



JEE-JEE
Batch-Growth (June) | Minor Test - 11

Time: 3 Hours**Date: 19th January 2025****Maximum Marks:300**

Name of the Candidate: _____ Roll No. _____

Centre of Examination (in Capitals): _____

Candidate's Signature: _____ Invigilator's Signature: _____

READ THE INSTRUCTIONS CAREFULLY

1. The candidates should not write their Roll Number anywhere else (except in the specified space) on the Test Booklet/Answer Sheet.
2. This Test Booklet consists of 75 questions.
3. This question paper is divided into three parts **PART A - MATHEMATICS, PART B - PHYSICS** and **PART C - CHEMISTRY** having 25 questions each and every **PART** has two sections.
 - (i) **Section-I** contains 20 multiple choice questions with only one correct option. Marking scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases.
 - (ii) **Section-II** contains 5 questions with INTEGRAL VALUE.
Marking scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases.
4. No candidate is allowed to carry any textual material, printed or written, bits of papers, mobile phone any electronic device etc., except the Identity Card inside the examination hall/room.
5. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
6. On completion of the test, the candidate must hand over the Answer Sheet to the invigilator on duty in the Room/Hall. However, the candidate is allowed to take away this Test Booklet with them.
7. **For the numerical based questions in Section-II of Mathematics, Physics, Chemistry, the answer should be in whole number only.**
8. **If learners fill the OMR with incorrect syntax (say 24.5. instead of 24.5), their answer will be marked wrong.**

TEST SYLLABUS
Batch-Growth (June) | Minor Test – 11
Test Date-19th Jan. 2025

Mathematics	:	Parabola
Physics	:	KTG & Thermodynamics
Chemistry	:	GOC

Useful Data Chemistry:

Gas Constant	R	= 8.314 J K ⁻¹ mol ⁻¹
		= 0.0821 Lit atm K ⁻¹ mol ⁻¹
		= 1.987 ≈ 2 Cal K ⁻¹ mol ⁻¹
Avogadro's Number	N _a	= 6.023 × 10 ²³
Planck's Constant	h	= 6.626 × 10 ⁻³⁴ Js
		= 6.25 × 10 ⁻²⁷ erg.s
1 Faraday		= 96500 Coulomb
1 calorie		= 4.2 Joule
1 amu		= 1.66 × 10 ⁻²⁷ kg
1 eV		= 1.6 × 10 ⁻¹⁹ J
Atomic No :	H=1, D=1, Li=3, Na=11, K=19, Rb=37, Cs=55, F=9, Ca=20, He=2, O=8, Au=79.	
Atomic Masses:	He=4, Mg=24, C=12, O=16, N=14, P=31, Br=80, Cu=63.5, Fe=56, Mn=55, Pb=207, Au=197, Ag=108, F=19, H=2, Cl=35.5, Sn=118.6	

Useful Data Physics:

Acceleration due to gravity $g = 10 \text{ m/s}^2$

PART-A: MATHEMATICS

SECTION-I

1. A parabola $y = ax^2 + bx + c$ crosses the x-axis at $(\alpha, 0)$ $(\beta, 0)$ both to the right of the origin, A circle also passes through these two points. The length of a tangent from the origin to the circle is:
 (A) $\sqrt{\frac{bc}{a}}$ (B) ac^2 (C) $\frac{b}{a}$ (D) $\sqrt{\frac{c}{a}}$
2. If AFB is a focal chord of the parabola $y^2 = 4ax$ and $AF = 4$, $FB = 5$, then length of latus rectum of parabola is:
 (A) $\frac{81}{12}$ (B) $\frac{80}{9}$ (C) $\frac{81}{10}$ (D) 9
3. Length of the latus rectum of the parabola $25[(x-2)^2 + (y-3)^2] = (3x-4y+7)^2$ is
 (A) 4 (B) 2 (C) $\frac{1}{5}$ (D) $\frac{2}{5}$
4. The Angle between the tangents drawn from a point $(-a, 2a)$ to $y^2 = 4ax$ is
 (A) $\frac{\pi}{4}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{2}$ (D) $\frac{\pi}{6}$
5. If $y = 2x + \lambda$ is normal to parabola $y^2 = 8x$, then λ is
 (A) -25 (B) -24 (C) -18 (D) -19
6. The length of chord of the parabola $x^2 = 4y$ passing through the vertex and having slope as $\cot \alpha$ is:
 (A) $4 \cos \alpha \operatorname{cosec}^2 \alpha$ (B) $4 \tan \alpha \sec \alpha$
 (C) $4 \sin \alpha \sec^2 \alpha$ (D) None of these
7. The minimum distance between $y^2 = 4x$ and $x^2 + y^2 - 12x + 31 = 0$
 (A) $\sqrt{6}$ (B) $\sqrt{7}$ (C) 2 (D) $\sqrt{5}$
8. y-intercept of the common tangent to the parabola $y^2 = 32x$ and $x^2 = 108y$.
 (A) -18 (B) -12 (C) -9 (D) 6
9. The mirror image of the parabola $y^2 = 4x$ in the tangent to the parabola to the point (1, 2) is:
 (A) $(x-1)^2 = 4(y+1)$ (B) $(x-1)^2 = 4(y+1)^2$
 (C) $(x+1)^2 = 4(y-1)$ (D) $(x-1)^2 = 4(y-1)$

