

## FINAL ANSWER KEY

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1. The relation  $R = \{(4, 4), (4, 5), (5, 7), (4, 8), (5, 5), (7, 8), (7, 7), (7, 5), (8, 8), (8, 7), (8, 5), (9, 9)\}$  on the set  $A = \{4, 5, 7, 8, 9\}$  is

- A) transitive
- B) symmetric
- C) reflexive
- D) equivalence relation
- E) a function

**Correct Answer :** Option C

2. Let  $A = \{1, 2, 3, 4\}$  and  $B = \{7, 8, 3, 4\}$  Then the number of elements common to both  $A \times B$  and  $B \times A$  is

- A) 8
- B) 6
- C) 12
- D) 4
- E) 2

**Correct Answer :** Option D

3. The range of the function  $f(x) = \log_e(4x^2 - 4x + 1)$ , where  $x \neq \frac{1}{2}$  is

- A)  $(-\infty, 0)$
- B)  $[0, \infty)$
- C)  $(0, \infty)$
- D)  $(-\infty, 0)$
- E)  $(-\infty, \infty)$

**Correct Answer :** Option E

4. The domain of the function  $f(x) = \sqrt{x^2 + 2x - 15}$  is

- A)  $(-\infty, -5) \cup (3, \infty)$
- B)  $(-\infty, -5) \cup [3, \infty)$
- C)  $(-\infty, -5] \cup (3, \infty)$
- D)  $(-\infty, -5] \cup [3, \infty)$
- E)  $[-5, 3]$

**Correct Answer :** Option D

5. All the points in  $A = \left\{ \frac{\lambda + i}{\lambda - i}; \lambda \in \mathbb{R} \right\}$  lie on
- A) a circle with radius  $\sqrt{2}$
  - B) a circle with radius 2
  - C) a circle with radius  $\frac{1}{2}$
  - D) a circle with radius 1
  - E) a straight line with slope 1

**Correct Answer :** Option D

6.  $\sum_{n=1}^{2025} i^n (1 + i), i^2 = -1$ , is equal to
- A)  $i + 1$
  - B)  $i - 1$
  - C)  $-i - 1$
  - D)  $-i + 1$
  - E)  $-i$

**Correct Answer :** Option B

7. If  $x, y \in \mathbb{R}$  and  $x + iy = -(6 + i)^3, i^2 = -1$ , then  $x - y$  is equal to
- A) 93
  - B) -93
  - C) 91
  - D) -91
  - E) -107

**Correct Answer :** Option D

8. Let  $z = x + iy$ , where  $x, y \in \mathbb{R}$  and  $i^2 = -1$ . If  $|z - i| = |z - 1|$ , then  $y =$
- A)  $-x$
  - B)  $x + 1$
  - C)  $-x - 1$
  - D)  $x + 2$
  - E)  $x$

**Correct Answer :** Option E

9. If  $a, b, c$  are real numbers such that  $(a - 2)^2 + (b - 2)^2 + (c - 2)^2 = 0$
- A)  $a, b, c$  are in G.P. and  $a + b + c = 6$

- B)  $a, b, c$  are in G.P. and  $a + b + c = 4$
- C)  $a, b, c$  are not in G.P.
- D)  $a, b, c$  are in G.P. and  $a + b + c = 8$
- E)  $a, b, c$  are not in G.P. and  $a + b + c = 16$

**Correct Answer :** Option A

10. Let  $a, \frac{3}{4}, ar^2, ar^3, \dots$  be in G.P. where  $r > 0$  If the product of first four terms of the G.P. is  $\frac{3^6}{4^5}$  then  $a$  is equal to

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

**Correct Answer :** Option D

11. Let  $a_1, a_2, \dots, a_n$  be positive non-zero real numbers. If  $a_1, a_2, \dots, a_n = k$  then the minimum value of  $a_1 + a_2 + \dots + a_n$  is

- A)  $n(k)^{2/n}$
- B)  $n(k)^{1/n}$
- C)  $(k)^{1/n}$
- D)  $(k)^{2/n}$
- E)  $2n(k)^{2/n}$

**Correct Answer:-Question Cancelled**

12. Let  $\lambda$  be the A.M. between  $\alpha$  and  $\beta$  and also G.M. between  $\alpha$  and  $\beta$ . Then  $\alpha^2 + \beta^2 =$

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

**Correct Answer :** Option E

13. The number of integers greater than 7000 using 2,4,6,7,8 without repetition, is

- A) 168
- B) 336

- C) 196
- D) 256
- E) 512

**Correct Answer :** Option A

- 14.** The coefficient of  $x^9$  in the expansion of  $\left(4 - \frac{x^2}{4}\right)^{12}$  is
- A)  $-^{12}C_7(4)^7(3)^5$
  - B)  $^{12}C_7(4)^7(3)^5$
  - C)  $^{12}C_6(4)^6(3)^6$
  - D)  $^{12}C_5(4)^5(3)^7$
  - E) 0

**Correct Answer :** Option E

- 15.** Five digit number is formed using the digits 0,1,2,3,4 and 5 without repetitions. Number of five digit numbers which are divisible by 10 is
- A) 360
  - B) 240
  - C) 120
  - D) 480
  - E) 520

**Correct Answer :** Option C

- 16.** The constant term in the expansion of  $\left(2x^2 - \frac{1}{x^2}\right)^6$  is
- A) -160
  - B) 160
  - C) -180
  - D) 180
  - E) 0

**Correct Answer :** Option A

- 17.** If  $n$  is a positive integer and the coefficient of  $x$  in the expansion of  $\left(x^2 + \frac{1}{x^3}\right)^n$  is  ${}^nC_7$ , then  $n$  is equal to
- A) 18
  - B) 16
  - C) 17
  - D) 21
  - E) 19

**Correct Answer :** Option A

**18.** Let  $A = (a_{ij})_{3 \times 3}$ ,  $B = (b_{ij})_{3 \times 2}$  and  $C = (c_{ij})_{3 \times 1}$ . Which one of the following products, is not defined ?

