

DET-2013(LA)

( For Admission into 3<sup>rd</sup> semester  
of 3 yrs of Diploma course )  
LA/CHEM & PHY (I)

**PART-I  
PHYSICS**

SET-CODE - 01

1. The SI unit of Gravitational constant  $G$  is
  - (A)  $\text{Nm kg}^{-1}$
  - (B)  $\text{Nm}^2 \text{kg}^{-1}$
  - (C)  $\text{Nm kg}^{-2}$
  - (D)  $\text{Nm}^2 \text{kg}^{-2}$
2. If a car at rest accelerates uniformly to a speed of 144 km/hour in 20 sec., it covers a distance of,
  - (A) 20 m
  - (B) 400 m
  - (C) 1440 m
  - (D) 2980 m
3. What is the dot product of two vectors of magnitude 3 and 5, if the angle between them is  $60^\circ$ ?
  - (A) 9.5
  - (B) 8.4
  - (C) 7.5
  - (D) 5.2
4. A javeline is thrown at an angle  $\theta$  with the horizontal and the range is maximum. The value of  $\tan \theta$  is
  - (A) 1
  - (B)  $\sqrt{3}$
  - (C)  $\frac{1}{\sqrt{3}}$
  - (D) 2

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( Space For Rough Work )

5. A weightlifter lifts a weight off the ground and holds it up.
- (A) Work is done in lifting as well as holding the weight.
- (B) No work is done in both lifting and holding the weight.
- (C) Work is done in lifting the weight, but no work is required to be done in holding it up.
- (D) No work is done in lifting the weight, but work is required to be done in holding it up.
6. The momentum of a body is numerically equal to its kinetic energy. The velocity of the particle will be,
- (A) 1 m/sec
- (B) 4 m/sec
- (C) 8 m/sec
- (D) 2 m/sec

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( Space For Rough Work )

7. Choose the false statement :

The acceleration due to gravity ( $g$ ) decreases if,

- (A) We go down from the surface of earth towards its centre.
- (B) We go up from the surface of the earth.
- ☒ (C) We go from equator towards the poles on the surface of the earth.
- (D) The rotational velocity of the earth is increased.

9. A metallic bar is heated from  $0^\circ\text{C}$  to  $100^\circ\text{C}$ . The coefficient of linear expansion is  $10^{-5}/^\circ\text{K}$ . What will be the percentage increase in length ?

- ☒ (A) 0.01%
- ☒ (B) 0.1%
- (C) 1%
- (D) 10%

8. If  $M_e$  and  $R_e$  be the mass and radius of earth, then the value of escape velocity is

- (A)  $\sqrt{\frac{GM_e}{R_e}}$
- ☒ (B)  $\sqrt{2\frac{GM_e}{R_e}}$
- (C)  $\sqrt{GM_e R_e}$
- (D)  $\sqrt{2 GM_e R_e}$

10. Which of the following causes more severe burns ?

- (A) Boiling water
- ☒ (B) Steam
- (C) Hot air
- (D) Sun rays

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( Space For Rough Work )

LA/CHEM & PHY (1)

11. A metallic rod is continuously heated at its two ends. The flow of heat through the rod does not depend upon

- (A) The area of cross-section of the rod
- (B) The mass of the rod
- (C) ☒ Time of heating
- (D) Temperature difference

13. Which of the following statement is correct ?

- (A) Both sound and light waves in air are longitudinal.
- (B) Both sound and light waves in air are transverse.
- (C) Sound waves in air are transverse while light waves are longitudinal.
- (D) ☒ Sound waves in air are longitudinal while light waves are transverse.

12. The time period of a simple pendulum is 2 sec. If its length is increased by 4 times, the time period becomes,

- (A) 4 sec
- (B) 6 sec
- (C) ☒ 8 sec
- (D) 2 sec

14. The refractive index of water with respect to air is  $\frac{4}{3}$  and the refractive index of glass with respect to air is  $\frac{3}{2}$ . What will be the refractive index of water with respect to glass ?