10. The length of focal chord of parabola $y^2 = 12x$ which makes an angle 60° with positive x-axis is:
(A) 18 (B) 16 (C) 20 (D) 15
11. If three distinct and real normal can be drawn to $y^2 = 8x$ from the point $(a, 0)$, then $a \in$
(A) $[0, 4]$ (B) $(-\infty, 4)$ (C) $(4, \infty)$ (D) \emptyset
12. The co-ordinate of a point on the parabola $y^2 = 8x$, whose focal distance is 4 unit is:
(A) (2, 4) (B) (4, 2) (C) (-2, -4) (D) (4, -2)
13. If (2, -8) is one end of a focal chord of the parabola $y^2 = 32x$, then the other end of the focal chord is-
(A) (32, 32) (B) (32, -32) (C) (-2, 8) (D) (2, 8)
14. A line from $(-1, 0)$ intersects the parabola $x^2 = 4y$ at A and B. Then the locus of centroid of ΔOAB is:
(A) $3x^2 - 2x = 4y$ (B) $3y^2 - 2y = 4x$ (C) $3x^2 + 2x = 4y$ (D) None of these
15. The locus of vertices of family of parabolas $y = ax^2 + 2a^2x + 1$ ($a \neq 0$) is a curve passing through
(A) (1, 0) (B) (1, 1) (C) (0, 1) (D) (0, 0)
16. The Area (in sq. unit) of an equilateral triangle inscribed in the parabola $y^2 = 8x$, with one of its vertices on the vertex of this parabola is:
(A) $256\sqrt{3}$ (B) $64\sqrt{3}$ (C) $128\sqrt{3}$ (D) $192\sqrt{3}$
17. The locus of the centre of the circle described on by focal chord of a parabola $y^2 = 4ax$ as diameter is
(A) $x^2 = 2a(y - a)$ (B) $x^2 = -2a(y - a)$
(C) $y^2 = 2a(x - a)$ (D) $y^2 = -2a(x - a)$
18. The director circle of the parabola $(y - 2)^2 = 16(x + 7)$ touches the circle $(x - 1)^2 + (y + 1)^2 = r^2$, then r is equal to:
(A) 10 (B) 11 (C) 12 (D) None of these
19. A tangent is drawn to the parabola $y^2 = 6x$ which is perpendicular to the line $2x + y = 1$. Which of the following point does not lie on it?
(A) (0, 3) (B) (-6, 0) (C) (4, 5) (D) (5, 4)

20. Which one of the following equations represented parametrically, represent equation to a parabolic profile?
- (A) $x = 3 \cos t$; $y = 4 \sin t$ (B) $x^2 - 2 = -2 \cos t$; $y = 4 \cos^2\left(\frac{t}{2}\right)$
- (C) $\sqrt{x} = \tan t$, $\sqrt{y} = \sec t$ (D) $x = \sqrt{1 - \sin t}$, $y = \sin \frac{t}{2} + \cos\left(\frac{t}{2}\right)$

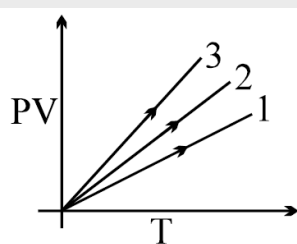
SECTION-II

21. If the angle between the two tangents drawn from the point (1, 4) to the parabola $y^2 = 12x$ is $\tan^{-1}(k)$, then $2k$ is equal to:
22. The straight line $3x - 4y + C = 0$ intersect the parabola $x^2 = 4y$ at the point A & B, if the lines joining points A & B to the vertex of parabola are perpendicular, then C is equal to
23. If $y = px + q$ is the common normal of parabola $y^2 = 4x$ and $(y - 2)^2 = 4(x - 1)$ then $|p + q|$ is equal to:
24. If the normal to a parabola $y^2 = 4ax$ at P meets the curve again in Q and if PQ and the normal at Q makes angle α and β , respectively with the x-axis, then $|\tan \alpha (\tan \alpha + \tan \beta)|$ is equal to
25. The midpoint of the chord $x + y = 2$ of parabola $y^2 = 4x$ is (p, q), then $p + q$ is equal to:

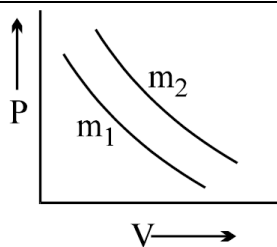
PART-B: PHYSICS

SECTION-I

26. PV versus T graph of equal masses of H_2 , He and CO_2 is shown in figure. Choose the correct alternative.

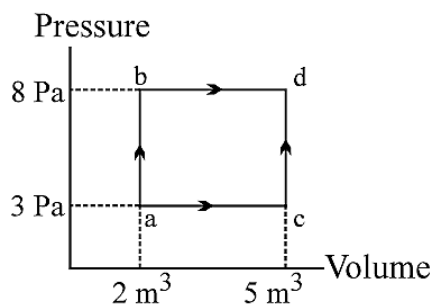


- (A) 3 correspond to H_2 , 2 to He and 1 to CO_2 .
 (B) 1 corresponds to He, 2 to H_2 and 3 to CO_2 .
 (C) 1 corresponds to He, 3 to H_2 and 2 to CO_2 .
 (D) 1 corresponds to CO_2 , 2 to H_2 and 3 to He
27. Two different isotherms representing the relationship between pressure P and volume V at a same temperature of the same ideal gas are shown for masses m_1 and m_2 of the gas respectively in the figure given, then:



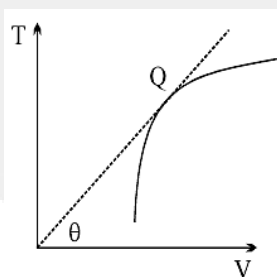
- (A) $m_1 > m_2$ (B) $m_1 = m_2$
 (C) $m_1 < m_2$ (D) All of the above are possible

28. Let v denote the root mean square speed of the molecules in an ideal diatomic gas at absolute temperature T . the mass of a molecule is m . Neglecting vibration energy terms, which is false?
 (A) a molecule can have a speed greater than $\sqrt{2} v$
 (B) v is proportional to \sqrt{T}
 (C) the average rotational kinetic energy of a molecule is $\frac{mv^2}{4}$
 (D) the average kinetic energy of a molecule is $\frac{5mv^2}{6}$
29. An isolated container holds 4 moles of hydrogen and 2 moles of helium at 400 K. The ratio of the total kinetic energy of the hydrogen molecules to the total kinetic energy of the helium molecules is:
 (A) 4:1 (B) 2:1 (C) 1:2 (D) 10:3
30. Which of the following sample of gases has the same internal energy as the energy of one mole of hydrogen gas at 27°C .
 (A) 1 mole of Helium gas at 327°C
 (B) 3 mole of Helium gas at 27°C
 (C) $\frac{1}{2}$ mole of O_2 gas at 327°C
 (D) 2 mole of O_2 gas at 27°C
31. In the pressure versus Volume graph shown, in the process of going from a to b, 60 J of heat is added, and in the process of going from b to d, 20 J of heat is added. In the process of going from a to c to d, what is the total heat (in Joule) added?

