

FINAL ANSWER KEY

Question Paper Code: 14/2025/OL

Exam:KEAM 2025 ENGG-5

Date of Test: 28-04-2025

- Let $A = \{x : x \text{ is a positive multiple of 2 less than 36}\}$,
1. $B = \{x : x \text{ is a positive multiple of 3 greater than 16}\}$, and
 $C = \{x : x \text{ is a positive multiple of 4 less than 42}\}$. Then $(A \cap B) \cap C =$
- A) $\{12, 24, 36\}$
 - B) $\{12, 24\}$
 - C) $\{24\}$
 - D) $\{24, 36\}$
 - E) ϕ

Correct Answer : Option C

2. If $n(A) = 8$, then the number of subsets of A which contain 2 or 6 elements is
- A) 24
 - B) 28
 - C) 48
 - D) 56
 - E) 216

Correct Answer : Option D

3. If $f(x) = [2x]$, where $[x]$ denotes the greatest integer function in x , then the image of $\{-2.3, 2.9\}$ is
- A) $\{-5, 3\}$
 - B) $\{-5, 5\}$
 - C) $\{-4, 5\}$
 - D) $\{-3, 2\}$
 - E) $\{-4, 6\}$

Correct Answer : Option B

4. If $f(x) = ax + bx^2$ then the co-efficient of x^3 in $f(f(x))$ is
- A) 0
 - B) ab
 - C) a^3
 - D) ab^2
 - E) $2ab^2$

Correct Answer : Option E

5. If $z = 1 + i \tan \theta$, where $\pi < \theta < \frac{3\pi}{2}$, then $|z|$ is equal to
- A) $1 + \tan \theta$
 - B) $2 \tan \theta$
 - C) $\sec \theta$
 - D) $-\sec \theta$
 - E) $\operatorname{cosec} \theta$

Correct Answer : Option D

6. If $z = \frac{3+i}{2-i}$ then z^{-1} is equal to
- A) $1 + i$
 - B) $\frac{1+i}{2}$
 - C) $\frac{1-i}{2}$
 - D) $2(1 - i)$
 - E) $1 - i$

Correct Answer : Option C

7. If z is a complex number, then the minimum value of $|z - 2| + |z - 4|$ is
- A) $\sqrt{20}$
 - B) 4
 - C) 6
 - D) $\sqrt{6}$
 - E) 2

Correct Answer : Option E

8. The point $z = \frac{1}{\sqrt{2}}(1 + i)$ in the complex plane is rotated about the origin through an angle $\frac{\pi}{4}$ in the clockwise direction, then the new position of z is
- A) 2
 - B) 1
 - C) $\frac{1}{\sqrt{2}}(1 - i)$
 - D) $\frac{1}{2}(1 - i)$
 - E) $1 - i$

Correct Answer : Option B

9. If the numbers $x, 6, y, 54, 162$ are in geometric progression, then $\frac{y}{x}$ is equal to

- A) 3
- B) 6
- C) 9
- D) 12
- E) 18

Correct Answer : Option C

10. If 1, $a, b, c, 16$ are in geometric progression, then $\sqrt[3]{abc}$ is equal to

- A) 1
- B) 2
- C) 6
- D) 4
- E) 8

Correct Answer : Option D

11. The sum of the geometric series $\sqrt{3} + \sqrt{12} + \sqrt{48} + \dots$ up to 10 terms is

- A) $1023\sqrt{3}$
- B) $1024\sqrt{3}$
- C) $511\sqrt{3}$
- D) $512\sqrt{3}$
- E) $215\sqrt{3}$

Correct Answer : Option A

12. The sum and difference of the arithmetic mean and the geometric mean of two positive integers are respectively, 18 and 8. Then the values of the two numbers are

- A) 12 and 24
- B) 2 and 24
- C) 6 and 20
- D) 8 and 18
- E) 1 and 25

Correct Answer : Option E

13. The coefficient of x^5 in the binomial expansion of $\left(\sqrt{x} + \frac{1}{x}\right)^{10}$ is

- A) 55
- B) 10
- C) 45
- D) 135
- E) 1

Correct Answer : Option E

14. Four digit numbers are formed using 0, 3, 4, 5, 9, 8 without repetitions. Then the number of such 4 digits numbers is
- A) 270
 - B) 300
 - C) 320
 - D) 400
 - E) 450

Correct Answer : Option B

15. A bag contains 5 red balls, 4 black balls, and 3 white balls. Then the number of ways of selecting three balls at random that contains at least one white ball is
- A) 220
 - B) 210
 - C) 180
 - D) 136
 - E) 74

Correct Answer : Option D

16. Four fair dices are rolled. Then the number of ways in which the sum of upper faces of four dices can be six, is
- A) 4
 - B) 10
 - C) 15
 - D) 24
 - E) 36

Correct Answer : Option B

17. $2 + {}^{15}C_1 + {}^{15}C_2 + \dots + {}^{15}C_{14} =$
- A) 2^{14}
 - B) 2^{15}
 - C) 2^{16}
 - D) 2^{10}
 - E) 2^{18}

Correct Answer : Option B

18. If $\begin{vmatrix} a & 1 & 1 \\ 1 & b & 1 \\ 1 & 1 & c \end{vmatrix} = 2$, where a, b and c are positive integers, then $a+b+c$ is equal to
- A) 6
 - B) 8
 - C) 12

- D) 18
- E) 28

Correct Answer : Option A

19. Let $\Delta = \begin{vmatrix} x & y & 1 \\ x+y & y+1 & x+1 \\ 1 & x & y \end{vmatrix}$. If $x+y=-1$, then the value of Δ is equal to

- A) 3
- B) 2
- C) 1
- D) 0
- E) -3

Correct Answer : Option D

20. If $A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 2 & 1 \\ 0 & 0 & -2 \end{bmatrix}$ then $|adj(adjA)|$ is equal to

- A) 16
- B) 256
- C) 128
- D) -256
- E) -16

Correct Answer : Option B

If the following system of linear equations

21. $x - 2y + z = 5$
 $2x - y + 2z = 7$
 $x + 2y + \lambda z = 5$ has a unique solution, then $\lambda \neq$

- A) 1
- B) -1
- C) 2
- D) -2
- E) 0

Correct Answer : Option A

22. If $\frac{x+1}{x-1} < 2$, then x lies in the interval

- A) $(-\infty, -3) \cup (1, \infty)$
- B) $(-\infty, -1) \cup (3, \infty)$
- C) $(-\infty, 1) \cup (3, \infty)$
- D) $(-3, -1)$

E) (1,3)

