Monthly Progressive Test

Class: XII

Subject: PCMB

Academic Excellence Programme TECHNO ACE

Test Booklet No.: MPT06 **Test Date: 03102024**

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 MPT0603102024.
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. A tank is filled with water to a height of 12.5 cm. The apparent depth of a needle lying at the bottom of the tank is measured by a microscope to be 9.4 cm. If water is replaced by a liquid of refractive index 1.63 upto same height, by what distance would the microscope have to be moved to focus on the needle again?

   Ⓐ 1.73 cm Ⓑ 2 cm Ⓒ 1.5 cm Ⓓ 2.5 cm

2. Find the sine of angle of refraction(sin r) in glass when the angle of incidence in water is 45°. Sin(r) =

   Ⓐ 0.4 Ⓑ 0.6 Ⓒ 0.7 Ⓓ 0.3

3. The refracting angle of a prism is 60° and the minimum deviation is measured to be 40° when a parallel beam of light is incident on a face of the prism. sin 53° = 0.766

   Then refractive index of prism material with respect to air =

   Ⓐ 1.2 Ⓑ 1.3 Ⓒ 1.53 Ⓓ 1.6

4. A small bulb is placed at the bottom of tank containing water to a depth of 80 cm. Then the area of the surface of water through which light from the bulb can emerge out?

   R.I of water is 4/3, Sin 48.6 = 0.75, tan 48.6 = 1.1345

   Ⓐ 1 sq.m Ⓑ 2 sq.m Ⓒ 2.6 sq.m Ⓓ 3.5 sq.m

5. A double convex lense of refractive index 1.55, with both faces of the same radius of curvature. What is the radius of curvature required if the focal length is to be 20 cm?

   Ⓐ 11 cm Ⓑ 15 cm Ⓒ 18 cm Ⓓ 22 cm

6. A beam of light converges at a point P. Now a lens is placed in the path of the convergent beam 12 cm from P. At what point does the beam converge if the lens is a convex lens of focal length 20 cm.

   Ⓐ 7.5 cm Ⓑ 8 cm Ⓒ 10 cm Ⓓ 16 cm

7. An object of size 3 cm is placed 14 cm in front of a concave lens of focal length 21 cm. The image distance is

   Ⓐ 7.5 cm Ⓑ –8.4 cm Ⓒ –10 cm Ⓓ –12 cm

8. The focal length of a convex lens of focal length 30 cm in contact with a concave lens of focal length 20 cm, is

   Ⓐ –40 cm Ⓑ –50 cm Ⓒ –60 cm Ⓓ 30 cm

9. A small pin fixed on a table top is viewed from above from a distance of 50 cm. By what distance would the pin to be raised if it is viewed from the same point through a 15 cm thick glass slab held parallel to the table ? Refractive index of glass = 1.5.

Ⓐ 1 cm Ⓑ 2 cm Ⓒ 3 cm Ⓓ 5 cm

10. For a normal eye, far point is

Ⓐ at infinity Ⓑ at 25 cm in front of the eye

Ⓒ at 15 cm in front of eye Ⓓ none of these

11. A small telescope has an objective lens of focal length 140 cm and an eye-piece of focal length 5 cm. The magnifying power of telescope for viewing distant objects when the telescope is in normal adjustment i.e., when the final image is at infinity, is

Ⓐ –20 Ⓑ –28 Ⓒ –25 Ⓓ –30

■ **Assertion Reason based Questions (12 – 13) :**

Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(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) Both Assertion (A) and Reason (R) are false.

12. **Assertion:** For normal adjustment of Telescope, the separation between eye-piece and objective is sum of their focal lengths.

Reason: The final image is at infinity.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

13. **Assertion:** For a glass prism of r.i 1.732, the angle of minimum deviation is equal to the angle of prism. Then, angle of prism is 60 degree.

Reason: The angle of prism is always 60 degree.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

■ **Case Study Based Questions (Q. No. 14):**

Read the passage given below and answer the following questions.

The image of a small electric bulb fixed on the wall of a room is to be obtained on the opposite wall 3 m(D) away by means of a large convex lens. There is laboratory experiment to find the maximum possible focal length of the lens.

