

PROVISIONAL ANSWER KEY

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1. Let R be a relation in \mathbb{N} defined by $\{(x, y) : x + 3y = 10, x, y \in \mathbb{N}\}$ Then the range of R is
- A) $\{1, 2, 3, 4\}$
 - B) $\{2, 3, 4\}$
 - C) $\setminus(\{1, 3, 4\})$
 - D) $\{1, 2, 3, \}$
 - E) $\{1, 3, \}$

Correct Answer : Option D

2. The domain of $f(x) = \frac{x^2 + 1}{x^2 + x + 1}$ is
- A) \mathbb{R}
 - B) $\mathbb{R} - \{2\}$
 - C) $\mathbb{R} - \{1\}$
 - D) $\mathbb{R} - \{0\}$
 - E) $\mathbb{R} - \{1, -1\}$

Correct Answer : Option A

3. Let A and B be two sets of having 3 and 2 elements respectively. Then the number of subsets of $A \times B$ having at least three elements is
- A) 24
 - B) 52
 - C) 42
 - D) 64
 - E) 60

Correct Answer : Option C

4. The number of elements in the set $\{(x, y) : 2x^2 + 3y^2 = 35, x, y \in \mathbb{Z}\}$, where \mathbb{Z} is the set of all integers, is
- A) 4
 - B) 6
 - C) 16
 - D) 12
 - E) 8

Correct Answer : Option E

5. If $|z + 4| = 2|z + 1|$, where z is a complex number, then $|z|$ is equal to
- A) 0
 - B) 2
 - C) 4
 - D) 8
 - E) 16

Correct Answer : Option B

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

Correct Answer : Option A

7. The imaginary part of $\frac{1 - i\sqrt{3}}{1 + i\sqrt{3}}$ is
- A) $\frac{-1}{2}$
 - B) $\frac{1}{2}$
 - C) $\frac{\sqrt{3}}{2}$
 - D) $\frac{-\sqrt{3}}{2}$
 - E) $\frac{\sqrt{3}}{4}$

Correct Answer : Option D

8. The sum of $i^2 + i^4 + \dots$ upto 25 terms is equal to
- A) 0
 - B) i
 - C) $-i$
 - D) 1
 - E) -1

Correct Answer : Option E

9. In a geometric progression of positive terms, if any term is equal to the sum of the next two terms, then the common ratio of the geometric progression is equal to

- A) $\frac{\sqrt{5} + 1}{2}$
- B) $\frac{\sqrt{5} - 1}{2}$
- C) $\frac{\sqrt{5} - 1}{4}$
- D) $\frac{\sqrt{5} + 1}{4}$
- E) $\frac{\sqrt{5}}{2}$

Correct Answer : Option B

10. A geometric progression has an even number of terms. If the sum of all terms is five times the sum of all odd terms, then the common ratio is equal to

- A) 4
- B) $\frac{2}{5}$
- C) 2
- D) $\frac{1}{5}$
- E) $\frac{4}{5}$

Correct Answer : Option A

11. If a, b, c are three unequal numbers such that a, b, c are in arithmetic progression and $b - a, c - b, a$ are in geometric progression, then $a : b : c$ is

- A) 3:4:5
- B) 1:2:3
- C) 1:3:2
- D) 2:1:3
- E) 1:4:3

Correct Answer : Option B

12. If three geometric means are inserted between 2 and 32, then the three numbers are

- A) 4,6,8
- B) 6,8,10
- C) 4,8,32
- D) 4,6,12
- E) 4,8,16

Correct Answer : Option E

13. If $\frac{{}^n P_{r-1}}{a} = \frac{{}^n P_r}{b} = \frac{{}^n P_{r+1}}{c}$, then

- A) $c^2 = b(a + c)$
- B) $b^2 = a(a + b)$
- C) $b^2 = a(b + c)$
- D) $a^2 = b(a + c)$
- E) $a^2 = c(a + b)$

Correct Answer : Option C

14. The number of ways in which we can choose a committee from 3 men and 6 women so that the committee includes at least two men and exactly twice as many women as men is

- A) 35
- B) 42
- C) 46
- D) 52
- E) 55

Correct Answer : Option C

15. If $\frac{1}{8!} + \frac{1}{9!} = \frac{x}{12!}$, then the value of x is equal to

- A) 100
- B) 80
- C) 90
- D) 72
- E) 120

Correct Answer : Option A

16. There are two women participants in a badminton tournament. The number of games the men played between themselves exceeds by 12 the number of games they played with women. If each player played one game with each other, then the number of men in the tournament was

- A) 4
- B) 6
- C) 7
- D) 8
- E) 10

Correct Answer : Option D

17. If the 17th and 18th term in the expansion of $(2 + x)^{50}$ are equal, then the value of x is equal to

- A) 1

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

Correct Answer : Option A

18. Let $f(x) = \begin{vmatrix} x & 1 \\ \sin 2\pi x & 2x^2 \end{vmatrix}$. If $f(x)$ is an odd function, $f(-x) = g(x)$ and $\lambda f(1)g(1) = 4$. Then the value of λ is equal to

- A) 1
- B) -4
- C) 0
- D) 4
- E) -1

Correct Answer : Option E

19. The value of the determinant of the inverse of the matrix $\begin{bmatrix} -4 & -5 \\ 2 & 2 \end{bmatrix}$ is

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

Correct Answer : Option B

20. If $A = \begin{bmatrix} 3 & \lambda - 3 \\ -1 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 2 \\ 2 & 1 \end{bmatrix}$ and $AB = \begin{bmatrix} 7 & 1 \\ -1 & -1 \end{bmatrix}$, then λ is equal to

- A) 2
- B) 4
- C) 6
- D) 7
- E) 8

Correct Answer : Option E

21. If $A = \begin{bmatrix} 1 & 1 \\ 0 & i \end{bmatrix}$ and $A^{42} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ then $a + d$ is equal to

- A) 0
- B) i

- C) $-i$
- D) 1
- E) -1

Correct Answer : Option A

- 22.** If $(x - 1)(x^2 - 5x + 7) < (x - 1)$, then x belongs to
- A) $(-\infty, -1) \cup (2, 3)$
 - B) $(-\infty, -1] \cup [2, 3]$
 - C) $(-\infty, 1) \cup (2, 3)$
 - D) $(-\infty, 1) \cup [2, 3]$
 - E) $(-\infty, 1) \cup (2, 3]$

Correct Answer : Option C

- 23.** The solution set of $|x + \frac{1}{x}| > 2$ is
- A) \mathbb{R}
 - B) $\mathbb{R} - \{0\}$
 - C) $\mathbb{R} - \{1, -1\}$
 - D) $\mathbb{R} - \{-1\}$
 - E) $\mathbb{R} - \{-1, 0, 1\}$