Correct Answer : Option C

23. The solution set of inequality $|x + 2| < 3$ is

- A) $-1 < x < 5$
- B) $-5 < x < 1$
- C) $-1 < x < 3$
- D) $1 < x < 3$
- E) $-1 < x < 1$

Correct Answer : Option B

24. If $\tan(x - y) = \frac{4}{5}$, $\tan(x + y) = \frac{6}{5}$ and $0 < x, y < \frac{\pi}{4}$, then $\tan 2x$ is

- A) 62
- B) 60
- C) 54
- D) 50
- E) 55

Correct Answer : Option D

25. The value of $\tan \frac{\pi}{12} + \tan \frac{\pi}{6} + (\tan \frac{\pi}{12} \tan \frac{\pi}{6})$ is equal to

- A) 1
- B) 2
- C) $\sqrt{3}$
- D) $-\sqrt{3}$
- E) -1

Correct Answer : Option A

26. The period of the function $f(x) = 2\sin 4x + 3\cos 2x$ is

- A) $\frac{\pi}{2}$
- B) π
- C) $\frac{3\pi}{2}$
- D) 2π
- E) 3π

Correct Answer : Option B

27. $\frac{1 - \cos 2x}{1 + \cos 2x} - \sec^2 x =$

- A) 1

- B) $\tan 2x$
- C) $\sec 2x$
- D) 0
- E) -1

Correct Answer : Option E

28. If $\theta \in \left[\frac{\pi}{2}, \frac{3\pi}{2} \right]$, then $\sin^{-1}(\sin \theta)$ is equal to

- A) θ
- B) $\theta - \pi$
- C) $\theta - \frac{\pi}{2}$
- D) $\pi - \theta$
- E) $\theta + \frac{\pi}{2}$

Correct Answer : Option D

29. If $\cos^{-1}x + \cos^{-1}y + \cos^{-1}z = 3\pi$, then $(x + y + z)$ is equal to

- A) 1
- B) 3
- C) 4
- D) -3
- E) $\frac{1}{8}$

Correct Answer : Option D

30. If $\sin^{-1}x + \sin^{-1}y = \frac{2\pi}{3}$, then $\cos^{-1}x + \cos^{-1}y$ is equal to

- A) $-\frac{\pi}{2}$
- B) $\frac{\pi}{2}$
- C) π
- D) $\frac{2\pi}{3}$
- E) $\frac{\pi}{3}$

Correct Answer : Option E

31. If the line joining of two points (1, 0) and (4, 3) is rotated about the point (1, 0) in counter clockwise direction through an angle 15° , then the equation of the line in the new position is

- A) $\sqrt{3}x - 2y - \sqrt{3} = 0$
- B) $\sqrt{3}x - y - \sqrt{3} = 0$

- c) $x + y - 1 = 0$
- d) $x + \sqrt{3}y - 1 = 0$
- e) $3x - y - 3 = 0$

Correct Answer : Option B

- 32.** The point with integral coordinates on the line $x + y = 1$, that lie at a distance 2 units from the line $5x + 12y = 0$, is
- A) (-7,8)
 - B) (-1,2)
 - C) (-12,13)
 - D) (-2,3)
 - E) (-3,4)

Correct Answer : Option D

- 33.** If the normal form of the equation of a straight line $x + \sqrt{3}y = 2\sqrt{3}$ is $x \cos \alpha + y \sin \alpha = p$ then the values of α and p are respectively
- A) $\frac{\pi}{6}$ and $\sqrt{6}$
 - B) $\frac{\pi}{3}$ and $\sqrt{6}$
 - C) $\frac{\pi}{3}$ and $\sqrt{3}$
 - D) $\frac{\pi}{6}$ and $\sqrt{3}$
 - E) $\frac{\pi}{4}$ and $\sqrt{6}$

Correct Answer : Option C

- 34.** If the two circles $(x - 2)^2 + (y - 3)^2 = 9$ and $(x - 2)^2 + (y + 3)^2 = a^2$ intersect in two distinct points, then
- A) $1 < a < 6$
 - B) $1 < a < 7$
 - C) $3 < a < 7$
 - D) $3 < a < 4$
 - E) $3 < a < 9$

Correct Answer : Option E

- 35.** If one end of the latus rectum of the parabola $y^2 = 16x$ is (4,8), then the coordinates of the other end of the latus rectum, are
- A) (4,-16)
 - B) (4,10)
 - C) (4,-10)

- D) (4,16)
- E) (4,-8)

Correct Answer : Option E

36. If the length of the latus rectum of an ellipse is one-fourth of the major axis, then the eccentricity of the ellipse is

- A) $\frac{\sqrt{3}}{2}$
- B) $\frac{\sqrt{3}}{4}$
- C) $\frac{\sqrt{5}}{4}$
- D) $\frac{\sqrt{5}}{6}$
- E) $\frac{2}{3}$

Correct Answer : Option A

37. The distance between the foci of the hyperbola $x^2 - 4y^2 = 16$, is

- A) $2\sqrt{5}$
- B) $4\sqrt{5}$
- C) $4\sqrt{3}$
- D) $5\sqrt{3}$
- E) $5\sqrt{2}$

Correct Answer : Option B

38. The unit vector that bisects the angle between two vectors $2i + j + 2k$ and $i + 2j - 2k$ is

- A) $\frac{i+j-k}{\sqrt{3}}$
- B) $\frac{i-j}{\sqrt{2}}$
- C) $\frac{i+j+k}{\sqrt{3}}$
- D) $\frac{i-j+k}{\sqrt{3}}$
- E) $\frac{i+j}{\sqrt{2}}$

Correct Answer : Option E

39. Let \vec{a} and \vec{b} be two unit vectors, and θ be the angle between them. If $\vec{a}-\vec{b}$ is a unit vector, then θ is equal to

- A) $\frac{\pi}{3}$
- B) $\frac{\pi}{2}$
- C) $\frac{\pi}{4}$
- D) $\frac{2\pi}{3}$
- E) $\frac{\pi}{6}$

Correct Answer : Option A

40. If $\vec{a} = i + 2j - 2k$ and $\vec{b} = 2i + j + 2k$ then a unit vector perpendicular to $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ is
- A) $\frac{2i - 2j + k}{3}$
 - B) $\frac{2i - 2j - k}{3}$
 - C) $\frac{i + j + k}{\sqrt{3}}$
 - D) $\frac{i + 2j + 2k}{3}$
 - E) $\frac{i + j - k}{\sqrt{3}}$