- A)  $C^T AB$
- B)  $A^T AB$
- C)  $(AB)^T C$
- D)  $(AB)C$
- E)  $B^T C$

**Correct Answer :** Option D

**19.** Let  $A$  be a square matrix of order 3 and  $|A| = 9$  Then  $|adj(adjA)| =$

- A) 6561
- B) 6564
- C) 6569
- D) 8187
- E) 8164

**Correct Answer :** Option A

**20.** If  $\begin{vmatrix} 1 & 0 & 0 \\ x & x+2 & 0 \\ x^2 & x & x+3 \end{vmatrix} = 0$ , then value of  $x$  are

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

**Correct Answer :** Option C

**21.** Let  $A = \begin{pmatrix} 0 & 2 \\ 3 & 4 \end{pmatrix}$ ,  $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ . If  $(I+A) \begin{pmatrix} 4 & -3 \\ 2 & -1 \end{pmatrix} = \begin{pmatrix} 8 & -5 \\ 22 & x \end{pmatrix}$ , then the value of  $x$  is equal to

- A) 14
- B) -14
- C) 12
- D) -12
- E) 15

**Correct Answer :** Option B

22. The solution set for  $-12x > 38$ , where  $x$  is a natural number, is

- A)  $\{1,2,3\}$
- B)  $\{1,2\}$
- C)  $\{1\}$
- D) empty set
- E)  $\{-1,-2,-3\}$

Correct Answer : Option D

23. Let  $x$  be a real number such that  $x + \frac{x}{4} + \frac{x}{3} < 13$ . Then the solution set is

- A)  $\left(-\infty, \frac{156}{19}\right)$
- B)  $\left(\frac{156}{19}, \infty\right)$
- C)  $\left(\frac{154}{19}, \infty\right)$
- D)  $\left(-\infty, \frac{154}{17}\right)$
- E)  $\left(\frac{-156}{19}, \frac{156}{19}\right)$

Correct Answer : Option A

24.  $\cos 75^\circ \cos 45^\circ \cos 15^\circ =$

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

Correct Answer : Option C

25. If  $\alpha + \beta + \gamma = 2\pi$ , then  $\tan \frac{\alpha}{2} + \tan \frac{\beta}{2} + \tan \frac{\gamma}{2} =$

- A)  $\tan \frac{\alpha}{2} \tan \frac{\beta}{2} \tan \frac{\gamma}{2}$
- B)  $-\tan \frac{\alpha}{2} \tan \frac{\beta}{2} \tan \frac{\gamma}{2}$
- C)  $2 \tan \frac{\alpha}{2} \tan \frac{\beta}{2} \tan \frac{\gamma}{2}$
- D)  $3 \tan \frac{\alpha}{2} \tan \frac{\beta}{2} \tan \frac{\gamma}{2}$

E)  $4 \tan \frac{\alpha}{2} \tan \frac{\beta}{2} \tan \frac{\gamma}{2}$

**Correct Answer :** Option A

26.  $\tan (315^\circ) \cot (-405^\circ) =$

A) -1

B) 1

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

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

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

**Correct Answer :** Option B

27.  $\frac{\sin \frac{\pi}{7} + \sin \frac{2\pi}{7}}{1 + \cos \frac{\pi}{7} + \cos \frac{2\pi}{7}} =$

A)  $\cot \frac{\pi}{7}$

B)  $\cos \frac{\pi}{14}$

C)  $1 + \sin \frac{\pi}{14}$

D)  $1 + \cos \frac{\pi}{14}$

E)  $\tan \frac{\pi}{7}$

**Correct Answer :** Option E

28.  $\sec \left( \cos^{-1} \left( \frac{2024}{2025} \right) \right)$  is equal to

A)  $\frac{2024}{2025}$

B)  $\frac{2025}{2024}$

C)  $\frac{1}{2025}$

D)  $\frac{-1}{2025}$

E)  $\frac{-2025}{2024}$

**Correct Answer :** Option B

29. If  $\sec^{-1}\left(\frac{x}{x+2}\right) = \frac{\pi}{2} - \operatorname{cosec}^{-1}\left(\frac{1}{2}\right)$ , then  $x =$

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

**Correct Answer:-Question Cancelled**

30.  $\tan^{-1}\left(\frac{1001}{999}\right) - \tan^{-1}\left(\frac{2}{2000}\right) =$

- A)  $\frac{\pi}{3}$
- B)  $\pi$
- C) 1
- D)  $\frac{\pi}{6}$
- E)  $\frac{\pi}{4}$

**Correct Answer :** Option E

31. Let  $a \neq 1$  be non-zero real number. If the lines  $2x + ay = 1$  and  $x + 2y = 1$  are perpendicular, then the value of  $a$  is equal to

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

**Correct Answer :** Option D

32. Let  $P(1, 2), Q(a, b), R(5, 7)$  and  $S(2, 3)$  be the vertices of a parallelogram PQRS. Then

- A)  $a = 4, b = 2$
- B)  $a = 6, b = 2$
- C)  $a = 6, b = 4$
- D)  $a = 3, b = 2$
- E)  $a = 4, b = 6$

**Correct Answer :** Option E

33. Which one of the following lines, passes through the point of intersection of  $x + y = 5$  and  $2x + y = 7$ ?

- A)  $4x + 3y = -1$
- B)  $3x + 2y = 7$

- C)  $4x - 3y = -1$
- D)  $4x + 3y - 2 = 0$
- E)  $4x + 3y + 3 = 0$

**Correct Answer :** Option C

- 34.** The axis of a parabola is  $x = 0$ . If the vertex is at a distance 3 from the origin above the  $x$ -axis. The vertex of the parabola is at
- A) (3,0)
  - B) (-3,0)
  - C) (3,-3)
  - D) (3,3)
  - E) (0,3)

**Correct Answer :** Option E

- 35.** Length of the Latus rectum of the ellipse  $\frac{x^2}{9} + \frac{y^2}{16} = 1$  is
- A)  $\frac{3}{2}$
  - B) 8
  - C)  $\frac{9}{2}$
  - D) 2
  - E)  $\frac{25}{2}$

**Correct Answer :** Option C

- 36.** The centre of the ellipse  $4x^2 + 24x + 9y^2 - 18y + 9 = 0$  is
- A) (1, 3)
  - B) (1, - 3)
  - C) (3, - 1)
  - D) (- 3, 1)
  - E) (3, - 3)

**Correct Answer :** Option D

- 37.** The line  $x - y + 4 = 0$  touches the ellipse  $x^2 + 3y^2 = 12$  at
- A) (1,3)
  - B) (3,1)
  - C) (0,2)
  - D) (0,-2)
  - E) (-3,1)

**Correct Answer :** Option E

38. Let  $\vec{OA} = 2\hat{i} + 3\hat{j} - 5\hat{k}$ ,  $\vec{OB} = 3\hat{i} + \hat{j} - 2\hat{k}$ ;  $\vec{OC} = 6\hat{i} - 5\hat{j} + 7\hat{k}$  be the position vectors of the points ,A B and C. Then
- A)  $\vec{AC} = 3\vec{AB}$   
 B)  $\vec{AB} = 3\vec{BC}$   
 C)  $\vec{AC} = 2\vec{AB}$   
 D)  $\vec{AB} = 3\vec{BC}$   
 E)  $\vec{AC} = 4\vec{AB}$

