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All India Test Series
Mock Test-4

Sankalp IIT

A MUST DO TEST SERIES FOR SURE SHOT SUCCESS
IN JEE MAIN AND ADVANCED

VineetLoomba.com AITS - 4

Time : 3 hrs.

Max. Marks: 360

Topics covered in various subjects :

SYLLABUS OF AITS-1, 2 AND 3

Instructions:

- (i) Duration of Test is 3 hrs.
- (ii) The Test booklet consists of 90 questions. The maximum marks are 360.
- (iii) There are **three** parts in the question paper. Distribution of marks subjectwise in each part is as under for each correct response.
Part A – PHYSICS (120 marks) – Questions No.1 to 30 consist **FOUR (4)** marks each for each correct response.
Part B – CHEMISTRY (120 marks) – Questions No.31 to 60 consist **FOUR (4)** marks each for each correct response.
Part C – MATHEMATICS (120 marks) – Questions No.61 to 90 consist **FOUR (4)** marks each for each correct response.
- (iv) One fourth ($\frac{1}{4}$) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.
- (v) **Pattern of the Question: Section – I : Multiple Type Objective Questions** (Straight Single Choice Multiple Type Questions); **Section – II: Assertion – Reason Type Questions**; **Section – III: Comprehension Type Questions** : (One Comprehension Type Question should have 3 questions - Multiple Concept Questions); **Section – IV: Straight Objective Questions**: (Straight Single Choice - Multiple Concept Questions and/or Difficulty/Lengthy calculations & Application based questions)

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PHYSICS**SECTION - I****Straight Single Choice Multiple Type Questions /
Application Based Single Choice Questions**

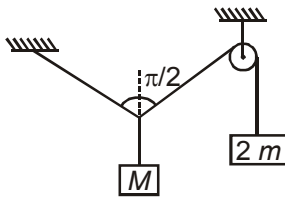
This section contains 16 multiple choice questions numbered 1 to 16. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

Choose the correct answer :

1. The dimensions of quantity $\frac{h}{e}$, where h is Plank's constant and e is electronic charge, is given by

- (1) $[ML^2T^{-2}]$ (2) $[M^2L^2T^{-2}A^{-1}]$
(3) $[ML^2T^{-2}A^{-1}]$ (4) $[MLT^{-2}A^{-1}]$

2. Find the minimum value of M for which the entire system remains in equilibrium

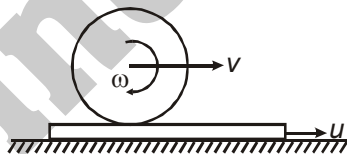


- (1) m (2) $2m$
(3) $3m$ (4) $4m$

3. Three identical rods, each of length l are joined to form an equilateral triangle. The radius of gyration of the system about one side is

- (1) $\frac{l}{\sqrt{6}}$ (2) $\frac{3l}{\sqrt{2}}$
(3) $\sqrt{2}l$ (4) $\frac{\sqrt{3}}{2}l$

4. A disc of radius R is moving with linear velocity v and angular velocity ω on a plank. If plank is also moving with speed u , then condition for pure rolling motion of disc will be



- (1) $v + u = R\omega$ (2) $v - u = R\omega$
(3) $v = R\omega$ (4) $u = R\omega$

5. A particle of mass m is placed at the distance r from the centre of spherical shell of mass m and radius $2r$. Then gravitational force on the mass m is

(1) $\frac{Gm^2}{r^2}$

(2) $\frac{Gm^2}{4r^2}$

(3) $\frac{Gm^2}{9r^2}$

(4) Zero

6. A satellite is orbiting in a circular path. If the velocity of the satellite is becoming more in another orbit then

- (1) Its total energy will increase and it will start orbiting in a circular orbit of larger radius
(2) Its total energy will decrease and it will start orbiting in a circular orbit of smaller radius
(3) Its kinetic energy will decrease and potential energy will increase
(4) Both (2) & (3)

7. A glass vessel of volume V is completely filled with water. On increasing its temperature by ΔT , the volume of the water overflow will be (γ_a = Coefficient of apparent expansion of the water, γ_w and γ_g are the coefficient of volume expansion of water and glass respectively)

