JEE MOCK TEST : 1

General Instructions
1. The test is of **3 hours** duration and the maximum marks is **300.**
2. The question paper consists of **3 Parts** (Part I: **Physics**, Part II: **Chemistry**, Part III: **Mathematics**). Each Part has **two** sections (Section 1 & Section 2).
3. Section 1 contains **20 Multiple Choice Questions**. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE CHOICE** is correct.
4. Section 2 contains **10 Numerical Value Type Questions**. candidates need to attempt **any 5 questions out of 10**. The answer to each question is a NUMERICAL VALUE . For each question, enter the correct numerical value of the answer. If the answer is a decimal numerical value, then round-off the value to TWO decimal places.

Marking Scheme
1. Section – 1: +4 for correct answer, –1 (negative marking) for incorrect answer, 0 for all other cases.
2. Section – 2: +4 for correct answer, 0 for all other cases. There is no negative marking.

PHYSICS
SECTION 1

This section contains 20 Multiple Choice Questions. Each question has 4 choices (1), (2), (3) and (4), out of which ONLY ONE CHOICE is correct.

1. If speed V, area A and force F are chosen as fundamental units, then the dimension of Young's modulus will be:
(1) FA^2V^{-1}
(2) $FA^{-1}V^0$
(3) FA^2V^{-2}
(4) $FA^2 V^{-3}$

2. Interference fringes are observed on a screen by illuminating two thin slits 1 mm apart with a light source (λ = 632.8 nm). The distance between the screen and the slits is 100 cm. If a bright fringe is observed on a screen at a distance of 1.27 mm from the central bright fringe, then the path difference between the waves, which are reaching this point from the slits is close is
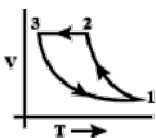(1) 1.27 μm
(2) 2.05 μm
(3) 2.87 nm
(4) 2 nm

3. An electric dipole of moment vector $\vec{p}$ = (- $\hat{\imath}$ - $3\hat{\jmath}$ + $2\hat{k}$) x 10^{-29} C. m is at the origin (0, 0, 0). The electric field due to this dipole at vector r = $\hat{\imath}$+ $3\hat{\jmath}$ + $5\hat{k}$ (note that vector($\vec{r}. \vec{p}$) = 0) is parallel to:
(1) $\hat{\imath}$ + $3\hat{\jmath}$ - $2\hat{k}$
(2) - $\hat{\imath}$ - $3\hat{\jmath}$ + $2\hat{k}$
(3) - $\hat{\imath}$ + $3\hat{\jmath}$ - $2\hat{k}$
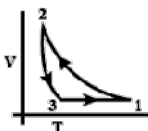(4) ($\hat{\imath}$ - $3\hat{\jmath}$ - $2\hat{k}$)

4. Which of the following is an equivalent cyclic process corresponding to the thermodynamic cyclic given in the figure? Where, $1\rightarrow 2$ is adiabatic.
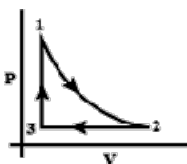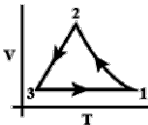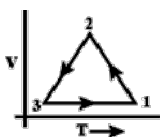

(1)

(2)

(3)

(4)

5. Concentric metallic hollow spheres of radii R and 4R hold charges Q_1 and Q_2 respectively. Given that surface charge densities of the concentric spheres are equal, the potential difference $V(R) - V(4R)$ is

(1) $\dfrac{3Q_2}{4\pi\varepsilon_0 R}$

(2) $\dfrac{3Q_1}{16\pi\varepsilon_0 R}$

(3) $\dfrac{Q_2}{4\pi\varepsilon_0 R}$

(4) $\dfrac{3Q_1}{4\pi\varepsilon_0 R}$

6. A metallic sphere cools from 50°C to 40°C in 300 s. If atmospheric temperature around is 20°C, then the sphere's temperature after the next 5 minutes will be close to:

(1) 33°C

(2) 31°C

(3) 35°C

(4) 28°C

7. Light travels in two media M_1 and M_2 with speeds 1.5×10^8 ms^{-1} and 2.0×10^8 ms^{-1} respectively. The critical angle between them is:

(1) $\tan^{-1}\left(\dfrac{3}{\sqrt{7}}\right)$

(2) $\tan^{-1}\left(\dfrac{2}{3}\right)$

(3) $\cos^{-1}\left(\dfrac{3}{4}\right)$

(4) $\sin^{-1}\left(\dfrac{2}{3}\right)$

8. A velocity selector consists of electric field $\vec{E} = E\hat{k}$ and magnetic field $\vec{B} = B\hat{j}$ with B = 12 mT. The value E required for an electron of energy 728 eV moving along the positive x-axis to pass undeflected is : (Given, mass of electron = 9.1×10^{-31}kg)

(1) 192 kVm^{-1}

(2) 192 m Vm^{-1}

(3) 9600 kVm^{-1}
(4) 16 kVm^{-1}

9. Consider a uniform rod of mass M = 4m and length l pivoted about its centre. A mass m moving with velocity v making angle $\theta = \frac{\pi}{4}$ to the rod's long axis collides with one end of the rod and sticks to it. The angular speed of the rod-mass system just after the collision is :

(1) $\frac{3}{7\sqrt{2}}\frac{v}{l}$

(2) $\frac{3}{7}\frac{v}{l}$

(3) $\frac{3\sqrt{2}}{7}\frac{v}{l}$

(4) $\frac{4}{7}\frac{v}{l}$

10. At time t = 0 magnetic field of 1000 Gauss is passing perpendicularly through the area defined by the closed loop shown in the figure. If the magnetic field reduces linearly to 500 Gauss, in the next 5s, then induced EMF in the loop is :
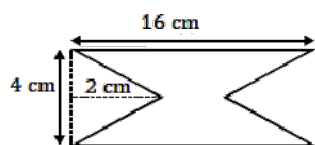