- (A)  $\frac{9}{8}$
- (B)  $\frac{8}{9}$
- (C)  $\frac{1}{2}$
- (D) 2

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( Space For Rough Work )

15. Optical fibres are based on

- ☒ (A) Total internal reflection
- (B) Less scattering
- (C) Refraction
- (D) Reflection

17. The capacitance of a parallel plate capacitor does not depend upon

- (A) Area of the plate
- ☒ (B) Medium between the plates
- (C) Distance between the plates
- (D) Metal of the plates

16. Two thin lenses are in contact and the focal length of the combination is 80 cm. If the focal length of one of the lenses is 20 cm, the power of the other lens is

- (A) 1.66 D
- (B) 4.00 D
- (C) -1.00 D
- ☒ (D) -3.75 D

$$\frac{1}{\text{focal length}_2} = \text{Power}$$

$$F = 80 \text{ cm} \Rightarrow P = \frac{1}{0.8 \text{ m}} = 1.25 \text{ D}$$

$$f_1 = 20 \text{ cm} \Rightarrow P = \frac{1}{0.2 \text{ m}} = 5 \text{ D}$$

$$P = P_1 + P_2$$

$$1.25 = 5 + P_2$$

$$P_2 = 5 - 1.25 = 3.75 \text{ D}$$

$$= -3.75 \text{ D}$$

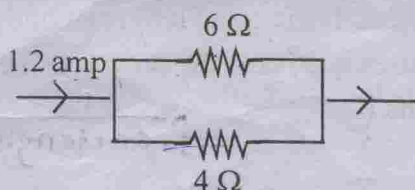
18. The resistivity of a wire depends on its

- (A) Length
- (B) Area of cross-section
- (C) Shape
- ☒ (D) Material

( Space For Rough Work )



19. In the figure given below, the current passing through  $6\ \Omega$  resistor is



- (A) 0.4 amp  
 (B) 0.48 amp  
 (C) 0.72 amp  
 (D) 0.8 amp

21. The magnetic field  $\vec{dB}$  due to a small current element  $\vec{dl}$  at a distance  $r$  and carrying current  $I$  is

(A)  $\vec{dB} = \frac{\mu_0}{4\pi} I \left( \frac{\vec{dl} \times \vec{r}}{r} \right)$

(B)  $\vec{dB} = \frac{\mu_0}{4\pi} I^2 \left( \frac{\vec{dl} \times \vec{r}}{r} \right)$

(C)  $\vec{dB} = \frac{\mu_0}{4\pi} I^2 \left( \frac{\vec{dl} \times \vec{r}}{r^2} \right)$

(D)  $\vec{dB} = \frac{\mu_0}{4\pi} I \left( \frac{\vec{dl} \times \vec{r}}{r^3} \right)$

20. How much electrical energy in kWh is consumed in operating ten number 50 watt bulbs for 10 hours per day in a month of 30 days.

- (A) 1500  
 (B) 15000  
 (C) 15  
 (D) 150

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

- (A) Charge  
 (B) Mass  
 (C) Momentum  
 (D) Energy

(Space For Rough Work)

19

$$\frac{1.2 \times 42}{10 \cdot 5} = \frac{2.4}{5} = 0.48$$

23. Control rods used in nuclear reactors are made of

- (A) Stainless steel
- (B) Graphite
- (C) Cadmium
- (D) Plutonium ✓

25. An atomic nucleus contains neutrons and protons. The sum of masses of the neutrons and protons in free space is

- ✓ (A) equal to the mass of nucleus
- (B) less than the mass of nucleus
- (C) greater than the mass of nucleus
- (D) sometimes less and sometimes more.

24.  $\gamma$ -rays passing through a strong uniform electric field get deflected :

- (A) in the direction of electric field
- ~~(B)~~ in the direction opposite to the electric field
- (C) in the direction perpendicular to the electric field

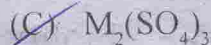
~~(D)~~ do not get deflected at all. (✓)  
 ( $\gamma$  rays are unaffected by an electric field.)  
Explanation  
 $\gamma$  rays are highly energetic waves with no charge associated with them, hence it is uncharged.