Correct Answer : Option B

41. Let \vec{a} , \vec{b} and \vec{c} be the sides of a triangle ABC such that $\vec{BC} = \vec{a}$, $\vec{CA} = \vec{b}$ and $\vec{AB} = \vec{c}$. If $BC = AC = 3$ and $\vec{b} \cdot \vec{c} = -9$ then $\vec{a} \cdot \vec{b}$ is equal to
- A) 27
 - B) 9
 - C) $3\sqrt{3}$
 - D) 0
 - E) $-3\sqrt{3}$

Correct Answer : Option D

42. The equation of the straight line joining the points (1, 2, 3) and (3, 4, k) is $\frac{x-3}{1} = \frac{y-4}{1} = \frac{z-k}{5}$. Then the value of k is
- A) 4
 - B) 5
 - C) 7
 - D) 10

E) 13

Correct Answer : Option E

43. The projection of a line segment on the co-ordinate axes are 5, 6, 8 . Then the length of the line segment is

- A) 5
- B) $5\sqrt{5}$
- C) 6
- D) $6\sqrt{6}$
- E) $6\sqrt{5}$

Correct Answer : Option B

44. The shortest distance between the point (2, 3, 4) and the line $\frac{x-4}{-2} = \frac{y-4}{2} = \frac{z-6}{1}$ is

- A) 12
- B) 9
- C) 3
- D) $\sqrt{5}$
- E) $\sqrt{3}$

Correct Answer : Option C

45. If a point P with x -coordinate 7 lies on the line joining the points A (1, 2, 3) and B (4, 6, 8) then the coordinates of the point P are

- A) (7, 10, -13)
- B) (7, -10, 13)
- C) (7, 10, 12)
- D) (7, 10, 13)
- E) (7, 10, 15)

Correct Answer : Option D

46. If the point (3, 6, k) lie on the line $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3}$, then the value of k is

- A) 2
- B) 3
- C) 9
- D) -2
- E) -3

Correct Answer : Option C

47. The mean deviation from mean of the five numbers 2, 4, 6, 8, 10 is

- A) 2.4

- B) 3.6
- C) 4.8
- D) 6
- E) 0

Correct Answer : Option A

48. If the standard deviation of six numbers $x_1, x_2, x_3, x_4, x_5, x_6$ is 4, then the variance of $2x_1 + 3, 2x_2 + 3, 2x_3 + 3, 2x_4 + 3, 2x_5 + 3, 2x_6 + 3$ is

- A) 64
- B) 67
- C) 16
- D) 19
- E) 8

Correct Answer : Option A

49. A die is rolled once. If the die shows odd number, then the probability of getting other than 5 is

- A) $\frac{1}{6}$
- B) $\frac{5}{6}$
- C) $\frac{1}{3}$
- D) $\frac{2}{3}$
- E) $\frac{1}{5}$

Correct Answer : Option D

50. If $P(A) = 0.4$, and $P(B/A) = 0.9$, then $P(\overline{A \cap B})$ is equal to

- A) 0.36
- B) 0.6
- C) 0.64
- D) 0.44
- E) 0.24

Correct Answer : Option C

51. If $f(x) + 3f(1 - x) = x + 4$, then $f(x) =$

- A) $\frac{19 - 4x}{8}$
- B) $\frac{11 - 4x}{8}$
- C) $\frac{11 - 2x}{8}$

- D) $\frac{11-2x}{9}$
E) $\frac{11-4}{9}$

Correct Answer : Option B

52. If $f(x) = \sqrt{10-x}$, then $\lim_{x \rightarrow 1} \frac{f(x)-f(1)}{x-1}$ is equal to

- A) 3
B) $\frac{1}{3}$
C) $\frac{1}{6}$
D) $-\frac{1}{6}$
E) $\frac{3}{2}$

Correct Answer : Option D

53. The value of $\lim_{x \rightarrow 0} \frac{(x - \sin 2x)(2x - \sin x)}{x^2}$ is equal to

- A) 0
B) -2
C) 2
D) -1
E) $-\frac{3}{2}$

Correct Answer : Option D

54. The function $f(x) = \begin{cases} \frac{3x^2-12}{x-2}, & x \neq 2 \\ \lambda, & x = 2 \end{cases}$ is continuous for $x \in \mathbb{R}$, then the value of λ is

- A) 0
B) 4
C) 6
D) 8
E) 12

Correct Answer : Option E

55. The set of all points where the function $f(x) = \frac{x}{x^2-4}$, $x \in \mathbb{R}$, is discontinuous, is

- A) $\{0,2\}$
B) $\{0,4\}$
C) $\{0,-2,2\}$
D) $\{2,4\}$

E) $\{-2,2\}$

Correct Answer : Option E

56. If $(xe)^y - e^x = 0$, then $\frac{dy}{dx}$ at $x = 1$ is

A) 0

B) 2

C) $\frac{1}{2}$

D) $\frac{1}{4}$

E) 4

Correct Answer : Option A

57. If $y = \sin x \sin 2x$, and $t = \cos x$, then $\frac{dy}{dt}$ is

A) $2(3t^2 - 1)$

B) $1 - 3t^2$

C) $\frac{1}{2}(1 - 3t^2)$

D) $(3t^2 - 1)$

E) $2(1 - 3t^2)$

Correct Answer : Option E

58. If $y = \sin^{-1}(2x\sqrt{1-x^2})$, then $\frac{dy}{dx}$ at $x=0$ is

A) 0

B) 1

C) 2

D) $\frac{\sqrt{3}}{2}$

E) -1

Correct Answer : Option C

59. If $(f(x))^n = f(nx)$, then $\frac{f'(nx)}{f'(x)}$ is

A) $(f(x))^n$

B) $nf(nx)$

C) $\frac{f(nx)}{f(x)}$

D) $\frac{f((n-1)x)}{f(x)}$

E) $\frac{f(x)}{f(nx)}$

Correct Answer : Option C

60. If $x^3 = \sin\theta, y^3 = \cos\theta$, then $x \frac{dy}{dx}$ is

A) $\frac{y^5 - 1}{y^5}$

B) $\frac{y^6 - 1}{y^5}$

C) $\frac{y^6 - 1}{y^6}$

D) $\frac{y^3 - 1}{y^3}$

E) $\frac{y^2 - 1}{y^2}$

Correct Answer : Option B

61. If $y = (5x - 2)e^x$, then $\frac{d^2y}{dx^2}$ is equal to

A) $e^x(5x + 8)$

B) $e^x(5x - 3)$

C) $e^x(5x + 5)$

D) $e^x(5x + 3)$

E) $e^x(5x - 5)$

Correct Answer : Option A

62. If the function $f(x) = ax^3 - 9x^2 + 6ax + 6$ attains maximum at $x = 1$ and minimum at $x = 2$, then the value of a is