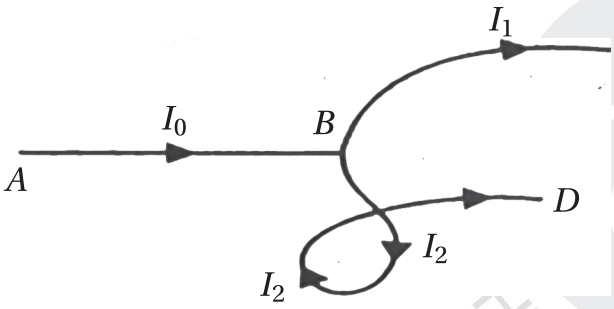
14. The formula can be used for maximum focal length is

Ⓐ $4f = D$ Ⓑ $2f = D$ Ⓒ $f = D$ Ⓓ None of these

15. For a small change in radius during stretching of conduction wire of resistance R and radius r, for $\frac{\Delta R}{R} =$

Ⓐ $\frac{-\Delta r}{r}$ Ⓑ $-2\frac{\Delta r}{r}$ Ⓒ $-3\frac{\Delta r}{r}$ Ⓓ $-4\frac{\Delta r}{r}$

16.



$I_0 =$

Ⓐ I_1 Ⓑ $I_1 + I_2$ Ⓒ I_2 Ⓓ None of these

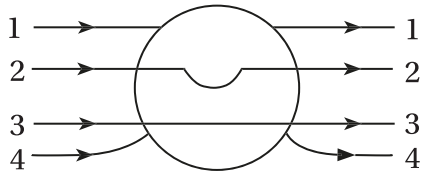
17. If $q = 2t$ Coulomb (where t is in s), then current in the circuit is

Ⓐ 2 A Ⓑ 1 A Ⓒ 1.5 A Ⓓ 2.5 A

18. Terminal $\rho \cdot d$ of discharging cell is $V = E - i \cdot r$. Is it true

Ⓐ True Ⓑ False Ⓒ May be true Ⓓ We can't say

19. A metallic solid sphere is placed in a uniform electric field. Which path, the lines of force follow as shown in figure?



Ⓐ 1 Ⓑ 2 Ⓒ 3 Ⓓ 4

20. A cassegrain telescope uses n number of mirrors, then n =

Ⓐ 1 Ⓑ 2 Ⓒ 3 Ⓓ 4

21. A cassegrain telescope is built with the mirrors 20 mm apart. If the radius of curvature of the large mirror is 220 mm and the small mirror is 140 mm, where will the final image of an object at infinity be?

Ⓐ 20 cm Ⓑ 25 cm Ⓒ 31.5 cm Ⓓ 42 cm

22. A small telescope has an objective lens of focal length 140 cm and an eye-piece of focal length 5 cm. The magnifying Power of the telescope for viewing distant object when the final image is formed at the least distance of distinct vision (25 cm) is

Ⓐ 30 Ⓑ 25 Ⓒ 20 Ⓓ 33.6

23. The effective focal length of the combination of a convex lens of focal length 30 cm, at a separation of 8 cm in air with a concave lens of focal length 20 cm is

Ⓐ 200 cm Ⓑ 100 cm Ⓒ –150 cm Ⓓ –300 cm

24. In a single-slit diffraction experiment, the width of the slit is made double the original width. Then the new intensity of the central diffraction band is

Ⓐ half the initial Ⓑ one fourth the original

Ⓒ remains same Ⓓ none of these

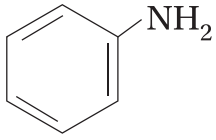
25. Two students are separated by a 7m partition wall in a room 10 m high. Then ($\lambda = 10^{-7}$m)

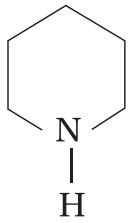
Ⓐ light can bend around the obstacle Ⓑ light can not bend around the obstacle

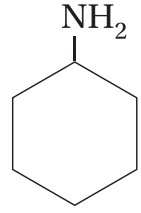
Ⓒ light can bend sometimes Ⓓ None of these

Chemistry

26. Which of the following is the weakest Bronsted base?

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ CH_3NH_2

27. The source of nitrogen in Gabriel synthesis of amines is _____.

Ⓐ Sodium azide, NaN_3 Ⓑ Sodium Nitrite, $NaNO_2$

Ⓒ Potassium cyanide, KCN Ⓓ Potassium phthalimide, $C_6H_4(CO_2)N^-K^+$

28. The gas leaked from a storage tank of the union carbide plant in Bhopal gas tragedy was
Ⓐ Methyl isocyanate Ⓑ Methyl amine Ⓒ Ammonia Ⓓ Phosgene

29. In the dichromate dianion
Ⓐ 4 Cr–O bonds are equivalent
Ⓑ 6 Cr–O bonds are equivalent
Ⓒ All Cr–O bonds are equivalent
Ⓓ All Cr–O bonds are equivalent

30. The IUPAC name of $[Ni(NH_3)_4][NiCl_4]$ is:
Ⓐ Tetrachloronickel(II)–tetraamminenickel(II)
Ⓑ Tetraamminenickel(II)–tetrachloronickel(II)
Ⓒ Tetraamminenickel(II)–tetrachloronickelate(II)
Ⓓ Tetrachloronickel(II)–tetraamminenickelate(II)