Correct Answer : Option E

- 24.** Let L be an arc of a circle which subtends 45° at the centre. If the radius of circle is 4 cm, then the length of the L in centimeter is
- A) $\frac{\pi}{6}$
 - B) π
 - C) $\frac{\pi}{4}$
 - D) $\frac{\pi}{2}$
 - E) $\frac{\pi}{3}$

Correct Answer : Option B

- 25.** If $A = \begin{bmatrix} 1 & \sin \theta & 1 \\ -\sin \theta & 1 & \sin \theta \\ -1 & -\sin \theta & 1 \end{bmatrix}$, $(0 \leq \theta \leq 2\pi)$, then the minimum value of $|A|$ is
- A) 2
 - B) 0
 - C) 1
 - D) -1
 - E) 4

Correct Answer : Option A

26. If $\tan\left(\frac{\pi}{4} + \theta\right) = \frac{1}{2}$ then the value of $\sin 2\theta$ is

- A) $\frac{-1}{5}$
- B) $\frac{2}{5}$
- C) $\frac{-3}{5}$
- D) $\frac{4}{5}$
- E) 1

Correct Answer : Option C

27. If $1 + \cos x = \alpha, 0 \leq x \leq \frac{\pi}{2}$, then $\sin \frac{x}{2}$ is equal to

- A) $\sqrt{\frac{2+\alpha}{2}}$
- B) $\sqrt{\frac{2-\alpha}{2}}$
- C) $\sqrt{2 - \frac{\alpha}{2}}$
- D) $\sqrt{\frac{1+\alpha}{2}}$
- E) $\sqrt{\frac{1-\alpha}{2}}$

Correct Answer : Option B

28. The value of $\cos^{-1}\left(\frac{-\sqrt{3}}{2}\right) + \sin^{-1}\left(\frac{1}{2}\right)$ is equal to

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

Correct Answer : Option E

29. The value of $2\tan^{-1}\left(\frac{1}{3}\right) + \cot^{-1}\left(\frac{3}{4}\right) =$

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

Correct Answer : Option E

30. If α and β are respectively the minimum and maximum values of $\frac{\pi^2}{8} + 2(\sin^{-1}x - \frac{\pi}{4})^2$, then $\frac{\beta}{\alpha} =$

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

Correct Answer : Option A

31. If the points $(3,-2), (a, 2), (8,8)$ are collinear, then the value of a is

- A) 0
- B) 2
- C) 4
- D) 5
- E) 6

Correct Answer : Option D

32. If the slope of the line joining the points $(3,4)$ and $(-2,a)$ is equal to $\frac{-2}{5}$, then the value of a is equal to

- A) 0
- B) 2
- C) 3
- D) 4
- E) 6

Correct Answer : Option E

33. The distance of the point $P(1, -3)$ from the line $2y - 3x = 4$ is

- A) $\sqrt{13}$ units
- B) 13 units

- C) 7 units
- D) $\sqrt{7}$ units
- E) $2\sqrt{13}$ units

Correct Answer : Option A

- 34.** The line $x - 1 = 0$ is the directrix of the parabola, $y^2 - kx + 8 = 0$. Then, the values of k are
- A) 8,4
 - B) 8,-4
 - C) -8,-4
 - D) 8
 - E) -8,4

Correct Answer : Option E

- 35.** The length of the latus rectum of $x^2 = -9y$ is equal to
- A) 9 units
 - B) $\frac{3}{2}$ units
 - C) 4 units
 - D) 3 units
 - E) $\frac{9}{4}$ units

Correct Answer : Option A

- 36.** The centre and radius of the circle $x^2 + y^2 - 2x + 4y = 8$ respectively are
- A) $(1,2),\sqrt{13}$
 - B) $(-1,2),\sqrt{13}$
 - C) $(-1,-1),\sqrt{13}$
 - D) $(1,-2),\sqrt{13}$
 - E) $(2,1),\sqrt{13}$

Correct Answer : Option D

- 37.** If the length of the major axis of an ellipse is thrice the length of the minor axis, then its eccentricity is equal to
- A) $\frac{2\sqrt{2}}{3}$
 - B) $\frac{\sqrt{2}}{\sqrt{3}}$
 - C) $\frac{1}{2}$
 - D) $\frac{1}{\sqrt{2}}$

E) $\frac{1}{2\sqrt{2}}$

Correct Answer : Option A

38. Let $\vec{a}, \vec{b}, \vec{c}$ be such that if $\vec{a} + \vec{b} + \vec{c} = \vec{0}$. If $|\vec{a}| = 3, |\vec{b}| = 4, |\vec{c}| = 5$ then $|\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}| =$

- A) 20
- B) 24
- C) 25
- D) 30
- E) 35

Correct Answer : Option C

39. If θ is the angle between two vectors \vec{a} and \vec{b} such that $|\vec{a}| = 7, |\vec{b}| = 1$ and $|\vec{a} \times \vec{b}|^2 = k^2 - (\vec{a} \cdot \vec{b})^2$ then the value(s) of k is/are

- A) 5
- B) -5
- C) 3
- D) -3
- E) ± 7

Correct Answer : Option E

40. If O is the origin and C is the midpoint of $A(-2, 1)$ and $B(4, -3)$, then \vec{OC} is

- A) $\hat{i} + \hat{j}$
- B) $-\hat{i} + -\hat{j}$
- C) $\frac{1}{2}\hat{i} + \frac{1}{2}\hat{j}$
- D) $\hat{i} - \hat{j}$
- E) $-\hat{i} + \hat{j}$

Correct Answer : Option D

41. If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + \hat{k}$, then the projection of \vec{a} on \vec{b} is

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

Correct Answer : Option B

42. If the lines $\frac{2x-1}{2} = \frac{3-y}{1} = \frac{z-1}{3}$ and $\frac{x+3}{2} = \frac{y+2}{5} = \frac{z+1}{a}$ are perpendicular to each other, then the value of a is equal to
- A) $\frac{1}{4}$
 - B) $\frac{3}{4}$
 - C) $\frac{1}{2}$
 - D) 2
 - E) 1

Correct Answer : Option E

43. The equation of straight line passing through (a, b, c) and parallel to x -axis is
- A) $\frac{x-a}{a} = \frac{y-b}{0} = \frac{z-c}{0}$
 - B) $\frac{x-a}{0} = \frac{y-b}{1} = \frac{z-c}{1}$
 - C) $\frac{x-a}{1} = \frac{y-b}{0} = \frac{z-c}{1}$
 - D) $\frac{x-a}{1} = \frac{y-b}{1} = \frac{z-c}{1}$
 - E) $\frac{x-a}{0} = \frac{y-b}{1} = \frac{z-c}{0}$

Correct Answer : Option A

44. The equation of a line passing through the point $(1, -2, 3)$ and equally inclined to the axes are
- A) $x + 1 = y - 2 = z + 3$
 - B) $x + 1 = y - 2 = z - 3$
 - C) $x - 1 = y - 2 = z + 3$
 - D) $x - 1 = y + 2 = z + 3$
 - E) $x - 1 = y + 2 = z - 3$

Correct Answer : Option E

45. The vector equation of the straight line $\frac{x-2}{3} = \frac{y+1}{2} = \frac{z-3}{2}$ is
- A) $(2\hat{i} - \hat{j} - 3\hat{k}) + \mu(3\hat{i} - 2\hat{j} - 2\hat{k})$
 - B) $(2\hat{i} - \hat{j} + 3\hat{k}) + \mu(3\hat{i} + 2\hat{j} + 2\hat{k})$, where μ is a scalar.
 - C) $(3\hat{i} - 2\hat{j} - 2\hat{k}) + \mu(2\hat{i} - \hat{j} - 3\hat{k})$, where μ is a scalar.
 - D) $(3\hat{i} + 2\hat{j} + 2\hat{k}) + \mu(2\hat{i} - \hat{j} + 3\hat{k})$, where μ is a scalar.

