JEE MAIN PAPER

CLASS 12th **VIJETA BATCH**

Time : 3 Hours **Maximum Marks : 180**

PART – 1 : MATHEMATICS

- This question paper contains two sections, section A & B.
- **Section A** contains 20 multiple choice questions **(SCQs)** with four options (A),(B),(C),(D) out of which only one option is correct.
- **Section B** contains 10 **Integer Type** questions, out of which candidate have to attempt only 5 questions.

Section-I

- This Section contain 20 questions (Q.No. 1 to Q.No. 20)
- Answer to each question in **Section A** will be evaluated according to the following marking scheme:

  Full Marks : $+\mathbf{4}$ for correct answer

  Zero Marks : $\mathbf{0}$ If the question is unanswered;

  Negative Marks: $-\mathbf{1}$ for incorrect answer

1. If A and B are two equivalence relations defined on set C, then

(A) $A \cap B$ is an equivalence relations (B) $A \cap B$ is not an equivalence relation

(C) $A \cup B$ is an equivalence relation (D) $A \cup B$ is not an equivalence relation

2. Let a relation R in the set N of natural numbers be defined as $(x, y) \Leftrightarrow x^2 - 4xy + 3y^2 = 0\ \forall x, y \in N$. The relation R is

(A) reflexive (B) symmetric

(C) transitive (D) an equivalence relation

3. Let r be a relation from R (set of real numbers) to R defined by $r = \{(a, b) \mid a, b \in R$ and $a - b + \sqrt{3}$ is an irrational number$\}$. The relation r is

(A) an equivalence relation (B) reflexive only

(C) symmetric only (D) transitive only

4. The minimum number of elements that must be added to the relation $R = \{(a, b), (b, c)\}$ on the set $\{a, b, c\}$ so that it becomes symmetric and transitive is :

(A) 3 (B) 7 (C) 4 (D) 5

5. Let R be a relation on $N \times N$ defined by $(a, b)R(c, d)$ if and only if $ad(b - c) = bc(a - d)$. Then R is

(A) transitive but neither reflexive nor symmetric

(B) symmetric but neither reflexive nor transitive

(C) symmetric and transitive but not reflexive

(D) reflexive and symmetric but not transitive

6. Let R be the relation on the set R, of all real numbers defined by aRb if $f(x) = |a - b| \leq 1$. Then, R is

(A) reflexive and symmetric (B) symmetric only

(C) transitive only (D) anti-symmetric only

7. The number of solutions of $\log_4 (x - 1) = \log_2 (x - 3)$ is

(A) 3 (B) 1 (C) 2 (D) 0

8. The function $f(x) = \sqrt{\frac{1}{\sqrt{x}} - \sqrt{x + 1}}$ is defined for

(A) $0 < x \leq \frac{\sqrt{5}-1}{2}$ (B) $\frac{-1-\sqrt{5}}{2} < x < 0$

(C) $0 < x < \frac{\sqrt{3}-1}{2}$ (D) $\frac{-1-\sqrt{3}}{2} < x < 0$

9. The absolute minimum value, of the function $f(x) = |x^2 - x + 1| + [x^2 - x + 1]$, where [t] denotes the greatest integer function, in the interval $[-1,2]$, is

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

10. The value of $[\sin x] + [1 + \sin x] + [2 + \sin x]$ in $x \in \left[\pi, \frac{3\pi}{2}\right]$ can be ([.] is the greatest integer function) can be

(A) 0 (B) 1 (C) 2 (D) 3

11. Given : $y = 2[x] + 3$ and $y = 3[x - 2] + 5$, then value of $[x + y]$ is

(A) 15 (B) 8 (C) 7 (D) 0

12. If [x] stands for the greatest integer function, then the value of $\left[\frac{1}{2} + \frac{1}{1000}\right] + \left[\frac{1}{2} + \frac{2}{1000}\right] + \cdots \left[\frac{1}{2} + \frac{999}{1000}\right]$ is

(A) 498 (B) 499 (C) 500 (D) 501

13. If {x} and [x] represent fractional and integral part of x, then the value of $[x] + \sum_{r=1}^{2000} \frac{\{x+r\}}{2000}$ is

(A) 0 (B) 2001 (C) x (D) 2000

14. The domain of the function $f(x) = {}^{16-x}C_{2x-1} + {}^{20-3x}P_{4x-5}$, where the symbols have their usual meanings, is the set

(A) {1,2,3,4,5} (B) {2,3,4} (C) {2,3} (D) none of these

15. The domain of the function $f(x) = \log_e (x - [x])$, where [.] denotes the greatest integer function, is

(A) R (B) $R - Z$ (C) $(0, +\infty)$ (D) none of these

16. If function f(x) is defined in $[-2,2]$ then domain of definition of $f(|x| + 1)$ is

(A) $[-2,2]$ (B) $[-3,3]$ (C) $[-1,1]$ (D) $[-3,1]$

17. The domain of the function $f(x) = \sqrt{2x^2 - |x|} + \log(1 - x^2)$ is

(A) $\left(-\infty, \frac{-1}{2}\right) \cup \left[\frac{1}{2}, \infty\right]$ (B) $(-1,1)$