A) 6

B) 5

C) 4

D) 3

E) 2

Correct Answer : Option E

63. The function $f(x) = \sin\theta + \cos\theta, 0 \leq x \leq 2\pi$ is decreasing in the interval

A) $0 \leq x < \pi$

B) $0 \leq x \leq \frac{\pi}{4}$

C) $\frac{\pi}{4} \leq x \leq \frac{5\pi}{4}$

D) $\frac{5\pi}{4} \leq x \leq 2\pi$

E) $\frac{\pi}{2} \leq x \leq \frac{3\pi}{2}$

Correct Answer : Option C

64. If $x + y = 50$, then the maximum value of $\sqrt{4xy}$ is

A) 25

B) 50

C) 100

D) 625

E) 2500

Correct Answer : Option B

65. $\int \cot x(1 - \operatorname{cosec} x)e^x dx$ is

A) $e^x \cot x + C$

B) $-e^x \cot x + C$

C) $e^x \operatorname{cosec} x + C$

D) $-e^x \operatorname{cosec} x + C$

E) $e^x \operatorname{cosec} x \cot x + C$

Correct Answer:-Question Cancelled

66. $\int \frac{dx}{\cos^{2/3} x \sin^{4/3} x}$ is

A) $3\tan^3 x + C$

B) $3\tan^{1/3} x + C$

C) $-3\tan^{1/3} x + C$

D) $-3\tan^{-1/3} x + C$

E) $3\tan^{-1/3} x + C$

Correct Answer : Option D

67. $\int x(1-x)^{10} dx =$

A) $\frac{(1-x)^{12}}{12} - \frac{(1-x)^{11}}{11} + C$

B) $\frac{(1-x)^{12}}{12} + \frac{(1-x)^{11}}{11} + C$

C) $\frac{(1-x)^{11}}{11} - \frac{(1-x)^{10}}{10} + C$

D) $\frac{(1-x)^{12}}{12} + \frac{(1+x)^{11}}{11} + C$

E) $\frac{(1-x)^{12}}{12} - \frac{(1+x)^{11}}{11} + C$

Correct Answer : Option A

68. $\int \left(\frac{\sin 3x}{\sin x} - \frac{\cos 3x}{\cos x} \right) dx$ is equal to
- A) $2\cos 2x + C$
 - B) $-2\cos 2x + C$
 - C) $2\sin 2x + C$
 - D) $2x + C$
 - E) $x + C$

Correct Answer : Option D

69. $\int_0^1 \frac{\sin x}{\sin x + \sin(1-x)} dx$ is equal to
- A) 6
 - B) 4
 - C) 2
 - D) $\frac{1}{2}$
 - E) $\frac{1}{4}$

Correct Answer : Option D

70. $\int_0^{\pi/2} \sin 2x e^{\sin x} dx$ is equal to
- A) 4
 - B) 3
 - C) 2
 - D) 1
 - E) 0

Correct Answer : Option C

71. The value of $\int_1^3 [x-1] dx$, where $[x]$ denotes the greatest integer function in x , is equal to
- A) -2
 - B) -1
 - C) 0
 - D) 1
 - E) 2

Correct Answer : Option D

72. Area of the region bounded by the function $f(x) = \begin{cases} x & x \leq 3 \\ -x+6 & x > 3 \end{cases}$ with the x -axis (in square units) in the first quadrant is
- A) 18
 B) 9
 C) 6
 D) 3
 E) 4.5

Correct Answer : Option B

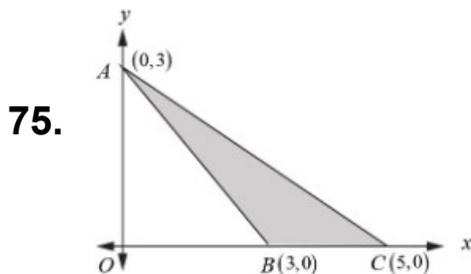
73. The general solution of the differential equation $ydx - xdy = y^2(xdy + ydx)$ is
- A) $\frac{y}{x} = xy + C$
 B) $\frac{x}{y^2} = xy + C$
 C) $\frac{y}{x^2} = xy + C$
 D) $x + y = xy + C$
 E) $\frac{x}{y} = xy + C$

Correct Answer : Option E

74. The solution of the linear differential equation $\frac{dy}{dx} + y = e^{-x}$, when $x = 0, y = 1$, is
- A) $ye^{-x} = x - 1$
 B) $ye^{-x} = e^x - 1$
 C) $ye^x = x + 1$
 D) $ye^{-x} = e^x + 1$
 E) $ye^x = x - 1$

Correct Answer : Option C

The shaded region ABC shown in the diagram is given by the inequalities



- A) $x + y \leq 3, 3x + 5y \geq 15, x \geq 0, y \geq 0.$
 B) $x + y \geq 3, 3x + 5y \leq 15, x \geq 0, y \geq 0.$
 C) $x + y \leq 3, 3x + 5y \leq 15, x \geq 0, y \geq 0.$
 D) $x + y \geq 3, 3x + 5y \geq 15, x \geq 0, y \geq 0.$
 E) $x + y \leq 3, 3x + 5y = 15, x \geq 0, y \geq 0.$

Correct Answer : Option B

- 76.** When a metallic sphere is heated, maximum percentage change will be observed in its
- A) volume
 - B) radius
 - C) diameter
 - D) surface area
 - E) mass

Correct Answer : Option A

- 77.** The dimensions of ratio of energy to Planck's constant are those of
- A) time
 - B) velocity
 - C) frequency
 - D) linear momentum
 - E) angular momentum

Correct Answer : Option C

- 78.** A garden roller of weight 100 kg is pulled with a force of 300 N acting at an angle of 30° with the ground. The effective pulling weight of the roller in (kg wt) is ($g = 10 \text{ ms}^{-2}$)
- A) 850
 - B) 725
 - C) 800
 - D) 820
 - E) 700

Correct Answer : Option A

- 79.** When a body starts from rest and moves with uniform acceleration, then its instantaneous displacement s is related to time t as
- A) $s \propto t^{-1}$
 - B) $s \propto t^{1/2}$
 - C) $s \propto t$
 - D) $s \propto t^2$
 - E) $s \propto t^{-2}$

Correct Answer : Option D

- 80.** A particle moving in a circular path, covers equal distances in equal intervals of time. Then the quantity associated with the particle that remains constant with time is
- A) displacement
 - B) velocity
 - C) speed