Assertion Reason Type Question (31):

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

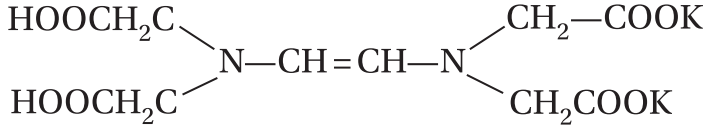
B: Assertion and Reason both are correct and Reason is not the correct explanation of Assertion

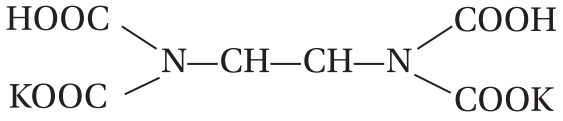
C: Assertion is correct but Reason is wrong

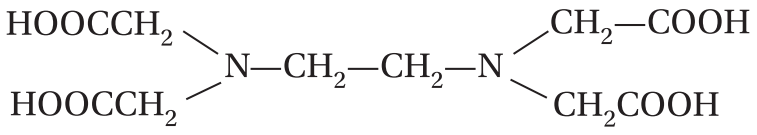
D: Assertion is wrong but Reason is correct

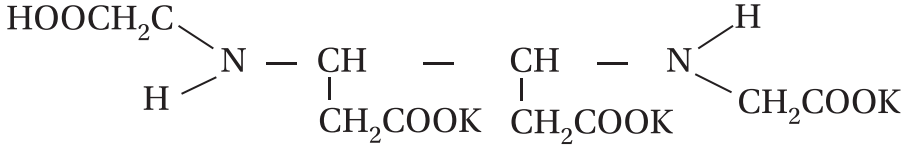
31. **Assertion:** $[Fe(H_2O)_5NO]SO_4$ is paramagnetic
Reason: The Fe in $[Fe(H_2O)_5NO]SO_4$ has three unpaired electrons.

32. The correct structure of ethylenediamine-tetraacetic acid (EDTA) is:

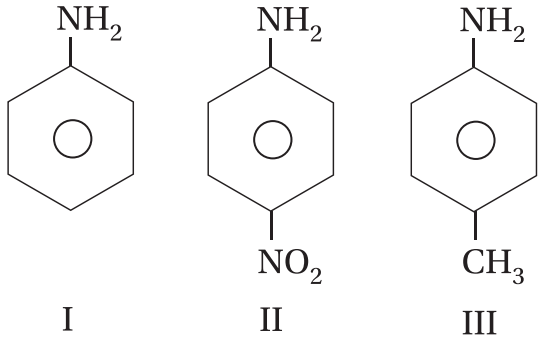
Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

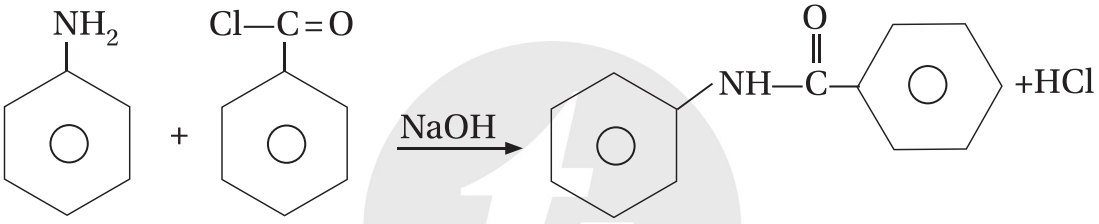
33. The correct increasing order of basic strength for the following compounds is:



I II III

Ⓐ II < III < I Ⓑ III < I < II Ⓒ III < II < I Ⓓ II < I < III

34. The following reaction:

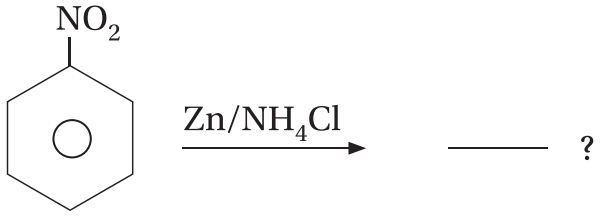


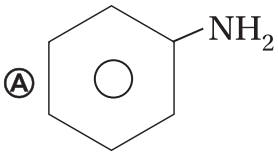
is known by the name:

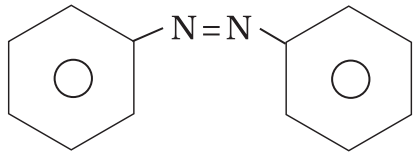
Ⓐ Acetylation reaction Ⓑ Schotten-Baumon reaction