E) $(3\hat{i} + 2\hat{j} + 2\hat{k}) + \mu(2\hat{i} + \hat{j} + 3\hat{k})$, where μ is a scalar.

Correct Answer : Option B

46. A dice is thrown three times. If the first thrown is five, the probability of getting 14 as the sum is

A) $\frac{1}{9}$

B) $\frac{1}{3}$

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

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

E) $\frac{1}{5}$

Correct Answer : Option A

47. If the variance of $1, 2, 3, \dots, n$ is 10, then the value of n is

A) 5

B) 9

C) 11

D) 13

E) 15

Correct Answer : Option C

48. If $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{5}$ and $P(A \cap B) = \frac{1}{8}$, then $P(A' / B')$ = (A' and B' denote the complements of A and B respectively)

A) $\frac{27}{32}$

B) $\frac{23}{32}$

C) $\frac{25}{32}$

D) $\frac{21}{32}$

E) $\frac{29}{32}$

Correct Answer : Option A

49. We have two data sets each of size 5. The variances are 4 and 5 and the corresponding means are 2 and 4 respectively. Then the variance of the combined data set is

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

- B) $\frac{5}{2}$
- C) 6
- D) $\frac{11}{2}$
- E) $\frac{13}{2}$

Correct Answer : Option D

50. The value of $\lim_{x \rightarrow 5} \left(\frac{25 - x^2}{4 - \sqrt{x^2 - 9}} \right)$ is

- A) 32
- B) 16
- C) 8
- D) 4
- E) 0

Correct Answer : Option C

51. The value of $\lim_{x \rightarrow 0} \frac{\sqrt{1 - \cos 2x}}{|x|}$ is equal to

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

Correct Answer : Option C

52. The positive integer n, such that $\lim_{x \rightarrow 3} \frac{x^n - 3^n}{x - 3} = 108$

- A) 3
- B) 12
- C) 6
- D) 9
- E) 4

Correct Answer : Option E

53. Let $\lim_{x \rightarrow a} f(x)g(x) = 16$ and $\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = 4$ If both $\lim_{x \rightarrow a} f(x)$ and $\lim_{x \rightarrow a} g(x)$ exists, then $\lim_{x \rightarrow a} f[(x) + g(x)] =$

- A) ± 10
- B) -16
- C) ± 2

- D) 16
- E) ± 4

Correct Answer : Option A

54. If $f(1) = 2; f'(1) = 1$, then $\lim_{x \rightarrow 1} \left[\frac{xf(1) - f(x)}{x - 1} \right] =$

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

Correct Answer : Option E

55. Let $f(x)$ and $g(x)$ be twice differentiable functions defined on $[0,2]$ such that $f''(x) - g''(x) = 0, f'(1) = 4, g'(1) = 2, f(2) = 9, g(2) = 3$.
At $x = 3/2, f(x) - g(x) =$

- A) 2
- B) 3
- C) 5
- D) 8
- E) 10

Correct Answer : Option C

56. If $y = \log\left(\sqrt{\frac{x-1}{x+2}}\right)$ then $\frac{dy}{dx} =$

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

Correct Answer : Option B

57. If $y = 3^x + e^x + x^x + x^3$, then $\frac{dy}{dx}$ at $x = 3$ is equal to

- A) $e^3 + 27\log_e 3 + 54$
- B) $e^3 + 27\log_e 3 + 27$

- c) $e^3 + 54\log_e 3 + 27$
- d) $e^3 + 54\log_e 3 + 54$
- e) $e^3 + 54\log_e 3 + 54$

Correct Answer : Option D

58. If $y = \sin x + e^x$, then $\frac{d^2x}{dy^2}$ is equal to

- A) $\frac{e^x - \sin x}{(\cos x + e^x)^2}$
- B) $\frac{e^x + \sin x}{(\cos x + e^x)^2}$
- C) $\frac{e^x - \sin x}{(\cos x + e^x)^3}$
- D) $\frac{\sin x - e^x}{(\cos x + e^x)^2}$
- E) $\frac{\sin x - e^x}{(\cos x + e^x)^3}$

Correct Answer : Option E

59. If $y = \log_{10} x + \log_e x$, then $\frac{dy}{dx}$ is equal to

- A) $\frac{1 - \log_{10} e}{x}$
- B) $\frac{1 + \log_e 10}{x}$
- C) $x + \log_{10} e$
- D) $x + \log_e 10$
- E) $\frac{1}{x} \left[\frac{1}{\log_e 10} + 1 \right]$

Correct Answer : Option E

60. The function $f(x) = x^4 - 2x^2$ is strictly increasing on

- A) $(-2,0)$ and $[1, \infty)$
- B) $[-1,0]$ and $[2, \infty)$
- C) $[-1,0]$ and $[1, \infty)$
- D) $(-2,0)$ and $[0, \infty)$
- E) $[-2,0]$ and $(1, \infty)$

Correct Answer : Option C

61. If the rate of increase of the radius of circle 5 cm/sec, then the rate of increase of its area when the radius is 20 cms, will be

- A) $10\pi \text{ cm}^2 / \text{sec}$
- B) $20\pi \text{ cm}^2 / \text{sec}$
- C) $100\pi \text{ cm}^2 / \text{sec}$
- D) $200\pi \text{ cm}^2 / \text{sec}$
- E) $400\pi \text{ cm}^2 / \text{sec}$