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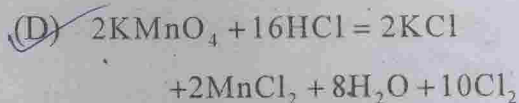
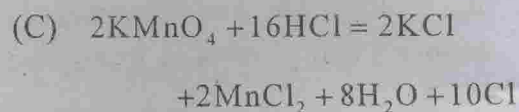
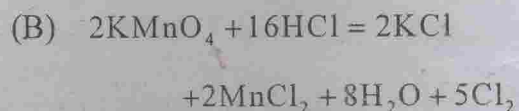
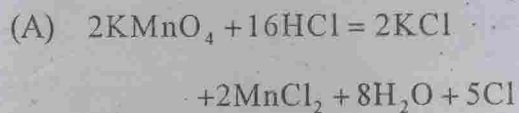
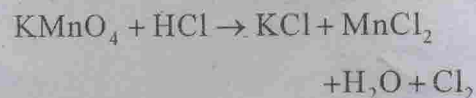
( Space For Rough Work )

PART—II  
CHEMISTRY

26. The formula of a metal nitride is MN.  
The formula of its sulphate is



27. Which one is the balanced form of the following chemical equation :



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( Space For Rough Work )



28. Which configuration is impossible ?

(A)  $3s^2$

(B)  $3p^5$

(C)  $2d^5$

☒ (D)  $4f^3$

30. M-shell can accommodate maximum

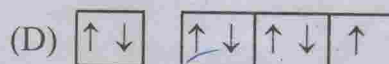
(A) 02 nos. of electrons

(B) 08 nos. of electrons

☒ (C) 18 nos. of electrons

(D) 32 nos. of electrons

29. The orbital diagram in which Aufbau's principle is violated is



31. Which of the following molecule is in linear shape ?

☒ (A)  $H_2O$

(B)  $H_2O_2$

☒ (C)  $CH_4$

(D)  $CO_2$

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( Space For Rough Work )

32. Ammonia molecule can form

- (A) ionic bond
- ☒ (B) covalent bond
- (C) co-ordinate bond
- (D) metallic bond

34. What is the equivalent mass of potassium carbonate ?

- (A) 49
- (B) 59
- ☒ (C) 69
- (D) 79

36. In electrolytic cell

- ☒ (A) Chemical energy is converted into electrical energy
- (B) Electrical energy is converted into chemical energy
- (C) Electrical energy is converted into light energy
- (D) Chemical energy is converted into light energy

33. Which of the following is a Lewis acid ?

- (A)  $\text{CaCl}_2$
- (B)  $\text{NaCl}$
- (C)  $\text{FeCl}_3$
- ☒ (D)  $\text{SiCl}_4$

35. pH values of basic solution will be

- ☒ (A) greater than 7
- (B) less than 7
- (C) equal to 7
- (D) equal to 6

37. The quantity of electricity which produces one gram equivalent of substance in Faraday's second law of electrolysis is

- ☒ (A) Farad
- (B) Volt
- (C) Ampere
- (D) Ohm

( Space For Rough Work )

$$\begin{aligned}
 \text{K}_2\text{CO}_3 &= 39 \times 2 + 12 + 48 \\
 &= \frac{138}{2} \\
 &= 69
 \end{aligned}$$

(Continued)

38. Limestone is a mineral of

- (A) Magnesium
- ☒ (B) Calcium
- (C) Sodium
- (D) Potassium

40. Cartridges are made from

- (A) Bronze
- ☒ (B) Brass
- (C) Bell metal
- (D) Nickel

42.  $\text{H}_2\text{C}=\text{CH}-$  group is known as

- (A) Vinyl
- (B) Propyl
- ☒ (C) Methyl
- (D) Ethyl

39. During extraction of metal which of the following method produces slag ?

- (A) Concentration
- (B) Calcination
- (C) Roasting
- ☒ (D) Smelting

41. In alkanes, carbon atoms are linked by

- ☒ (A) single covalent bond
- (B) double covalent bond
- (C) triple covalent bond
- (D) single ionic bond

43. In Ion-exchange method, the exhausted cation exchange resin will be regenerated by the treatment with

- (A) moderately concentrated acetic acid
- (B) moderately concentrated oxalic acid
- (C) moderately concentrated phosphoric acid
- ☒ (D) moderately concentrated sulphuric acid

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( Space For Rough Work )