- (1) $V\gamma_a\Delta T$
(2) $V\gamma_w\Delta T$
(3) $V(\gamma_w + \gamma_g)\Delta T$
(4) $V\frac{\gamma_w^2}{\gamma_g}\Delta T$

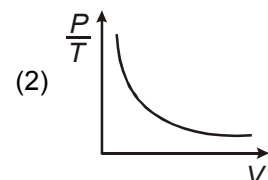
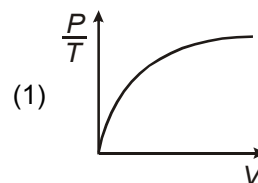
8. Coefficient of volume expansion of an ideal gas at temperature T K at constant pressure is

- (1) T (2) $\frac{1}{T}$
(3) $\frac{1}{T^2}$ (4) T^2

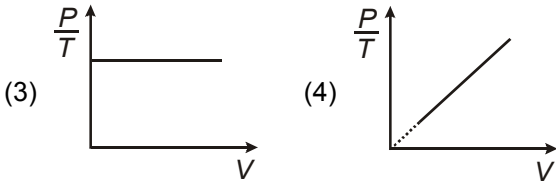
9. Two rods A and B having same area of cross-section are joined in series. Thermal conductivity of A is half the thermal conductivity of B . Ratio of temperature gradient in A and B is

- (1) 2 : 1 (2) 1 : 2
(3) 4 : 1 (4) 1 : 4

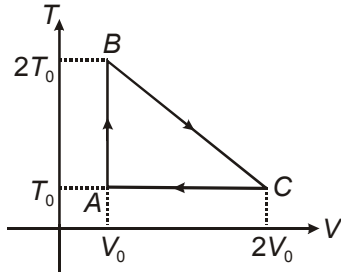
10. Which of the following graph is for an ideal gas correct? (Symbols have their usual meanings)



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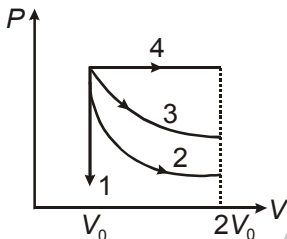


11. A cyclic process $A \rightarrow B \rightarrow C \rightarrow A$ for n moles of an ideal monoatomic gas is shown in fig. The change in internal energy of the gas in the process $A \rightarrow B$ is



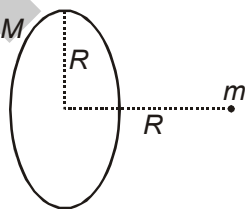
- (1) $\frac{3}{2}nRT_0$
- (2) $\frac{5}{2}nRT_0$
- (3) $3nRT_0$
- (4) $2nRT_0$

12. A gas expands from volume V_0 to $2V_0$ under four different processes, then



- (1) $W_1 = 0, W_2 > W_3 > W_4$
- (2) $W_1 = 0, W_2 < W_3 = W_4$
- (3) $W_1 = 0, W_2 < W_3 < W_4$
- (4) $W_1 = W_4 = 0, W_2 < W_3$

13. A uniform ring has mass M and radius R . A point mass m is placed at a distance R on the axial line of the ring. Potential energy of ring and point mass system is



- (1) $-\frac{GMm}{R}$
- (2) $-\frac{GMm}{\sqrt{2}R}$

- (3) $-\frac{GMm}{2R}$
- (4) $-\frac{\sqrt{2}GMm}{R}$

14. A body is rotating with angular velocity ω about an axis passing through its centre of mass. Linear speed of a particle in the body at a distance r from axis of rotation is v . Then

- (1) $\omega \propto v$
- (2) $\omega \propto \frac{1}{r}$
- (3) $\omega = 0$
- (4) ω is independent of r

15. A uniform rod of mass m and length l lies on a smooth horizontal table. A particle of mass m moving with velocity v perpendicular to the length of rod strikes at a distance $\frac{l}{2}$ from centre and comes to rest. The angular velocity of the rod just after collision is

- (1) $\frac{6v}{L}$
- (2) $\frac{2v}{L}$
- (3) $\frac{v}{2L}$
- (4) $\frac{2v}{3L}$

16. If R_s is radius of sun & R_{SE} is distance between sun and earth then

- (1) $\frac{1}{R_{SE}}$
- (2) $\frac{1}{R_{SE}^2}$
- (3) $\frac{1}{R_s}$
- (4) $\frac{1}{R_s^2}$

SECTION - II

Assertion – Reason Type Questions

Directions : Questions number 17 to 21 are Assertion-Reason type questions. Each of these questions contains two statements. Statement-1 (Assertion) and Statement-2 (Reason). Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select the correct choice.