(C) $\left(-1, -\frac{1}{2}\right] \cup \left[\frac{1}{2}, 1\right) \cup \{0\}$ (D) none of these

18. If [.] denotes the greatest integer function then the domain of the real valued function $\log_{[x+1/2]} |x^2 - x - 2|$ is

(A) $\left(-\frac{1}{2}, 2\right)$ (B) $\left[\frac{3}{2}, \infty\right)$

(C) $\left[\frac{3}{2}, 2\right) \cup (2, \infty)$ (D) $\left(\frac{1}{2}, 2\right) \cup (2, \infty)$

19. If $f(x) = ax^2 + bx + c$, then the value of a & b for which the identify $f(x + 1) - f(x) = 8x + 3$ is satisfied are

(A) $a = 1, b = 4$ (B) $a = 1, b = -4$

(C) $a = 4, b = 1$ (D) $a = 4, b = -1$

20. If $f(x) = \frac{x(x-1)}{2}$, then the value of $f(x + 2)$ is

(A) $f(x) + f(x + 1)$ (B) $\frac{(x+2)}{2} f(x + 1)$

(C) $\left(\frac{x+1}{2}\right) f(x + 1)$ (D) $\frac{(x+2)}{2} f(x + 1)$

Section-II

- This Section contain 10 questions (Q.No. 21 to Q.No. 30) whose answer to be filled as numerical value **(Attempt any five)**
- Answer to each question in **Section B** will be evaluated according to the following marking scheme:

Full Marks : **+4** for correct answer

Zero Marks : **0** If the question is unanswered;

Zero Marks : **0** for incorrect answer

21. Let R_1 and R_2 be relations on the set {1,2, …, 50 } such that $R_1 = \{(p, p^n): p \text{ is a prime and } n \geq 0 \text{ is an integer}\}$ and $R_2 = \{(p, p^n): p \text{ is a prime and } n = 0 \text{ or } 1\}$. Then, the number of elements in $R_1 - R_2$ is _____.

22. Let $A = \{0,3,4,6,7,8,9,10\}$ and R be the relation defined on A such that $R = \{(x, y) \in A \times A:$ $x - y$ is odd positive integer or $x - y = 2\}$. The minimum number of elements that must be added to the relation R, so that it is a symmetric relation, equal to _____.

23. When $0 \leq x < 2\pi$ and [x] denotes greatest integer $\leq x$,

then $[\sin x] + [\cos x] + [\sin x + \cos x]$ takes exactly k integer values. Then k must be _____.

24. If [x] denotes greatest integer ≤ x the function [tan x], $\left(0 < x < \frac{5\pi}{12}\right)$ takes exactly k values. The numerical quantity k should be _____.

25. There are exactly k integers for which the function $f(x) = {}^{16-x}C_{2x-1} + {}^{20-3x}C_{4x-5}$ is defined. k must be _____.

26. If $0 \leq x \leq 100$, then total number of integer values taken by the function $[x] + [2x] + [3x] + [4x] + [5x]$ is _____.

27. If $\frac{\pi}{6} \leq x \leq \frac{\pi}{3}$ and [x] denotes greatest integer ≤ x then find the number of values taken by $[\sec x] + [\operatorname{cosec} x]$.

28. Find the domain of the following functions:

$$y = \frac{1}{\sqrt{\log_{\frac{1}{2}}(x^2 - 7x + 13)}}$$

29. Find the domain of the following functions:

$$y = \sqrt{\log_3(\cos(\sin x))}$$

30. Let $A = \{1,2,3,4\}$ and $R = \{(1,2), (2,3), (1,4)\}$ be a relation on A. Let S be the equivalence relation on A such that $R \subset S$ and the number of elements in S is n. Then, the minimum value of n is _____.

PART – 2 : PHYSICS

- This question paper contains two sections, section A & B.
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- **Section B** contains 10 **Integer Type** questions, out of which candidate have to attempt only 5 questions.

Section-I

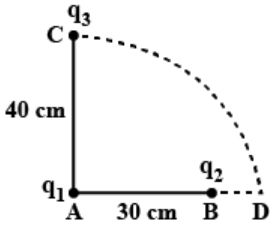
- This Section contain 20 questions (Q.No. 1 to Q.No. 20)
- Answer to each question in **Section A** will be evaluated according to the following marking scheme:

  Full Marks : **+4** for correct answer

  Zero Marks : **0** If the question is unanswered;

  Negative Marks: **−1** for incorrect answer

31. Two charges q_1 and q_2 are placed 30 cm apart, shown in the figure. A third charge q_3 is moved along the arc of a circle of radius 40 cm from C to D. The change in the potential energy of the system is $\frac{q_3}{4\pi\epsilon_0}$ k, here k is

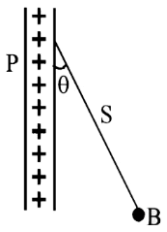


(A) $8q_2$ (B) $8q_1$ (C) $6q_2$ (D) $6q_1$

32. A uniform electric field pointing in positive x-direction exists in a region. Let A be the origin, B be the point on the x-axis at $x = +1$ cm and C be the point on the y-axis at $y = +1$ cm. Then the potentials at the points A, B and C satisfy