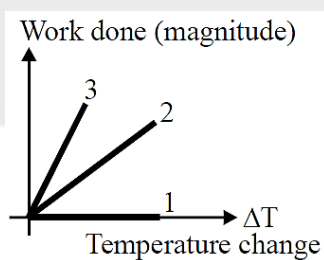


- (A) 80 (B) 60 (C) 65 (D) 56

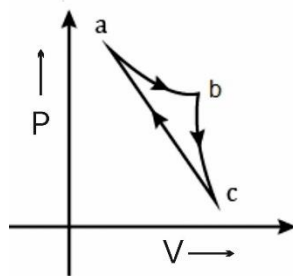
- 32.** The efficiency of a Carnot engine is 0.6. It rejects total 20 J of heat. Find work done (in joule) by the engine.
 (A) 30 (B) 40 (C) 50 (D) 20
- 33.** The heat capacity at constant volume of a sample of an ideal monoatomic gas is 35 J/K. Following are given three statements. State in order from (i) to (iii) whether they are true (T) or False (F). Taking $R = \frac{25}{3} \text{ J/mole K}$.
 (i) Number of moles of the gas are 1.5
 (ii) Internal energy of the gas at 0°C is approx $35 \times 273 \text{ J}$
 (iii) Molar heat capacity at constant pressure is approx $125/6 \text{ J/mol-K}$
 (A) TTT (B) TFT (C) FTT (D) TFF
- 34.** If one mole of an ideal monoatomic gas ($\gamma = 5/3$) is mixed with one mole of ideal diatomic gas ($\gamma = 7/5$), find the value of γ for the mixture.
 (A) 1.5 (B) 1.4 (C) 1.53 (D) 3.07
- 35.** Consider the TV diagram of a thermodynamic process. Using the details shown in the figure, find out the molar heat capacity of the gas at the point Q. Consider the gas to be ideal and monoatomic.



- (A) $2.5R$ (B) $3R$ (C) $4R$ (D) $5.2R$
- 36.** For an ideal gas graph is shown for three processes. Processes 1, 2 and 3 respectively are.

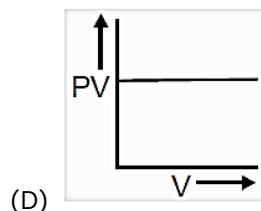
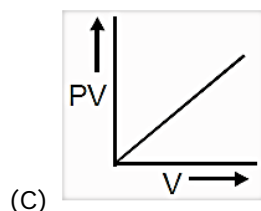
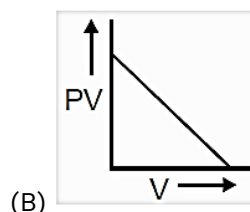
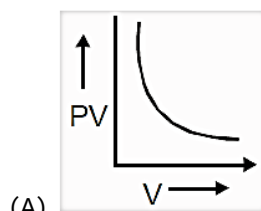


- (A) Isobaric, adiabatic, isochoric (B) Adiabatic, isobaric, isochoric
 (C) Isochoric, adiabatic, isobaric (D) Isochoric, isobaric, adiabatic
- 37.** In the P-V diagram shown, the gas does 5 J of work in isothermal process ab and 4 J in adiabatic process bc. What will be the magnitude of change in internal energy (in Joule) of the gas in straight path c to a?



- (A) 9 (B) 1 (C) 5 (D) 4
38. The temperature of an ideal gas is increased from 27°C to 927°C . Then how many times rms speed will increase?
 (A) twice (B) half (C) four times (D) one fourth
39. Under constant temperature, graph between P and $\frac{1}{V}$ is a-
 (A) Parabola (B) Hyperbola (C) Straight Line (D) Circle
40. At constant temperature on increasing the pressure of a gas by 5%. Then find percentage decreases in its volume.
 (A) 5.26% (B) 4.26% (C) 4.76% (D) 5
41. If the molecular weight of two gases are M_1 and M_2 , then at a temperature the ratio of root mean square velocity (v_1) and (v_2) will be-
 (A) $\sqrt{\frac{M_1}{M_2}}$ (B) $\sqrt{\frac{M_2}{M_1}}$ (C) $\sqrt{\frac{M_1 + M_2}{M_1 - M_2}}$ (D) $\sqrt{\frac{M_1 - M_2}{M_1 + M_2}}$
42. A perfect gas is compressed adiabatically. In that state the value of $\frac{\Delta P}{P}$ will be-
 (A) $\frac{1}{\gamma} \frac{\Delta V}{V}$ (B) $-\frac{\Delta V}{V}$ (C) $-\gamma \frac{\Delta V}{V}$ (D) $\gamma \frac{\Delta V}{V}$
43. The ratio of the slope of adiabatic and isothermal (P, V) curves will be-
 (A) γ (B) $\frac{1}{\gamma}$ (C) $\gamma + 1$ (D) $\gamma - 1$
44. On mixing 1 gm mole of a monoatomic with 1 gm mole of a diatomic gas the specific heat of mixture at constant volume will be-
 (A) R (B) $\frac{3}{2} R$
 (C) $2R$ (D) $\frac{5}{2} R$

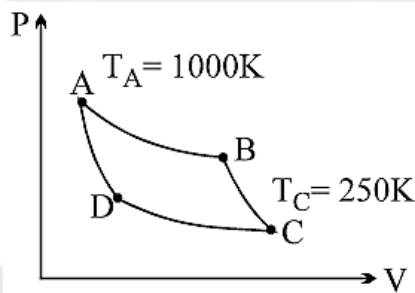
45. Which of the following curves is isothermal-



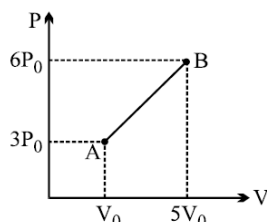
SECTION-II

46. A monoatomic ideal gas expands at constant pressure, with heat Q supplied. If X is the percentage of heat supplied which goes as work done by the gas then find X .