44. Temporary hardness is due to presence of

- ☒ (A) soluble bicarbonates of Calcium and Magnesium
- (B) soluble carbonates of Calcium and Magnesium
- (C) soluble chlorides of Calcium and Magnesium
- (D) soluble sulphates of Calcium and Magnesium

46. Molybdenum disulphide is stable in presence of air up to

- ☒ (A) 400 °C
- (B) 600 °C
- (C) 800 °C
- (D) 1000 °C

45. In making lead pencils, which of the following is used ?

- (A) Boron trifluoride
- (B) Boron Nitride
- (C) Molybdenum Disulphide
- ☒ (D) Graphite

47. Calorific value of a fuel is the amount of heat energy released by complete combustion of

- (A) 10 kg of fuel
- (B) 10 gm of fuel
- ☒ (C) 1 gm of fuel
- (D) 1 kg of fuel

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( Space For Rough Work )

48. Combination of identical monomers form

- (A) copolymer
- ☒ (B) homopolymer
- (C) heteropolymer
- (D) polymer

49. Man is the receptor of CO gas which causes

- (A) Blindness
- ☒ (B) Cardiac arrest
- (C) Arthritis
- (D) Meningitis

50. Which of the following gas in atmosphere absorbs IR radiation ?

- (A) Oxygen
- (B) Hydrogen
- (C) Nitrogen
- ☒ (D) Carbon dioxide

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( Space For Rough Work )



**PART—III**  
**MATHEMATICS**

51. The value of the determinant

$$\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix} \text{ is}$$

- ✓ (A) 0 ✓  
(B) 1  
(C)  $a + b + c$   
(D)  $ab + bc + ca$

53. If  $A = \begin{bmatrix} 1 & -2 \\ 5 & 3 \end{bmatrix}$ , then  $A + A^T$  equals

- ✓ (A)  $\begin{bmatrix} 2 & 3 \\ 3 & 6 \end{bmatrix}$   
(B)  $\begin{bmatrix} 2 & -4 \\ 10 & 6 \end{bmatrix}$   
(C)  $\begin{bmatrix} 2 & 4 \\ -10 & 6 \end{bmatrix}$   
(D) None of these.

52. If  $K$  is a scalar and  $A$  is a  $n \times n$  square matrix, then  $|KA|$  is equal to

(A)  $K|A|^n$

(B)  $K|A|$

(C)  $K^n|A^n|$

✓ (D)  $K^n|A|$

54. If  $A = \begin{bmatrix} -5 & 2 \\ 1 & -3 \end{bmatrix}$ , then  $\text{adj. } A$  is equal to

✓ (A)  $\begin{bmatrix} -3 & -2 \\ -1 & -5 \end{bmatrix}$

(B)  $\begin{bmatrix} 3 & -2 \\ -1 & 5 \end{bmatrix}$

(C)  $\begin{bmatrix} 5 & 1 \\ 2 & 3 \end{bmatrix}$

(D)  $\begin{bmatrix} 3 & 2 \\ 1 & 5 \end{bmatrix}$

( Space For Rough Work )

55. The middle term in the expansion of

$$\left(x + \frac{1}{x}\right)^{10} \text{ is}$$

(A)  ${}^{10}C_5 \frac{1}{x}$

(B)  ${}^{10}C_5$

(C)  ${}^{10}C_6$

(D)  ${}^{10}C_7 x$

57. Find the values of  $x$  and  $y$  if

$$(1-i)x + (1+i)y = 1-3i$$

(A)  $x = -1, y = 2$

(B)  $x = 2, y = -1$

(C)  $x = 2, y = 2$

(D)  $x = 1, y = -1$

56. The no. of terms in the expansion of

$$\sqrt{(3x^2 + 2y^2)^{16}} \text{ is}$$

~~(A) 9~~

(B) 17

(C) 10

(D) 16

58. If  $1, \omega, \omega^2$  are imaginary cube-roots of unity, then the value of

$$(1-\omega+\omega^2)^7 + (1+\omega-\omega^2)^7 \text{ is}$$

~~(A) -128~~

(B) 218

~~(C) 128~~

(D) None of these.