Correct Answer : Option D

62. If the function $f(x) = x^2 + ax + 1$ is increasing on $[1,2]$, then a is greater than or equal to

- A) -2
- B) -5
- C) -4
- D) -7
- E) -3

Correct Answer : Option A

63. The absolute maximum value of the function $f(x) = x^3 - 3x + 2$ in $[0,2]$ is

- A) 0
- B) 1
- C) 2
- D) 3
- E) 4

Correct Answer : Option E

64. If $\int (3t^2 \sin(\frac{1}{t}) - t \cos(\frac{1}{t})) dt = f(t) \sin(\frac{1}{t}) + c$ then $f(2)$ is equal to

- A) -2
- B) 2
- C) 4
- D) 8
- E) 16

Correct Answer : Option D

65. If $\int \frac{2^{1/x}}{x^2} dx = k 2^{1/x} + c$ then k is equal to

- A) $\frac{1}{\log 2}$
- B) $\log 4$
- C) $\frac{1}{\log 3}$
- D) $\frac{-1}{\log 3}$

E) $\frac{-1}{\log 2}$

Correct Answer : Option E

66. $\int e^x \left(\frac{1 - \sin x}{1 - \cos x} \right) dx =$

- A) $e^x \cot x + C$
- B) $-e^x \cot x + C$
- C) $e^x \cot \frac{x}{2} + C$
- D) $-e^x \cot \frac{x}{2} + C$
- E) $2e^x \cot \frac{x}{2} + C$

Correct Answer : Option D

67. If $u = \int e^x \cos x dx, v = \int e^x \sin x dx$, then $u + v =$

- A) $-u' + C$
- B) $u' + C$
- C) $-v' + C$
- D) $v' + C$
- E) $2v' + C$

Correct Answer : Option D

68. $\int \sin^3 x e^{\log \cos x} dx =$

- A) $\frac{\cos^4 x}{4} + C$
- B) $\frac{-\cos^4 x}{4} + C$
- C) $\frac{x \cos^4 x}{4} + C$
- D) $\frac{\sin^4 x}{4} + C$
- E) $\frac{-\sin^4 x}{4} + C$

Correct Answer : Option D

69. If $\int_a^b x^3 dx = 0$ and $\int_a^b x^2 dx = \frac{2}{3}$, then the values of a and b respectively are

- A) 1 and 1
- B) 0 and 1
- C) 1 and -1

- D) -1 and 0
- E) -1 and 1

Correct Answer : Option E

70. $\int_{\pi/6}^{\pi/3} \frac{dx}{1 + \sqrt{\tan x}} =$

- A) $\frac{\pi}{6}$
- B) $\frac{\pi}{4}$
- C) $\frac{\pi}{3}$
- D) $\frac{\pi}{12}$
- E) $\frac{\pi}{2}$

Correct Answer : Option D

71. The area of the region bounded by the lines, $y = x + 2$, $x = 0$, $x = 1$ and $y = 0$ is

- A) 2 sq.units
- B) $\frac{5}{2}$ sq.units
- C) $\frac{9}{2}$ sq.units
- D) 9 sq.units
- E) 12 sq.units

Correct Answer : Option B

72. $\int_0^{\pi/4} \sqrt{1 + \sin 2x} dx =$

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

Correct Answer : Option A

73. The solution of $(e^y + 1)\cos x dx + e^y \sin x dy = 0$ is

- A) $(e^y + 1)\sin x = C$
- B) $(e^y + 1) = C \sin x$
- C) $e^y = C \sin x$

D) $(e^y - 1)\sin x = C$

E) $(e^y + 1)\cos x = C$

Correct Answer : Option A

74. The function $y = be^x + ae^{-x}$, a and b are constants, is a solution of

A) $y'' + y = 0$

B) $y'' - y = 0$

C) $y'' + x = 0$

D) $y'' - 2y = 0$

E) $y'' + xy = 0$

Correct Answer : Option B

75. Which one of the following point is not in a feasible region bounded by the inequalities $x \leq 4, y \leq 6, x + y \leq 6, x \geq 0, y \geq 0$

A) (0,0)

B) (4,0)

C) (4,2)

D) (0,6)

E) (6,0)

Correct Answer : Option E

76. A physical quantity that has the same dimensions as those of Boltzmann constant is

A) energy

B) bulk modulus

C) power

D) gas constant R

E) thermal conductivity

Correct Answer : Option D

77. Taking into consideration of significant figures, in the conversion relation $2.0 \text{ ms}^{-2} = X \text{ km h}^{-2}$, the value of X is

A) 2.6×10^4

B) 2.592×10^4

C) 2×10^4

D) 2.592×10^5

E) 2.60×10^5

Correct Answer : Option A

78. A body starts moving from the origin along a straight line at a speed of 20 kmh^{-1} for 1 hour. Then it turns perpendicular to its path and moves with the same velocity for 30 minutes. Then the magnitude of its displacement is
- A) 10 km
 - B) 20 km
 - C) $10\sqrt{5} \text{ km}$
 - D) $10\sqrt{2} \text{ km}$
 - E) $20\sqrt{5} \text{ km}$

Correct Answer : Option C

79. If the angular speed of a particle moving in a circular path of radius 1.2 m is increased from 2 rads^{-1} to 4 rads^{-1} keeping its radius constant, then its linear speed is increased by
- A) 1.6 ms^{-1}
 - B) 2.4 ms^{-1}
 - C) 3.6 ms^{-1}
 - D) 4.8 ms^{-1}
 - E) 6 ms^{-1}

Correct Answer : Option B

80. If the position vector of a particle is $\vec{r} = 2t\hat{i} + \sqrt{3}t^2\hat{j} + 5\hat{k}$ with \vec{r} in m and t in s , then at $t=1s$ the angle made by the velocity vector with x-axis is
- A) 30°
 - B) 45°
 - C) 60°
 - D) 120°
 - E) 90°

Correct Answer : Option C

81. If the maximum acceleration of a moving platform to keep a box of mass 5 kg on it without sliding is 3 ms^{-1} , then the static friction between the box and floor of the platform is ($g = 10 \text{ ms}^{-2}$)
- A) 0.15
 - B) 0.25
 - C) 0.30
 - D) 0.35
 - E) 0.4

Correct Answer : Option C

82. If 10 identical silver coins each of mass m are placed one over the other, then force on the 6th coin from the bottom is
- A) 10 mg

- B) 8 mg
- C) 6 mg
- D) 4 mg
- E) zero

Correct Answer : Option D

- 83.** A body initially at rest breaks up into two pieces of masses M and $3M$ and move with a total kinetic energy of E , then the kinetic energy of the piece of mass M is
- A) $\frac{3E}{4}$
 - B) $\frac{E}{4}$
 - C) $\frac{2E}{3}$
 - D) $\frac{E}{3}$
 - E) $\frac{E}{2}$

Correct Answer : Option A

- 84.** If a proton, a deuteron and an α -particle have the same speed, then the kinetic energy is
- A) same for all particles
 - B) the lowest for proton
 - C) the highest for deuteron
 - D) same for proton and deuteron
 - E) the lowest for α -particle

Correct Answer : Option B

- 85.** The moment of inertia of a system of two masses 2 kg and 4 kg lying in the x-y plane at distances, $2 m$ and $4 m$, respectively from the origin about the z-axis is (in kgm^2)
- A) 36
 - B) 48
 - C) 64
 - D) 72
 - E) 80