- D) acceleration
- E) linear momentum

Correct Answer : Option C

81. A body of mass 2 kg is moving with a velocity of 10 ms^{-1} . If a force of 50 N is applied on it for 10 s along its motion, the velocity of the body (in ms^{-1}) is

- A) 220
- B) 200
- C) 150
- D) 175
- E) 260

Correct Answer : Option E

82. A body of mass 5 kg collides with a wall with a speed of 50 ms^{-1} and rebounds with the same speed. If the time of contact of the body with the wall is $\frac{1}{20}$ s the force exerted on the wall is

- A) $0.5 \times 10^4 \text{ N}$
- B) $2.5 \times 10^4 \text{ N}$
- C) $2 \times 10^3 \text{ N}$
- D) $1 \times 10^4 \text{ N}$
- E) $4 \times 10^3 \text{ N}$

Correct Answer : Option D

83. Power of an engine driving a vehicle of mass m with a speed v on a horizontal road is (μ is the coefficient of friction between the road and the tyre)

- A) $\frac{mg}{\mu v}$
- B) μmgv
- C) μmgv^2
- D) $\frac{\mu mg}{v}$
- E) $\frac{\mu mv}{g}$

Correct Answer : Option B

84. In a perfectly inelastic head on collision

- A) kinetic energy is conserved
- B) total energy is not conserved
- C) linear momentum is not conserved

- D) two bodies move as one body after collision
- E) two bodies move separately in different directions

Correct Answer : Option D

- 85.** A rotating fly wheel with an initial angular speed of 4 rad s^{-1} has an angular acceleration of 2 rad s^{-2} . The angle (in radian) it will turn in a time of 4s from the start is
- A) 32
 - B) 16
 - C) 8
 - D) 64
 - E) 24

Correct Answer : Option A

- 86.** Radius of gyration of a uniform circular disc of radius R about its diameter is
- A) $\frac{R}{8}$
 - B) 2R
 - C) R
 - D) $\frac{R}{4}$
 - E) $\frac{R}{2}$

Correct Answer : Option E

- 87.** When two rigid bodies with moments of inertia I_1 and I_2 and angular velocities ω_1 and ω_2 respectively are coupled in such a way that their rotation axes coincide, the angular velocity of the combination is ω . Then
- A) $(I_1 \omega_1 + I_2 \omega_2) = (I_1 + I_2)\omega$
 - B) $I_1 \omega_1 - I_2 \omega_2 = (I_1 + I_2)\omega$
 - C) $I_1 I_2 \omega_1 \omega_2 = I_1 I_2 \omega$
 - D) $(I_1 + I_2)(\omega_1 + \omega_2) = (I_1 + I_2)\omega$
 - E) $\omega_1 + \omega_2 = \omega$

Correct Answer : Option A

- 88.** If K is the kinetic energy of a satellite at a height h from the surface of earth, then its total energy is
- A) -K
 - B) 2K
 - C) \sqrt{K}
 - D) $-\frac{K}{2}$

E) $-\frac{K}{4}$

Correct Answer : Option A

89. The force between two identical solid spheres each of radius r kept in contact is F . If the distance of their centres is made $4r$, then the force between them is

A) $\frac{F}{2}$

B) $\frac{F}{4}$

C) $\frac{F}{8}$

D) $\frac{F}{16}$

E) $\frac{F}{24}$

Correct Answer : Option B

90. Global warming leads to

- A) falling of sea level
- B) lowering of the average temperature of earth
- C) static weather pattern
- D) melting of ice caps at slower rate
- E) expansion of desert

Correct Answer : Option E

91. The specific heat capacity at constant volume C_v of a mole of an ideal gas is related to the gas constant R and the ratio of the specific heats γ as

A) $\frac{R}{\gamma - 1}$

B) $\frac{R\gamma}{1 - \gamma}$

C) $\frac{R(1 - \gamma)}{\gamma}$

D) $\frac{R}{(1 - \gamma)}$

E) $\frac{R}{(1 + \gamma)}$

Correct Answer : Option A

92. When a gas is compressed in an insulated vessel

- A) its internal energy decreases
- B) its temperature decreases
- C) both its pressure and volume increase
- D) both its temperature and volume increase

E) both its temperature and internal energy increase

Correct Answer : Option E

93. The statement, the total pressure of a mixture of ideal gases is the sum of partial pressures, is called as

- A) Boyle's law
- B) Charles' law
- C) Dalton's law
- D) Perfect gas law
- E) Law of equipartition

Correct Answer : Option C

94. If the temperature of a gas is changed to 9 times the initial value, then the *rms* velocity of the gaseous molecule increases by

- A) 9 times
- B) 3 times
- C) $\sqrt{3}$ times
- D) 18 times
- E) 12 times

Correct Answer : Option B

95. For an ideal gas at temperature T having the total number of molecules N , the product of the pressure and volume, PV is equal to (k_B is the Boltzmann constant)

- A) $2NT$
- B) $K_B NT$
- C) $K_B T \sqrt{N}$
- D) $K_B N \sqrt{T}$
- E) NT

Correct Answer : Option B

96. If the mean kinetic energy of one mole of helium gas at 400 K temperature is 5000 J, then that for one mole of neon gas at 800 K is

- A) 5000 J
- B) 50000 J
- C) 10000 J
- D) 2500 J
- E) 500 J

Correct Answer : Option C

97. If T and ρ represent the temperature and density of a gas, then the velocity of sound in the gas is directly proportional to

- A) \sqrt{T}
- B) $\sqrt{\rho}$
- C) T
- D) ρ^2
- E) T^2

Correct Answer : Option A

98. For smaller angular displacement, the period of a simple pendulum depends on

- A) its amplitude
- B) its phase constant
- C) its energy
- D) the mass of the bob
- E) its length

Correct Answer : Option E

99. If the speed of transverse waves on a stretched wire of linear density $7 \times 10^3 \text{ kg m}^{-1}$ is 100 ms^{-1} , then the tension in the wire is

- A) 60 N
- B) 600 N
- C) 700 N
- D) 70 N
- E) 80 N

Correct Answer:-Question Cancelled

100. Force between two charges $+8 \mu\text{C}$ and $+2 \mu\text{C}$ is 16 N. If the charges are brought into contact and then separated by the same distance, the force between them is