(A) $V_A < V_B$ (B) $V_A > V_B$ (C) $V_A < V_C$ (D) $V_A > V_C$

33. A charged ball B hangs from a silk thread S, which makes an angle θ with a large charged conducting sheet P, as shown in the figure. The surface charge density σ of the sheet is proportional to



(A) sin θ (B) tan θ (C) cos θ (D) cot θ

34. The charges on two spheres are $+7\mu C$ and $-5\mu C$ respectively. They experience a force F. If each of them is given an additional charge of $-2\mu C$, the new force of attraction will be

(A) F (B) F/2 (C) $F/\sqrt{3}$ (D) 2 F

35. The displacement of a charge Q in the electric field $\vec{E} = e_1\hat{i} + e_2\hat{j} + e_3\hat{k}$ is $\vec{r} = a\hat{i} + b\hat{j}$. The work done is

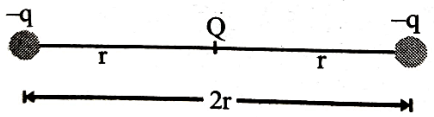
(A) $Q(ae_1 + be_2)$

(B) $Q\sqrt{(ae_1)^2 + (be_2)^2}$

(C) $Q(e_1 + e_2)\sqrt{a^2 + b^2}$

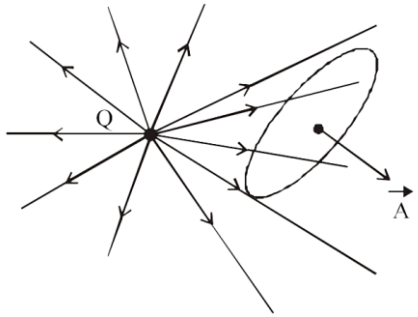
(D) $Q\left(\sqrt{e_1^2 + e_2^2}\right)(a + b)$

36. Charges $-q, Q$ and $-q$ are placed at equal distance on a straight line. If the total potential energy of the system of three charges is zero, then find the ratio Q/q.



(A) 1/2 (B) 1/4 (C) 2/3 (D) 3/4

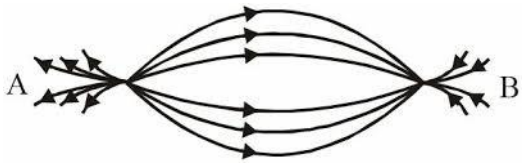
37. In the figure, the net electric flux through the area A is $\phi = \vec{E} \cdot \vec{A}$ when the system is in air. On immersing the system in water the net electric flux through the area



(A) becomes zero (B) remains same

(C) increases (D) decreases

38. The spatial distribution of electric field due to charges (A, B) is shown in figure. Which one of the following statements is correct ?



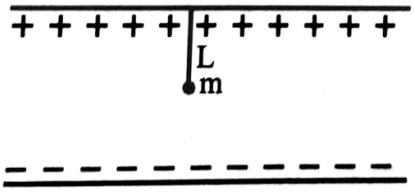
(A) A is + ve and B − ve, $|A| > |B|$

(B) A is -ve and B + ve, $|A| = |B|$

(C) Both are + ve but $A > B$

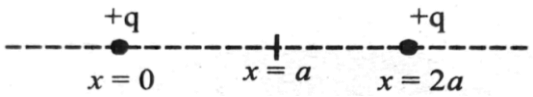
(D) Both are −ve but $A > B$

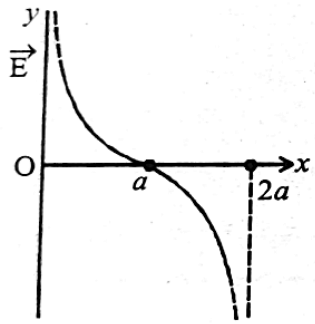
39. A small sphere carrying a charge ' q ' is hanging in between two parallel plates by a string of length L. Time period of pendulum is T_0. When parallel plates are charged, the time period changes to T. The ratio T/T_0 is equal to

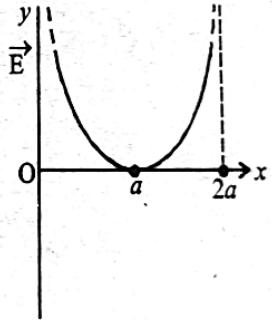


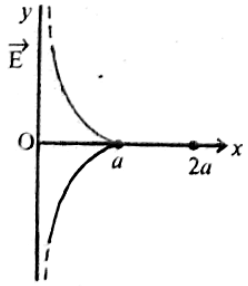
(A) $\left(\frac{g+\frac{qE}{m}}{g}\right)^{1/2}$ (B) $\left(\frac{g}{g+\frac{qE}{m}}\right)^{3/2}$ (C) $\left(\frac{g}{g+\frac{qE}{m}}\right)^{1/2}$ (D) None of these

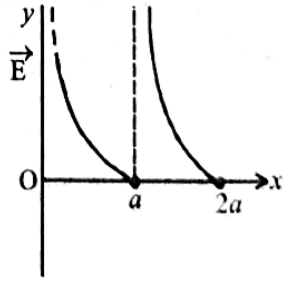
40. Figure shows two charges of equal magnitude separated by a distance 2a. As we move away from the charge situated at $x = 0$ to the charge situated at $x = 2a$, which of the following graphs shows the correct behaviour of electric field?