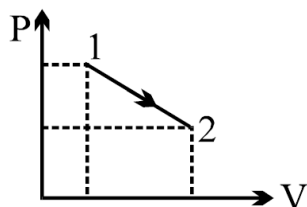
47. A monatomic ideal gas is used as the working substance for the Carnot cycle shown in the figure. Processes AB and CD are isothermal, while processes BC and DA are adiabatic. During process AB, 400 J of work is done by the gas on the surroundings. If heat is expelled by the gas during process CD is Q (in joule) then find $\frac{Q}{10}$.



48. One mole of a monoatomic ideal gas undergoes the process $A \rightarrow B$ in the given P-V diagram. If the specific heat for this process is mR/n then find $m + n$.



49. A process $1 \rightarrow 2$ using monoatomic gas is shown on the P-V diagram on the right. $P_1 = 2P_2 = 10^6 \text{ N/m}^2$, $V_2 = 4V_1 = 0.4 \text{ m}^3$. If the heat absorbed (in kJ) by the gas in this process is Q then find the value of $Q/10$:

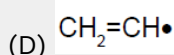
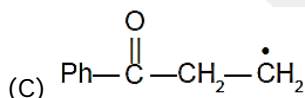
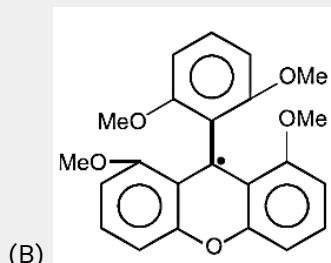
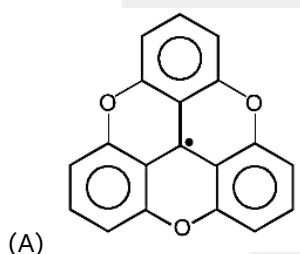


50. If velocities of 5 molecules of certain gas are $-7, 5, 4, -3$ and 1 m/sec respectively then find mean speed of molecules is (m/sec)-

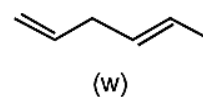
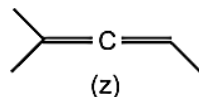
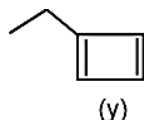
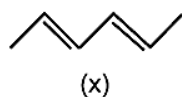
PART-C: CHEMISTRY

SECTION-I

51. Which is most stable?

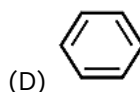
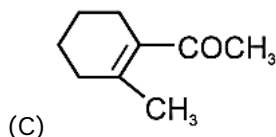
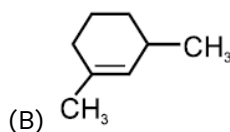
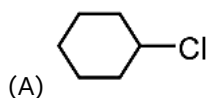


52. The correct stability order of following species is

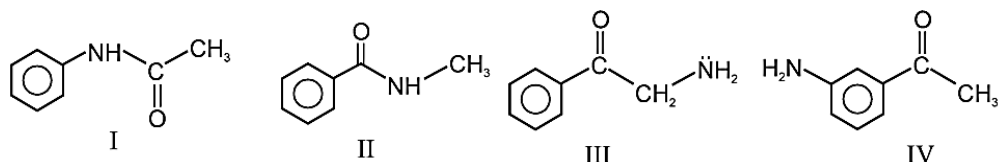


- (A) $x > y > w > z$
 (B) $y > x > w > z$
 (C) $x > w > z > y$
 (D) $z > x > y > w$