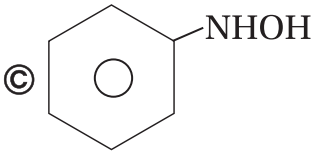
Ⓒ Friedel-Craft's reaction Ⓓ Perkin's reaction

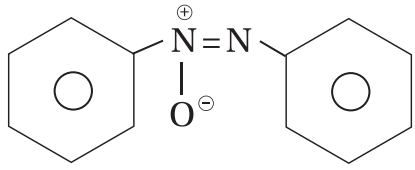
35. What is the product obtained in the following reaction



Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

Case Study Based Questions (36–37):

Read the passage given below and answer the following questions:

Although the literature contains numerous references to the boiling points of individual n-alkyl primary amines, no systemic study of the boiling points the series of n-alkyl primary amines has ever been reported. The increased interest in these amines, together with their recent commercial availability, indicates the need for such a study. The purpose of this paper is to report the boiling points at various pressures of the members of the series of saturated n-alkyl primary amines containing from six to eighteen carbon atoms inclusive.

In general the amines are used were prepared by conversion of the corresponding acids to nitriles and hydrogenation of the nitriles to amines. The nitriles were purified by fractional distillation. With the exception of stearonitrile which was purified by crystallization. After hydrogenation the amines ever fractionally distilled in order to separate them from any unchanged nitriles or secondary amines.

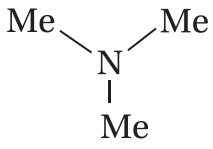
36. The order of basicity of amines in gaseous state is:

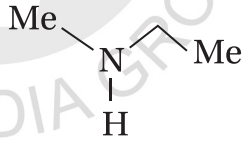
Ⓐ $1° > 2° > 3° > NH_3$ Ⓑ $3° > 2° > NH_3 > 1°$ Ⓒ $3° > 2° > 1° > NH_3$ Ⓓ $NH_3 > 1° > 1° > 3°$

37. The amine that does not react with acetyl chloride is:

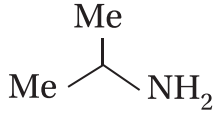
Ⓐ CH_3NH_2 Ⓑ $(CH_3)_2NH$ Ⓒ $(CH_3)_3N$ Ⓓ $C_2H_5NH_2$

38. An amine C_3H_9N reacts with benzene sulphonyl chloride to form a white precipitate which is insoluble in aqueous NaOH. The amine is:

Ⓐ 

Ⓑ 

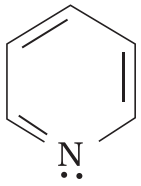
Ⓒ 

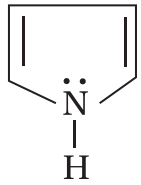
Ⓓ 

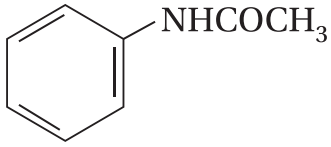
39. The product formed by the reaction of acetamide with bromide in presence of NaOH is:

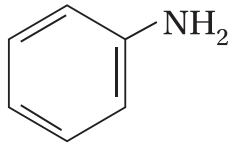
Ⓐ CH_3CN Ⓑ CH_3CHO Ⓒ CH_3CH_2OH Ⓓ CH_3NH_2

40. Which one of the following has the most nucleophilic nitrogen?

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

41. Propene takes part in oxymercuration demercuration reaction. Correct statement about the product is

Ⓐ Compound is optically active

Ⓑ It is a secondary alcohol

Ⓒ It is less soluble than its positional isomer

Ⓓ After oxidation reaction, it forms an aldehyde

42. Which is true for lead storage battery ?

Ⓐ At the time of discharging, Pb is reduced and PbO_2 is oxidised

Ⓑ At the time of charging, H_2SO_4 is reduced and PbO_2 is produced

Ⓒ At the time of charging, Pb is formed and H_2SO_4 is reduced

Ⓓ H_2SO_4 suffers neither oxidation nor reduction

Assertion Reason Type Question (43):

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

43. **Assertion :** KCl and NH_4Cl cannot be used in salt bridge of a cell containing Ag^+, Hg_2^{2+}, Tl^+ ions.