17. Statement-1 : Sound wave is longitudinal in nature.

and

Statement-2 : Wave propagation and movement of particle is in same direction during propagation of sound.

- (1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for

Class (XII)

Statement-1

(2) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct explanation for Statement-1

(3) Statement-1 is True, Statement-2 is False

(4) Statement-1 is False, Statement-2 is True

18. Two bodies are released from a certain height.

Statement-1 : Path followed by centre of mass is a straight line.

and

Statement-2 : Acceleration of centre of mass is g .

(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(2) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct explanation for Statement-1

(3) Statement-1 is True, Statement-2 is False

(4) Statement-1 is False, Statement-2 is True

19. Statement-1 : If a particle starts moving with constant velocity then its path will be a straight line.

and

Statement-2 : If particle is moving with constant speed then its acceleration will be zero.

(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(2) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct explanation for Statement-1

(3) Statement-1 is True, Statement-2 is False

(4) Statement-1 is False, Statement-2 is True

20. Statement-1 : Molar specific heat capacity of a gas can be negative, positive or zero.

and

Statement-2 : Molar specific heat capacity for a gas is

equal to $\frac{\Delta Q}{n \cdot \Delta T}$.

(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(2) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct explanation for Statement-1

(3) Statement-1 is True, Statement-2 is False

(4) Statement-1 is False, Statement-2 is True

21. Statement-1 : In standing wave, two points having same speed are separated by a distance $\frac{\lambda}{2}$.

and

Statement-2 : Distance between two consecutive nodes is $\frac{\lambda}{2}$.

(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(2) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct explanation for Statement-1

(3) Statement-1 is True, Statement-2 is False

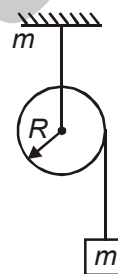
(4) Statement-1 is False, Statement-2 is True

SECTION - III

Comprehension Type Questions

Directions : Question No. 22 to 24 are based on the following paragraph.

A very long thread is wound around a ring of mass m and radius R . The free end of thread is connected to a block of mass m . There is no slipping anywhere



22. Acceleration of hanging block is

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

(3) $\frac{2g}{3}$ (4) $\frac{g}{5}$

23. Angular acceleration of ring is

(1) $\frac{g}{R}$ (2) $\frac{g}{2R}$

(3) $\frac{2g}{3R}$ (4) $\frac{g}{3R}$

24. Tension in the string is

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

(3) $\frac{2mg}{3}$ (4) $\frac{mg}{3}$

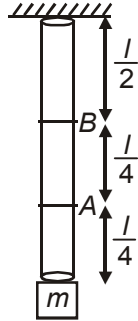
SECTION - IV

Straight Objective Questions

Directions : Question No. 25 to 30 are based on the following Multiple concept questions and/or difficulty/lengthy calculations & application based questions.

25. A rope of mass m and length l is suspended by ceiling. In the free end a block of mass m is also attached. The ratio of tension in the rope at B and A is

- (1) $\frac{6}{5}$
 (2) $\frac{5}{6}$
 (3) $\frac{3}{2}$
 (4) $\frac{2}{3}$



26. Four rods each of mass m and length l are joined to form a square. The moment of inertia of loop about one of the side is

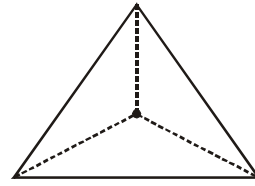


- (1) $\frac{5}{2}ml^2$ (2) $\frac{5}{3}ml^2$
 (3) $\frac{2}{3}ml^2$ (4) $\frac{3}{2}ml^2$

27. The ratio of orbital velocity of a satellite at a height R and $2R$ above the earth surface is

- (1) $\frac{1}{\sqrt{2}}$
 (2) $\sqrt{\frac{2}{3}}$
 (3) $\sqrt{\frac{3}{2}}$
 (4) $\sqrt{2}$

28. Three rods each of mass m and length l is joined to form an equilateral triangle. If E and v denotes gravitational field and potential at the centroid then