53. In which of the following molecules all the effects namely inductive, mesomeric and hyperconjugation operate?

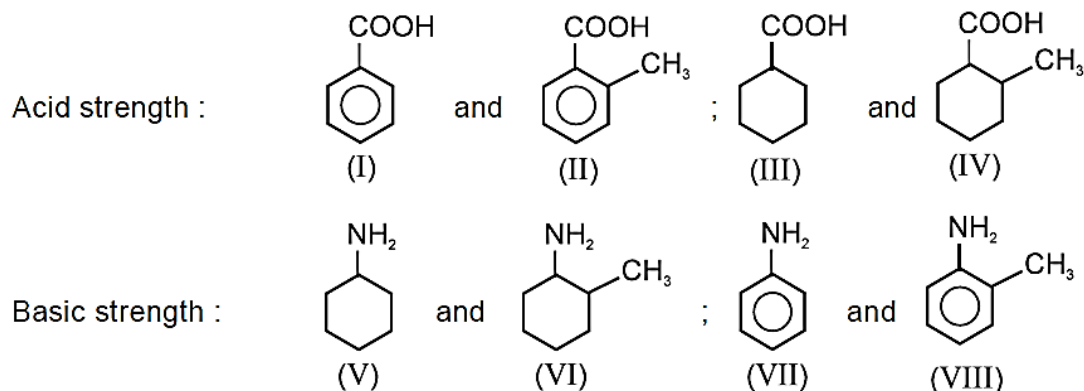


54. The correct basic strength order is



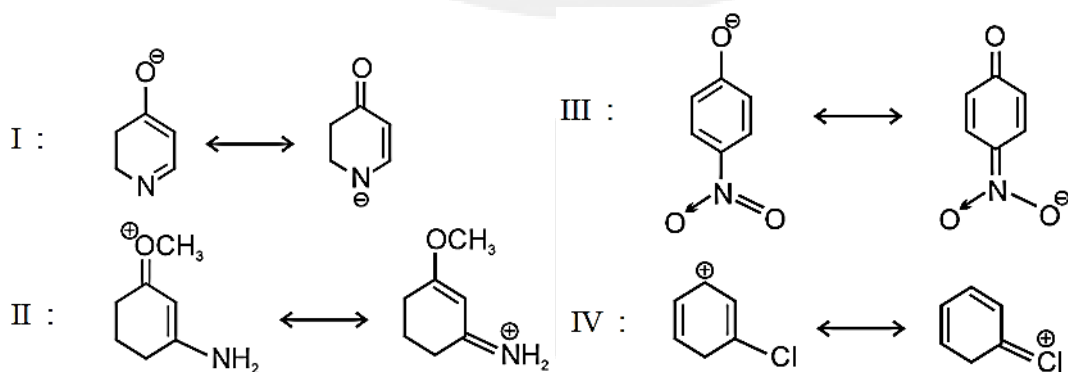
- (A) I > II > IV > III (B) IV > III > II > I
(C) III > II > IV > I (D) III > IV > II > I

55. The correct order of acid and basic strength for the following pair of compounds should be?



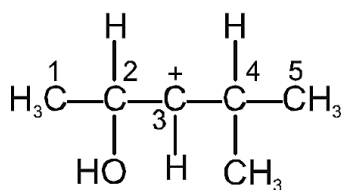
- (A) I > II ; III > IV ; V < VI ; VII < VIII (B) I < II ; III > IV ; V < VI ; VII > VIII
(C) I > II ; III > IV ; V > VI ; VII > VIII (D) I < II ; III > IV ; V < VI ; VII < VIII

56. In the following set of resonating structures which sets have the second resonating structure more contributing first:



- (A) I and III (B) II and IV
(C) I, II and IV (D) II, III and IV

57. In the following carbocation; H/CH₃ that is most likely to migrate to the positively charged carbon is

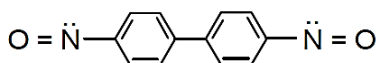


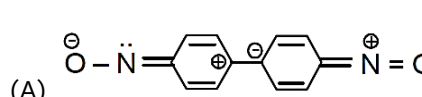
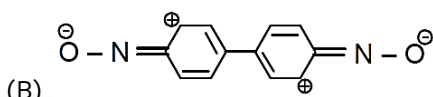
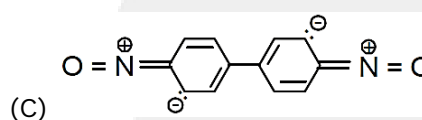
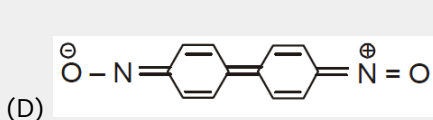
- (A) CH₃ at C-4 (B) H at C-4
(C) CH₃ at C-2 (D) H at C-2

58. The correct heat of hydrogenation order is

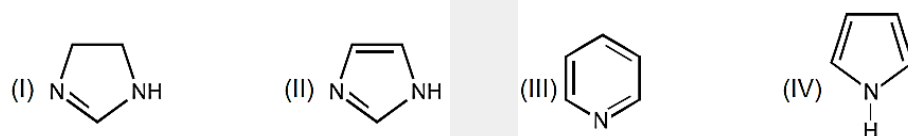
- (p) 1, 3-Pentadiene (q) 1, 3-butadiene
 (r) 2, 3-Dimethyl-1, 3-butadiene (s) Propadiene
 (A) $p > q > r > s$
 (B) $s > q > p > r$
 (C) $q > s > p > r$
 (D) $s > p > q > r$