- A) 25 N
- B) 20 N
- C) 30 N
- D) 15 N
- E) 12 N

Correct Answer : Option A

101. If the work done in moving a charge of 3 C from A to B is 12 J, then the potential difference between A and B is

- A) 5 V
- B) 4 V
- C) 36 V
- D) 26 V
- E) 10 V

Correct Answer : Option B

102. The magnitude of the torque experienced by an electric dipole of dipole moment **P** placed at an angle of 30° in a uniform electric field **E** is

- A) PE
- B) $\frac{\sqrt{3}}{2} PE$
- C) $\frac{PE}{2}$
- D) $\frac{PE}{\sqrt{2}}$
- E) $\frac{PE}{\sqrt{3}}$

Correct Answer : Option C

103. The *rms* value of *a.c* with peak value of 200 V is

- A) $100V$
- B) $\frac{200}{\sqrt{2}} V$
- C) $300V$
- D) $200\sqrt{2}V$
- E) $\frac{200}{\sqrt{3}} V$

Correct Answer : Option B

104. Mobility is the drift velocity per unit

- A) charge
- B) volume
- C) electric field
- D) current
- E) time

Correct Answer : Option C

105. The resistivity of a metallic wire is directly proportional to (T – temperature; τ average time of collisions of free electrons; n – number of free electrons per unit volume; A – area of cross-section)

- A) n
- B) τ
- C) A
- D) $\frac{1}{n}$
- E) $\frac{1}{T}$

Correct Answer : Option D

106. Gyromagnetic ratio of an electron is the ratio between

- A) charge and angular momentum
- B) magnetic moment and angular acceleration
- C) magnetic moment and angular momentum
- D) charge and angular momentum
- E) magnetic moment and angular velocity

Correct Answer : Option C

107. For a circular coil carrying current, the thumb in the right hand thumb rule gives the direction of

- A) magnetic field
- B) Current
- C) induced emf
- D) electric field
- E) electric force

Correct Answer : Option A

108. In synchrotron, the required high magnetic fields are generated by

- A) solenoid only
- B) electromagnet only
- C) toroid only
- D) solenoid and electromagnet
- E) solenoid and toroid

Correct Answer : Option E

109. The power required to push the arm of a rectangular conductor with a constant speed v in a motor is directly proportional to

- A) v
- B) v^2
- C) \sqrt{v}
- D) $\sqrt[3]{v}$
- E) v^3

Correct Answer : Option B

110. A 1 kW bulb radiates light uniformly in all directions. The intensity at a point on the surface of the surrounding sphere of area 200 m^2 is (in Wm^{-2})

- A) 2
- B) 4
- C) 5

- D) 6
- E) 8

Correct Answer : Option C

- 111.** The transverse nature of electromagnetic waves is confirmed by the phenomenon of
- A) diffraction
 - B) polarization
 - C) photoelectric effect
 - D) interference
 - E) total internal reflection

Correct Answer : Option B

- 112.** If two waves of equal amplitude A and opposite phase interfere, the amplitude of the resultant wave is
- A) A
 - B) $2A$
 - C) $A/2$
 - D) 0
 - E) A^2

Correct Answer : Option D

- 113.** At the lowest point of the plot of angle of deviation versus the angle of incidence of a triangular prism, the angle of incidence is equal to
- A) the angle of refraction at the first face
 - B) the angle of refraction at the second face
 - C) the angle of emergence
 - D) the angle of prism
 - E) half of the angle of prism

Correct Answer : Option C

- 114.** Plane polarized light can be produced by the phenomenon of
- A) reflection
 - B) dispersion
 - C) diffraction
 - D) scattering
 - E) interference

Correct Answer : Option A

- 115.** Above the threshold frequency, if the intensity of incident light falling on a photo sensitive material is increased, then the correct statement is:
- A) The number of emitted electrons increases
 - B) The maximum kinetic energy of electrons increases

- C) The stopping potential increases
- D) The number of electrons emitted decreases
- E) The stopping potential decreases

Correct Answer : Option A

- 116.** The ratio between the wavelengths of the air column vibrating in the first two modes in an open organ pipe is
- A) 2 : 1
 - B) 1 : 2
 - C) 1 : 1
 - D) 1 : 3
 - E) 6 : 1

Correct Answer : Option A

- 117.** Light of wavelength $\frac{36}{5R} m$ is emitted by a hydrogen atom during the transition of electrons from the state
- A) $n = 3$ to $n = 2$
 - B) $n = 4$ to $n = 1$
 - C) $n = 4$ to $n = 2$
 - D) $n = 4$ to $n = 3$
 - E) $n = 3$ to $n = 1$

Correct Answer : Option A

- 118.** 75% of $^{234}_{90}\text{Th}$ decays in t years. Its half-life is (in years):
- A) t
 - B) $\frac{t}{2}$
 - C) $2t$
 - D) $4t$
 - E) $\frac{t}{4}$

Correct Answer : Option B

- 119.** The I-V characteristic of a semiconductor diode in forward bias is a/an:
- A) straight line
 - B) parabolic curve
 - C) exponentially decreasing curve
 - D) exponentially increasing curve
 - E) sinusoidal curve

Correct Answer : Option D

- 120.** The *pn* junction diode acts as a rectifier because:
- A) it conducts in both directions
 - B) it blocks current in reverse bias
 - C) it allows ac to pass
 - D) it amplifies the signal
 - E) it offers a phase difference between voltage and current

Correct Answer : Option B

- 121.** Which of the following has the highest molar mass?
(Atomic mass: N=14, O=16, Ag=108, Pb=208, Na=23, H=1, K=39)
- A) Silver nitrate
 - B) Lead nitrate
 - C) Ammonium nitrate
 - D) Sodium nitrate
 - E) Potassium nitrate

Correct Answer : Option B

- 122.** When the uncertainty in momentum is zero then the uncertainty in the position of a particle is
- A) $h/4\pi$
 - B) 1
 - C) 2
 - D) $\frac{1}{2}$
 - E) infinity

Correct Answer : Option E

- 123.** Which of the following statement is NOT true with Bohr's model of atom?
- A) It accounts the stability and line spectra of He^+
 - B) It fails to account for the finer details of the hydrogen atom spectrum by using sophisticated spectroscopic techniques.
 - C) It is unable to explain the spectrum of atom/ion which possess only two electrons.
 - D) It only explains about the splitting of spectral lines in the presence of electric field.
 - E) It is unable to explain the ability of atoms to form molecules by chemical bonds.

Correct Answer : Option D

- 124.** Which of the following statement is INCORRECT with p-block elements?
- A) p-Block elements comprise of Group 13 to Group 18.
 - B) The outer electronic configuration of p-block elements is $ns^2 p^{1-6}$.
 - C) Halogens belongs to Group 16.
 - D) Gallium and Bromine are liquids.
 - E) The zero group elements having general formula $ns^2 p^6$ are inert, because their energy levels are completely filled.