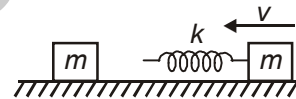
- (1) $E = 0, V = 0$
 (2) $E = 0, V \neq 0$
 (3) $E \neq 0, V = 0$
 (4) $E \neq 0, V \neq 0$

29. The path followed by projectile projected from ground

is $y = x - \frac{x^2}{10}$ then the range of the projectile will be

- (1) 5 (2) 10
 (3) 15 (4) 20

30. In the situation shown in the figure the maximum possible compression in the spring is



- (1) $v\sqrt{\frac{m}{k}}$
 (2) $v\sqrt{\frac{2m}{k}}$
 (3) $2v\sqrt{\frac{m}{k}}$
 (4) $v\sqrt{\frac{m}{2k}}$

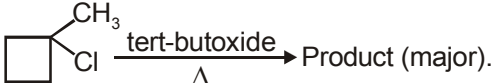


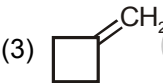
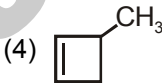
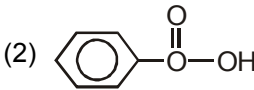
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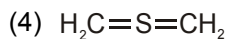
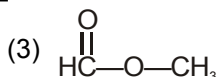
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CHEMISTRY**SECTION - I****Straight Single Choice Multiple Type Questions /
Application Based Single Choice Questions**

This section contains 16 multiple choice questions numbered 31 to 46. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

31. Borax contains
 (1) sp hybridised B-atom only
 (2) sp² hybridised B-atom only
 (3) sp³ hybridised B-atom only
 (4) Both sp² and sp³ hybridised B-atom
32. 0.5 mole of each of H₂, SO₂ and CH₄ are kept in a container. A hole was made in the container. After 3 hours, the order of partial pressures in the container will be
 (1) P(CH₄) > P(SO₂) > P(H₂)
 (2) P(H₂) > P(CH₄) > P(SO₂)
 (3) P(SO₂) > P(CH₄) > P(H₂)
 (4) P(H₂) > P(SO₂) > P(CH₄)
33. The solution having pH value 12 is 100 times diluted, the pH value of final solution will be
 (1) 10 (2) 8
 (3) 12 (4) 14
34. The hybridisation of phosphorous in solid PBr₅ is
 (1) sp³ (2) sp³d²
 (3) sp³d (4) Both (1) & (2)
35. An electron is moving in Bohr's fourth orbit. Its de-broglie wavelength is λ. What is the circumference of the fourth orbit?
 (1) 2λ (2) 2/λ
 (3) λ/4 (4) 4λ
36. At low pressure the correct expression of van der Waal equation is
 (1) P(V - nb) = nRT
 (2) $\left(P + \frac{n^2a}{V^2}\right)V = nRT$
 (3) PV = nRT
 (4) $\left(P + \frac{n^2a}{V^2}\right)(V - nb) = nRT$
37. NaOH is prepared by electrolysis of NaCl in
 (1) Down's cell (2) Hoop's method
 (3) Baeyer's method (4) Kellner-Solvey cell
38. In which of the following case maximum cooling will be observed if one mole salt is dissolved in the same amount of water?
 (1) KNO₃ (ΔH = 35.4 KJ mol⁻¹)
 (2) NaCl (ΔH = + 5.35 KJ mol⁻¹)
 (3) KOH (ΔH = -55.6 KJ mol⁻¹)
 (4) KBr (ΔH = -83.3 KJ mol⁻¹)
39. In the given reaction

 The major product is
 (1)  (2) 
 (3)  (4) 
40. Maximum hyperconjugation is present in
 (1) Tert-butylbenzene (2) Ethylbenzene
 (3) Isopropylbenzene (4) Toluene
41. The most acidic hydrogen is present in
 (1) Cyclopenta-1, 3-diene
 (2) Cyclohepta-1, 3, 5-triene
 (3) Cyclopropene
 (4) Toluene
42. The ratio of radii of 3rd orbit of Li⁺² and 2nd orbit of He⁺ is
 (1) 2 : 3 (2) 1 : 3
 (3) 3 : 2 (4) 3 : 1
43. 98 g H₂SO₄ is added in water no. of moles of ions produced will be
 (1) 0.3 N_A
 (2) 0.3 × 6.023 × 10²³
 (3) 0.3 × 98
 (4) 0.3
44. An organic monobasic acid contains 40% C, $\frac{20}{3}\%$, molecular w.t. is 60. Its molecular formula is
 (1) CH₃COOH (2) 