(1) 36 μV
(2) 48 μV
(3) 56 μV
(4) 28 μV

11. A satellite of mass m is launched vertically upwards with an initial speed u from the surface of the earth. After it reaches height R (R = radius of the earth), it ejects a rocket of mass m/10 so that subsequently the satellite moves in a circular orbit. The kinetic energy of the rocket is (G is the gravitational constant; M is the mass of the earth):

(1) $\frac{m}{20}\left(u - \sqrt{\frac{2GM}{3R}}\right)^2$

(2) $5m\left(u^2 - \frac{119}{200}\frac{GM}{R}\right)$

(3) $\frac{3m}{8}\left(u - \sqrt{\frac{5G}{6R}}\right)^2$

(4) $\frac{m}{20}\left(u^2 + \frac{113}{200}\frac{GM}{R}\right)$

12. Three point particles of masses 1.0kg, 1.5kg and 2.5kg are placed at three corners of a right angle triangle of sides 4.0cm,3.0cm and 5.0cm as shown in the figure. The centre of mass of the system is at a point :
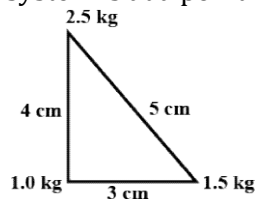
(1) 1.5 cm right and 1.2 cm above 1 kg mass

JEE NEET CBSE AVAILABLE PDF SALES MATERIALS

1.	1. JEE MAIN 2013 TO 2025	RS.200
2.	2. JEE ADV 2013 TO 2025	RS.200
3.	3. JEE JAN 2025 ALL SHIFTS QUS ANS	RS.200
4.	4. JEE 40 DAYS PCM 120 CHAPTER WISE TESTS	RS.500
5.	5. JEE PYQ PCM CHAPTERWISE	RS.500
6.	6. JEE CHAPTER WISE 10 DPPS PCM CLASS 11 & 12	RS.350
7.	7. JEE 25 FULL MOCK TESTS WITH SOLUTIONS	RS.500
8.	8. MATHS 11 12 MCQS WORD FORMAT	RS.250
9.	9. CHEMISTRY 11 12 MCQS WORD FORMAT	RS.250
10.	10. PHYSICS 11 12 MCQS WORD FORMAT	RS.250
11.	11. CHEMISTRY FOUNDATION 11TH WORD PDF	RS.200
12.	12. CHEMISTRY FOUNDATION 12TH WORD PDF	RS.200
13.	13. MATHS FOUNDATION 11TH WORD PDF	RS.200
14.	14. MATHS FOUNDATION 12TH WORD PDF	RS.200
15.	15. PHYSICS FOUNDATION 11TH WORD PDF	RS.200
16.	16. PHYSICS FOUNDATION 12TH WORD PDF	RS.200
17.	17. 80 NEET FULL MOCK TEST PAPERS	RS.2000
18.	18. 80 நீட் தமிழ் மீடியம் FULL MOCK TEST PAPERS	RS.1500
19.	19. NEET 45 PCB EM SUBJECT 200 MARKS TESTS	RS.1000
20.	20. NEET 45 PCB தமிழ் மீடியம் SUBJECT 200 MARKS TESTS	RS.1000
21.	21. NEET BIOLOGY CHAPTER QUS BANK	RS.500
22.	22. NEET CHEMISTRYY CHAPTER QUS BANK	RS.500

23.	23. NEET PHYSICS CHAPTER QUS BANK	**RS.500**
24.	24. NEET இயற்பியல் CHAPTERS QUS BANK	**RS.500**
25.	25. NEET உயிரியல் CHAPTERS QUS BANK	**RS.500**
26.	26. NEET வேதியல் CHAPTERS QUS BANK	**RS.500**
27.	27. NEET 60 MARKS EM PCB SLIP 99 TESTS	**RS.500**
28.	28. NEET நீட் PCB 100 MARKS 86 CHAPTERS SLIP TESTS	**RS.500**
29.	29. NEET 9528 MCQS ANS TN உயிரியல் வேதியல் இயற்பியல் *NOT SOLVED ONLY ANSWERS*	**RS.500**
30.	30. NEET 16000 MCQS ANS TN STATE BIOLOGY CHEMISTRY PHYSICS *NOT SOLVED ONLY ANSWERS*	**RS.750**
31.	31. BIOLOGY FOUNDATION 11TH WORD PDF	**RS.200**
32.	32. BIOLOGY FOUNDATION 12TH WORD PDF	**RS.200**
33.	33. NEET 54 PCB FULL TESTS	**RS.500**
34.	34. PYQS SINGLE BIOLOGY NEET	**RS.250**
35.	35. PYQS SINGLE CHEMISTRY NEET	**RS.250**
36.	36. PYQS SINGLE PHYSICS NEET	**RS.250**
37.	37. NEET BIOLOGY CHAP PRE QUESTION WITH SOLUTION WORD PDF	**RS.200**
38.	38. NEET CHEMISTRY CHAP PRE QUS WITH SOLUTION WORD PDF	**RS.200**
39.	39. NEET PHYSICS CHAP PRE QUESTION WITH SOLUTION WORD PDF	**RS.200**
40.	40. NEET JUNE TO MARCH 47 PCB COMBINED 300+ QUS TESTS	**RS.1000**
41.	1. 12TH CBSE MATHS CHAPTER STUDY MATERIAL	**RS.250**
42.	2. 12TH CBSE PHYSICS CHAPTER STUDY MATERIAL	**RS.250**
43.	3. 12TH CBSE CHEMISTRY CHAPTER STUDY MATERIAL	**RS.250**
44.	4. 12TH CBSE BIOLOGY CHAPTER STUDY MATERIAL	**RS.250**
45.	5. 12TH CBSE COMPUTER CHAPTER STUDY MATERIAL	**RS.250**