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( Space For Rough Work )

59. Resolving into partial fraction if

$$\frac{3x+2}{(x-1)(x-2)(x-3)} = \frac{A}{x-1} + \frac{B}{x-2} + \frac{C}{x-3}$$

then the value of  $C$  is

(A)  $\frac{5}{2}$

(B)  $\frac{11}{2}$

(C)  $\frac{9}{2}$

(D) None of these.

61. The distance between the parallel lines

$$3x - 4y + 9 = 0 \text{ and } 6x - 8y - 15 = 0 \text{ is}$$

(A)  $\frac{33}{10}$

(B)  $\frac{10}{33}$

(C)  $\frac{9}{15}$

(D)  $\frac{15}{9}$

60. The equation of a straight line which passes through the point  $(0, 1)$  and has an inclination  $45^\circ$  with  $X$ -axis is

(A)  $x + y + 1 = 0$

(B)  $x - y - 1 = 0$

(C)  $y - x - 1 = 0$

(D) None of these.

62. If  $p$  be the length of the perpendicular from the origin on the line whose intercepts on the co-ordinate axes are  $a$  and  $b$ , then it satisfies the equation is

(A)  $p = \sqrt{a^2 + b^2}$

(B)  $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$

(C)  $p = \frac{1}{\sqrt{a^2 + b^2}}$

(D) None of these.

( Space For Rough Work )

$$x^2 + y^2 + 2gx + 2fy + c = 0$$

63. The radius of the circle

$$x^2 + y^2 - 2x + 4y + 1 = 0$$
 is

(A) 1

(B) 4

(C) 2

(D)  $\sqrt{19}$ 

64. The equation of the circle which passes through the points (0, 1), (1, 0) and (2, 1) is

~~(A)  $x^2 + y^2 - 2x - 2y + 1 = 0$~~

~~(B)  $x^2 - y^2 + 2x - 2y - 1 = 0$~~

~~(C)  $x^2 + y^2 + 2x + 2y - 1 = 0$~~

(D) None of these.

65. The projection of the line segment (1, 3, -1) and (3, 2, 4) on Z-axis is

(A) 1

(B) 3

(C) 4

(D) 5

66. If a line makes angles  $\alpha$ ,  $\beta$ ,  $\gamma$  with X, Y and Z-axis respectively, then the value of  $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma$  is

(A) 1

(B) 2

(C) 0

(D) None of these.

(Space For Rough Work)

$$(63) \quad x^2 + y^2 + 2gx + 2fy + c = 0$$

$$r = \sqrt{g^2 + f^2 - c}$$

$$g = -1, f = 2, c = 1$$

$$r = \sqrt{(-1)^2 + (2)^2 - 1} = \sqrt{1 + 4 - 1} = \sqrt{4} = 2$$

67. The angle between the lines whose direction ratios are  $(2, 3, 4)$  and  $(1, -2, 1)$  is

(A)  $\frac{\pi}{2}$  ✓

(B)  $\frac{\pi}{4}$

(C)  $\frac{\pi}{3}$

~~(D)  $\pi$~~

69. The equation of a plane perpendicular to Z-axis and passing through the point  $(1, -2, 4)$  is

(A)  $x = 1$

(B)  $y + 2 = 0$

✓ (C)  $z - 4 = 0$

(D)  $x + y + z - 3 = 0$

68. If two planes  $A_1x + B_1y + C_1z + D_1 = 0$  and  $A_2x + B_2y + C_2z + D_2 = 0$  are parallel, then it satisfies the condition is

(A)  $\frac{A_1}{A_2} \neq \frac{B_1}{B_2}$

~~(B)  $\frac{A_1}{A_2} = \frac{B_1}{B_2} = \frac{C_1}{C_2}$~~

~~(C)  $\frac{A_1}{A_2} = \frac{B_1}{B_2} \neq \frac{C_1}{C_2}$~~

(D) None of these.