Correct Answer : Option E

39. Let  $\vec{AB} = 2\hat{i} + 10\hat{j} + 11\hat{k}$  and  $\vec{AC} = -\hat{i} + 2\hat{j} + 2\hat{k}$ . If  $\theta$  is the angle between  $\vec{AB}$  and  $\vec{AC}$  then  $\sin\theta =$
- A)  $\frac{\sqrt{13}}{9}$   
 B)  $\frac{\sqrt{15}}{9}$   
 C)  $\frac{\sqrt{14}}{9}$   
 D)  $\frac{\sqrt{17}}{9}$   
 E)  $\frac{4}{9}$

Correct Answer : Option D

40. Let  $\vec{a} \times (2\hat{i} + 3\hat{j} + 4\hat{k}) = (2\hat{i} + 3\hat{j} + 4\hat{k}) \times \vec{b}$ . If  $|\vec{a} + \vec{b}| = \sqrt{29}$ , then  $\vec{a} + \vec{b} =$
- A)  $(2\hat{i} + 3\hat{j} - 4\hat{k})$   
 B)  $-(2\hat{i} + 3\hat{j} - 4\hat{k})$   
 C)  $\pm(2\hat{i} + 3\hat{j} + 4\hat{k})$   
 D)  $\pm(2\hat{i} - 3\hat{j} + 4\hat{k})$   
 E)  $\pm\sqrt{29}(2\hat{i} + 3\hat{j} + 4\hat{k})$

Correct Answer : Option C

41. Let  $\vec{a} = \hat{i} + 2\hat{j} + 4\hat{k}$ ,  $\vec{b} = 2\hat{i} + 4\hat{j} + 8\hat{k}$  and  $\vec{c} = 2\hat{i} + 4\hat{j} + 3\hat{k}$ . Then  $(\vec{a} \times \vec{b}) \cdot \vec{c} =$
- A) 4  
 B) 6  
 C) 8  
 D) 2

E) 0

**Correct Answer :** Option E

**42.** The point of intersection of the lines  $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-11}{4}$  and  $\frac{x-3}{1} = \frac{y-\frac{9}{2}}{2} = \frac{z}{1}$  is

A)  $\left(-2, \frac{11}{2}, 5\right)$

B)  $\left(-2, \frac{11}{2}, -5\right)$

C)  $\left(-2, \frac{-11}{2}, -5\right)$

D)  $\left(-2, \frac{11}{4}, -5\right)$

E)  $\left(-2, \frac{-11}{5}, \frac{-5}{2}\right)$

**Correct Answer:-Question Cancelled**

**43.** The equation of the line passing through  $(0, 0, 1)$  and  $(1, 1, 0)$  is

A)  $\vec{r} = \hat{k} + \lambda (\hat{i} + \hat{j} - \hat{k}), \lambda \in \mathbb{R}$

B)  $\vec{r} = \hat{j} + \lambda (\hat{i} - \hat{j} + \hat{k}), \lambda \in \mathbb{R}$

C)  $\vec{r} = \hat{i} + \lambda (\hat{i} + \hat{j} + \hat{k}), \lambda \in \mathbb{R}$

D)  $\vec{r} = \hat{i} + \hat{j} + \lambda (\hat{i} - \hat{j} - \hat{k}), \lambda \in \mathbb{R}$

E)  $\vec{r} = \hat{i} + \hat{j} + \hat{k} + \lambda (\hat{i} + \hat{j} - \hat{k}), \lambda \in \mathbb{R}$

**Correct Answer :** Option A

**44.** Which one of the following is a vector parallel to the straight line  $\vec{r} = (\hat{i} - 11\hat{j} + 101\hat{k}) + \lambda (3\hat{i} - 5\hat{j} + 2\hat{k}), \lambda \in \mathbb{R}$

A)  $-3\hat{i} + 5\hat{j} - 2\hat{k}$

B)  $3\hat{i} + 5\hat{j} + 2\hat{k}$

C)  $\hat{i} - 11\hat{j} + 101\hat{k}$

D)  $-\hat{i} + 11\hat{j} + 101\hat{k}$

E)  $-4\hat{i} - 16\hat{j} + 103\hat{k}$

**Correct Answer :** Option A

**45.** A straight line through the point  $(1, -1, 0)$  meets the line  $\frac{x-1}{1} = \frac{y+1}{1} = \frac{z-1}{-1}$  at right angle . It's equation is

- A)  $\frac{x-1}{1} = \frac{y+1}{1} = \frac{z}{2}$
- B)  $\frac{x-1}{1} = \frac{y-1}{1} = \frac{z}{4}$
- C)  $\frac{x-1}{-1} = \frac{y-1}{1} = \frac{z}{6}$
- D)  $\frac{x-1}{-1} = \frac{y-1}{-1} = \frac{z}{3}$
- E)  $\frac{x-1}{1} = \frac{y+1}{1} = \frac{z}{-2}$

**Correct Answer :** Option A

The mean deviation about the mean for the following data

46.

$x$	:	2	4	6	10
$f$	:	7	4	5	4

- A) 2
- B) 2.5
- C) 4
- D) 6
- E) 5

**Correct Answer :** Option B

47. If  $P(A) = 0.7, P(B) = 0.5$  and  $P(A \cup B) = 0.9$ . Then  $P(A / B)$  is

- A) 0.3
- B) 0.4
- C) 0.5
- D) 0.6
- E) 0.7

**Correct Answer :** Option D

48. The variance of 240, 260, 270, 280 is

- A)  $\frac{475}{4}$
- B)  $\frac{475}{2}$
- C)  $\frac{475}{8}$
- D)  $\frac{475}{16}$
- E)  $\frac{875}{4}$

**Correct Answer :** Option E

49. Four unbiased coins are tossed simultaneously. Probability of getting atmost two heads, is
- A)  $\frac{5}{8}$
  - B)  $\frac{9}{16}$
  - C)  $\frac{11}{16}$
  - D)  $\frac{13}{16}$
  - E)  $\frac{15}{16}$

**Correct Answer :** Option C

50.  $\lim_{x \rightarrow 0} \frac{\sin(\pi \sin^2 x)}{x^2} =$
- A)  $\frac{\pi}{2}$
  - B)  $\pi$
  - C)  $2\pi$
  - D)  $\pi^2$
  - E)  $\frac{\pi^2}{2}$

**Correct Answer :** Option B

51. If  $[x]$  is the greatest integer less than or equal to  $x$ , then  $\lim_{x \rightarrow 0^-} \frac{\sin[x]}{[x]}$  is equal to
- A) 1
  - B)  $\sin 1$
  - C) -1
  - D) 0
  - E)  $-\sin 1$