46.	6. 12TH CBSE MATHS SLIP CHAPTER TESTS	RS.200
47.	7. 12TH CBSE PHYSICS CHAPTERS TESTS	RS.200
48.	8. 12TH CBSE CHEMISTRY SLIP CHAPTER TESTS	RS.200
49.	9. 12TH CBSE PCMB CSC MCQS ONLY (PER SUBJECT)	RS.100
50.	10. 12TH CBSE PCMB PREVIOUSLY ASKED QB (PER SUBJECT)	RS.150
51.	11. 12TH NOTES AND SAMPLE PAPER PCMB	RS.400
52.	12. 12TH CBSE ACCOUNTS STUDY MATERIALS	RS.250
53.	13. 12TH ECONOMICS STUDY MATERIALS	RS.250
54.	14. 12TH CBSE BUS STUDIES CHAPTER STUDY MATERIAL	RS.250
55.	15. 12TH CBSE AC BST ECO PRE YEAR PAPERS (PER SUBJECT)	RS.150
56.	16. 12TH NOTES AND SAMPLE PAPER AC BST ECO	RS.300
57.	17. 11TH CBSE MATHS CHAPTER STUDY MATERIAL	RS.250
58.	18. 11TH CBSE PHYSICS CHAPTER STUDY MATERIAL	RS.250
59.	19. 11TH CBSE CHEMISTRY CHAPTER STUDY MATERIAL	RS.250
60.	20. 11TH CBSE BIOLOGY CHAPTER STUDY MATERIAL	RS.250
61.	21. 11TH NOTES AND SAMPLE PAPER AC BST ECO	RS.300
62.	22. 11TH NOTES AND SAMPLE PAPER PCMB	RS.400
63.	23. 10TH CBSE MATHS CHAPTER STUDY MATERIAL	RS.250
64.	24. 10TH CBSE SCIENCE CHAPTER STUDY MATERIAL	RS.250
65.	25. 10TH CBSE SOCIAL SCIENCE CHAPTER STUDY MATERIAL	RS.250
66.	26. 10TH CBSE ENGLISH CHAPTER STUDY MATERIAL	RS.150
67.	27. 10TH CBSE HINDI CHAPTER STUDY MATERIAL	RS.150
68.	28. 10TH CBSE MATHS SLIP TESTS	RS.200
69.	29. 10TH CBSE SCIENCE SLIP TESTS	RS.200

70.	30. 10TH CBSE SST SLIP TESTS	RS.200
71.	31. 10TH CBSE MATHS FOUNDATION	RS.150
72.	32. 10TH CBSE SCIENCE FOUNDATION	RS.150
73.	33. 10TH CBSE SST FOUNDATION	RS.150
74.	34. 10TH NOTES AND SAMPLE PAPER MAT SCI SST	RS.300
75.	35. 9TH CBSE MATHS CHAPTER STUDY MATERIAL	RS.250
76.	36. 9TH CBSE SCIENCE CHAPTER STUDY MATERIAL	RS.250
77.	37. 9TH CBSE SST CHAPTER STUDY MATERIAL	RS.250
78.	38. 9TH NOTES AND SAMPLE PAPER MAT SCI SST	RS.300
79.	39. 9TH CBSE MATHS FOUNDATION	RS.150
80.	40. 8TH NOTES AND SAMPLE PAPER MAT SCI SST	RS.300
81.	41. 8TH CBSE MATHS FOUNDATION	RS.150
82.	42. 7TH NOTES AND SAMPLE PAPER MAT SCI SST	RS.300
83.	43. 7TH CBSE MATHS FOUNDATION	RS.150
84.	44. 6TH NOTES AND SAMPLE PAPER MAT SCI SST	RS.300
85.	45. 6TH CBSE MATHS FOUNDATION	RS.150
86.	46. 10TH MATHS FULL PAPERS COLLECTIONS	RS.250
87.	47. 10TH SCIENCE FULL PAPERS COLLECTIONS	RS.250
88.	48. 10TH SST FULL PAPERS COLLECTIONS	RS.250
89.	49. 12TH MATHS FULL PAPERS COLLECTIONS	RS.250
90.	50. 12TH PHYSICS FULL PAPERS COLLECTIONS	RS.250
91.	51. 12TH CHEMISTRY FULL PAPERS COLLECTIONS	RS.250
92.	52. 12TH BIOLOGY FULL PAPERS COLLECTIONS	RS.250

JOIN 2026 – 27 WHATSAPP JEE NEET TEST GROUP 1 YEAR FEES RS.4000

(2) 2.0 cm right and 0.9 cm above 1 kg mass
(3) 0.6 cm right and 2.0 cm above 1 kg mass
(4) 0.9 cm right and 2.0 cm above 1 kg mass

13. In young's double slit experiment, the fringe width is 12mm. If the entire arrangement is placed in water of refractive index $\frac{4}{3}$, then the fringe width becomes (in mm)
(1) 16
(2) 9
(3) 48
(4) 12