70. If  $\cos \theta = -\frac{1}{2}$  and  $\pi < \theta < \frac{3\pi}{2}$ , then the value of  $4 \tan^2 \theta - 3 \operatorname{cosec}^2 \theta$  is

✓ (A) 8

(B) -10

(C) -8

(D) 10

( Space For Rough Work )



71. The value of  $\frac{\cos 15^\circ - \sin 15^\circ}{\cos 15^\circ + \sin 15^\circ}$  is

(A)  $\frac{1}{\sqrt{2}}$

(B)  $\sqrt{3}$

☒ (C)  $\frac{1}{\sqrt{3}}$

(D)  $\frac{1}{2}$

72. The principal solution of the equation

$$\cos^2 \theta + \sin \theta + 1 = 0 \text{ is}$$

(A)  $\frac{2\pi}{3}$

☒ (B)  $\frac{3\pi}{2}$

(C)  $\frac{5\pi}{2}$

(D)  $\frac{\pi}{3}$

73. The general solution of the equation  $\tan ax = \tan bx$  is

(A)  $\frac{\pi \left( n + \frac{1}{2} \right)}{a+b}$

(B)  $\frac{n\pi}{a+b}$

(C)  $n\pi - (a+b)$

☒ (D) None of these. ✓

74. In any triangle  $ABC$ , if  $A : B : C = 1 : 2 : 3$  then  $\sin A : \sin B : \sin C$  is

(A)  $2:1:\sqrt{3}$

(B)  $1:\sqrt{2}:3$

☒ (C)  $1:\sqrt{3}:2$

(D)  $\sqrt{3}:1:2$

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( Space For Rough Work )

75. In triangle  $ABC$  if

$$\frac{\cos A}{a} = \frac{\cos B}{b} = \frac{\cos C}{c}$$

then the triangle is

(A) equilateral

(B) isosceles

(C) scalene

(D) right angle

76.  $\lim_{x \rightarrow \infty} \frac{5x-6}{\sqrt{4x^2+9}}$  is equal to

(A)  $\frac{5}{4}$

(B)  $\frac{5}{2}$

(C)  $\frac{5}{9}$

(D)  $-\frac{1}{2}$

77. The value of  $\lim_{x \rightarrow 0} \left(1 + \frac{x}{2}\right)^{\frac{1}{x}}$  is

(A)  $e^{\frac{1}{2}}$

(B)  $e^2$

(C)  $e$

(D)  $\frac{1}{2}$

78. The value of  $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2}$  is

(A)  $\frac{1}{4}$

(B)  $\frac{1}{2}$

(C) 1

(D) None of these.

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( Space For Rough Work )

79. For what value of  $k$  the function given

by  $f(x) = \begin{cases} kx^2, & \text{if } x > 2 \\ 3, & \text{if } x \leq 2 \end{cases}$  is continuous

at  $x = 2$

(A) 3

(B)  $\frac{4}{3}$

(C) 4

(D)  $\frac{3}{4}$

80. If  $y = \sqrt{1 + \sin 2x}$ , then  $\frac{dy}{dx}$  is

(A)  $\sin x - \cos x$

(B)  $\sin x + \cos x$

(C)  $\cos x - \sin x$

(D) None of these.

81. If  $y = \tan^{-1}\left(\frac{1+x^2}{1-x^2}\right)$ , then  $\frac{dy}{dx}$  is

(A)  $\frac{-1}{1+x^4}$

(B)  $\frac{2x}{1+x^4}$

(C)  $\frac{1}{1-x^4}$

(D) None of these.

82. If  $y = x^x$ , then  $\frac{dy}{dx}$  is

(A)  $(1 + \log x)$

(B)  $\frac{1}{\log x - 1}$

(C)  $x^x(1 + \log x)$

(D) None of these.

(Space For Rough Work)

80

~~$y = 1 + \sin$~~   
 $y = x^x$

taking log both the sides

$\log y = \log x^x = x \cdot \log x$

$\frac{dy}{y} = \frac{dx}{x} + \log x$

(21)

~~$\frac{dy}{y} = \frac{dx}{x} + \log x$~~

$\frac{dy}{y} = \frac{1}{x} + \log x$

(Continued)

$\frac{dy}{dx} = y \left( \frac{1}{x} + \log x \right)$

LA/MATH (1)

83. If  $x^y = y^x$ , then  $\frac{dy}{dx}$  is

(A)  $\frac{\ln y + \frac{y}{x}}{y^2}$

☒ (B)  $\frac{\ln y - \frac{y}{x}}{\ln x - \frac{x}{y}}$

(C)  $\frac{1 + \frac{y}{x}}{1 - \frac{y}{x}}$

(D) None of these.