Correct Answer : Option C

125. Which of the following molecule has zero dipole moment?

- A) BF_3
- B) CH_2Cl_2
- C) NH_3
- D) SO_2
- E) NF_3

Correct Answer : Option A

Types of system and their definitions are given below:

System	Definition
(a) Closed system	(i) A system which can exchange both energy and matter with surrounding
(b) Open system	(ii) A system which cannot exchange matter or energy with surrounding
(c) Isolated system	(iii) A system consisting of single phase
(d) Homogeneous system	(iv) A system consisting of many phases
(e) Heterogeneous system	(v) A system which can exchange only energy with surrounding

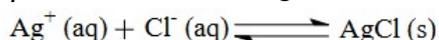
126.

Choose the correct match from the following codes:

- A) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv), (e)-(v)
- B) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv), (e)-(v)
- C) (a)-(i), (b)-(ii), (c)-(iv), (d)-(iv), (e)-(iii)
- D) (a)-(v), (b)-(i), (c)-(ii), (d)-(iii), (e)-(iv)
- E) (a)-(v), (b)-(ii), (c)-(i), (d)-(iii), (e)-(iv)

Correct Answer : Option D

The $\Delta_r H^\circ$ for the following reaction at 25°C is



127. (Given: $\Delta_f H^\circ(\text{Ag}^+, \text{aq}) = 105.6 \text{ kJ mol}^{-1}$,

$\Delta_f H^\circ(\text{Cl}^-, \text{aq}) = -167.2 \text{ kJ mol}^{-1}$ and

$\Delta_f H^\circ(\text{AgCl}, \text{s}) = -127.1 \text{ kJ mol}^{-1}$)

- A) 6.0 kJ mol^{-1}
- B) 65.5 kJ mol^{-1}
- C) $-65.5 \text{ kJ mol}^{-1}$
- D) -6.0 kJ mol^{-1}
- E) 100 kJ mol^{-1}

Correct Answer:-Question Cancelled

128. The pH of a solution is 4 then its OH^- ion concentration (in mol dm^{-3}) is

- A) 10^{-4}
- B) 10^{-10}
- C) 10^{-2}
- D) 10^{-12}
- E) 10^{-6}

Correct Answer : Option B

4 g of NaOH were dissolved in 1 litre of a solution containing 1 mole of CH_3COOH and 1

129. mole of CH_3COONa . The $[\text{H}^+]$ in the resultant solution is

(Given: $K_a(\text{CH}_3\text{COOH}) = 1.1 \times 10^{-5}$)

- A) $1.47 \times 10^{-5} \text{M}$
- B) $2 \times 10^{-5} \text{M}$
- C) $2.5 \times 10^{-5} \text{M}$
- D) $1.5 \times 10^{-5} \text{M}$
- E) $0.9 \times 10^{-5} \text{M}$

Correct Answer : Option E

130. Which of the following statement is INCORRECT for the concept of oxidation?

- A) Addition of oxygen
- B) Removal of hydrogen
- C) Decreases in number of positive charges
- D) Decreases in number of negative charges
- E) Removal of an electron

Correct Answer : Option C

131. Which of the following statement is true for the electrochemical, Daniel cell?

- A) Electrons flow from copper electrode to zinc electrode.
- B) Current flows from zinc electrode to copper electrode.
- C) Cation moves toward copper electrode.
- D) Cation moves toward zinc electrode
- E) Reduction occurs at cathode.

Correct Answer:-Question Cancelled

132. The osmotic pressure of 0.01 M aqueous solution of urea at 300 K is
($R = 0.082 \text{ lit atm mol}^{-1}$)

- A) 0.0082 atm
- B) 0.082 atm
- C) 2.46 atm
- D) 24.6 atm

E) 0.246 atm

Correct Answer : Option E

133. The first order rate constant for the decomposition of N_2O_5 is $6.93 \times 10^{-4} \text{ sec}^{-1}$. Its half-life period is

- A) 1000 s
- B) 100 s
- C) 10 s
- D) 1 s
- E) 10000 s

Correct Answer : Option A

134. Which of the following is a zero order reaction?

- A) Decomposition of H_2O_2 catalysed by iodide in alkaline medium.
- B) Artificial radioactive decay of unstable nuclei.
- C) Decomposition of N_2O_5
- D) Decomposition of N_2O
- E) Decomposition of gaseous ammonia on a hot platinum surface.

Correct Answer : Option E

135. Which of the following outermost electronic configuration of the element shows the highest oxidation state?

- A) $3d^3 4s^2$
- B) $3d^5 4s^1$
- C) $3d^5 4s^2$
- D) $3d^6 4s^2$
- E) $3d^2 4s^2$

Correct Answer : Option C

136. CrO_3 is a/an

- A) acidic oxide
- B) basic oxide
- C) neutral oxide
- D) amphoteric oxide
- E) reducing agent

Correct Answer : Option A

137. Which of the following statement is INCORRECT?

- A) Transition metals and many of their compounds show paramagnetic behaviour.

- B) The enthalpies of atomisation of the transition metals are high.
- C) The transition metals generally form coloured compounds.
- D) Transition metals and their many compounds act as good catalyst.
- E) Zn, Cd and Hg are very hard and have very low volatility.

Correct Answer : Option E

138. The correct order of ionic radii of Ce, La, Pm and Yb in +3 oxidation state is

- A) $\text{La}^{3+} < \text{Pm}^{3+} < \text{Ce}^{3+} < \text{Yb}^{3+}$
- B) $\text{La}^{3+} < \text{Ce}^{3+} < \text{Pm}^{3+} < \text{Yb}^{3+}$
- C) $\text{Yb}^{3+} < \text{Ce}^{3+} < \text{Pm}^{3+} < \text{La}^{3+}$
- D) $\text{Yb}^{3+} < \text{Pm}^{3+} < \text{Ce}^{3+} < \text{La}^{3+}$
- E) $\text{La}^{3+} > \text{Pm}^{3+} > \text{Ce}^{3+} > \text{Yb}^{3+}$

Correct Answer : Option D

139. The IUPAC name of $[\text{Fe}(\text{CO})_5]$ is

- A) Pentacarbonylferrate(0)
- B) Pentacarbonylferrate(III)
- C) Pentacarbonyliron(0)
- D) Pentacarbonyl iron(II)
- E) Pentacarbonylferrate(II)

Correct Answer : Option C

140. The isomerism exhibited by the octahedral complex $[\text{Co}(\text{NH}_3)_4\text{Br}_2]\text{Cl}$ is

- A) Geometrical
- B) Optical
- C) Linkage
- D) Coordination
- E) Ionisation

Correct Answer:-Question Cancelled

141. Which of the following is not an electron withdrawing group?

- A) -CN
- B) -NO₂
- C) -COOH
- D) -COOR
- E) -OCH₃

Correct Answer : Option E

142. Which of the following statements is INCORRECT with Kolbe's electrolytic process?

- A) Ethane can be prepared by this method.
- B) Presence of alkyl groups in α -position decrease the yield of alkanes.