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45. In a container initially only PCl_5 gas is filled at 100 mm pressure. At equilibrium $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$, it is partially dissociated to PCl_3 & Cl_2 and total pressure becomes 120 mm. The value of K_p will be
- (1) 20 (2) 144
(3) 5 (4) 4
46. Acetic acid and aq. NH_3 are weak monobasic acid and weak monoacidic base respectively and K_a of acetic acid is equal to K_b of aq. NH_3 . Which of the following statements are incorrect?
- (1) The mixing of CH_3COOH and NH_3 in any proportion would result in neutral solution having $\text{pH} = 7$ at 25°C
- (2) If aq. NH_3 is exactly half neutralised by HCl , then pOH of resulting solution is equal to $\text{p}K_b$
- (3) If acetic acid is exactly half neutralised by NaOH then pH of resulting solution is equal to $\text{p}K_a$
- (4) If acetic acid is exactly neutralised by aq. NH_3 , then pH of resulting solution is equal to $1/2 \text{p}K_w$.

SECTION - II

Assertion – Reason Type Questions

Directions : Questions number 47 to 51 are Assertion-Reason type questions. Each of these questions contains two statements. Statement-1 (Assertion) and Statement-2 (Reason). Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select the correct choice.

47. Statement-1 : Pyrrole is less basic than pyridine.

and

Statement-2 : Pyrrole is aromatic and pyridine is antiaromatic.

- (1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1
- (2) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct explanation for Statement-1
- (3) Statement-1 is True, Statement-2 is False
- (4) Statement-1 is False, Statement-2 is True
48. Statement-1 : At an equilibrium reaction, $\Delta H = T\Delta S$.

and

Statement-2 : At equilibrium $\Delta G^\circ = 0$

- (1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1
- (2) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct explanation for Statement-1
- (3) Statement-1 is True, Statement-2 is False

- (4) Statement-1 is False, Statement-2 is True

49. Statement-1 : Alkynes are more reactive than alkenes towards hydrogenation in the presence of metal catalyst

and

Statement-2 : Terminal alkynes are most acidic aliphatic hydrocarbon

- (1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1
- (2) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct explanation for Statement-1
- (3) Statement-1 is True, Statement-2 is False
- (4) Statement-1 is False, Statement-2 is True
50. Statement-1 : Boiling point of D_2O is greater than H_2O .

and

Statement-2 : Dielectric constant of D_2O is less than H_2O .

- (1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1
- (2) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct explanation for Statement-1
- (3) Statement-1 is True, Statement-2 is False
- (4) Statement-1 is False, Statement-2 is True
51. Statement-1 : SiO_2 is more acidic than CO_2 .

and

Statement-2 : SiO_2 is solid and CO_2 is gaseous compound.

- (1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1
- (2) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct explanation for Statement-1
- (3) Statement-1 is True, Statement-2 is False
- (4) Statement-1 is False, Statement-2 is True

SECTION - III

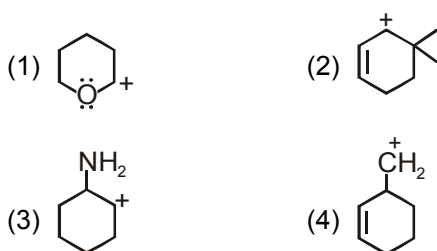
Comprehension Type Questions

Directions : Question No. 52 to 54 are based on the following paragraph.

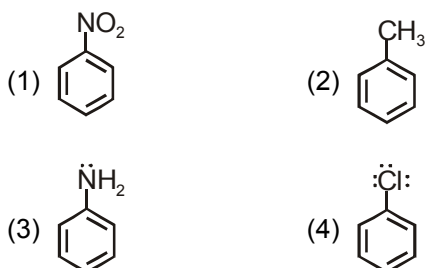
Stability of carbocations can be determined by using given effects

- (i) Resonance
- (ii) % s-character on carbon
- (iii) Hyperconjugation
- (iv) Inductive effect