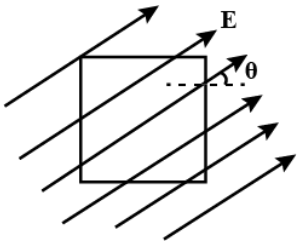
(A)


(B)


(C)


(D)


41. A square surface of side L meter in the plane of the paper is placed in a uniform electric field E (volt/m) acting along the same plane at an angle θ with the horizontal side of the square as shown in Figure. The electric flux linked to the surface, in units of volt. m, is



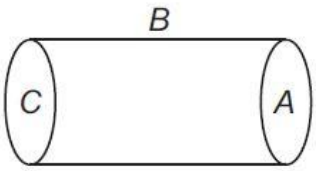
(A) EL^2 (B) $EL^2\cos\theta$ (C) $EL^2\sin\theta$ (D) zero

42. A solid sphere of radius R has a charge Q distributed in its volume with a charge density $\rho = \kappa r^a$, where κ and a are constants and r is the distance from its centre.

If the electric field at $r = \frac{R}{2}$ is $\frac{1}{8}$ times that at $r = R$, find the value of a

(A) 2 (B) 3 (C) 5 (D) 6

43. A hollow cylinder has a charge q coulomb within it. If ϕ is the electric flux in units of voltmeter associated with the curved surface B, the flux linked with the plane surface A in units of voltmeter will be



(A) $\frac{q}{2\varepsilon_0}$ (B) $\frac{\phi}{3}$ (C) $\frac{q}{\varepsilon_0} - \phi$ (D) $\frac{1}{2}\left(\frac{q}{\varepsilon_0} - \phi\right)$

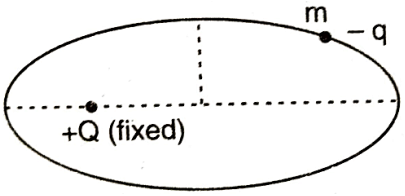
44. Two positive ions, each carrying a charge q, are separated by a distance d. If F is the force of repulsion between the ions, the number of electrons missing from each ion will be (e being the charge of an electron)

(A) $\frac{4\pi\varepsilon_0 Fd^2}{e^2}$ (B) $\sqrt{\frac{4\pi\varepsilon_0 Fe^2}{d^2}}$ (C) $\sqrt{\frac{4\pi\varepsilon_0 Fd^2}{e^2}}$ (D) $\frac{4\pi\varepsilon_0 Fd^2}{q^2}$

45. Two small similar metal spheres A and B having charges 4q and $-4q$, when placed at a certain distance apart, exert an electric force F on each other. When another identical uncharged sphere C, first touched with A then with B and then removed to infinity, the force of interaction between A and B for the same separation will be

(A) F/2 (B) F/8 (C) F/16 (D) F/32

46. A positive point charge $+Q$ is fited in space. A negative point charge $-q$ of mass m revolves round a fixed charge in elliptical orbit. The fixed charge $+Q$ is at one focus of the ellipse. The only force acting on negative charge is the electrostatic force due to positive charge. Then which of the following statement is true?



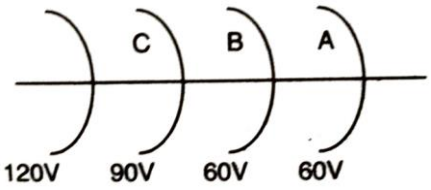
(A) Linear momentum of negative point charge is conserved.

(B) Angular momentum of negative point charge about fixed positive charge is conserved.

(C) Total kinetic energy of negative point charge is conserved.

(D) Electrostatic potential energy of system of both point charges is conserved.

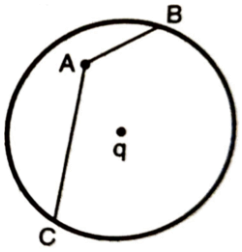
47. Four equipotential curves in an electric field are shown in the figure. A, B, C are three points in the field. If electric intensity at A, B, C are E_A, E_B, E_C, then :



(A) $E_A = E_B = E_C$ (B) $E_A > E_B > E_C$

(C) $E_A < E_B < E_C$ (D) $E_A > E_B < E_C$

48. If in the electric field of a point charge q. a charge is carried from A to B and A to C :



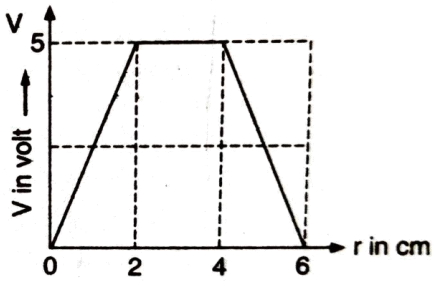
(A) the work done in case I is greater than work done in case II

(B) the work done in case II is greater than work done in case I

(C) the work done in both the cases is same but not zero

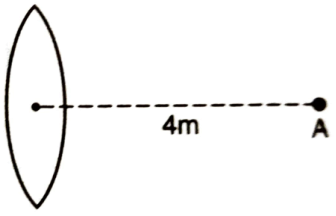
(D) the work done in both the cases is same and zero

49. The variation of potential with distance r from a fixed point is shown in Fig. 3.161. The electric field at $r = 5$ cm, is :