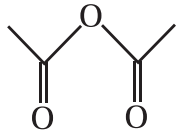
Reason : Cell will be destroyed due to precipitation of metal chlorides

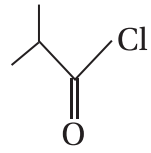
44. $CH_3CHO \xrightarrow{\text{dilute NaOH, } \Delta} A \xrightarrow[H_3O^+]{LiAlH_4} B \xrightarrow{\text{alkaline } KMnO_4} C \xrightarrow{NaOH,CaO,\ \Delta} D$

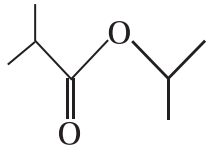
Compound 'D' is

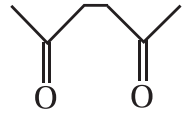
Ⓐ Propane Ⓑ Butane Ⓒ Propene Ⓓ Butene

45. Which is hydrolysed to the maximum extent ?

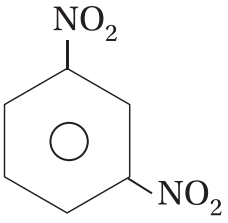
Ⓐ 

Ⓑ 

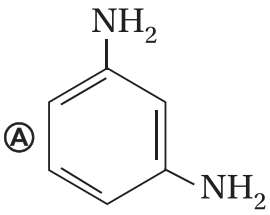
Ⓒ 

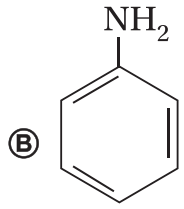
Ⓓ 

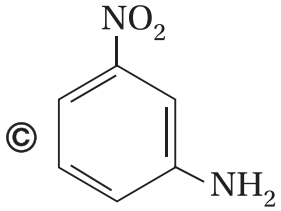
46. Write the product (P) obtained



$\xrightarrow{(NH_4)_2S}$ 'P' ; 'P' is

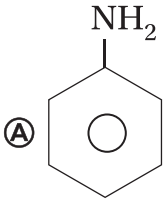
Ⓐ 

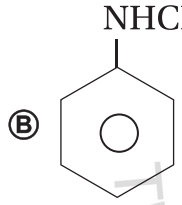
Ⓑ 

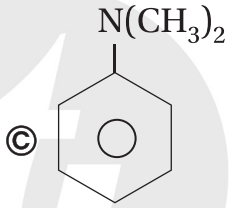
Ⓒ 

Ⓓ None of these

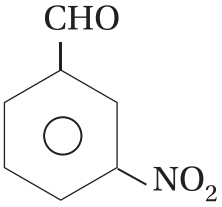
47. Which of the following give isocyanide test?

Ⓐ 

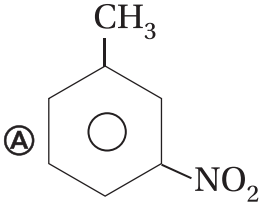
Ⓑ 

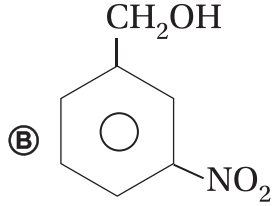
Ⓒ 

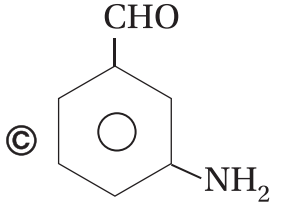
Ⓓ $(CH_3)_2NH$

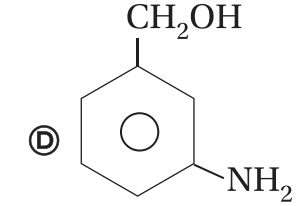
48. 

$\xrightarrow{SnCl_2/HCl}$ The product is:

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

49. The spin only magnetic moment value (in Bohr Magneton Units) of $Cr(CO)_5$ is:

Ⓐ 0 Ⓑ 2.84 Ⓒ 4.90 Ⓓ 5.92

50. As per I.U.P.A.C nomenclature, the name of the complex $[CO(H_2O)_4(NH_3)_2]Cl_3$ is:

Ⓐ Tetraaquadiaminecobalt(III) Chloride Ⓑ Tetraaquadiammucebalt(II) Chloride

Ⓒ Diaminetetraaquacobalt(II) Chloride Ⓓ Diamminetetraaquacobalt(III) chloride

Mathematics

51. The order and degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^2+\left(\frac{dy}{dx}\right)^3+y^4=0$ are respectively

Ⓐ 2, 2 Ⓑ 2, 1 Ⓒ 1, 2 Ⓓ 3, 2

52. If $\frac{dy}{dx}=e^{-2y}$ and $y=0$ when $x=5$, then the value of x for $y=3$ is

Ⓐ e^5 Ⓑ e^6+1 Ⓒ $\frac{e^6+9}{2}$ Ⓓ $\log_e 6$

53. The solution of the differential equation $\left(1+x^2\right)\frac{dy}{dx}+2xy=\cos x$ is

Ⓐ $y\left(1+x^2\right)=c+\cos x$ Ⓑ $y\left(1+x^2\right)=c+\sin x$

Ⓒ $y=x+c$ Ⓓ $y=\cos x+x^2$

54. If $\frac{dy}{dx}+\frac{2y}{x}=0$, $y(1)=1$, then $y(2)=$

Ⓐ $\frac{1}{4}$ Ⓑ 4 Ⓒ $-\frac{1}{2}$ Ⓓ $-\frac{1}{4}$

55. If the function f defined as

$$f(x)=\begin{cases}\frac{x^2-9}{x-3}, & x\neq 3\\ k, & x=3\end{cases}$$

is continuous at $x=3$, find the value of k.