52. Both hyperconjugation and resonance effect are observed in



53. The most stable cation is formed by attack of electrophile on



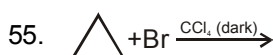
54. Carbon atom in C_3O_2 are

- (1) sp^2 hybridised
- (2) sp^3 hybridised
- (3) sp hybridised
- (4) sp and sp^2 hybridised

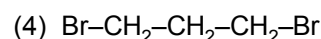
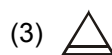
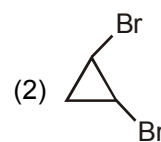
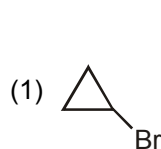
SECTION - IV

Straight Objective Question

Directions : Question No. 55 to 60 are based on (Straight Single Choice - Multiple Concept Questions and/or Difficulty/Lengthy calculations & Application based questions)



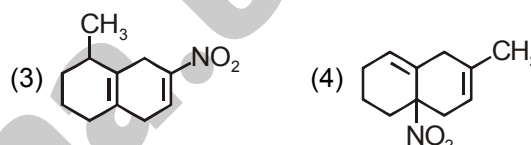
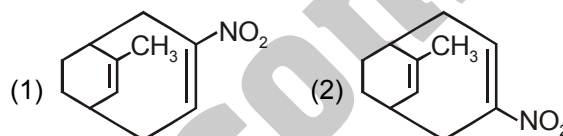
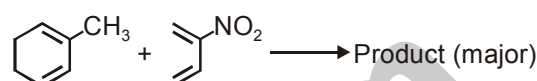
Product of the reaction is



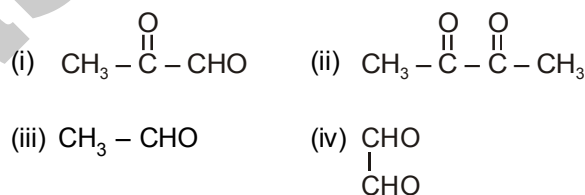
56. The volume of 0.2 M $KMnO_4$ required for complete oxidation of 1 litre of 5.6 V H_2O_2 solution in acidic medium is

- (1) 1 litre
- (2) 0.5 litre
- (3) 0.2 litre
- (4) 0.1 litre

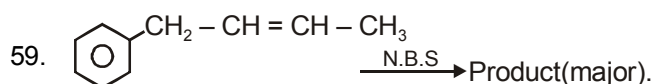
57. In given reaction



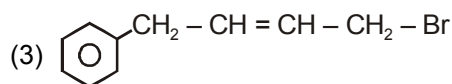
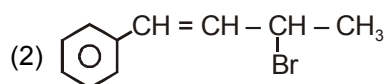
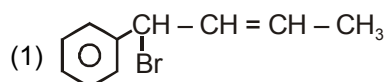
58. The reductive ozonolysis of o-xylene cannot form

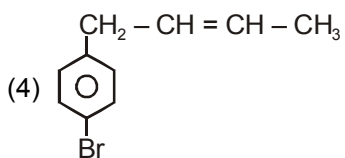


- (1) (ii) & (iii)
- (2) (i), (iii) & (iv)
- (3) (ii), (iii) & (iv)
- (4) Only (iii)

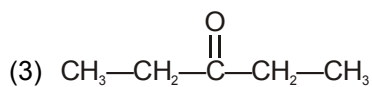
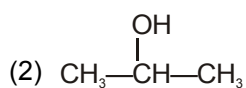
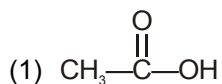


The major product is





60. CHCl_3 is one of the product in the following reaction when A is



(4) All of these

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MATHEMATICS**SECTION - I****Straight Single Choice Multiple Type Questions /
Application Based Single Choice Questions**

This section contains 16 multiple choice questions numbered 61 to 76. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

61. The number of solution(s) of the equation

$$\sin^2 x - 4\sin x + 3 = 0 \text{ in } [0, 4\pi] \text{ is}$$

- (1) 0 (2) 3
(3) 2 (4) 4

62. Let $A = \{1, 2, 3\}$, then the total number of reflexive relation(s) from A to A is

- (1) 1 (2) 16
(3) 32 (4) 64

63. Let $|z_1| = 1$, $|z_2| = 4$ and $|z_1 + z_2| = 3$. Then $|z_2 + 16z_1|$ is equal to

- (1) 10 (2) 6
(3) 12 (4) 7

64. If the quadratic equation $ax^2 + bx + c = 0$ has non-real complex roots and $a - b + c > 0$, then the value of $a + b + c$ may be