(A) (2.5)V/cm (B) (-2.5)V/cm (C) $(-2/5)$V/cm (D) (2/5)V/cm

50. A fixed uniformly charged ring of radius 3 m has a positive linear charge density $\frac{50}{3}\mu$C/m. A point charge 5μC is moving towards the ring along its axis such that its kinetic energy at A is 5 J. Its kinetic energy at the centre of ring will be nearly:



(A) 1.3 J (B) 2.7 J (C) 3.1 J (D) 4.1 J

Section-II

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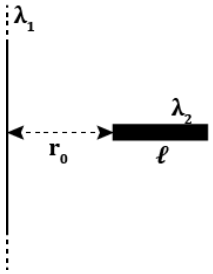
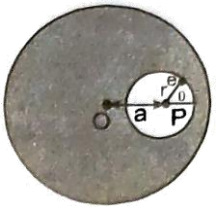
51. Two small balls of masses 3 m and 2 m and each having charges Q are connected by a string passing over a fixed pulley. Calculate the acceleration of the balls (in m/sec^2) if the whole assembly is located in a uniform electric field $E = \frac{mg}{2Q}$ acting vertically downwards. Neglect any interaction between the balls. Take $g = 10\ m/s^2$.

52. The electric field at a point A on the perpendicular bisector of a uniformly charged wire of length $\ell = 3$ m and total charge $q = 5nC$ is $\times$ V/m. The distance of A from the centre of the wire is $b = 2$ m. Find the value of x.

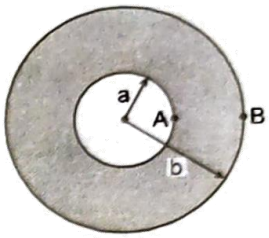
53. An infinitely long string uniformly charged with a linear charge density λ_1 and a segment of length ℓ uniformly charged with linear charge density λ_2 lie in a plane at right angles to each other and separated by a distance r_0 as shown in figure. The force with which these two interact is $\frac{\lambda_1\lambda_2}{4\pi\varepsilon_0}\ln(x)$. If $\ell = r_0$, then find the value of x.



54. A cavity of radius r is present inside a solid dielectric sphere of radius R, having a volume charge density of ρ. The distance between the centres of the sphere and the cavity is a. An electron e is kept inside the cavity at an angle $\theta = 45°$ as shown. The electron (mass m and charge $-e$) touches the sphere again after time $\left(\frac{P\sqrt{2}mr\varepsilon_0}{ea\rho}\right)^{1/2}$? Find the value of P. Neglect gravity.



55. A hollow sphere having uniform charge density ρ (charge per unit volume) is shown in figure. If $b = 2a$ and potential difference between A and B is $\frac{\rho a^2}{n\varepsilon_0}$. Then find the value of n :



56. A particle having charge +q is fixed at a point O and a second particle of mass m and having charge $-q_0$ moves with constant speed in a circle of radius r about the charge +q. The energy required to be supplied to the moving charge to increase radius of the path to 2r is $\frac{qq_0}{n\pi\varepsilon_0 r}$. Find the value of n.

57. The electric potential varies in space according to the relation: $V = 3x + 4y$. A particle of mass 10Kg starts from rest from point (2,3.2) under the influence of this field. Find the speed in m/s of the particle when it crosses the x-axis. The charge on the particle is +1C. Assume V and (x, y) are in S.I. units.

58. The electric field in a region is given by $\vec{E} = E_0 \times \hat{i}$. The charge contained inside a cubical volume bounded by the surface $x = 0, x = 2m, y = 0, y = 2m, z = 0$ and $z = 2m$ is $n\varepsilon_0 E_0$. Find the value of n.

59. A very long uniformly charged thread oriented along the axis of a circle of radius $R = 1$ m. rests on its centre with one of the ends. The charge per unit length on the thread is $\lambda = 16\varepsilon_0$. Find the flux of the vector E through the circle area in (Vm).

60. The electric field in a region is radially outward with magnitude $E = 2r$. The charge contained in a sphere of radius $a = 2$ m centred at the origin is $4x\pi\varepsilon_0$. Find the value of x.

PART – 3 : CHEMISTRY

- This question paper contains two sections, section A & B.
- **Section A** contains 20 multiple choice questions **(SCQs)** with four options (A),(B),(C),(D) out of which only one option is correct.
- **Section B** contains 10 **Integer Type** questions, out of which candidate have to attempt only 5 questions.

Section-I

- This Section contain 20 questions (Q.No. 1 to Q.No. 20)
- Answer to each question in **Section A** will be evaluated according to the following marking scheme:

  Full Marks : **+4** for correct answer

  Zero Marks : **0** If the question is unanswered;

  Negative Marks: **−1** for incorrect answer

61. Equal masses of iron and sulphur are heated together to form FeS. What fraction of the original mass of excess reactant is left unreacted? ($Fe = 56, S = 32$)

(A) 0.22 (B) 0.43 (C) 0.86 (D) 0.57

62. The number of 'two-centre-two electron' and 'three-centre-two electron' bonds in $[Al(BH_4)_3]$ are respectively

(A) twelve and zero

(B) twelve and three

(C) six and six

(D) nine and three

63. The most stable conformation of 2-Fluoroethanol is

(A) Gauche (B) Anti

(C) fully-Eclipsed (D) Partially-eclipsed

64. 34 gm of H_2O_2 is present in 1135 ml of solution. Volume strength of solution is

(A) 10 V (B) 20 V (C) 30 V (D) 32 V

65. The orbitals occupy more space will have more "s" character and accordingly which is incorrect statement.

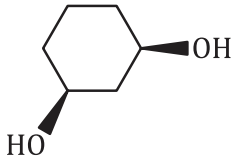
(A) l.p. will go to the axial position of PBP (pentagonal bipyramidal) geometry.