Ⓐ 4 Ⓑ 6 Ⓒ 5 Ⓓ 3

56. The radius of an air bubble is increasing at the rate of 0.5 cm/sec. The rate by which the volume of the bubble is increasing when the radius is 1 cm is

Ⓐ π cm^3/sec. Ⓑ 3π cm^3/sec. Ⓒ 2π cm^3/sec. Ⓓ 4π cm^3/sec

57. $\int\frac{\cos 2x}{\cos x}dx$ is equal to

Ⓐ $2\sin x-\ln(\sec x+\tan x)+c$ Ⓑ $2\sin x-\ln(\sec x-\tan x)+c$

Ⓒ $2\sin x+\ln(\sec x+\tan x)+c$ Ⓓ None of these

■ **Assertion Reason based Questions (58–59):**

Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(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.

58. **Assertion (A)** : The order of differential equation of family of curves $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is 1.

Reason (R) : The number of arbitrary constant in the general solution of a differential equation of order n is always n.

Ⓐ a Ⓑ b Ⓒ c Ⓓ d

59. **Assertion (A)** : The general solution of the differential equation $\frac{y}{x}\frac{dy}{dx}=\frac{1+y^2}{1+x^2}$ is $(1+y^2)=A(1+x^2)$.

Reason (R) : $\int \frac{x}{1+x^2}dx=\frac{1}{2}\log\left|1+x^2\right|+c$.

Ⓐ a Ⓑ b Ⓒ c Ⓓ d

■ **Case Study Based Questions (60–62):**

If an equation is of the form $\frac{dy}{dx}+Py=Q$, where P, Q are functions of x, then such equation is known as linear differential equation. Its solution is given by $y\cdot(I.F.)=\int Q\cdot(I.F.)dx+c$, where $I.F.=e^{\int P dx}$.

Now, suppose the given equation is $(1+\sin x)\frac{dy}{dx}+y\cos x+x=0$.

Based on the above information, answer the following questions.

60. The value of P and Q respectively are

Ⓐ $\frac{\sin x}{1+\cos x}, \frac{x}{1+\sin x}$ Ⓑ $\frac{\cos x}{1+\sin x}, \frac{-x}{1+\sin x}$ Ⓒ $\frac{-\cos x}{1+\sin x}, \frac{x}{1+\sin x}$ Ⓓ $\frac{\cos x}{1+\sin x}, \frac{x}{1+\sin x}$

61. The value of I.F. is

Ⓐ $1-\sin x$ Ⓑ $\cos x$ Ⓒ $1+\sin x$ Ⓓ $1-\cos x$

62. Solution of given equation is

Ⓐ $y(1-\sin x)=x+c$ Ⓑ $y(1+\sin x)=-x^2+c$

Ⓒ $y(1-\sin x)=\frac{-x^2}{2}+c$ Ⓓ $y(1+\sin x)=\frac{-x^2}{2}+c$

63. $\int\frac{dx}{\tan x+\cot x}=$

Ⓐ $\frac{\cos 2x}{4}+c$ Ⓑ $\frac{\sin 2x}{4}+c$ Ⓒ $-\frac{\sin 2x}{4}+c$ Ⓓ $-\frac{\cos 2x}{4}+c$

64. If $f(x)=2x^3-9x^2+12x-6$, then in which interval $f(x)$ is monotonically increasing

Ⓐ $(1, 2)$ Ⓑ $(-\infty, 1)$ Ⓒ $(2, \infty)$ Ⓓ $(-\infty, 1)\cup(2, \infty)$

65. $\int_0^{\pi/4}\frac{x\cdot\sin x}{\cos^3 x}dx$ equals to

Ⓐ $\frac{\pi}{4}+\frac{1}{2}$ Ⓑ $\frac{\pi}{4}-\frac{1}{2}$ Ⓒ $\frac{\pi}{4}$ Ⓓ $\frac{\pi}{4}+1$