- (1) 1 (2) 0
(3) -1 (4) -2

65. If x, y, z , are independent to each other, then the sum of coefficients in the expansion of $(5x + 3y - 8z)^{30}$ is

- (1) 1 (2) 2
(3) 0 (4) 4

66. If $x > 0$, then the minimum value of $x^4 + \frac{4}{x}$ is

- (1) 5 (2) 4
(3) 3 (4) 1

67. If the point (α, α) lies between the lines $|x + y| = 4$, then α belongs to

- (1) (2, 3) (2) (1, 2)
(3) (-2, 2) (4) (-2, -1)

68. The fundamental period of the function f defined as $f(x) = |\sin x| + |\cos x| + \cos(\cos x)$ is

(1) $\frac{\pi}{2}$ (2) 2π

(3) π (4) 4π

69. If the equation $3\sin x + 4\cos x = 2k$ has at least one solution, then the number of non-negative integral values of k is

- (1) 1 (2) 3
(3) 4 (4) 2

70. The value of k for which the equation

$$kx + \sin^{-1}(x^2 - 2x + 2) + \cos^{-1}(x^2 - 2x + 2) = \pi$$
 has a solution is

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

(3) $\frac{\pi}{7}$ (4) $\frac{\pi}{6}$

71. If $(1-p)(1+3x+9x^2+27x^3+81x^4+243x^5) = 1-p^6$, $x \neq 0, p \neq 1$, then one of the possible value of $\frac{p}{x}$ is

(1) $\frac{1}{3}$ (2) 3

(3) $\frac{1}{2}$ (4) 2

72. The harmonic mean of the roots of the equation $(5 + \sqrt{2})x^2 - (4 + \sqrt{5})x + (8 + 2\sqrt{5}) = 0$ is

- (1) 2 (2) 4
(3) 6 (4) 8

73. If $|z_1 - 1| \leq 1$, $|z_2 - 2| \leq 2$, $|z_3 - 3| \leq 3$, then the maximum value of $|z_1 + z_2 + z_3|$ is

- (1) 6 (2) 10
(3) 12 (4) 16

74. The co-efficient of x^6 in the expansion of

$$\{(1+x)^6 + (1+x)^7 + \dots + (1+x)^{15}\}$$
 is

- (1) ${}^{16}C_9$ (2) ${}^{16}C_5 - {}^6C_5$
(3) ${}^{16}C_6 - 1$ (4) ${}^{15}C_9$

75. If $3\sin\theta + 4\cos\theta = 5$, then the value of $4\sin\theta - 3\cos\theta$ is

- (1) 5 (2) 0
(3) -5 (4) 1

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76. If $\sin^{-1} x + \sin^{-1} y = \frac{2\pi}{3}$, $\cos^{-1} x - \cos^{-1} y = \frac{\pi}{3}$, then the number of possible ordered pair(s) (x, y) is

- (1) 2
- (2) 4
- (3) 1
- (4) Infinitely many

SECTION - II

Assertion – Reason Type Questions

Directions : Questions number 77 to 81 are Assertion-Reason type questions. Each of these questions contains two statements. Statement-1 (Assertion) and Statement-2 (Reason). Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select the correct choice.

77. Statement-1 : The lines $x + y + 1 = 0$ and $x - y + 1 = 0$ are perpendicular.

and

Statement-2 : If the lines $y = m_1x + c_1$ and $y = m_2x + c_2$ are perpendicular, then $m_1m_2 = -1$

- (1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1
 - (2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
 - (3) Statement-1 is True, Statement-2 is False
 - (4) Statement-1 is False, Statement-2 is True
78. Statement-1 : The curves represented by $x^2 - y^2 = 0$ are orthogonal.

and

Statement-2 : The distance between the lines represented by $x^2 + 3x + 2 = 0$ is 1.

- (1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1
 - (2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
 - (3) Statement-1 is True, Statement-2 is False
 - (4) Statement-1 is False, Statement-2 is True
79. Statement-1 : Two circles which are never concentric always have a unique common normal.

and

Statement-2 : Two circles always have a common tangent.