14. A water drop of radius 1 cm is broken into 729 equal droplets. If surface tension of water is 75 dyne/cm, then the gain in surface energy upto first decimal place will be:
(Given $\pi = 3.14$)
(1) 8.5×10^{-4} J
(2) 8.2×10^{-4} J
(3) 7.5×10^{-4} J
(4) 5.3×10^{-4} J

15. Two gases-argon (atomic radius 0.07nm, atomic weigh 40) and xenon (atomic radius 0.1nm, atomic weight 140) have the same number density and are at the same temperature. The ratio of their respective mean free times is closest to :
(1) 2.04
(2) 4.67
(3) 1.83
(4) 3.67

16. An electron of mass m and magnitude of charge |e| initially at rest gets accelerated by a constant electric field E. The rate of change of de-Broglie wavelength of this electron at time t ignoring relativistic effects is :
(1) $\frac{-h}{|e|Et^2}$

(2) $\frac{|e|Et}{h}$

(3) $-\frac{h}{|e|E\sqrt{t}}$

(4) $-\frac{h}{|e|Et}$

17. A galvanometer having a coil resistance 100 Ω gives a full scale deflection when a current of 1mA is passed through it. What is the value of the resistance which can convert this galvanometer into a voltmeter giving full scale deflection for a potential difference of 10 V?
(1) 9.9kΩ
(2) 10 kΩ
(3) 8.9 kΩ
(4) 7.9 kΩ

18. A plane electromagnetic wave of frequency 25 GHz is propagating in vacuum along the z-direction. At a particular point in space and time, the magnetic field is given by vector $\vec{B} = 5 \times 10^{-8}$ $\hat{j}$T. The corresponding electric field vector $\vec{E}$ is (speed of light c = 3 × 10^8 ms^{-1})

(1) 1.66×10^{-16} iV/m

(2) 15 iV/m

(3) -1.66 x 10^{-16} iV/m

(4) -15 iV/m

19. A stationary observer receives sound from two identical tuning forks, one of which approaches and the other one recedes with the same speed (much less than the speed of sound). The observer hears 2 beats/sec. The oscillation frequency of each tuning fork is v_0 = 1400 Hz and the velocity of sound in air is 350 m/s. The speed of each tuning fork is close to:

(1) 1 m/s

(2) $\frac{1}{2}$ m/s

(3) $\frac{1}{4}$ m/s

(4) $\frac{1}{8}$ m/s

20. The electric field of a plane electromagnetic wave is given by

$\vec{E} = E_0 \frac{\hat{i}+\hat{j}}{\sqrt{2}} \cos(kz+\omega t)$

At a positively charged particle is at the point (x,y,z) = $\left(0,0,\frac{\pi}{k}\right)$ If its instantaneous velocity at is the force acting on it due to the wave is:

(1) zero

(2) antiparallel to $\frac{\hat{i}+\hat{j}}{\sqrt{2}}$

(3) parallel to $\hat{k}$

(4) parallel to $\frac{\hat{i}+\hat{j}}{\sqrt{2}}$
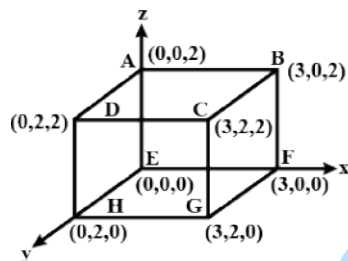
SECTION : 2

Section 2 contains 10 Numerical Value Type Questions Out of which ONLY 5 (any) questions have to be attempted. The answer to each question should be rounded off to the nearest integer.

21. An ideal cell of emf 10 V is connected in circuit shown in figure. Each resistance is 2 Ω. The potential difference (in V) across the capacitor when it is fully charged is .....
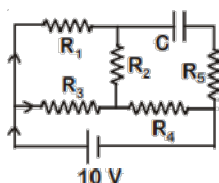
22. A 60pF capacitor is fully charged by a 20 V supply. It is then disconnected from the supply and is connected to another uncharged 60 pF capacitor in parallel. The electrostatic energy that is lost in this process by the time the charge is redistributed between them is (in nJ) _____ .

23. An electric field $\vec{E}$ = $4x\hat{\imath} - (y^2+1)\hat{\jmath}$ N/C passes through the box shown in figure. The flux of the electric field through surfaces ABCD and BCGF are marked as ϕ_I and ϕ_{II} respectively. The difference between $(\phi_I - \phi_{II})$ is (in Nm^2/C)

24. A body of mass m = 10 kg is attached to one end of a wire of length 0.3 m. The maximum angular speed (in rads^{-1}) with which it can be rotated about its other end in space station is (Breaking stress of wire = 4.8×10^7 Nm^{-2} and area of cross section of the wire =10^{-2} cm^2) is:

25. A square shaped hole of side l = $\frac{a}{2}$ carved out at a distance d = $\frac{a}{2}$ from the centre 'O' of a uniform circular disk of radius a. If the distance of the centre of mass of the remaining portion from O is $-\frac{a}{X}$, value of X (to the nearest integer) is ....

26. If the initial velocity in horizontal direction of a projectile is unit vector $\hat{\imath}$ and the equation of trajectory is y = 5x(1-x). The y component vector of the initial velocity is _____ $\hat{\jmath}$
(Take = g = 10 m/s^2)

27. A potentiometer wire of length 300 cm is connected in series with a resistance 780 Ω and a standard cell of emf 4V. A constant current flows through potentiometer wire. The length of the null point for cell of emf 20 mV is found to be 60 cm. The resistance of the potentiometer wire is _____ Ω .

28. Vectors $a\hat{\imath} + b\hat{\jmath}+\hat{k}$ and $2\hat{\imath} - 3\hat{\jmath}+4\hat{k}$ are perpendicular to each other when 3a + 2b = 7, the ratio of a to b is $\frac{x}{2}$. The value of x is _____.