**Correct Answer :** Option B

52.  $\lim_{x \rightarrow 2} \frac{(x^3 - 8)\sin(x - 2)}{x^2 - 4x + 4}$  is equal to
- A) 4
  - B) 8
  - C) 12
  - D) -8
  - E) -12

**Correct Answer :** Option C

53.  $\lim_{x \rightarrow 0} \frac{x \cos^2 x}{\sin x}$  is equal to

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

Correct Answer : Option E

54. Let  $[a]$  be the greatest integer less than or equal to  $a$ , then  $\lim_{x \rightarrow 0^+} x \left\{ \left[ \frac{1}{x} \right] + \left[ \frac{2}{x} \right] \right\}$  is equal to

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

Correct Answer : Option C

55. If  $f(x) = \sin(|x|) - |x|$ ,  $x \in \mathbb{R}$ , then  $f$  is

- A) not differentiable at  $x = \frac{\pi}{6}$
- B) not differentiable at  $x = \frac{\pi}{2}$
- C) not differentiable at  $x = \frac{\pi}{4}$
- D) not differentiable at  $x = \pi$
- E) not differentiable at  $x = 0$

Correct Answer:-Question Cancelled

56. The function  $f(x) = |x^2 - 3x + 2|$ ,  $x \in \mathbb{R}$  is not differentiable at

- A)  $x = 1$  and  $x = 3$
- B)  $x = 1$  and  $x = 2$
- C)  $x = 2$  and  $x = 4$
- D)  $x = 4$  and  $x = 5$
- E)  $x = -1$  and  $x = -2$

Correct Answer : Option B

57. If  $e^y + x^2y + xy^2 = e^2$ , then  $\frac{dy}{dx}$  at  $(0,1)$  is equal to

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

E)  $\frac{-1}{e}$

**Correct Answer :** Option E

**58.** If  $f(x) = x |x|$ , then  $f'(-10) =$

- A) -20
- B) -10
- C) -40
- D) 20
- E) 40

**Correct Answer :** Option D

**59.** If  $y = (\tan x)^x$ , then  $\frac{1}{y} \frac{dy}{dx} =$

- A)  $\log(\tan x) + 2x \operatorname{cosec}(2x)$
- B)  $\log(\tan x) + x \operatorname{cosec}(2x)$
- C)  $x \log(\tan x) + 2x \operatorname{cosec}(2x)$
- D)  $x \log(\tan x) + x^2 \operatorname{cosec}(2x)$
- E)  $\log(\tan x) + \frac{x}{2} \operatorname{cosec}(2x)$

**Correct Answer :** Option A

**60.** The minimum of  $f(x) = |x + 2|$ ,  $x \in \mathbb{R}$  occurs at

- A)  $x = 0$
- B)  $x = 2$
- C)  $x = 1$
- D)  $x = -2$
- E)  $x = -1$

**Correct Answer :** Option D

**61.** If  $g(x) = x^2 - x$ ,  $x \in \mathbb{R}$ , then  $g(x)$  is increasing in

- A)  $(-\infty, \infty)$
- B)  $(-\infty, 0)$
- C)  $(0, -\infty)$
- D)  $(-5, 5)$
- E)  $\left[\frac{1}{2}, \infty\right)$

**Correct Answer :** Option E

62. The distance travelled by a moving particle is given by  $s = t^2 - 6t + 10$ , where  $t$  is the time in seconds. The particle is at rest when  $t =$
- A) 1
  - B) 4
  - C) 6
  - D) 3
  - E) 8

Correct Answer : Option D

63. The maximum value of the function  $f(x) = x\sqrt{4x - x^2}$  is
- A)  $\sqrt{3}$
  - B)  $4\sqrt{3}$
  - C)  $5\sqrt{3}$
  - D)  $3\sqrt{3}$
  - E)  $6\sqrt{3}$

Correct Answer : Option D

64.  $\int \frac{\sin 2x}{\sin x} dx =$
- A)  $\sin x + C$
  - B)  $2\cos x + C$
  - C)  $-\cos x + C$
  - D)  $-\sin x + C$
  - E)  $2\sin x + C$

Correct Answer : Option E

65.  $\int \frac{\log(1+x)}{(1+x)} dx =$
- A)  $\frac{1}{2} \log(1+x) + C$
  - B)  $\frac{1}{2} [\log(1+x)]^2 + C$
  - C)  $[\log(1+x)]^2 + C$
  - D)  $\log(1+x) + C$
  - E)  $x \log(1+x) + C$

Correct Answer : Option B

66.  $\int \frac{\cos \theta}{2 - \sin^2 \theta} d\theta =$
- A)  $\frac{1}{2} \log \left| \frac{\sqrt{2} - \sin \theta}{\sqrt{2} + \sin \theta} \right| + C$

- B)  $\frac{1}{2} \log \left| \frac{\sqrt{2} + \sin \theta}{\sqrt{2} - \sin \theta} \right| + C$
- C)  $\log \left| \frac{\sqrt{2} + \sin \theta}{\sqrt{2} - \sin \theta} \right| + C$
- D)  $\frac{1}{\sqrt{2}} \log \left| \frac{\sqrt{2} + \sin \theta}{\sqrt{2} - \sin \theta} \right| + C$
- E)  $\frac{1}{2\sqrt{2}} \log \left| \frac{\sqrt{2} + \sin \theta}{\sqrt{2} - \sin \theta} \right| + C$

**Correct Answer :** Option E

67.  $\int (\sin^{-1}\sqrt{x} + \cos^{-1}\sqrt{x}) dx =$

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

**Correct Answer :** Option D

68.  $\int e^x \left[ \frac{1}{1+x} - \frac{1}{(1+x)^2} \right] dx =$

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

**Correct Answer :** Option A

69.  $\int_3^5 \frac{1}{x(1+x)} dx =$

- A)  $\log\left(\frac{10}{9}\right)$
- B)  $\log(5)$
- C)  $\log(2)$

D)  $\log\left(\frac{11}{9}\right)$

E)  $\log\left(\frac{13}{9}\right)$

**Correct Answer :** Option A

70. If  $[x]$  is the greatest integer less than or equal to  $x$ , then  $\int_{-3}^3 [x] dx =$

A) -3

B) -6

C) -4

D) -2

E) 0

**Correct Answer :** Option A

71.  $\int_{-\pi/2}^{\pi/2} (x^5 + x^3 + x) \cos x dx =$

A)  $\frac{\pi}{4}$

B)  $\pi$

C)  $\frac{2\pi}{3}$

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

E) 0

**Correct Answer :** Option E

72.  $\int_{-\log_3 3}^{+\log_3 3} e^{|x|} dx =$

A) 3

B) 6

C) 4

D) 8

E) 0

**Correct Answer :** Option C

73. The integrating factor of the differential equation  $\frac{dy}{dx} - 2y = 2x - 3$  is

A)  $e^{2x}$

B)  $\frac{-1}{2} e^{-2x}$

- C)  $\frac{1}{2}e^{-2x}$
- D)  $\frac{1}{2}e^{-2x}$
- E)  $e^{-2x}$

**Correct Answer :** Option E

**74.** The elimination of arbitrary constants  $c_1, c_2, c_3, c_4$  from  $y = (c_1 + c_2)\sin(2x + c_3) + c_4e^{5x}$  gives a differential equation of order

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

**Correct Answer :** Option C

Consider the linear programming problem.