Correct Answer : Option D

- 86.** A swimmer jumps from a height is able to increase the number of loops made in air by
- A) stretching his legs outwards
 - B) decreasing angular velocity
 - C) by stretching his arms
 - D) by pulling his legs and arms inward
 - E) by pulling his legs inward and stretching his arms outward

Correct Answer : Option D

- 87.** The ratio of the weights of an object of mass m at a height R and $2R$ from the surface of earth is (R is the radius of earth)
- A) 4 : 9
 - B) 1 : 1
 - C) 9 : 4
 - D) 1 : 2
 - E) 4 : 1

Correct Answer : Option C

- 88.** If the magnitude of gravitational potential energy of an object of mass 200 kg at a height of $3.6 \times 10^6\text{ m}$ from the earth surface is $6 \times 10^6\text{ J}$ then its value at a height of $5.6 \times 10^6\text{ m}$ is (Radius of earth is $6.4 \times 10^6\text{ m}$)
- A) $5 \times 10^6\text{ J}$
 - B) $4 \times 10^6\text{ J}$
 - C) $3 \times 10^6\text{ J}$
 - D) $2 \times 10^6\text{ J}$
 - E) 10^6 J

Correct Answer : Option A

- 89.** The force required to increase the length of a thin copper wire of cross-sectional area 0.1 cm^2 by 0.1% is (Young's modulus of copper is $11 \times 10^{10}\text{ Nm}^{-2}$)
- A) 550 N
 - B) $11 \times 10^4\text{ N}$
 - C) $10.5 \times 10^3\text{ N}$
 - D) 1100 N
 - E) $5.5 \times 10^3\text{ N}$

Correct Answer : Option D

- 90.** If a huge tank has a small side hole at a depth of 2 m from the surface of water, then the velocity of water flowing through the hole is ($g = 10\text{ ms}^{-2}$)
- A) $2\sqrt{5}\text{ ms}^{-1}$
 - B) $2\sqrt{10}\text{ ms}^{-1}$
 - C) $\sqrt{10}\text{ ms}^{-1}$
 - D) $4\sqrt{10}\text{ ms}^{-1}$
 - E) $4\sqrt{5}\text{ ms}^{-1}$

Correct Answer : Option B

- 91.** Lakes and ponds freeze at the top surface with water below. This phenomenon is due to
- A) high pressure at their bottom
 - B) low pressure at their bottom
 - C) the maximum density of water at 4°C
 - D) the maximum density of water at 0°C
 - E) elevation of freezing point of water

Correct Answer : Option C

- 92.** If the temperature of 2 moles of krypton gas is increased from -11°C to 89°C at constant volume, then (specific heat at constant volume of krypton is C_V)
- A) work done on the gas is not zero
 - B) internal energy is not changed
 - C) work is done by the gas
 - D) amount of heat added is $200 C_V$
 - E) internal energy is increased by $100 C_V$

Correct Answer : Option D

- 93.** If an ideal heat engine with an efficiency of 40 % rejects heat at 27°C , then it should have absorbed heat at
- A) 377°C
 - B) 500°C
 - C) 227°C
 - D) 427°C
 - E) 460°C

Correct Answer : Option C

- 94.** Two perfect monoatomic gases at temperatures 300 K and 410 K are mixed without any loss of heat. If 10^{24} and 10^{23} are the number of molecules in the respective gases, then the temperature of the mixture is
- A) 340 K
 - B) 310 K
 - C) 360 K
 - D) 350 K
 - E) 370 K

Correct Answer : Option B

- 95.** If the temperature T of oxygen molecule is raised to $9T$, then its root mean square speed v is increased to

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

Correct Answer : Option A

96. For a particle executing simple harmonic motion with amplitude A and time period T along x -axis, the time taken by the particle to move from $x = 0$ to $x = A$ is

- A) $\frac{T}{2}$
- B) $\frac{T}{3}$
- C) $\frac{T}{4}$
- D) $\frac{T}{8}$
- E) $\frac{T}{6}$

Correct Answer : Option C

97. With Laplace correction in Newton's formula for the velocity of sound in gases, the velocity of sound in monoatomic gas at STP is

- A) $\sqrt{\frac{7P}{5\rho}}$
- B) $\sqrt{\frac{5P}{3\rho}}$
- C) $\sqrt{\frac{2P}{2\rho}}$
- D) $\sqrt{\frac{7P}{2\rho}}$
- E) $\sqrt{\frac{P}{\rho}}$

Correct Answer : Option B

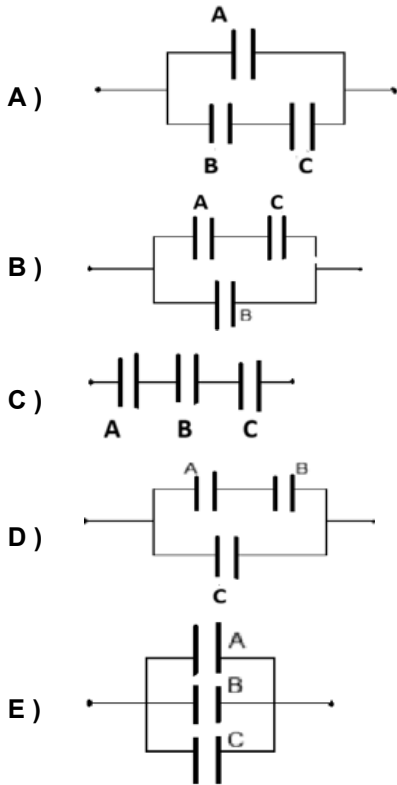
98. A, B and C are three points in space forming an equilateral triangle of side 10 cm. If a point charge $8 \mu\text{C}$ is placed at A, then the work done in moving a unit charge from B to C is

- A) zero
- B) 720 J
- C) 7200 J

- D) 360 J
- E) 3600 J

Correct Answer : Option A

- 99.** Three capacitors A, B, C with respective capacitance of $1\mu\text{F}, 2\mu\text{F}$ and $3\mu\text{F}$ are connected as shown. For a given voltage source V connected across them, the combination that can store the maximum energy is



Correct Answer : Option E

- 100.** The equipotential surface of a system of two point charge $5\mu\text{C}$ and $-5\mu\text{C}$ at points A and B separated by 80 cm is a plane perpendicular to the line connecting A and B at

- A) 0.4 m from A
- B) 0.6 m from A
- C) 0.5 m from A
- D) 0.6 m from B
- E) 0.5 m from B

Correct Answer : Option A

- 101.** If an infinitely long uniformly charged wire produces an electric field of intensity E at a distance of d from it, then the linear charge density λ of the wire is

- A) $\pi \epsilon_0 E d$
- B) $\frac{\pi}{2} \epsilon_0 E d$
- C) $\frac{1}{2} \epsilon_0 E d$