59. The most stable resonating structure of following compound is



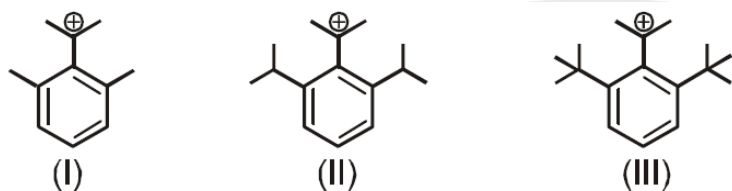
- (A)  (B) 
 (C)  (D) 

60. Acid strength of the conjugate acids of the following are-



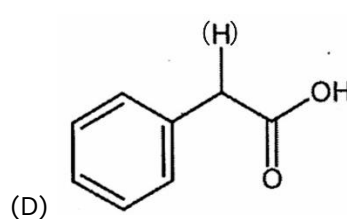
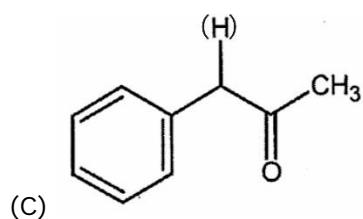
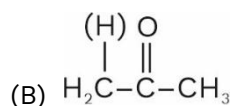
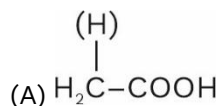
- (A) $I > II > III > IV$ (B) $III > II > I > IV$
 (C) $IV > III > II > I$ (D) None of these

61. The stability order of following carbocation is



- (A) $I > II > III$ (B) $II > I > III$
 (C) $III > I > II$ (D) $II > III > I$

62. Among the following, marked proton of which compound shows lowest pK_a value?

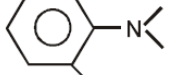
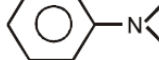


63. The increasing order of stability of the following free radicals is:

- (A) $(\text{C}_6\text{H}_5)_3\dot{\text{C}} < (\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{H} < (\text{CH}_3)_3\dot{\text{C}} < (\text{CH}_3)_2\dot{\text{C}}\text{H}$
 (B) $(\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{H} < (\text{C}_6\text{H}_5)_3\dot{\text{C}} < (\text{CH}_3)_3\dot{\text{C}} < (\text{CH}_3)_2\dot{\text{C}}\text{H}$
 (C) $(\text{CH}_3)_2\dot{\text{C}}\text{H} < (\text{CH}_3)_3\dot{\text{C}} < (\text{C}_6\text{H}_5)_3\dot{\text{C}} < (\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{H}$
 (D) $(\text{CH}_3)_2\dot{\text{C}}\text{H} < (\text{CH}_3)_3\dot{\text{C}} < (\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{H} < (\text{C}_6\text{H}_5)_3\dot{\text{C}}$

64. Arrange the carbanions, $(\text{CH}_3)_3\bar{\text{C}}$, $\bar{\text{C}}\text{Cl}_3$, $(\text{CH}_3)_2\bar{\text{C}}\text{H}$, $\text{C}_6\text{H}_5\bar{\text{C}}\text{H}_2$ in order of their decreasing stability

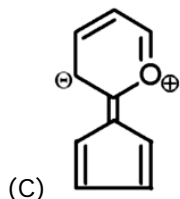
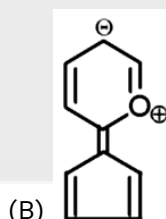
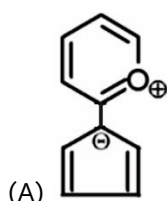
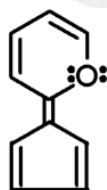
- (A) $(\text{CH}_3)_2\bar{\text{C}}\text{H} > \bar{\text{C}}\text{Cl}_3 > \text{C}_6\text{H}_5\bar{\text{C}}\text{H}_2 > (\text{CH}_3)_3\bar{\text{C}}$ (B) $\bar{\text{C}}\text{Cl}_3 > \text{C}_6\text{H}_5\bar{\text{C}}\text{H}_2 > (\text{CH}_3)_2\bar{\text{C}}\text{H} > (\text{CH}_3)_3\bar{\text{C}}$
 (C) $(\text{CH}_3)_3\bar{\text{C}} > (\text{CH}_3)_2\bar{\text{C}}\text{H} > \text{C}_6\text{H}_5\bar{\text{C}}\text{H}_2 > \bar{\text{C}}\text{Cl}_3$ (D) $\text{C}_6\text{H}_5\bar{\text{C}}\text{H}_2 > \bar{\text{C}}\text{Cl}_3 > (\text{CH}_3)_3\bar{\text{C}} > (\text{CH}_3)_2\bar{\text{C}}\text{H}$

65. **Assertion:** C – N bond length in  is more than C – N bond length in 

Reason: This is due to steric inhibition of resonance in former which does not appear in the later.