84. If  $u = t^2$ , and  $v = \sin t^2$ , then  $\frac{dv}{du}$  is

(A)  $\cos^2 t$

☒ (B)  $2t \cos t^2$

(C)  $\frac{\cos^2 t}{2t}$

(D)  $\cos t^2$

85. If  $f(x) = x^3 - 6x^2 + 9x + 7$ , then the local minimum value of  $f(x)$  is

☒ (A) 7

(B) 11

(C) 6

(D) -7

86.  $\int \sin\left(a + \frac{x}{b}\right) dx$  is equal to

(A)  $\cos\left(a + \frac{x}{b}\right) + c$

☒ (B)  $-b \cos\left(a + \frac{x}{b}\right) + c$

(C)  $-b \sin\left(a + \frac{x}{b}\right) + c$

(D)  $\frac{1}{b} \cos\left(a + \frac{x}{b}\right) + c$

(Space For Rough Work)

83

$$\begin{aligned}
 x^y &= y^x \\
 \ln x^y &= \ln y^x \\
 \Rightarrow y \cdot \frac{1}{x} \cdot \frac{dx}{x} &= x \cdot \frac{1}{y} \cdot \frac{dy}{y} + \ln y \\
 \ln x \frac{dy}{dx} + y + \frac{1}{x} &= x \cdot \frac{1}{y} \cdot \frac{dy}{y} + \ln y \\
 \frac{dy}{dx} \left[ \ln x - \frac{x}{y} \right] &= \ln y - \frac{y}{x} \\
 \frac{dy}{dx} &= \frac{\ln y - \frac{y}{x}}{\ln x - \frac{x}{y}}
 \end{aligned}$$

(22)

(Turn Over)



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

(A)  $\ln(e^x + 1) + c$  ✓

(B)  $\ln(e^{-x} + 1) + c$

(C)  $\ln(e^x + e^{-x}) + c$

(D) None of these.

88. If  $\int x \sin x dx = -x \cos x + A$ , then  $A$  is equal to

(A)  $\cos x + \text{constant}$

~~(B) constant~~

~~(C)  $\sin x + \text{constant}$~~  ✓

(D) None of these.

89.  $\int e^x [f(x) + f'(x)] dx$  is equal to

~~(A)  $e^x f(x) + c$~~

(B)  $e^x f'(x) + c$

(C)  $e^x [f(x) + f'(x)] + c$

(D) None of these.

90.  $\int \frac{3x-1}{(x-1)(x+1)} dx$  is equal to

(A)  $\log[(x-1)(x+1)] + c$

(B)  $\frac{1}{x-1} + \frac{1}{x+1} + c$

(C)  $\frac{3}{x-1} + \frac{2}{x+1} + c$

~~(D) None of these.~~ ✓

(Space For Rough Work)

87  $1 + e^{-x} - e^{-x}$   
 $x = \int \frac{e^{-x}}{1+e^{-x}} dx$

$x(-\cos x) - \int x(-\cos x) \cdot dx$   
 $x + \log(1+e^{-x})$

(23)

90  $\frac{A}{x-1} + \frac{B}{x+1}$   
 $A(x+1) + B(x-1) = 3x-1$   
 $Ax + A + Bx - B = 3x-1$   
 $A+B = 3$   
 $A-B = -1$   
 $A = 1, B = 2$   
 $\log(x-1) + 2 \log(x+1)$

(Continued)



91. The value of the integral

$$\int_0^{\pi} |\cos x| dx \text{ is}$$

(A) 1

(B) 2 ✓

~~(C) 0~~

(D) -1

92. The area under the curve  $y = 2\sqrt{x}$ , included between the line  $x = 0$ ,  $x = 1$  and X-axis is(A)  $\frac{1}{4}$  sq. units(B)  $\frac{1}{2\sqrt{2}}$  sq. units(C)  $\frac{3}{4}$  sq. units(D)  $\frac{4}{3}$  sq. units ✓

93. The order and degree of the differential

$$\text{equation } \left[ 1 + \left( \frac{dy}{dx} \right)^2 \right]^{\frac{3}{2}} = 5 \frac{d^2y}{dx^2} \text{ is}$$