(B) l.p. will go to the equatorial position of TBP (trigonal bipyramidal) geometry.

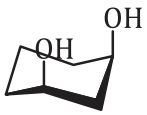
(C) Axial bond lengths of PBP geometry is longer than equatorial.

(D) Equatorial bond lengths of TBP geometry are shorter than axial.

66. Select the most stable conformer of cis-1,3-cyclohexanediol

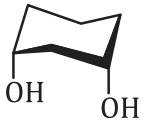


cis-1,3-cyclohexanediol

(A) 

(B) 

(C) 

(D) 

67. Which occurs when a substance is converted from liquid to gas at the normal boiling point ?

I. Potential energy of the system increases

II. The distance between molecules increases

III. The average kinetic energy of the molecules increases

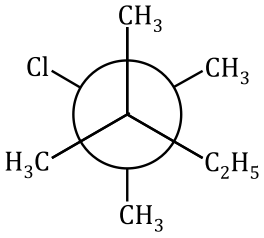
(A) II only (B) I and II only (C) II and III only (D) I, II and III

68. Find out the relation between (adjacent angle) $\widehat{FClF}$ and $\widehat{FBrF}$ bond angle in ClF_3 and BrF_3 molecule respectively.

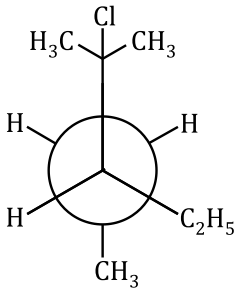
(A) $\widehat{FClF} = \widehat{FBrF}$ (B) $\widehat{FClF} > \widehat{FBrF}$

(C) $\widehat{FClF} < \widehat{FBrF}$ (D) Can't predicted.

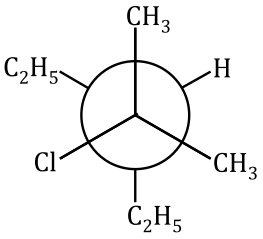
69. Newman projections P, Q, R and S are shown below:



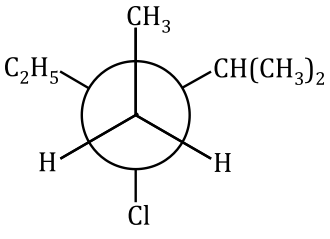
P



Q



R

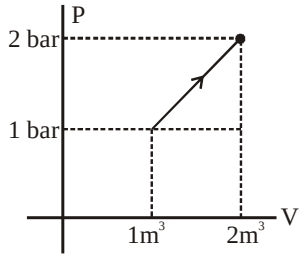


S

Which one of the following options represents identical molecules?

(A) P and Q (B) Q and S (C) Q and R (D) R and S

70. What is ΔU for the process described by figure? Heat transfer (q) during the process is = 200 kJ.



(A) +50 kJ (B) –50 kJ (C) –150 kJ (D) + 150 kJ

71. In which of following cases the extent of back bonding is most effective.

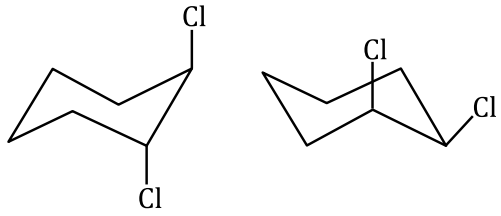
(A) BeF_2

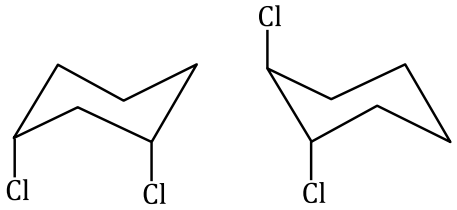
(B) $(CH_3)_2O$

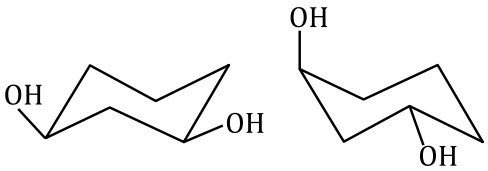
(C) AsF_3

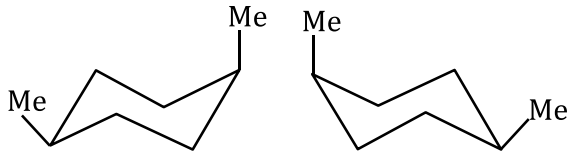
(D) Cl_3C^-

72. Which of the following is a pair of conformational isomerism

(A) 

(B) 

(C) 

(D) 