29. A single turn current loop in the shape of a right angle triangle with sides 5 cm, 12 cm, 13 cm is carrying a current of 2A. The loop is in a uniform magnetic field of magnitude 0.75 T whose direction is parallel to the current in the 13 cm side of the loop. The magnitude of the magnetic force on the 5 cm side will be x/130 N. The value of x is _____.

30. A uniform electric field of 10 N/C is created between two parallel charged plates (as shown in figure). An electron enters the field symmetrically between the plates with a kinetic energy 0.5 eV. The length of each plate is 10 cm. The angle (θ) of deviation of the path of electron as it comes out of the field is _____ (in degree).

CHEMISTRY
SECTION : 1

This section contains 20 Multiple Choice Questions. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE CHOICE is correct.

31. Match List - I with List - II.

List-I	List-II
(A) PCl_5	(i) Square pyramidal
(B) SF_6	(ii) Trigonal planar
(C) BrF_5	(iii) Octahedral
(d) BF_3	(iv) Trigonal bipyramidal

Choose the correct answer from the options given below.
(1) (A)-(iv), (B)-(iii), (c)-(i), (d)-(ii)
(2) (A)-(ii), (B)-(iii), (c)-(iv), (d)-(i)
(3) (A)-(iii), (B)-(i), (c)-(iv), (d)-(ii)
(4) (A)-(iv), (B)-(iii), (c)-(ii), (d)-(i)

32. Which technique among the following, is most appropriate in separation of a mixture of 100 mg of *p*-nitrophenol and picric acid?
(1) Steam distillation
(2) 2-5 ft long column of silica gel
(3) Sublimation
(4) Preparative TLC (Thin Layer Chromatography)

33. In Carius method of estimation of halogen, 0.172g of an organic compound showed presence of 0.08g of bromine. Which of these is the correct structure of the compound :
(1)

(2) H_3C-CH_2-Br
(3)

(4) $H_3C -Br$
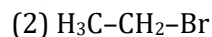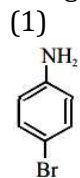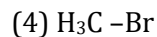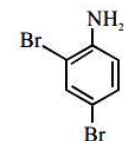
34. While titrating dilute HCl solution with aqueous NaOH, which of the following will not be required?
(1) Clamp and phenolphthalein
(2) Burette and porcelain tile

(3) Pipette and distilled water
(4) Bunsen burner and measuring cylinder

35. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R.
Assertion A : LiF is sparingly soluble in water
Reason R : The ionic radius of Li^+ ion is smallest among its group members, hence has least hydration enthalpy.
In the light of the above statements, choose the *most appropriate* answer from the options given below
(1) Both A and R are true and R is the correct explanation of A
(2) Both A and R are true but R is NOT the correct explanation of A
(3) A is true but R is false
(4) A is false but R is true

36. Animal starch is the other name of
(1) amylose
(2) maltose
(3) glycogen
(4) amylopectin

37. Which of the following reactions will not produce a racemic product ?
(1)

(2)

(3)

(4) $CH_3CH_2CH = CH_2 \xrightarrow{HBr}$
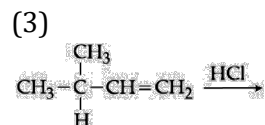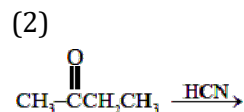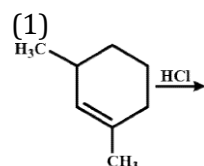
38. The IUPAC name of the coordination compound $K_3[Fe(CN)_6]$ is
(1) Tripotassium hexacyanoiron (II)
(2) Potassium hexacyanoiron (II)
(3) Potassium hexacyanoferrate (III)
(4) Potassium hexacyanoferrate (II)

39. The equation that is incorrect is:
(1) $(\Lambda_m^0)_{NaBr} - (\Lambda_m^0)_{NaCl} = (\Lambda_m^0)_{KBr} - (\Lambda_m^0)_{KCl}$
(2) $(\Lambda_m^0)_{NaBr} = (\Lambda_m^0)_{HCl} + (\Lambda_m^0)_{NaOH} - (\Lambda_m^0)_{NaCl}$
(3) $(\Lambda_m^0)_{NaBr} - (\Lambda_m^0)_{NaI} = (\Lambda_m^0)_{KBr} - (\Lambda_m^0)_{NaBr}$
(4) $(\Lambda_m^0)_{KCl} - (\Lambda_m^0)_{NaCl} = (\Lambda_m^0)_{KBr} - (\Lambda_m^0)_{NaBr}$

40. Within each pair of elements F & Cl, S & Se, and Li & Na, respectively, the elements that release more energy upon an electron gain are:
(1) F, Se and Na
(2) F, S and Li
(3) Cl, S and Li
(4) Cl, Se and Na

41. Complex A has a composition of $H_{12}O_6Cl_3Cr$. If the complex on treatment with conc. H_2SO_4 loses 13.5% of its original mass, the correct molecular formula of A is :
[Given : atomic mass of Cr = 52 amu and Cl = 35 amu]
(1) $[Cr(H_2O)5Cl]Cl_2 \cdot H_2O$
(2) $[Cr(H_2O)_3Cl_3] \cdot 3H_2O$
(3) $[Cr(H_2O)_4Cl_2]Cl \cdot 2H_2O$
(4) $[Cr(H_2O)_6]Cl_3$