- C) The reaction proceeds via methyl free radical.
- D) At anode alkane and CO₂ gas is formed.
- E) An alkane obtained at anode contains odd number of carbon atoms.

Correct Answer : Option E

143. Which of the following hydrocarbon pair have the highest boiling point and highest melting point respectively?

- A) Eicosane and Methane
- B) Eicosane and Decane
- C) Eicosane and 2,2-Dimethylpropane
- D) Eicosane and 2-Methylbutane
- E) 2,2-Dimethylpropane and Eicosane

Correct Answer : Option C

144. The order of reactivity towards S_N2 reaction among the following is (a)CH₃Cl (b)CH₃CH(Cl)CH₃ (c) (CH₃)₃CCl (d) CH₃CH₂Cl

- A) a > d > b > c
- B) a > b > c > d
- C) a > c > d > b
- D) b > a > c > d
- E) c > b > d > a

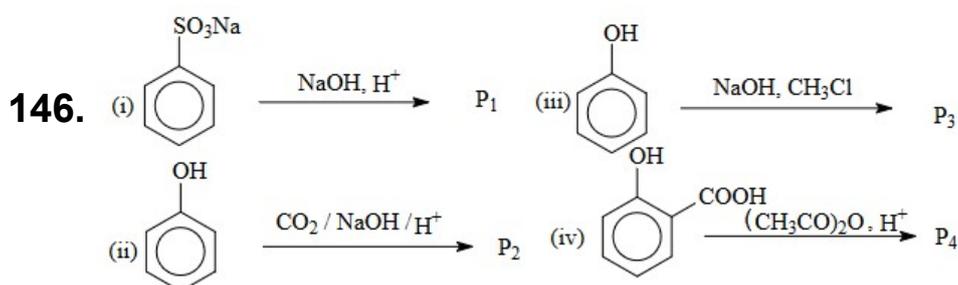
Correct Answer : Option A

145. The correct decreasing order of acidic strength is

- A) C₆H₅OH > *p*-CH₃-C₆H₄OH > *m*-CH₃-C₆H₄OH > C₂H₅OH
- B) C₂H₅OH > *m*-CH₃-C₆H₄OH > *p*-CH₃-C₆H₄OH > C₆H₅OH
- C) *m*-CH₃-C₆H₄OH > C₆H₅OH > *p*-CH₃-C₆H₄OH > C₂H₅OH
- D) C₆H₅OH > *m*-CH₃-C₆H₄OH > *p*-CH₃-C₆H₄OH > C₂H₅OH
- E) C₆H₅OH > *m*-CH₃-C₆H₄OH > C₂H₅OH > *p*-CH₃-C₆H₄OH

Correct Answer : Option D

The products P₁, P₂, P₃ and P₄ of the following reactions are



- A) P₁ = Phenol, P₂ = Salicylaldehyde, P₃ = Cyclohexanol, P₄ = Phenyl acetate,

- B) $P_1 = \text{Benzene}$, $P_2 = \text{Salicylic acid}$, $P_3 = \text{Cyclohexanol}$, $P_4 = \text{Phenyl acetate}$,
 C) $P_1 = \text{Phenol}$, $P_2 = \text{Salicylic acid}$, $P_3 = \text{Anisole}$, $P_4 = \text{Aspirin}$,
 D) $P_1 = \text{Phenol}$, $P_2 = \text{Salicylic acid}$, $P_3 = \text{Anisole}$, $P_4 = \text{Phenyl acetate}$,
 E) $P_1 = \text{Cyclohexanol}$, $P_2 = \text{Salicylic acid}$, $P_3 = \text{Phenol}$, $P_4 = \text{Aspirin}$,

Correct Answer : Option C

147. Which one of the following compounds undergoes HVZ reaction?

- A) $\text{C}_6\text{H}_5\text{COOH}$
 B) $\text{CH}_3\text{CH}_2\text{COOH}$
 C) $\text{Cl}_3\text{C-COOH}$
 D) $\text{CH}_3\text{CH}_2\text{CHO}$
 E) HCOOH

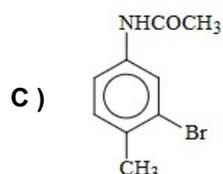
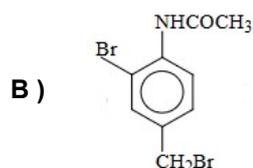
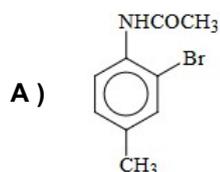
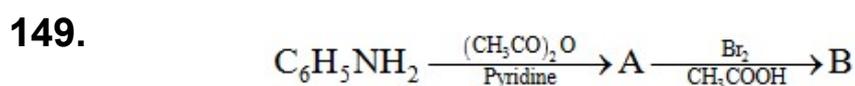
Correct Answer : Option B

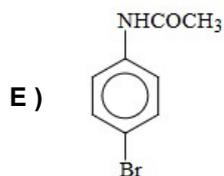
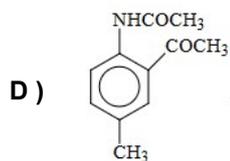
148. Which of the following does not undergo Cannizarro reaction?

- A) $(\text{CH}_3)_3\text{CCHO}$
 B) $\text{C}_6\text{H}_5\text{CHO}$
 C) $\text{C}_6\text{H}_5\text{COC}_6\text{H}_5$
 D) CH_3CHO
 E) HCHO

Correct Answer : Option D

In the following reaction, the final product B is





Correct Answer : Option E

Match Column I with column II.

- 150.**
- | Column I (Vitamins) | Column II (Sources) |
|----------------------------|----------------------|
| (a) Vitamin A | (i) Sunflower oil |
| (b) Vitamin B ₁ | (ii) Amla |
| (c) Vitamin C | (iii) Fish liver oil |
| (d) Vitamin E | (iv) Yeast |
- A) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
 B) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
 C) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)
 D) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
 E) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

Correct Answer : Option E