73. A mixture of 2 moles of carbon monoxide(g) and 1 mole of oxygen(g) in a closed vessel is ignited to get carbon dioxide(g), then :

(A) $\Delta H > \Delta U$ (B) $\Delta H < \Delta U$

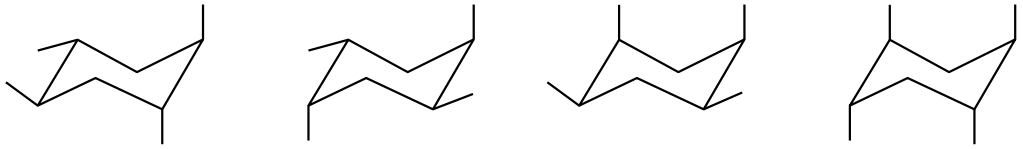
(C) $\Delta H = \Delta U$ (D) can't determine

74. Find out the similarities between I_2Cl_6 and Al_2Cl_6.

(A) both have coordinate bond (B) both have sp^3 hybridisation for the central atom

(C) both are non-planar (D) All are correct`

75. Correct order of stability for the given compound 1,2,4,5-tetramethyl cyclohexane is



(P) (Q) (R) (S)

(A) P < S < R < Q (B) S < R < Q < P

(C) R < P < Q < S (D) Q < S < P < R

76. For a reaction, $2X(s) + 2Y(s) \rightarrow 2C(\lambda) + \Delta\ (g)$

The q_p at 27°C is – 28 kcal mol^{-1}. The value of q_V is :

(A) – 27.4 kcal mol^{-1} (B) + 27.4 kcal mol^{-1}

(C) –28.6 kcal mol^{-1} (D) 28.6 kcal mol^{-1}

77. In which of the following structure, the number of shared O-atom per tetrahedron is two and half.

(A) Pyroxene chain silicate (B) Amphibole chain silicate

(C) Cyclic silicate (D) Sheet silicate

78. An ideal gas undergoes isothermal expansion from A(10 atm, 1l) to B(1 atm, 10 l) either by

(I) Infinite stage expansion or by

(II) First against 5 atm and then against 1 atm Calculate $\frac{q_I}{q_{II}}$

(A) $\frac{1}{13\times 2.303}$ (B) 13×2.303 (C) $\frac{13}{23.03}$ (D) $\frac{23.03}{13}$

79. Incorrect statement(s) for $B(OH)_3$ and $B(OH)_4^-$ is:

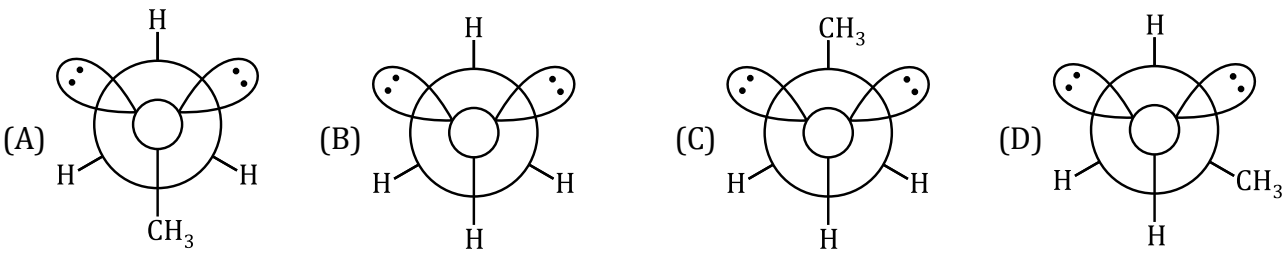
(A) Extent of back bonding: $B(OH)_3 > B(OH)_4^-$

(B) $\angle OBO$: $B(OH)_3 > B(OH)_4^-$

(C) $B(OH)_4^-$ does not form adduct with NH_3

(D) Hybridization of O-atom in $B(OH)_4^-$: sp^2

80. The least stable conformation of ethyl alcohol among following is



(A) (B) (C) (D)

Section-II

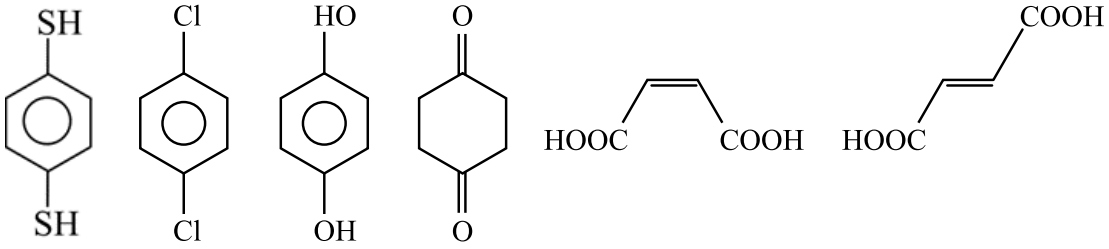
- This Section contain 10 questions (Q.No. 21 to Q.No. 30) whose answer to be filled as numerical value **(Attempt any five)**
- Answer to each question in **Section B** will be evaluated according to the following marking scheme:

Full Marks : **+4** for correct answer
Zero Marks : **0** If the question is unanswered;
Zero Marks : **0** for incorrect answer

81. HCl gas is passed into water yielding a solution of density 1.095 g/mL and containing 30% HCl by weight then the molarity of the solution will be;

82. Consider the structure of $Al_2(CH_3)_6$. This compound has Z_1 number of $2c-2e$ bonds and Z_2 number of $3c-2e$ bonds. What is sum of Z_1 and Z_2 ?