Minimize  $z = x + y$

**75.** Subject to the constraint  
 $2x + 3y \geq 6, x \geq 0, y \geq 0$   
 Then the solution of L.P.P. is

- A) 0
- B) 2
- C) 3
- D) 5
- E) 6

**Correct Answer :** Option B

**76.** The dimensions of  $\frac{mB}{kT}$  where m is the magnetic moment, B, the magnetic flux density, k, Boltzmann constant and T, the absolute temperature are:

- A)  $ML^{-1}T^{-1}$
- B)  $ML^2T^{-1}$
- C)  $MLT^{-1}$
- D)  $ML^{-2}T$
- E)  $M^0L^0T^0$

**Correct Answer :** Option E

**77.** The SI unit of surface tension is

- A)  $Nm^{-1}$
- B)  $Nm^{-2}$

- C)  $Nm^2$
- D)  $Nm$
- E) N

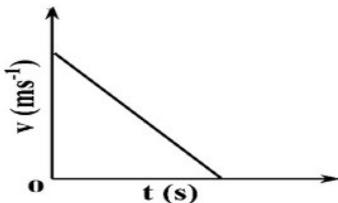
**Correct Answer :** Option A

- 78.** A car starting from rest moves such that its acceleration varies with time as  $a = 6t$  ( $ms^{-2}$ ). Its velocity (in  $ms^{-1}$ ) and displacement (in m) after 4 seconds, respectively, are
- A) 48, 64
  - B) 16, 24
  - C) 16, 38
  - D) 24, 32
  - E) 32, 24

**Correct Answer :** Option A

For the graph shown below between time  $t$  and velocity  $v$  of the motion of a body, the correct statement is:

**79.**



- A) The body comes to rest at infinite time
- B) At  $t = 0$ , acceleration is positive
- C) At  $t = 0$ , acceleration is negative
- D) At  $t = 0$ , the body has maximum velocity
- E) The displacement of the particle is zero.

**Correct Answer :** Option D

- 80.** The coefficient of friction is defined as the ratio of
- A) frictional force to applied force
  - B) frictional force to normal force
  - C) normal force to frictional force
  - D) weight of the object to frictional force
  - E) applied force to frictional force

**Correct Answer :** Option B

- 81.** A tennis ball of mass 150 g is moving at  $20 ms^{-1}$ . A racket strikes it, reversing its direction with a final speed of  $30 ms^{-1}$ . If the contact time is 0.02 s, then the magnitude of the force (in N) exerted by the racket is

- A) 1.5 N
- B) 3.75 N
- C) 15 N
- D) 150 N
- E) 375 N

**Correct Answer :** Option E

**82.** A traffic light of mass  $10\sqrt{3}$  kg is suspended by two cables making  $30^\circ$  with the vertical. The tension in each cable is:

- A) 10 N
- B) 9.8 N
- C) 98 N
- D) 19.6 N
- E) 20 N

**Correct Answer :** Option C

**83.** A car moves at a speed of  $20\text{ ms}^{-1}$  under a force of 500 N. The power output of the car is

- A) 9.8 kW
- B) 980 kW
- C) 98 kW
- D) 10 kW
- E) 100 kW

**Correct Answer :** Option D

**84.** A spring is stretched twice its initial extension. Compared to its initial value, the potential energy

- A) becomes four times
- B) is doubled
- C) is halved
- D) remains the same
- E) becomes zero

**Correct Answer :** Option A

**85.** If a spinning object contracts, its angular velocity

- A) remains the same
- B) becomes zero
- C) becomes negative
- D) increases
- E) decreases

**Correct Answer :** Option D

86. A boy whirls a ball on a string along a horizontal circle of radius 98 cm. The angular velocity (in  $\text{rad s}^{-1}$ ) with which the ball has to be whirled so that its acceleration towards the centre of the circle has the same magnitude as acceleration due to gravity is
- A)  $\sqrt{10}$
  - B)  $\frac{1}{\sqrt{10}}$
  - C) 10
  - D) 0.1
  - E) 100

**Correct Answer :** Option A

87. The centre of mass of a thin uniform rod of length L lies at a distance (from one end)
- A)  $\frac{2L}{3}$
  - B)  $\frac{3L}{4}$
  - C)  $\frac{L}{2}$
  - D)  $\frac{L}{3}$
  - E)  $\frac{L}{4}$

**Correct Answer :** Option C

88. The ratio of the escape velocity to the orbital velocity of the earth is
- A) 2
  - B)  $\sqrt{2}$
  - C)  $\frac{1}{\sqrt{2}}$
  - D)  $\frac{1}{2}$
  - E)  $\sqrt{3}$

**Correct Answer :** Option B

89. The gravitational potential energy of a body of mass m on the surface of earth of mass M and radius R is (G - Gravitational constant)
- A)  $\frac{-GMm}{R}$
  - B)  $\frac{GMm}{R}$
  - C) mgR
  - D) -mgR
  - E) Zero

**Correct Answer:-Question Cancelled**

90. In a liquid medium, if the depth increases, the pressure at that place

- A) decreases
- B) increases
- C) remains constant
- D) depends on the shape of the container
- E) is zero

**Correct Answer :** Option B

- 91.** The angle of contact is the angle between
- A) the normals to the liquid surface and the container wall
  - B) the liquid surface and the container wall
  - C) the tangent to the liquid surface and solid surface within the liquid at the point of contact
  - D) the liquid surface and solid surface outside the liquid
  - E) the line joining the centres of curvature of the liquid meniscus

**Correct Answer :** Option C

- 92.** Water flows at  $3 \text{ ms}^{-1}$  in a horizontal pipe under a pressure of  $2 \times 10^5 \text{ Nm}^{-2}$ . The pipe narrows to half its original diameter at one end. The speed of water (in  $\text{ms}^{-1}$ ) in this narrow section is
- A) 3
  - B) 4
  - C) 6
  - D) 12
  - E) 24