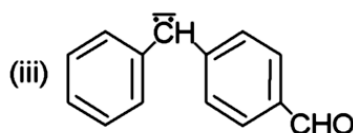
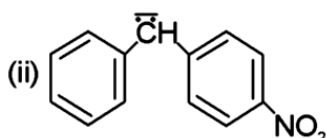
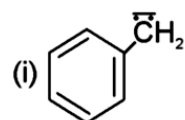
- (A) If both Assertion and Reason are true and the Reason is correct explanation of the Assertion.
 (B) If both Assertion and Reason are true, but Reason is not correct explanation of the Assertion.
 (C) If Assertion is true, but Reason is false.
 (D) If Assertion is false, but the Reason is true.

66. The most stable canonical structure of this molecule is:



(D) All structures are equal contribution

67. Select the correct stability order of the following carbanions.



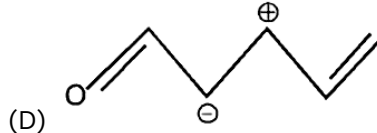
(A) (i) > (ii) > (iii)

(B) (ii) > (iii) > (i)

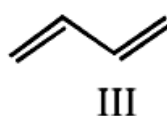
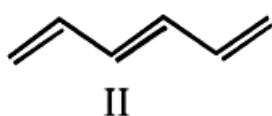
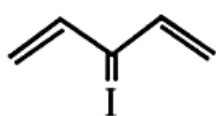
(C) (iii) > (ii) > (i)

(D) (ii) > (i) > (iii)

68. The least stable resonating structure is



69.



Among these compounds, the correct order of resonance energy is:

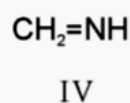
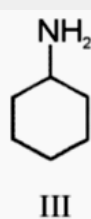
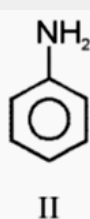
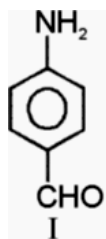
(A) I > II > III

(B) II > I > III

(C) III > I > II

(D) I > III > II

70.



Among these compounds the correct order of C-N bond length is

(A) IV > I > II > III

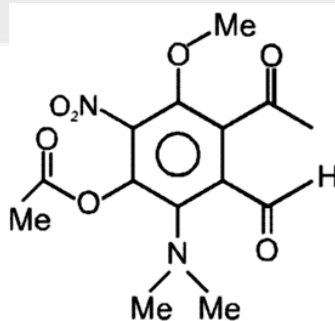
(B) III > I > II > IV

(C) III > II > I > IV

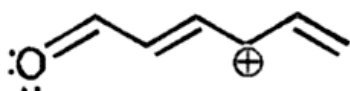
(D) III > I > IV > II

SECTION-II

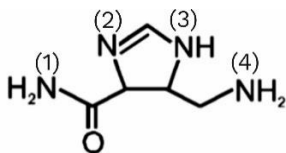
71. Find the total + m groups attached to the benzene ring in the given compound?



72. Number of p electrons in resonance in the following structure is

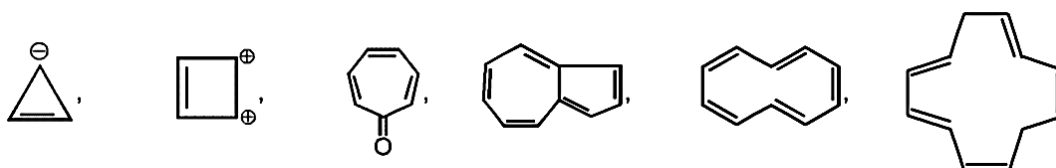


73. In the given compound which is the most basic N-atom.



74. How many carbocations given below are more stable than sec. butyl carbocation
t-butyl carbocation Benzyl carbocation Allyl carbocation Cyclopropenyl cation
Tropylium cation n-butyl carbocation cyclopropylmethyl carbocation

75. How many species out of the following are aromatic?



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