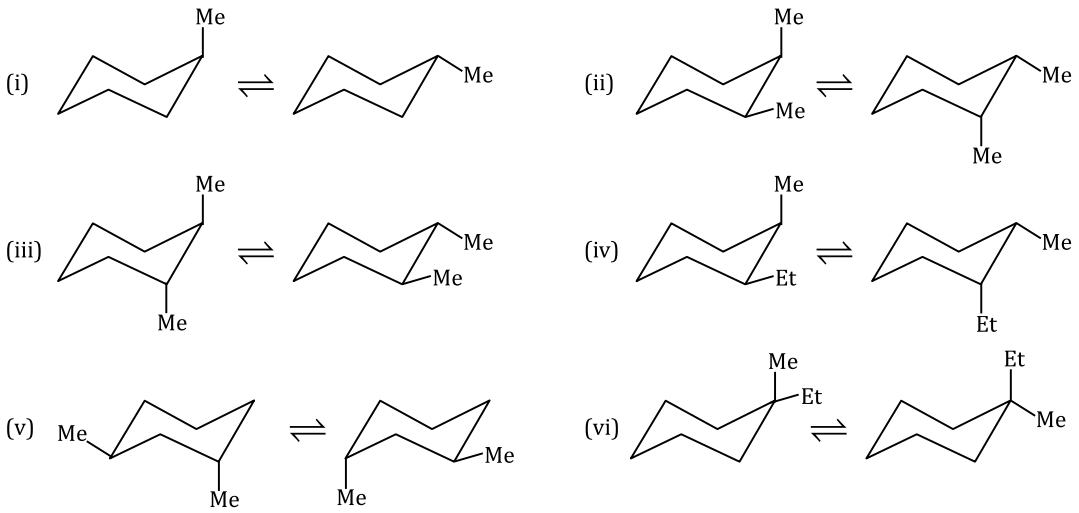
83. Total number of compounds with non-zero dipole moment are



84. 1 mole of an ideal gas is allowed to expand reversibly and isothermally at 300 K from 1.25 dm^3 to 2.5 dm^3. Work done (in Joule) by the system will be
Given : R = 8.3 JK–1mol–1, ln2 = 0.7

85. Length of chain silicone can be controlled by adding $R_nS(OH)_{4-n}$ unit, then find out correct value of n.

86. Total number of reactions for which $K_{eq} > 1$



87. How many of the following physical properties are extensive :

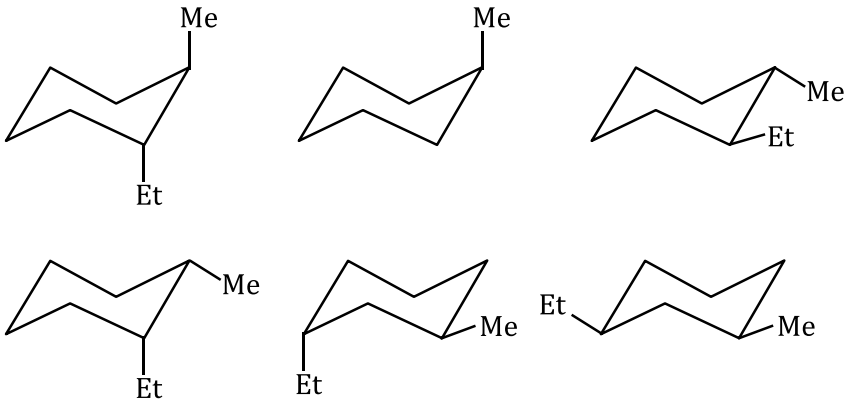
(i) Mass (ii) Vapour pressure (iii) Mole

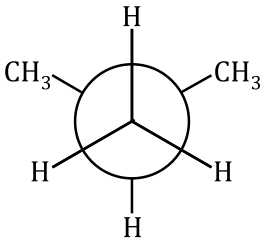
(iv) Kinetic energy (v) Internal energy (vii) molarity

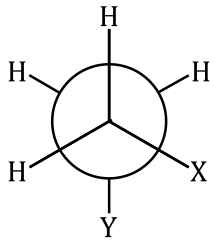
88. In which of the following compounds bridging bonds and terminal bonds are lying in same plane

$Be_2H_4, Be_2Cl_4, I_2Cl_6, Al_2Cl_6, Fe_2Cl_4, Al_2H_6, Al_2(NH_2)_6, Al_2(OH)_6$

89. In the given conformers total number of trans isomers of 1-Ethyl-2–methyl cyclohexane are



90. A compound P is a isomer of 

and its conformation is 

then

total number of correct pairs for X, Y respectively, from the following is

(i) $-H, -C_2H_5$ (ii) $-C_2H_5, -C_2H_5$ (iii) $-CH_3, -CH_3$

(iv) $-C_2H_5, -CH_3$ (v) $-H, -H$ (vi) $-C_2H_5, -H$