66. The function $f(x)=\log\left(x^2+\sqrt{x^2+1}\right)$ is

Ⓐ even function Ⓑ odd function Ⓒ both Ⓐ and Ⓑ Ⓓ none of these

67. The multiplicative inverse of $A=\begin{bmatrix}\cos\theta & -\sin\theta\\ \sin\theta & \cos\theta\end{bmatrix}$ is

Ⓐ $\begin{bmatrix}-\cos\theta & -\sin\theta\\ -\sin\theta & \cos\theta\end{bmatrix}$ Ⓑ $\begin{bmatrix}\cos\theta & \sin\theta\\ -\sin\theta & \cos\theta\end{bmatrix}$ Ⓒ $\begin{bmatrix}-\cos\theta & -\sin\theta\\ \sin\theta & -\cos\theta\end{bmatrix}$ Ⓓ $\begin{bmatrix}\cos\theta & \sin\theta\\ \sin\theta & -\cos\theta\end{bmatrix}$

68. If $f(x)=\begin{cases}mx+1, & \text{if } x\le\frac{\pi}{2}\\ \sin x+n, & \text{if } x>\frac{\pi}{2}\end{cases}$ is continuous at $x=\frac{\pi}{2}$, then

Ⓐ $m=1, n=0$ Ⓑ $m=\frac{n\pi}{2}+1$ Ⓒ $n=\frac{m\pi}{2}$ Ⓓ $m=n=\frac{\pi}{2}$

69. If $y=\cos^{-1}\left(\frac{2\cos x-3\sin x}{\sqrt{13}}\right)$, then $\frac{dy}{dx}$ is

Ⓐ zero Ⓑ constant = 1 Ⓒ constant ≠ 1 Ⓓ none of these

70. $\int \frac{1}{x(x^4-1)}dx =$

Ⓐ $\log\left(\frac{x^4}{x^4-1}\right)$ Ⓑ $\frac{1}{2}\log\left(\frac{x^2-1}{x^2+1}\right)$ Ⓒ $\frac{1}{4}\log\left(\frac{x^4-1}{x^4}\right)$ Ⓓ $\log\frac{x(x^2-1)}{x^2+1}$

71. 20 is divided into two parts so that product of cube of one quantity and square of the other quantity is maximum. The parts are

Ⓐ 10, 10 Ⓑ 16, 4 Ⓒ 6, 14 Ⓓ 12, 8

72. $\int \frac{dx}{4\sin^2 x + 5\cos^2 x} =$

Ⓐ $\frac{1}{\sqrt{5}}\tan^{-1}\left(\frac{2\tan x}{\sqrt{5}}\right)+c$ Ⓑ $\frac{1}{\sqrt{5}}\tan^{-1}\left(\frac{\tan x}{\sqrt{5}}\right)+c$

Ⓒ $\frac{1}{2\sqrt{5}}\tan^{-1}\left(\frac{2\tan x}{\sqrt{5}}\right)+c$ Ⓓ None of these

73. The value of the integral $\int_3^6 \frac{\sqrt{x}}{\sqrt{9-x}+\sqrt{x}}dx$ is

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

74. If $y = \sin^{-1}\left(\frac{x}{\sqrt{1+x^2}}\right)+\cos^{-1}\left(\frac{1}{\sqrt{1+x^2}}\right)$, the value of $\frac{dy}{dx}$ is

Ⓐ 0 Ⓑ 1 Ⓒ $\frac{2}{1+x^2}$ Ⓓ $\frac{4}{1+x^2}$

75. Find the general solution of the differential equation $y\frac{dy}{dx} = 5x^2 + 2$.

Ⓐ $10x^3 + 12x - 3y^2 + C = 0$ Ⓑ $12x - 3y^2 + C = 0$

Ⓒ $10x^3 + 12x - y^2 + C = 0$ Ⓓ $10x^2 - 3y^2 + C = 0$

76. The levels of biological organisation, ecology is concerned with, are—
Ⓐ Organisms Ⓑ Populations Ⓒ Communities Ⓓ All of these

77. Desert plants have sunken stomata to minimise the process of:
Ⓐ Respiration Ⓑ Photosynthesis Ⓒ Transpiration Ⓓ Excretion

78. People living in high altitudes compensate for the low oxygen in the air by
Ⓐ Increasing production of RBCs
Ⓑ Slowing down breathing rate
Ⓒ Going into a sleep-like state throughout winter
Ⓓ Increasing the count of platelets

79. The organisms tolerating high range of salinity are called
Ⓐ Euryhalines Ⓑ Stenohalines Ⓒ Osmoregulators Ⓓ Osmoconformers

80. Organisms that can be found flourishing in hot springs, where temperature reaches upto 100°C, are:
Ⓐ Ice fish Ⓑ Archaebacteria Ⓒ Eubacteria Ⓓ Fungi

81. Sex ratio is the number of females per _____ males of a population in a given time.
Ⓐ 10 Ⓑ 100 Ⓒ 1000 Ⓓ 10,000

82. Choose the incorrect statement:
Ⓐ Natality is the number of births during a given period of time.
Ⓑ Mortality decreases the population density.
Ⓒ Size of the population is not a static parameter.
Ⓓ Predation pressure has no effect on population growth.