**Correct Answer :** Option D

- 93.** A Carnot engine is working between  $127^\circ\text{C}$  and  $27^\circ\text{C}$ . Keeping the sink temperature unaltered, the temperature at which the source has to be kept so as to double its efficiency is
- A)  $400^\circ\text{C}$
  - B)  $273^\circ\text{C}$
  - C)  $327^\circ\text{C}$
  - D)  $525^\circ\text{C}$
  - E)  $600^\circ\text{C}$

**Correct Answer :** Option C

- 94.** The ratio of specific heat capacities of a diatomic gas at constant pressure and constant volume is
- A) 1.4
  - B) 1.6
  - C) 1.7
  - D) 1.8
  - E) 1.5

**Correct Answer :** Option A

95. The translational kinetic energy of an ideal gas containing  $N$  molecules at temperature  $T$  is ( $k$  - Boltzmann constant)
- A)  $\frac{5}{2} NkT$
  - B)  $\frac{1}{2} NkT$
  - C)  $\frac{3}{2} NkT$
  - D)  $\frac{7}{2} NkT$
  - E)  $\frac{9}{2} NkT$

**Correct Answer :** Option C

96. For an ideal gas of molar mass  $M$ , the slope of the plot between the rms velocity ( $v_{rms}$  along the y-axis) and the square root of absolute temperature ( $\sqrt{T}$  along the x-axis) is
- A)  $\sqrt{\frac{M}{3R}}$
  - B)  $\sqrt{\frac{3R}{M}}$
  - C)  $\sqrt{\frac{R}{3M}}$
  - D)  $\frac{R}{3M}$
  - E)  $\frac{3R}{M}$

**Correct Answer :** Option B

97. In a simple harmonic motion,
- A) the velocity is constant
  - B) the motion is periodic
  - C) the acceleration is directly proportional to velocity
  - D) the acceleration is along the direction of displacement
  - E) the motion must be along a straight line

**Correct Answer :** Option B

98. The principle of superposition in wave motion states that
- A) the net displacement is the vector sum of individual displacements
  - B) waves interfere with each other and lose energy
  - C) waves cannot occupy the same space at the same time
  - D) it is applicable to sound waves only

E) it is applicable to standing waves only

**Correct Answer** : Option A

**99.** The number of nodes and antinodes in a guitar string vibrating in the third harmonic is:

- A) 5 nodes, 4 antinodes
- B) 4 nodes, 3 antinodes
- C) 3 nodes, 2 antinodes
- D) 2 nodes, 3 antinodes
- E) 1 node, 2 antinodes

**Correct Answer** : Option B

**100.** The electric field inside a uniformly charged spherical shell of radius  $R$  is:

- A) directly proportional to the charge within the shell
- B) inversely proportional to  $R^2$
- C) same as that outside the shell
- D) zero
- E) maximum at the centre

**Correct Answer** : Option D

**101.** The torque on an electric dipole consisting of charges  $q$  and  $-q$  of dipole moment  $\mathbf{P}$  in a uniform electric field  $\mathbf{E}$  is

- A)  $q\mathbf{E}$
- B)  $-q\mathbf{E}$
- C) Zero
- D)  $\mathbf{P}\cdot\mathbf{E}$
- E)  $\mathbf{P} \times \mathbf{E}$

**Correct Answer** : Option E

**102.** The direction of the electric field due to a positive charge is:

- A) circular around the charge
- B) radially inwards towards the charge
- C) radially outwards away from the charge
- D) along a fixed straight line away from the charge
- E) along a fixed straight line towards the charge

**Correct Answer** : Option C

**103.** A Wheatstone bridge is used to measure

- A) unknown resistances
- B) direct current
- C) alternating current
- D) electric power

E) voltage

**Correct Answer :** Option A

**104.** The current carrying rail of a subway track is made of steel and has a cross-sectional area of about  $20 \text{ cm}^2$ . The resistance of  $2 \text{ km}$  of the track is (in ohm) as a multiple of the specific resistance of steel,  $\rho$  is:

- A)  $10^2 \rho$
- B)  $10^3 \rho$
- C)  $10^4 \rho$
- D)  $10^5 \rho$
- E)  $10^6 \rho$

**Correct Answer :** Option E

**105.** If  $n$  identical cells each of emf  $E$  and internal resistance  $r$  are connected in parallel, the total EMF and total internal resistance of the combination, respectively, are

- A)  $nE, nr$
- B)  $E, nr$
- C)  $E, \frac{r}{n}$
- D)  $nE, 2nr$
- E)  $nE, \frac{r}{n}$

**Correct Answer :** Option C

**106.** The line integral of the magnetic field around a closed loop is directly proportional to the:

- A) current enclosed
- B) charge enclosed
- C) voltage across the loop
- D) length of the loop
- E) electric field around the loop

**Correct Answer :** Option A

**107.** The magnetic dipole moment of a current loop carrying current  $I$  and of area  $A$  with  $n$  turns is

- A)  $\frac{IA}{n}$
- B)  $\frac{IA}{n^2}$
- C)  $\frac{IA}{2}$
- D)  $nIA$
- E)  $IA$

**Correct Answer :** Option D

**108.** A galvanometer is converted into a voltmeter by connecting

- A) a high resistance in series
- B) a low resistance in series
- C) a high resistance in parallel
- D) a low resistance in parallel
- E) an inductance in series

**Correct Answer :** Option A

**109.** The resistance of a semiconductor

- A) increases with increase in temperature
- B) decreases with increase in temperature
- C) is independent of temperature
- D) becomes infinite at high temperature
- E) becomes zero at high temperature

**Correct Answer :** Option B

**110.** A metal rod of length  $0.5\text{ m}$  moves with its length perpendicular to a uniform magnetic field of  $0.2\text{ T}$  with a velocity of  $3\text{ ms}^{-1}$ . The induced emf in the rod is

- A)  $0.1\text{ V}$
- B)  $0.2\text{ V}$
- C)  $0.3\text{ V}$
- D)  $0.4\text{ V}$
- E)  $0.6\text{ V}$

**Correct Answer :** Option C

**111.** The speed of electromagnetic waves in a medium depends on the

- A) intensity of the wave
- B) initial phase of the wave
- C) permittivity and permeability of the medium
- D) energy it carries
- E) reflectivity of the medium

**Correct Answer :** Option C

**112.** When a beam of white light enters into an optical prism, the most deviated colour is

- A) green
- B) violet
- C) yellow
- D) red
- E) blue

**Correct Answer :** Option B

**113.** The phenomenon of diffraction is most significant when the slit width is

- A) much larger than the wavelength
- B) much smaller than the wavelength
- C) comparable to the wavelength
- D) equal to the screen distance
- E) independent of the wavelength

**Correct Answer :** Option C

**114.** In Huygens construction, the secondary wavelets move

- A) in all directions
- B) only radially outward
- C) only radially inward
- D) only in the backward direction of the incident light
- E) in a direction perpendicular to the direction of the incident light

**Correct Answer :** Option A

**115.** The plot of maximum kinetic energy of photo-electrons to the energy of the incident photon above its threshold frequency on a photo-sensitive material of work function  $\phi$  is

- A) an oblique straight line with a positive slope.
- B) an oblique straight line with a negative slope.
- C) an oblique straight line passing through the origin.
- D) an exponential curve.
- E) a polynomial curve of order 2.