D) $2\pi \epsilon_0 Ed$

E) $\epsilon_0 Ed$

Correct Answer : Option D

102. The ratio of the rate of flow of electrons through three resistors connected in parallel to a voltage source V is $3 : 2 : 1$, then the ratio of their respective resistance values is

A) $1 : 1 : 1$

B) $6 : 3 : 2$

C) $2 : 3 : 6$

D) $9 : 4 : 1$

E) $\sqrt{6}:\sqrt{4}:\sqrt{2}$

Correct Answer : Option C

103. The ratio of the heat produced in a 2Ω and a 4Ω resistor connected in series with a voltage source of 12 V is

A) $2 : 1$

B) $1 : 4$

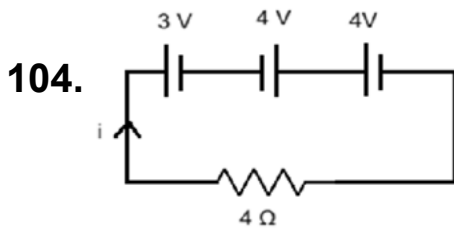
C) $4 : 1$

D) $1 : 2$

E) $1 : 8$

Correct Answer : Option D

Three cells of 3 V , 4 V and 4 V with respective internal resistances 0.5Ω , 0.75Ω and 0.75Ω are connected in series to a resistor of 4Ω . Then the current in the circuit is



A) 1 A

B) 0.5 A

C) 0.25 A

D) 0.75 A

E) 0.67 A

Correct Answer : Option B

105. If a current carrying circular loop is suspended in a uniform magnetic field \mathbf{B} , then

A) a couple will act on the loop

B) the loop will start to rotate

C) areal vector of the loop will be set in the direction of \mathbf{B}

D) areal vector of the loop will be perpendicular to the direction of \mathbf{B}

E) loop will be deflected away from the field \mathbf{B}

Correct Answer : Option C

106. In a uniform magnetic field \mathbf{B} , a bar magnet of magnetic moment M is kept suspended at an angle of 60° with respect to \mathbf{B} . The work done to turn it from 60° to 90° with respect to the field is

- A) MB
- B) $\sqrt{2}MB$
- C) 0
- D) $2MB$
- E) $\frac{MB}{2}$

Correct Answer : Option E

107. The flow of current of 2A through a straight solenoid of length 2 m produces a magnetic field of $2\pi \times 10^{-4}\text{T}$ at its centre. Then the number of turns in the solenoid is

- A) 600
- B) 500
- C) 3500
- D) 5000
- E) 700

Correct Answer : Option B

108. A wire of length 4 m carrying a current of 1 A is bent to form a circular loop. The magnetic moment of the loop (in Am^2) is

- A) $\frac{4}{\pi^2}$
- B) $\frac{2}{\pi^2}$
- C) $\frac{2}{\pi}$
- D) $\frac{4}{\pi}$
- E) 4π

Correct Answer : Option D

109. The plane of a circular loop of area 150 cm^2 is perpendicular to a uniform magnetic field of 0.5 T. If the loop is turned such that its plane is in the direction of the field in 0.5 s, then the induced *emf* produced is

- A) 25 mV
- B) 10 mV
- C) 2.5 mV
- D) 15 mV
- E) 7.5 mV

Correct Answer : Option D

- 110.** Two identical transformers A and B each with $\frac{N_p}{N_s} = 2$ are connected such that the secondary output obtained from A is given as the primary input voltage for B . If the primary ac voltage of A is 200 V, then the secondary voltage from B is
- A) 100 V
 - B) 200 V
 - C) 50 V
 - D) 400 V
 - E) 500 V

Correct Answer : Option C

- 111.** Microwaves are
- A) used in radio and television communications
 - B) having frequency range from 54 MHz to 890 MHz
 - C) short wavelength radio waves
 - D) produced by hot bodies and molecules
 - E) absorbed by ordinary glass

Correct Answer : Option C

- 112.** An object placed at 10 cm in front of a concave mirror of focal length of 8 cm gives image of magnification of
- A) 4
 - B) 6
 - C) 8
 - D) 2
 - E) 10

Correct Answer : Option A

- 113.** The magnifying power of a telescope of length 76 cm in the normal adjustment is 75. Then the focal lengths of the objective and eyepiece lenses are, respectively,
- A) 50 cm, 25 cm
 - B) 70 cm, 5 cm
 - C) 75 cm, 1 cm
 - D) 73 cm, 2 cm
 - E) 60 cm, 15 cm

Correct Answer : Option C

- 114.** The fringe width obtained in a given Young's double slit experimental set up for red light, blue light and green light are, respectively, β_R , β_B and β_G . Then
- A) $\beta_B > \beta_R$

- B) $\beta_R > \beta_G$
- C) $\beta_G > \beta_R$
- D) $\beta_B > \beta_R$
- E) $\beta_R = \beta_B = \beta_G$

Correct Answer : Option B

115. If the de Broglie wavelength associated with an electron is 0.1227 nm, then its accelerating potential is

- A) 64 V
- B) 200 V
- C) 100 V
- D) 160 V
- E) 36 V

Correct Answer : Option C

116. If a radiation of energy 5.2 eV falls on the photosensitive surfaces of Mo and Ni, they emit photoelectrons with maximum kinetic energy of 0.5eV and 1 eV, respectively. Then the work function of

- A) Mo is 2.6 eV
- B) Ni is 6.2 eV
- C) Mo is 6.2 eV
- D) Ni is 4.2 eV
- E) Mo is 4.2 eV

Correct Answer : Option D

117. If a radioactive parent nucleus ${}_{94}^{236}X$ emits two alpha particles and two β particles successively to reach the daughter nucleus a_bY , then the values of a and b are

- A) 224 and 90
- B) 220 and 94
- C) 228 and 92
- D) 230 and 92
- E) 226 and 92

Correct Answer : Option C

118. The difference in magnitudes of angular momentum of the electrons revolving in 5th Bohr's orbit and 3rd Bohr's orbit of hydrogen atom is

- A) $\frac{2h}{\pi}$
- B) $\frac{h}{\pi}$
- C) $\frac{h}{2\pi}$

- D) $\frac{3h}{2\pi}$
 E) $\frac{5h}{2\pi}$

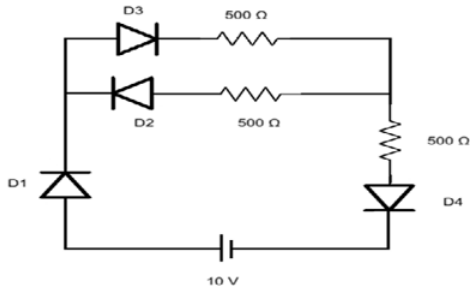
Correct Answer : Option B

- 119.** Intrinsic semiconductors Ge or Si doped with
 A) indium becomes an n-type semiconductor
 B) antimony becomes a p-type semiconductor
 C) phosphorus becomes a n-type semiconductor
 D) boron becomes a n-type semiconductor
 E) arsenic becomes a p-type semiconductor

Correct Answer : Option C

Four ideal diodes are connected as shown then the current drawn from the battery is

120.