- (1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-

1

(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1

(3) Statement-1 is True, Statement-2 is False

(4) Statement-1 is False, Statement-2 is True

80. Statement-1 : $y^2 = 4ax$, $a \in R$ always represents a parabola.

and

Statement-2 : Let the focus of a parabola be $(1, 1)$ and directrix be $3x + 4y + 13 = 0$. The length of latus rectum is 8.

(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1

(3) Statement-1 is True, Statement-2 is False

(4) Statement-1 is False, Statement-2 is True

81. Statement-1 : The area of parallelogram formed by the tangents at the ends of conjugate diameters with

respect to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ is 24.

and

Statement-2 : The eccentricity of the conic $xy + x + y = 0$ is $\sqrt{2}$.

(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1

(3) Statement-1 is True, Statement-2 is False

(4) Statement-1 is False, Statement-2 is True

SECTION - III

Comprehension Type Questions

Directions : Question No. 82 to 84 are based on the following paragraph.

The locus of point of intersection of perpendicular tangents to a curve is the director circle of the curve.

Consider the curve $x^2 + 2y^2 - 2x - 4y + 1 = 0$ and give the answers of the following questions.

82. The locus of point of intersection of perpendicular tangents to the curve is

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

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- (2) $x^2 + y^2 = 2$
 (3) $x^2 + y^2 = 1$
 (4) $x^2 + y^2 = 5$
83. The product of lengths of perpendiculars drawn from foci of the given conic to any tangent to the conic is
- (1) 2
 (2) 1
 (3) 3
 (4) 4
84. The maximum value of sum of coordinates of a point on the curve represented by the given equation is
- (1) $2 - \sqrt{5}$
 (2) $\sqrt{5} - 2$
 (3) $2 + \sqrt{3}$
 (4) $\sqrt{5}$
86. The number of common tangent(s) to the circles $x^2 + y^2 - 6x - 14y + 48 = 0$ and $x^2 + y^2 - 6x = 0$ is
- (1) 1
 (2) 2
 (3) 0
 (4) 4
87. The number of distinct normals that can be drawn from $(-2, 1)$ to the parabola $y^2 - 4x - 2y - 3 = 0$ is
- (1) 1
 (2) 2
 (3) 3
 (4) 0
88. The foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$ and the hyperbola $\frac{x^2}{144} - \frac{y^2}{81} = \frac{1}{25}$ coincide. Then the value of b^2 is
- (1) 5
 (2) 7
 (3) 9
 (4) 1
89. L is a variable line such that the algebraic sum of the distances of the points $(1, 1)$, $(2, 0)$ and $(0, 2)$ from the line is equal to zero. The line L will always pass through
- (1) $(1, 1)$
 (2) $(2, 2)$
 (3) $(1, 2)$
 (4) $(2, 1)$
90. If $x^2 + y^2 + z^2 = 1$, then the value of $xy + yz + zx$ lies in the interval
- (1) $\left[\frac{1}{2}, 2\right]$
 (2) $[-1, 2]$
 (3) $\left[-\frac{1}{2}, 1\right]$
 (4) $\left[-1, \frac{1}{2}\right]$

SECTION - IV

Straight Objective Question

Directions : Question No. 85 to 90 are based on (Straight Single Choice - Multiple Concept Questions and/or Difficulty/Lengthy calculations & Application based questions)

85. The distance of the line $2x - 3y = 4$ from the point $(1, 1)$ measured along the line $x + y - 1 = 0$ is
- (1) $\sqrt{2}$
 (2) $5\sqrt{2}$
 (3) $\frac{1}{\sqrt{2}}$
 (4) 10

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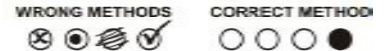
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1. Please fill the Question Paper Code in above Box.
2. This sheet should not be folded or crushed.
3. Use only blue/black ball point pen to fill the circles.
4. Use of pencil is strictly prohibited.
5. Circles should be darkened completely and properly.
6. Cutting and erasing on this sheet is not allowed.
7. Do not make any stray marks on the sheet.
8. Do not use marker or white fluid on the sheet.



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2.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	17.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	32.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	47.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	62.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	77.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	18.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	33.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	48.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	63.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	78.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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6.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	21.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	36.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	51.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	66.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	81.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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9.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	24.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	39.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	54.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	69.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	84.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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