42. The increasing order of the reactivity of the following compounds in nucleophilic addition reaction is :
Propanal, Benzaldehyde, Propanone, Butanone
(1) Benzaldehyde < Butanone < Propanone < Propanal
(2) Propanal < Propanone < Butanone < Benzaldehyde
(3) Benzaldehyde < Propanal < Propanone < Butanone
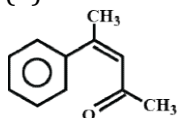(4) Butanone < Propanone < Benzaldehyde < Propanal

43. Identify (A) in the following reaction sequence :
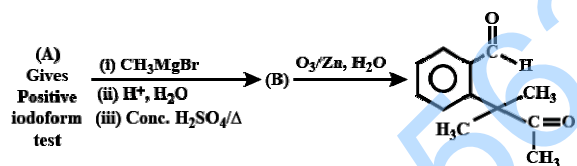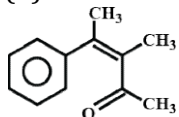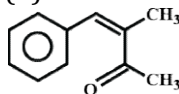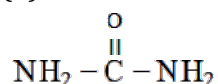

(1)
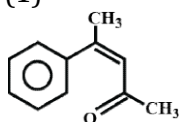
(2)

(3)

(4)

44. The correct order of the thermal stability of hydrogen halides (H – X) is
(1) HI > HCI < HF > HBr
(2) HCI< HF > HBr < HI
(3) HF > HCI < HBr > HI
(4) HI < HBr > HCI < HF

45. Kjeldahi's method cannot be used to estimate nitrogen for which of the following compounds?
(1)

$$NH_2 - \overset{\overset{\displaystyle O}{\displaystyle \|}}{C} - NH_2$$

(2) $CH_3CH_2 - C \equiv N$
(3) $C_6H_5NH_2$
(4) $C_6H_5NO_2$

46. The correct order of the calculated spin-only magnetic moments of complexes (A) to (D) is:
(A) $Ni(CO)_4$
(B) $[Ni(H_2O)_6]Cl_2$
(C) $Na_2[Ni(CN)_4]$
(D) $PdCl_2(PPh_3)_2$
(1) (C) $\approx$ (D) < (B) < (A)
(2) (A) $\approx$ (C) < (B) $\approx$ (D)
(3) (C) < (D) < (B) < (A)
(4) (A) $\approx$ (C) $\approx$ (D) < (B)

47. At the vapour pressure of CS_2 is 512mm Hg and that of acetone is 344 mm. A solution of CS_2 in acetone has a total vapour pressure of 600 mm. The false statement amongst the following is:
(1) Raoult's law is not obeyed by this system
(2) CS_2 and acetone are less attracted to each other than to themselves
(3) Heat must be absorbed in order to produce the solution at 35^0C
(4) A mixture of 100 mL CS_2 and 100mL acetone has a volume < 200mL

48. In comparison to the zeolite process for the removal of permanent hardness, the synthetic resins method is:
(1) more efficient as it can exchange only cations
(2) more efficient as it can exchange both cations as well as anions
(3) less efficient as it exchanges only anions
(4) less efficient as the resins cannot be regenerated

49. It is observed that characteristic X-ray spectra of elements show regularity. When frequency to the power 'n' i.e. vn of X-rays emitted is plotted against atomic number 'Z', following graph is obtained.
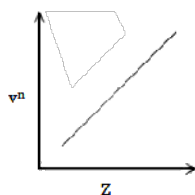
The value of 'n' is
(1) 1
(2) 2
(3) 1/2
(4) 3

50. In the depression of freezing point experiment, it is found that
(a) The vapour pressure of the solution is less than that of pure solvent
(b) The vapour pressure of the solution is more than that of pure solvent
(c) Only solute molecules solidify at the freezing point
(d) Only solvent molecules solidify at the freezing point
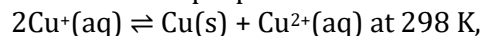Choose the most appropriate answer from the option given below
(1) A and D only
(2) A and C only
(3) A only
(4) B and C only

SECTION : 2

Section 2 contains 10 Numerical Value Type Questions Out of which ONLY 5 (any) questions have to be attempted. The answer to each question should be rounded off to the nearest integer.

51. For the disproportionation reaction
$2Cu^+(aq) \rightleftharpoons Cu(s) + Cu^{2+}(aq)$ at 298 K,
ln K (where K is the equilibrium constant) is ..... x 10^{-1} .
Given ($E^0_{cu^{2+}/cu^+}$ = 0.16 V, $E^0_{cu^{2+}/cu^+}$ = 0.52 V , $\frac{RT}{F}$ = 0.025)

52. 3 g of acetic acid is added to 250 mL of 0.1 M HCl and the solution made up to 500 mL . To 20 mL of this solution $\frac{1}{2}$ mL of 5M NaOH is added. The pH of the solution is _____.
[Given: pKa of acetic acid = 4.75, molar mass of acetic acid = 60 g/mol, log3 = 0.4771]
Neglect any changes in volume.

53. The sum of the total number of bonds between chromium and oxygen atoms in chromate and dichromate ions is _____ .

54. The molarity of HNO_3 in a sample which has density 1.4 g/mL and mass percentage of 63 % is
_____.
(Molecular Weight of HNO_3 = 63)

55. The work function of sodium metal is 4.41 × 10-19 J. If the photons of wavelength 300 nm are incident on the metal, the kinetic energy of the ejected electrons will be
(h = 6.63 x 10^{-34} Js; c = 3 × 10^8 m/s) .... × 10^{-21} J

56. In the presence of sunlight, benzene reacts with Cl_2 to give product, X. The number of hydrogens in X is _____.

57. Number of moles of AgCl formed in the following reaction is ___
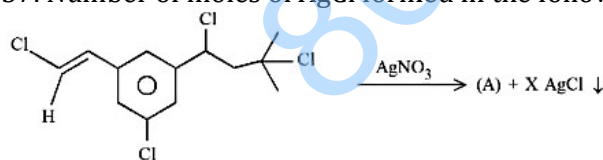
58. Sum of π-bonds present in peroxodisulphuric acid and pyrosulphuric acid is _____.