- A) zero
 B) 10 mA
 C) 100 mA
 D) 50 mA
 E) 20 mA

Correct Answer : Option B

- 121.** The empirical formula of a metal oxide which has 54 % metal (M) and 46 % oxygen (O) is (Atomic mass of M = 27 amu and O= 16 amu)
 A) M_3O_2
 B) MO_2
 C) M_2O_3
 D) M_2O_5
 E) M_2O

Correct Answer : Option C

- 122.** The threshold wavelength of a metal is 6000 \AA . The work function of the metal is ($h = 6.62 \times 10^{-34} \text{ J s}$)
 A) $3.31 \times 10^{19} \text{ J}$
 B) $3.31 \times 10^{-19} \text{ J}$

- C) 13.2×10^{-19} J
- D) 13.2×10^{19} J
- E) 1.5×10^{-19} J

Correct Answer : Option B

123. The radius of the first orbit He^+ is

- A) 52.9 pm
- B) 13.24 pm
- C) 211.6 pm
- D) 105.8 pm
- E) 26.45 pm

Correct Answer : Option E

124. In Mosley experiment, the X-ray spectrum is obtained by plotting

- A) square root of frequency vs atomic mass
- B) square root of frequency vs atomic number
- C) square of frequency vs atomic mass
- D) square root of wavelength vs atomic number
- E) square root of wavelength vs atomic mass

Correct Answer : Option B

125. Which of the following elements have the highest and the lowest first ionization enthalpy?
(i) Be (ii) B (iii) C (iv) N (v) O

- A) (ii) and (iv)
- B) (i) and (v)
- C) (i) and (iii)
- D) (ii) and (iii)
- E) (i) and (ii)

Correct Answer : Option A

126. The correct increasing order of dipole moment of the following molecules is

- A) $\text{NF}_3 < \text{CHCl}_3 < \text{NH}_3 < \text{H}_2\text{O}$
- B) $\text{NF}_3 < \text{CHCl}_3 < \text{H}_2\text{O} < \text{NH}_3$
- C) $\text{H}_2\text{O} < \text{NF}_3 < \text{CHCl}_3 < \text{NH}_3$
- D) $\text{CHCl}_3 < \text{NF}_3 < \text{H}_2\text{O} < \text{NH}_3$
- E) $\text{NH}_3 < \text{NF}_3 < \text{CHCl}_3 < \text{H}_2\text{O}$

Correct Answer : Option A

- 127.** The number of bonding pairs and lone pairs of electrons in BrF_5 molecule are respectively
- A) 4 and 2
 - B) 3 and 2
 - C) 4 and 1
 - D) 5 and 1
 - E) 3 and 1

Correct Answer : Option D

- 128.** Which of the following bond has highest mean bond enthalpy?
- A) $\text{N}=\text{N}$
 - B) $\text{O}=\text{O}$
 - C) $\text{N}\equiv\text{N}$
 - D) $\text{C}\equiv\text{C}$
 - E) $\text{C}\equiv\text{O}$

Correct Answer : Option E

- 129.** The correct increasing order of enthalpy of fusion of $\Delta_{\text{fus}}H^\circ$ (in kJ mol^{-1}) of the following compounds is
- A) $\text{CH}_3\text{COCH}_3 < \text{CCl}_4 < \text{C}_6\text{H}_6$
 - B) $\text{CH}_3\text{COCH}_3 < \text{C}_6\text{H}_6 < \text{CCl}_4$
 - C) $\text{CCl}_4 < \text{C}_6\text{H}_6 < \text{CH}_3\text{COCH}_3$
 - D) $\text{CCl}_4 < \text{CH}_3\text{COCH}_3 < \text{C}_6\text{H}_6$
 - E) $\text{C}_6\text{H}_6 < \text{CH}_3\text{COCH}_3 < \text{CCl}_4$

Correct Answer : Option D

- 130.** The solubility product, K_{sp} of a sparingly soluble salt, AX_2 , is $3.2 \times 10^{-14} \text{ mol}^3\text{lit}^{-3}$. Its solubility is
- A) $4 \times 10^{-3} \text{ mol lit}^{-1}$
 - B) $2 \times 10^{-2} \text{ mol lit}^{-1}$
 - C) $2 \times 10^{-5} \text{ mol lit}^{-1}$
 - D) $8 \times 10^{-4} \text{ mol lit}^{-1}$
 - E) $2 \times 10^{-3} \text{ mol lit}^{-1}$

Correct Answer : Option C

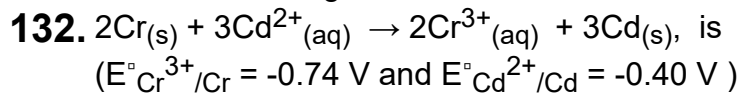
Match the correct pH value with the following substances:

- 131.**
- | | |
|----------------------|---------------|
| (a) Milk of magnesia | (i) pH = 6.8 |
| (b) Black coffee | (ii) pH = 7.8 |
| (c) Egg white | (iii) pH = 5 |
| (d) Milk | (iv) pH = 10 |
- A) (a)-(iv), (b)-(ii), (c)-(i), (d)-(ii)
 - B) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)

- C) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)
- D) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
- E) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

Correct Answer : Option E

The $\Delta_r G^\circ$ of the galvanic cell in which the following cell reaction takes place,



- A) $-196.86 \text{ kJ mol}^{-1}$
- B) $+196.86 \text{ kJ mol}^{-1}$
- C) $-96.50 \text{ kJ mol}^{-1}$
- D) $+96.50 \text{ kJ mol}^{-1}$
- E) $+98.12 \text{ kJ mol}^{-1}$

Correct Answer : Option A

The molar conductivity of a weak mono basic acid, HA at 298 K is $70 \text{ Scm}^2\text{mol}^{-1}$. What is the percentage ionisation of HA at 298 K?



- A) 8.35 %
- B) 16.7 %
- C) 20 %
- D) 32.5 %
- E) 15.3 %

Correct Answer : Option B

134. The percentage of helium present in air used by scuba divers is

- A) 56.2 %
- B) 11.7 %
- C) 32.1%
- D) 19.7%
- E) 21.5%

Correct Answer : Option B

135. A first order reaction follows the equation $k = (4 \times 10^{10} \text{ s}^{-1}) e^{-2000/T}$. The value of E_a for the reaction is about ($R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

- A) 17.4 kJ mol^{-1}
- B) 18.5 kJ mol^{-1}
- C) 17.5 kJ mol^{-1}
- D) 16.6 kJ mol^{-1}
- E) 17.8 kJ mol^{-1}

Correct Answer : Option D

In a pseudo first order reaction, the following results were obtained.