**Correct Answer :** Option A

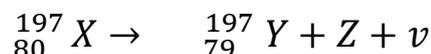
**116.** The ratio of the respective de Broglie wavelengths of two particles with kinetic energy of 0.02 eV and 2 eV, respectively, is

- A) 1 : 1
- B) 10 : 1
- C) 1 : 10
- D) 1 :  $\sqrt{10}$
- E)  $\sqrt{10}$  : 1

**Correct Answer :** Option B

In the following nuclear reaction, Z is a/an

**117.**



- A)  $\alpha$  particle
- B)  $\beta^+$  particle

- C)  $\beta^-$  particle
- D) proton
- E) neutron

**Correct Answer :** Option B

- 118.** If a radioactive element disintegrates for a period of time equal to its mean life, then the fraction of the original amount remaining undisintegrated is
- A)  $e^-$
  - B)  $1-e$
  - C)  $1-\frac{1}{e}$
  - D)  $\frac{1}{e}$
  - E)  $2e$

**Correct Answer :** Option D

- 119.** In a Germanium crystal containing N atoms, the total number of outer electrons in the crystal is
- A) N
  - B) 2 N
  - C) 3 N
  - D) 6 N
  - E) 4 N

**Correct Answer :** Option E

- 120.** The donor level in an *n*-type semiconductor lies
- A) just below the conduction band
  - B) exactly at the middle of the band gap
  - C) just below the valence band
  - D) just above the conduction band
  - E) on the valence band

**Correct Answer :** Option A

- 121.** Ten grams of calcium carbonate which is only 90% pure is treated with excess hydrochloric acid. What is the mass of  $CO_2$  gas liberated? (Atomic mass: Ca=40, C=12 & O=16)
- A) 4.4g
  - B) 3.96g
  - C) 2.2g
  - D) 0.44g
  - E) 0.22g

**Correct Answer :** Option B

- 122.** For any sub-shell defined by ' $l$ ' value how many values of magnetic quantum number ( $m_l$ ) are possible?
- A)  $(2l)$
  - B)  $(2l - 1)$
  - C)  $(2l + 1)$
  - D)  $(l + 1)$
  - E)  $(l - 1)$

**Correct Answer :** Option C

- 123.** What is the total number of orbitals associated with the principal quantum number  $n=3$ ?
- A) 3
  - B) 6
  - C) 9
  - D) 10
  - E) 14

**Correct Answer :** Option C

- 124.** The alkali metal with the highest first enthalpy of ionization is
- A) Cs
  - B) Rb
  - C) K
  - D) Na
  - E) Li

**Correct Answer :** Option E

- 125.** Which one of the following molecules contains two 'sigma' bonds and two 'pi' bonds?
- A)  $O_2$
  - B)  $N_2$
  - C)  $C_2H_2$
  - D)  $CO_2$
  - E) CO

**Correct Answer :** Option D

- 126.** 12g of pure graphite is burnt completely in a bomb calorimeter in excess of oxygen at 298 K at 1 atm. pressure. During combustion, the temperature rises from 298 K to 308 K. The heat capacity of the bomb calorimeter is  $20.7 \text{ kJ K}^{-1}$ . What is the enthalpy change for combustion of 1 mole of graphite (in  $\text{kJ mol}^{-1}$ ) at 298 K and 1 atm. pressure? ( $R=8.3 \text{ JK}^{-1} \text{ mol}^{-1}$ )

- A) -2070
- B) -207
- C) +2070
- D) +207
- E) +2.07

**Correct Answer :** Option B

**127.** If water vapour is assumed to be a perfect gas, molar enthalpy change for vapourisation of 1 mol of water at 1bar and 100°C is  $41\text{kJ mol}^{-1}$ . Calculate the internal energy change (in  $\text{kJ mol}^{-1}$ ) when 1 mole of water is vaporized at 100°C at 1 bar assuming water vapour as an ideal gas. ( $R=8.3\text{ JK}^{-1}\text{mol}^{-1}$ )

- A) 43.1
- B) 37.9
- C) -43.1
- D) -37.9
- E) 41.0

**Correct Answer :** Option B

**128.** If "S" is the solubility of  $X_3Y_2$  in pure water, assuming that neither kind of ion reacts with water, then, the solubility product,  $K_{sp}$  is

- A)  $27 S^4$
- B)  $108 S^5$
- C)  $108 S^2$
- D)  $27 S^6$
- E)  $27 S^2$

**Correct Answer :** Option B

**129.** In which of the following equilibrium  $K_p = K_c$  ?

- A)  $\text{CaCO}_3(s) \rightleftharpoons \text{CaO}(s) + \text{CO}_2(g)$
- B)  $2\text{SO}_2(g) + \text{O}_2(g) \rightleftharpoons 2\text{SO}_3(g)$
- C)  $\text{PCl}_5(g) \rightleftharpoons \text{PCl}_3(g) + \text{Cl}_2(g)$
- D)  $\text{H}_2(g) + \text{I}_2(g) \rightleftharpoons 2\text{HI}(g)$
- E)  $\text{N}_2\text{O}_4(g) \rightleftharpoons 2\text{NO}_2(g)$

**Correct Answer :** Option D

In the following cell reaction,

**130.**  $\text{Zn}(s) + \text{Cu}^{2+} (0.1\text{ M}) \rightleftharpoons \text{Zn}^{2+} (0.001\text{ M}) + \text{Cu}(s)$ , at 298 K,

Calculate the  $E_{cell}$  at 298 K if  $E^0_{cell}$  at this temperature is 1.1V. ( $2.303\text{ RT/F} = 0.059\text{ V}$  at 298 K)

- A) 1.218 V
- B) 1.118 V
- C) 1.159 V
- D) 1.041 V
- E) 0.982 V

**Correct Answer :** Option C

**131.** For which of the following electrode reactions the standard electrode potential is the highest at 298 K? The ions are present in aqueous solution.