Assertion-Reason type Questions (83–85):

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

A. Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.
B. Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.
C. Assertion is true but Reason is false.
D. Assertion is false but Reason is true.

83. **Assertion:** Leaf butterfly and stick insect show mimicry to dodge their enemies.
Reason: Mimicry is a method to acquire body colour blending with the surroundings.
Ⓐ A Ⓑ B Ⓒ C Ⓓ D

84. **Assertion:** Small sized animals are rarely found in polar regions.

Reason: Small sized animals have larger surface area relative to their volume and have to spend energy to generate body heat.

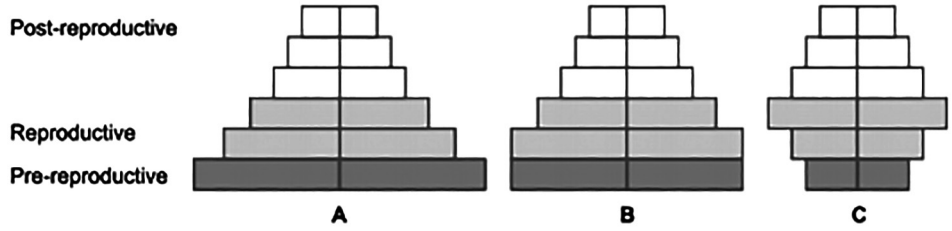
Ⓐ A Ⓑ B Ⓒ C Ⓓ D

85. **Assertion:** Epiphytes growing on branches of trees exhibit commensalism.

Reason: In commensalism, one organism benefits from the association, while the other has no effect.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

Case Study Based Question (86–87):



Study the three different age pyramids for human population given below and answer the questions that follow:

86. Pyramid A and Pyramid B, in order are:

Ⓐ A–Expanding pyramid; B–Stable pyramid

Ⓑ A–Stable pyramid; B–Expanding pyramid

Ⓒ A–Stable pyramid; B–Dynamic pyramid

Ⓓ A–Expanding pyramid; B–Declining pyramid

87. Which pyramid is identical for human population?

Ⓐ Pyramid A Ⓑ Pyramid B Ⓒ Pyramid C Ⓓ All the pyramids

88. What would be the growth rate pattern when the resources are limited?

Ⓐ Exponential Ⓑ Logarithmic Ⓒ Both Ⓐ and Ⓑ Ⓓ Transitional

89. *Cuscuta* is an example of:

Ⓐ Ectoparasite Ⓑ Blood parasite Ⓒ Predator Ⓓ Endoparasite

90. Which of the following is a partial root parasite?

Ⓐ Sandalwood Ⓑ Mistletoe Ⓒ *Orobanche* Ⓓ *Ganoderma*

91. Use of bioresources by multinational companies, without proper authorisation from the countries or people concerned, is called

Ⓐ Bioethics Ⓑ Biopatent Ⓒ Biopiracy Ⓓ Biological warfare

92. Analogous structures are a result of

Ⓐ Divergent evolution Ⓑ Convergent evolution

Ⓒ Shared ancestry Ⓓ Stabilising selection

93. Colostrum is rich in which antibody?

Ⓐ IgA Ⓑ IgG Ⓒ IgM Ⓓ IgE

94. Which part of the sperm is rich in mitochondria?

Ⓐ Head Ⓑ Neck Ⓒ Middle piece Ⓓ Tail

95. Amniotic fluid protects the foetus from

Ⓐ Shock Ⓑ Encystment Ⓒ Degeneration Ⓓ Disease

Assertion-Reason type Questions (96–98):

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

A. Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.

C. Assertion is true but Reason is false.

D. Assertion is false but Reason is true.

96. **Assertion:** Some species of insects and frogs are cryptically coloured.

Reason: The Monarch butterfly is highly distasteful to its predator.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

97. **Assertion:** Mango trees do not grow in Canada.

Reason: The levels of thermal tolerance of different species do not determine their geographical distribution.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

98. **Assertion:** Seals have a thick layer of fat under their skin, called blubber.

Reason: The blubber helps them tolerate the high salinity.

Ⓐ A Ⓑ B Ⓒ C Ⓓ D

99. The Mediterranean orchid *Ophrys* employs _____ to get pollination done by a species of bee

Ⓐ Diapause Ⓑ Parasitism Ⓒ Sexual deceit Ⓓ Camouflage

100. The human liver fluke, a parasite, depends on two intermediate hosts to complete its life cycle. They are

Ⓐ Man and snail Ⓑ Snake and snail Ⓒ Snail and fish Ⓓ None of these

Space For Rough Works

Space For Rough Works