~~(A) order 2, degree-2~~ ✓

(B) order 1, degree-3

~~(C) order 2, degree-3~~~~(D) order 2, degree-1~~ ✗

94. The integrating factor of the linear differential equation

$$\frac{dy}{dx} + \frac{2xy}{1+x^2} = \frac{4x}{1+x^2} \text{ is}$$

~~(A)  $1+x^2$~~  ✓(B)  $\frac{2x}{1+x^2}$ (C)  $4x$ ~~(D) None of these.~~ wrong

(Space For Rough Work)

(91)

$$\boxed{\sin x}^{\pi}$$

$$\sin \pi = 0$$

$$\log e = 1$$

(93)

order '2'  
degree '3'

(24)

$$\log (1+x^2)$$

$$= -1 + \dots$$

(94)

$$e^{\frac{2x}{1+x^2} dx}$$

D. None of them

(Turn Over)

95. The solution of the differential equation

$$\frac{dy}{dx} + \frac{\tan y}{\tan x} = 0 \text{ is}$$

(A)  $\tan y = \tan x + c$

(B)  $\tan y \cdot \tan x = c$

☒ (C)  $\sin y \cdot \sin x = c$  ✓

(D) None of these.

96. The differential equation

$$(ay^2 + x + x^8)dx + (y^8 - y + bxy)dy = 0$$

is said to be exact if

(A)  $b = a$

☒ (B)  $b = 2a$  ✓

(C)  $a = 1, b = 3$

(D)  $b \neq 2a$

97. If  $\vec{a}$  and  $\vec{b}$  are two unit vectors inclined at an angle  $\theta$ , such that  $\vec{a} + \vec{b}$  is a unit vector, then  $\theta$  is equal to

(A)  $\frac{\pi}{3}$

☒ (B)  $\frac{\pi}{4}$

☒ (C)  $\frac{\pi}{2}$

☒ (D)  $\frac{2\pi}{3}$  ✓

98. The value of  $\hat{i} \times (\hat{j} \times \hat{k})$  is

☒ (A)  $\vec{0}$

(B)  $\hat{i}$

(C)  $\hat{j}$

(D)  $\hat{k}$

---

( Space For Rough Work )

99. If  $z = \sin^{-1}\left(\frac{x}{y}\right)$ , then  $\frac{\partial z}{\partial y}$  is

(A)  $\frac{1}{\sqrt{x^2 - y^2}}$

(B)  $\frac{-x}{y\sqrt{y^2 - x^2}}$  ✓

(C)  $\frac{y}{\sqrt{y^2 - x^2}}$

(D)  $\frac{x}{\sqrt{y^2 - x^2}}$

100. If  $v = x^3 + axy^2$ , satisfies the equation

$$\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = 0, \text{ then the value of } a \text{ is}$$

(A) 3

(B) 6

(C) -3 ✓

(D) -6

---

( Space For Rough Work )

✓ **DIPLOMA ENTR**

**SET-1 (LA)**

Q.No.	Answer
1	D
2	B
3	C
4	A
5	C
6	D
7	C
8	B
9	B
10	C
11	B
12	A
13	D
14	B
15	A
16	D
17	D
18	D
19	B
20	D
21	D
22	D
23	C
24	D
25	C
26	C
27	B
28	C
29	B
30	C
31	D
32	C
33	D
34	C
35	A
36	B
37	A
38	B
39	D
40	B
41	A
42	A
43	D
44	A
45	D
46	A
47	C
48	B
49	B
50	D

✓ **DIPLOMA ENTR**

**SET-1**

Q.No.	Answer
51	A
52	D
53	A
54	A
55	C
56	A
57	B
58	C
59	B
60	C
61	A
62	B
63	C
64	A
65	D
66	B
67	A
68	B
69	C
70	A
71	C
72	B
73	A
74	C
75	A
76	B
77	A
78	B
79	D
80	C
81	B
82	C
83	B
84	D
85	A
86	B
87	A
88	C
89	A
90	A
91	B
92	D
93	A
94	A
95	C
96	B
97	D
98	A
99	B
100	C