59. A litre of buffer solution contains 0.1 mole of each of NH_3 and NH_4Cl. On the addition of 0.02 mole of HCl by dissolving gaseous HCl, the pH of the solution is found to be _____ × 10^{-3}
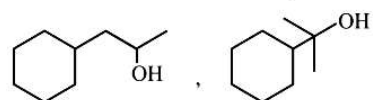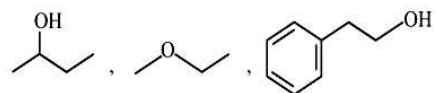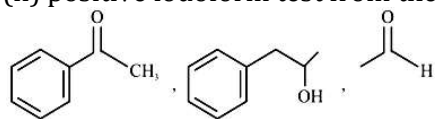(Nearest integer)
[Given : $pK_b(NH_3)$ = 4.745
log 2 = 0.301
log 3 = 0.477
T = 298 K]

60. Number of compounds giving

(i) red colouration with ceric ammonium nitrate and also
(ii) positive iodoform test from the following is _____.

MATHAMATICS
SECTION : 1

This section contains 20 Multiple Choice Questions. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE CHOICE is correct.

61. If c is a point at which Rolle's theorem holds for the function, $f(x) = \log_e\left(\frac{x^2+a}{7x}\right)$ in the interval [3, 4], where a ∈ R, then f''(c) is equal to :
(1) $\frac{1}{12}$
(2) $-\frac{1}{24}$
(3) $\frac{\sqrt{3}}{7}$
(4) $-\frac{1}{12}$

62. The shortest distance between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$ and $\frac{x-3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$ is
(1) $3\sqrt{30}$
(2) 3
(3) $2\sqrt{30}$
(4) $\frac{7}{2}\sqrt{30}$

63. Area (in sq. units) of the region outside $\frac{|x|}{2} + \frac{|y|}{3} = 1$ and inside the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$ is :
(1) 3 (4 - π)
(2) 6 (π - 2)
(3) 3 (π - 2)
(4) 6 (4 - π)

64. If R = {(x,y) : x,y ∈ Z, $x^2 + 3y^2 \le 8$} is a relation on the set of integers Z, then the domain of R^{-1} is :
(1) {−2, −1, 1,2}
(2) {−1, 0, 1}
(3) {−2,-1,0,1,2}
(4) {0,1}

65.
$\int\limits_{0}^{20\pi} (|\sin x| + |\sin x|)^2 dx$ is equalt to
(1) $10(\pi + 4)$
(2) $10(\pi + 2)$
(3) $20(\pi - 2)$
(4) $20(\pi + 2)$

66. The integral
$$\int \frac{\left(1 - \frac{1}{\sqrt{3}}\right)(\cos x - \sin x)}{\left(1 + \frac{2}{\sqrt{3}}\sin 2x\right)} dx$$

Is equal to

(1)

$$\frac{1}{2}\log_e\left|\frac{tan\left(\frac{x}{2}+\frac{\pi}{12}\right)}{tan\left(\frac{x}{2}+\frac{\pi}{6}\right)}\right| + C$$

(2)

$$\frac{1}{2}\log_e\left|\frac{tan\left(\frac{x}{2}+\frac{\pi}{6}\right)}{tan\left(\frac{x}{2}+\frac{\pi}{3}\right)}\right| + C$$

(3)

$$\log_e\left|\frac{tan\left(\frac{x}{2}+\frac{\pi}{6}\right)}{tan\left(\frac{x}{2}+\frac{\pi}{12}\right)}\right| + C$$

(4)

$$\frac{1}{2}\log_e\left|\frac{tan\left(\frac{x}{2}-\frac{\pi}{12}\right)}{tan\left(\frac{x}{2}-\frac{\pi}{6}\right)}\right| + C$$

67. Let a function f:[0, 5] →R be continuous, f(1) = 3 and F be defined as:

$$F(x) = \int_1^x t^2 g(t) dt, \text{where } g(t) = \int_1^t f(u) du$$

Then for the function F , the point is $x = 1$
(1) a point of inflection
(2) not a critical point
(3) a point of local minima
(4) a point of local maxima

68. Let a, b ∈ R, a ≠ 0 be such that the equation, $ax^2 - 2bx + 5 = 0$ has a repeated root α, which is also a root of the equation, $x^2 - 2bx - 10 = 0$. If β is the other root of this equation, then $α^2 + β^2$ is equal to:
(1) 26
(2) 25
(3) 28
(4) 24

69. Let A = $[a_{ij}]$ and B= $[b_{ij}]$ be two 3 × 3 matrices such that $b_{ij} = (3)^{(i+j-2)} a_{ij}$ where I , j = 1,2,3. If the determinant of B is 81 then the determinant of A is:
(1) 3
(2) 1/3
(3) 1/81
(4) 1/9

70. Let f(x) be a polynomial of degree 5 such that x =±1 are its critical points. If
$$\lim_{x\to 0}\left(2 + \frac{f(x)}{x^3}\right) = 4$$

then which one of the following is not true ?

(1) f(1)- 4f (-1)= 4

(2) x = 1 is a point of maxima and x = -1 is a point of minimum of f.

(3) f is an odd function.