136.

Time /s	0	10	20	30	40	50	60
[A]/mol lit ⁻¹	0.65	0.55	0.46	0.38	0.26	0.2	0.13

Average rate of the reaction between 20 and 40 seconds is

- A) 0.01 mol lit⁻¹ s⁻¹
- B) 0.02 mol lit⁻¹ s⁻¹
- C) 0.001 mol lit⁻¹ s⁻¹
- D) 0.1 mol lit⁻¹ s⁻¹
- E) 0.04 mol lit⁻¹ s⁻¹

Correct Answer : Option A

137. Which of the following compound of manganese is a mixed oxide?

- A) MnO
- B) Mn₃O₄
- C) Mn₂O₃
- D) MnO₂
- E) Mn₂O₇

Correct Answer : Option B

138. The formula of Pentaamminecarbonatocobalt(III)chloride is

- A) [Co(NH₃)₅(CO)]Cl₂
- B) [Co(NH₃)₅(CO₃)]Cl
- C) [Co(NH₃)₅(CO)₃]Cl₂
- D) [Co(NH₃)₅(CO₃)]Cl₂
- E) [Co(NH₃)₅(CO₃)]Cl₃

Correct Answer : Option B

The correct increasing order of wavelength of absorption of the following complexes is

139. (i) [CoCl(NH₃)₅]²⁺ (ii) [Co(NH₃)₅(H₂O)]³⁺ (iii) [Co(NH₃)₆]³⁺ (iv) [Co(CN)₆]³⁻

- A) (i) < (ii) < (iii) < (iv)
- B) (i) < (ii) < (iv) < (iii)
- C) (ii) < (i) < (iv) < (iii)
- D) (iv) < (iii) < (ii) < (i)

E) (iv) < (i) < (ii) < (iii)

Correct Answer : Option D

140. When sodium fusion extract is treated with sodium nitropruside, the appearance of violet colour is due to the formation of

- A) $[\text{Fe}(\text{CN})_5\text{NO}]^{2-}$
- B) $[\text{Fe}(\text{CN})_5\text{NO}]^{2+}$
- C) $[\text{Fe}(\text{CN})_5\text{NOS}]^{4-}$
- D) $[\text{Fe}(\text{CN})_5\text{NOS}]^{2-}$
- E) $[\text{Fe}(\text{CN})_5\text{NOS}]^{2+}$

Correct Answer : Option C

Which of the following gives 2-methylbutane on hydrogenation?

141. (i) 2-methylbut-1-ene (ii) 3-methylbut-1-yne (iii) 2-methylbut-2-ene

(iv) 3-methylbut-1-ene (v) pent-2-ene

- A) (i) and (iii)
- B) (ii), (iii), (iv)
- C) (ii), (iii), (v)
- D) (i), (ii), (v)
- E) (i), (iii), (iv)

Correct Answer : Option E

142. An alkene, C_3H_6 (X), on treatment with HBr in presence of peroxide gives (Y). The compound (Y) on treatment with AgNO_2 in ethanol gives (Z). The compounds (X), (Y) and (Z) are respectively

- A) propene, 1-bromopropane, 1-nitropropane
- B) propene, 2-bromopropane, 2-nitropropane
- C) propene, 2-bromopropane, 1-nitropropane
- D) propyne, 1-bromopropane, 1-nitropropane
- E) propene, 1,2-dibromopropane, 1,2-dinitropropane

Correct Answer : Option A

143. The reaction $\text{CH}_3\text{Br} + \text{AgF} \rightarrow \text{CH}_3\text{F} + \text{AgBr}$ is termed as

- A) Stephen reaction
- B) Swarts reaction
- C) Sandmeyer reaction
- D) Kolbe's reaction
- E) Riemer-Tiemann reaction

Correct Answer : Option B

- 144.** When 2-methylbutan-2-ol is treated with Lucas reagent con.HCl and $ZnCl_2$ at room temperature, the product obtained is
- A) 2-chlorobutane
 - B) 2-chloro-2-methylbutane
 - C) 1-chlorobutane
 - D) 1-chloropentane
 - E) 2-chloro-2-methylbutene

Correct Answer : Option B

- The relative ease of dehydration of the following alcohols is
- 145.** (i) Propan-2-ol (ii) Propan-1-ol (iii) 2-Methylpropan-2-ol
- A) (iii) > (ii) > (i)
 - B) (ii) > (i) > (iii)
 - C) (ii) > (iii) > (i)
 - D) (i) > (ii) > (iii)
 - E) (iii) > (i) > (ii)

Correct Answer : Option E

- 146.** Which of the following is a commercial method of manufacture of benzaldehyde?
- A) Hydrogenation of benzoylchloride with Pd/ $BaSO_4$ as catalyst.
 - B) Oxidation of toluene with chromyl chloride followed by hydrolysis
 - C) Toluene is treated with Cr_2O_3 in acetic anhydride followed by hydrolysis
 - D) Side chain chlorination of toluene followed by hydrolysis.
 - E) Benzene is treated with CO and HCl in the presence of anhydrous $AlCl_3$.

Correct Answer : Option D

- 147.** Vigorous oxidation of n-propylbenzene with alkaline potassium permanganate ($KMnO_4$ -KOH/ Δ) followed by hydrolysis gives
- A) phenol
 - B) phenyl acetic acid
 - C) phenyl propionic acid
 - D) benzaldehyde
 - E) benzoic acid

Correct Answer : Option E

The descending order of basic strength of the following amines is

- 148.** (i) N-Methylbenzenamine (ii) N,N'-Dimethylbenzenamine (iii) Benzenamine (iv) Phenylmethanamine
- A) (i) > (ii) > (iv) > (iii)
 - B) (iv) > (i) > (ii) > (iii)
 - C) (iv) > (ii) > (i) > (iii)

- D) (iv) > (iii) > (ii) > (i)
- E) (i) > (iv) > (ii) > (iii)

Correct Answer : Option C

149. Benzene diazoniumchloride on treatment with HCl in the presence of copper powder gives chlorobenzene. This reaction is termed as

- A) Sandmeyer reaction
- B) Gatterman reaction
- C) Stephen reaction
- D) Gatterman Koch reaction
- E) Etard reaction

Correct Answer : Option B

Which of the following statements are true about sucrose?

- (i) It is a disaccharide
- (ii) It is a reducing sugar
- (iii) It is laevorotatory
- (iv) Sucrose on hydrolysis gives equimolar mixture of D(+) glucose and D(-)fructose.
- (v) In sucrose, two monosaccharides are held together by a glycosidic linkage

- 150.** A) (i), (ii), (iii)
- B) (i), (ii), (v)
- C) (ii), (iii), (v)
- D) (i), (iii), (v)
- E) (i), (iv), (v)

Correct Answer : Option E