- A)  $\text{Co}^{3+} + \text{e}^{-} \rightarrow \text{Co}^{2+}$
- B)  $\text{Cl}_{2(g)} + 2\text{e}^{-} \rightarrow 2\text{Cl}^{-}$
- C)  $\text{MnO}_{2(s)} + 4\text{H}^{+} + 2\text{e}^{-} \rightarrow \text{Mn}^{2+} + 2\text{H}_2\text{O}$
- D)  $\text{F}_{2(g)} + 2\text{e}^{-} \rightarrow 2\text{F}^{-}$
- E)  $\text{AgCl}_{(s)} + \text{e}^{-} \rightarrow \text{Ag}_{(s)} + \text{Cl}^{-}$

**Correct Answer :** Option D

**132.** The vapour pressure of pure benzene (molar mass =  $78 \text{ g mol}^{-1}$ ) at a certain temperature is 0.85 bar. When 0.5 g of a non-volatile, non-electrolyte is added to 39 g of benzene, the vapour pressure was found to be 0.845 bar at the same temperature. What is the molar mass of the substance?

- A)  $85 \text{ g mol}^{-1}$
- B)  $127.5 \text{ g mol}^{-1}$
- C)  $170 \text{ g mol}^{-1}$
- D)  $210 \text{ g mol}^{-1}$
- E)  $145 \text{ g mol}^{-1}$

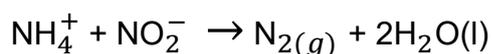
**Correct Answer :** Option C

**133.** A first order reaction is 75% completed in 6000 s at 300 K. What is its half life period at the same temperature? ( $\log 2 = 0.3010$ )

- A) 15 min
- B) 25 min
- C) 75 min
- D) 50 min
- E) 60 min

**Correct Answer :** Option D

**134.** Ammonium ion ( $\text{NH}_4^{+}$ ) reacts with nitrite ion ( $\text{NO}_2^{-}$ ) according to the following equation:



The following initial rates of reaction have been measured for the given reactant

concentrations.

Experiment	$[\text{NH}_4^+]_0, \text{M}$	$[\text{NO}_2^-]_0, \text{M}$	Initial rate, M/hour
I	0.010	0.020	0.020
II	0.015	0.020	0.030
III	0.010	0.010	0.005

Which of the following is the rate law (rate equation) for this reaction?

- A)  $\text{Rate} = k[\text{NH}_4^+]^{1/2} [\text{NO}_2^-]$
- B)  $\text{Rate} = k[\text{NH}_4^+] [\text{NO}_2^-]$
- C)  $\text{Rate} = k[\text{NH}_4^+]^0 [\text{NO}_2^-]$
- D)  $\text{Rate} = k[\text{NH}_4^+] [\text{NO}_2^-]^{1/2}$
- E)  $\text{Rate} = k[\text{NH}_4^+] [\text{NO}_2^-]^2$

**Correct Answer :** Option E

**135.** Acidified potassium dichromate cannot oxidize

- A) Iodides to iodine
- B) Iron (II) salt to iron (III) salt
- C) Tin (II) salt to tin (IV) salt
- D)  $\text{H}_2\text{S}$  to sulphur
- E) Fluoride to fluorine

**Correct Answer :** Option E

**136.** Which of the following is a basic oxide?

- A)  $\text{CrO}$
- B)  $\text{CrO}_3$
- C)  $\text{Mn}_2\text{O}_7$
- D)  $\text{Cr}_2\text{O}_3$
- E)  $\text{V}_2\text{O}_5$

**Correct Answer :** Option A

**137.** The transition metal ion with the highest magnetic moment is

- A)  $\text{Fe}^{2+}$
- B)  $\text{Mn}^{2+}$
- C)  $\text{Ni}^{2+}$
- D)  $\text{Co}^{2+}$
- E)  $\text{Cr}^{2+}$

**Correct Answer :** Option B

**138.** The transition metal with the highest melting point is

- A) Mo
- B) Mn
- C) W
- D) Cr
- E) Au

**Correct Answer :** Option C

**139.** Which of the following complex has the least conductivity?

- A)  $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$
- B)  $\text{Cis-}[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$
- C)  $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$
- D)  $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$
- E)  $\text{trans-}[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$

**Correct Answer :** Option D

**140.** Which one of the following is an ambidentate ligand?

- A) Oxalate
- B) Carbon monoxide
- C) Ethylene diamine
- D) Ammonia
- E) Nitrite

**Correct Answer :** Option E

**141.** The empirical formula of an organic compound is  $\text{CH}_2$ . The molar mass of the compound is  $56\text{ g mol}^{-1}$ . The organic compound is

- A) n-Butane
- B) Propene
- C) Propane
- D) 2-Methylpropane
- E) Cyclobutane

**Correct Answer :** Option E

**142.** Which of the following finely divided metals can be used as catalyst in the hydrogenation of alkenes and alkynes?

(i) Pt (ii) Fe (iii) Ni (iv) Pd

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

**Correct Answer :** Option C

**143.** The solvent used in Wurtz reaction is

- A) Water
- B) Methanol
- C) Ethanol
- D) Dry ether
- E) Aqueous ethanol

**Correct Answer :** Option D

When chlorobenzene is treated with  $\text{Cl}_2$  in the presence of anhydrous  $\text{FeCl}_3$  catalyst **144.** gives a mixture of 1,2-dichlorobenzene and 1,4-dichlorobenzene. This reaction is an example of

- A) Nucleophilic substitution reaction
- B) Electrophilic substitution reaction
- C) Free radical substitution reaction
- D) Nucleophilic addition reaction
- E) Electrophilic addition reaction

**Correct Answer :** Option B

**145.** Which of the following compound contains two primary alcoholic and one secondary alcoholic groups?

- A) Ethylene glycol
- B) Isopropyl alcohol
- C) 3° Butyl alcohol
- D) Glycerol
- E) 2° Butyl alcohol

**Correct Answer :** Option D

**146.** Propene on hydroboration-oxidation gives

- A) 1-propanol
- B) 2-propanol
- C) propanal
- D) propanone
- E) ethanoic acid

**Correct Answer :** Option A

**147.** When propanone is treated with  $\text{Zn}/\text{Hg}$  and  $\text{Con.HCl}$  propane is formed. This reaction is known as

- A) Wolf-Kishner reaction
- B) Clemmensen reaction
- C) Hoffman reaction

- D) Kolbe's reaction
- E) Cannizzaro reaction

**Correct Answer :** Option B

**148.** Benzoyl chloride can be converted to benzaldehyde by

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

**Correct Answer :** Option A

**149.** The amine with the highest  $pK_b$  value is

- A) Methanamine
- B) N-methylmethanamine
- C) Benzeneamine
- D) N-Methylaniline
- E) Ethanamine

**Correct Answer :** Option C

**150.** The base that is not present in DNA is

- A) uracil
- B) adenine
- C) guanine
- D) thymine
- E) cytosine

**Correct Answer :** Option A