs at
Ⓐ (4, 0) Ⓑ (28, 8) Ⓒ $(2, \frac{1}{2})$ Ⓓ (0, 3)

75. If $\int \frac{dx}{\cos^3 x\sqrt{2\sin 2x}} = (\tan x)A + C(\tan x)B + k$, where k is a constant of integration, then the value of A + B + C is equal to
Ⓐ $\frac{21}{5}$ Ⓑ $\frac{21}{10}$ Ⓒ $\frac{16}{5}$ Ⓓ $\frac{7}{10}$

Biology

76. In cleistogamous flowers, the anthers and stigma _____
Ⓐ are borne on separate flowers Ⓑ lie close to each other
Ⓒ lie at varying heights to prevent self pollination Ⓓ mature at different times

77. MTPs are relatively safe upto how many weeks of pregnancy?
Ⓐ 12 Ⓑ 9 Ⓒ 6 Ⓓ 3

78. According to Erwin Chargaff, for a double stranded DNA, $\frac{A+T}{G+C}$ = ?
Ⓐ 100 Ⓑ 1 Ⓒ 10 Ⓓ 9

79. Choose the incorrect statement:
Ⓐ Australian marsupials display adaptive radiation.

Ⓑ They all evolved from a common ancestral stock.

Ⓒ The sugar glider and tiger wolf belong to this stock.

Ⓓ The marsupials are examples of divergent evolution.

80. *Papaver somniferum* is used to extract which of the following:

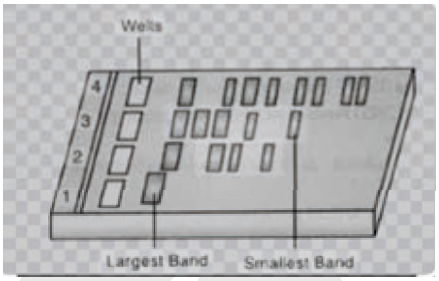
Ⓐ Morphine Ⓑ Cocaine Ⓒ LSD Ⓓ All

81. Select the mismatched pair:

Ⓐ *Propionibacterium sharmanii* – Swiss cheese Ⓑ *Aspergillus niger* – Citric acid

Ⓒ *Trichoderma polysporum* – Statin Ⓓ *Saccharomyces cerevisiae* – Ethyl alcohol

82. Given below is a diagram showing gel electrophoresis. How are the DNA fragments isolated from the gel?



Ⓐ By elution Ⓑ By joining them with cloning vectors

Ⓒ By using ethidium chloride Ⓓ None

83. The bacterium *Thermus aquaticus* finds a huge commercial application in which of the following processes?

Ⓐ PCR Ⓑ Bioreactors

Ⓒ As a selectable marker Ⓓ Cloning vector

84. What role is played by DNA ligase in making a recombinant DNA?

Ⓐ Formation of hydrogen bonds between sticky ends of DNA fragments.

Ⓑ Formation of phosphodiester bond between two DNA fragments.

Ⓒ Ligation of all purine and pyramidine bases.

Ⓓ None

85. The association between sea anemone and clown fish is –

Ⓐ Ectoparasitism Ⓑ Comensalism Ⓒ Amensalism Ⓓ None

Assertion-Reason type Questions (86–90):

Direction : A statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

A. Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

B. Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

C. Assertion (A) is true but reason (R) is false.

D. Assertion (A) is false but reason (R) is true.

86. **Assertion (A):** The corpus luteum secretes large amounts of progesterone.

Reason (R): Progesterone maintains the endometrium required for implantation and subsequent pregnancy.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

87. **Assertion (A):** Complete lactation could help as a natural method of contraception.

Reason (R): MTP is legalized in India.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

88. **Assertion (A):** DNA replication is semi conservative.

Reason (R): After replication, each DNA molecule will have one parental strand and one newly synthesized strand.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

89. **Assertion (A):** The lobefins were the first amphibians.

Reason (R): The amphibians evolved into aves.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

90. **Assertion (A):** Since DNA is hydrophilic, it cannot pass through cell membranes.

Reason (R): Retroviruses have been disarmed to deliver desirable genes into animal cells.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

Case Based Questions (91–94):

Read the given passage and answer the following questions:

The process of gamete formation is called gametogenesis. Spermatogenesis occurs in the testes and oogenesis in the ovaries. Spermatogenesis is initiated at puberty by the gonadotropin releasing hormone. Oogenesis is initiated during the embryonic development stage when millions of gamete mother cells are formed in the foetal ovaries.

91. Each spermatogonium has _____ chromosomes and forms primary spermatocytes by _____

Ⓐ Diploid; mitosis Ⓑ Haploid, mitosis Ⓒ Haploid, differentiation Ⓓ Diploid, meiosis

92. The spermatozoa are released from the seminiferous tubules by the process of :

Ⓐ Spermiation Ⓑ Spermiogenesis Ⓒ Reduction division Ⓓ Maturation

93. During oogenesis, the secondary oocyte divides into :

Ⓐ One second polar body and one ovum Ⓑ Two second polar bodies and one ovum

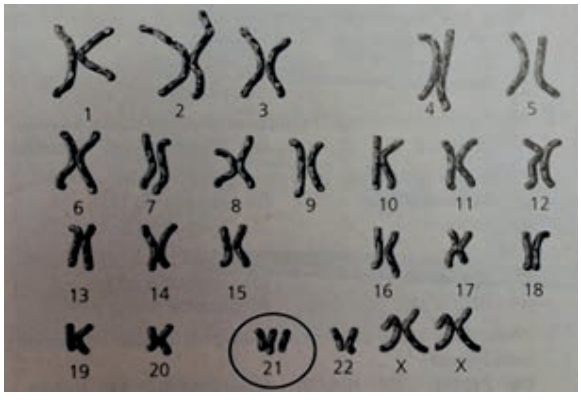
Ⓒ One second polar body and two ova Ⓓ Two ova

94. Corpus luteum is formed during which phase of the menstrual cycle?

Ⓐ Secretory phase Ⓑ Ovulatory phase Ⓒ Follicular phase Ⓓ Menstrual phase

Case Based Questions (95–97):

Refer to the given figure. It shows the karyotype of an individual having a chromosomal disorder.



95. Select the correct statement:

Ⓐ Such individuals are sterile.

Ⓑ This is caused by failure of cytokinesis after telophase, causing an increase in the whole set of chromosome.

Ⓒ This occurs due to failure of segregation of chromatids during cell division cycle, resulting in the gain of chromosome

Ⓓ None

96. What would happen if, in a gene encoding a polypeptide of 50 amino acids, the 25th codon (UAU) is mutated to UAA?

Ⓐ A polypeptide of 24 amino acids will be formed

Ⓑ Two polypeptides of 24 and 26 amino acids will be formed.

Ⓒ A polypeptide of 49 amino acids will be formed.

Ⓓ No polypeptide will be formed.

97. Gynaecomastia is expressed in:

Ⓐ Down' s syndrome Ⓑ Turner's syndrome Ⓒ Klinefelter's syndrome Ⓓ All

Case Based Questions (98–100):

Read the given passage and answer the following questions:

Biodiversity is an important aspect for stability of an ecosystem. Ecologists believe that communities with more species tend to be more stable than those with less species. There are three important components of biodiversity. The Earth Summit was held in Rio de Janeiro in 1992, which called upon all nations to take appropriate measures for conservation of biodiversity and sustainable utilization of its benefits.

98. Biodiversity of a geographical region represents:

Ⓐ Endangered species found in the region

Ⓑ The diversity in the organisms living in the region

Ⓒ Genetic diversity in the dominant species of the region

Ⓓ Species endemic to the region

99. Which of the following is not an invasive alien species in the Indian context?

Ⓐ *Lantana* Ⓑ *Cynodon* Ⓒ *Parthenium* Ⓓ *Eichhornia*

100. Which one of the following is not observed in biodiversity hot spots?

Ⓐ Lesser inter-specific competition Ⓑ Species richness

Ⓒ Endemism Ⓓ Species loss