(4) x= 1is a point of minima and x = -1is a point of maxima of f.

71. The probability that a randomly chosen 5-digit number is made from exactly two digits is:

(1) $\frac{135}{10^4}$

(2) $\frac{150}{10^4}$

(3) $\frac{121}{10^4}$

(4) $\frac{134}{10^4}$

72. If a has vertices ΔA(-1,7), B(-7,1) and C(5, -5), then its orthocenter has coordinates

(1) $\left(-\frac{3}{5},\frac{3}{5}\right)$

(2) (-3, 3)

(3) $\left(\frac{3}{5},-\frac{3}{5}\right)$

(4) (-3, 3)

73. If f'(x)=tan^{-1}(sec x + tan x),$-\frac{\pi}{2}$< x < $\frac{\pi}{2}$, and f(0)=0, then f(1) is equal to?

(1) $\frac{\pi+2}{4}$

(2) $\frac{\pi-1}{4}$

(3) $\frac{\pi+1}{4}$

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

74. If e$_1$ and e$_2$ are the eccentricities of the ellipse, $\frac{x^2}{18}+\frac{y^2}{4}=1$ and the hyperbola, $\frac{x^2}{18}-\frac{y^2}{4}=1$ respectively and (e$_1$, e$_2$) is a point on the ellipse, 15x^2 + 3y^2 = k, then k is equal to :

(1) 15

(2) 14

(3) 17

(4) 16

75. Let $\vec{a}$ = 2$\hat{\imath}$ + $\hat{\jmath}$ - 2$\hat{k}$ and $\vec{b}$ = $\hat{\imath}$ +$\hat{\jmath}$. If c is a vector such that $\vec{a}\,\vec{c}$. $|\vec{c}-\vec{a}|$ =2$\sqrt{2}$ and the angle between ($\vec{a}\times\vec{b}$) and $\vec{c}$ is 30^0, then $\left|(\vec{a}\times\vec{b})\times\vec{c}\right|$ is equal to :

(1)2/3

(2) 3/2

(3) 2

(4) 3

76. The mirror image of the point (1, 2, 3) in a plane is $\left(-\frac{7}{3},-\frac{4}{3},-\frac{1}{3}\right)$Which of the following points lies on this plane?

(1) (1,1,1)

(2) (1, –1, 1)

(3) (–1, –1, 1)

(4) (–1,–1, –1)

77. An unbiased coin is tossed 5 times. Suppose that a variable X is assigned the value k when k consecutive heads are obtained for k = 3,4,5 , otherwise X takes the value -1. Then the expected value of X, is:

(1) $-\frac{3}{16}$

(2) $-\frac{3}{8}$

(3) $\frac{3}{16}$

(4) $\frac{1}{8}$

78. If $\text{Re}\left(\frac{z-1}{2z+i}\right) = 1$, where , then z = x+iy the point (x, y) lies on a :

(1) Circle whose centre is at $\left(-\frac{1}{2}, -\frac{3}{2}\right)$

(2) Straight line whose slope is $-\frac{2}{3}$

(3) Circle whose diameter is $\frac{\sqrt{5}}{2}$

(4) Straight line whose slope is $\frac{3}{2}$

79. For some $\theta \in (0, \frac{\pi}{2})$, if the eccentricity of the hyperbola, $x^2 - y^2 \sec^2\theta = 10$ is $\sqrt{5}$ times the eccentricity of the ellipse, $x^2\sec^2\theta + y^2 = 5$, then the length of the latus rectum of the ellipse, is:

(1) $\frac{2\sqrt{5}}{3}$

(2) $\sqrt{30}$

(3) $2\sqrt{6}$

(4) $\frac{4\sqrt{5}}{3}$

80. Let two numbers have arithmetic mean 9 and geometric mean 4. Then these numbers are the roots of the quadratic equation
(a) $x^2 - 18x - 16 = 0$
(b) $x^2 - 18x + 16 = 0$
(c) $x^2 + 18x - 16 = 0$
(d) $x^2 + 18x + 16 = 0$

SECTION : 2

Section 2 contains 10 Numerical Value Type Questions Out of which ONLY 5 (any) questions have to be attempted. The answer to each question should be **rounded off to the nearest integer**.

81. Let [t] denote the greatest integer less than or equal to t. Then the value of

$$\int_1^2 |2x - [3x]| \, dx \text{ is} _____$$

82. Let X={n∈N:1≤n≤50}. If A={n∈X:n is a multiple of 2} and B={n∈X:n is a multiple of 7}, then the number of elements in the smallest subset of X containing both A and B is _____.

83. If $Cr = {}^{25}C_r$ and $C_0 + 5.C_1 + 9.C_2 + ... + (101).C_{25} = 2^{25}.k$ then k is equal to _____.

84. If for x ≥ 0, y = y(x) is the solution of the differential equation, $(x +1)dy = ((x +1)^2 + y - 3)dx$, y(2) =0, then y(3) is equal to _____.

85. For a positive integer n, $\left(1 + \frac{1}{x}\right)^n$ is expanded in increasing powers of x. If three consecutive coefficients in this expansion are in the ratio, 2 : 5 : 12, then n is equal to_____

86. The value of $\frac{8}{\pi} \int_0^{\frac{\pi}{2}} \frac{(\cos x)^{2023}}{(\sin x)^{2023}+(\cos x)^{2023}} \, dx$ is _____

87. If $\frac{1^3+2^3+3^3+\cdots+\text{upto n terms}}{1.3+2.5+3.7+\cdots\text{up to n terms}} = \frac{9}{5}$, then the value of n is _____

88. Let a ∈ R and let a, b be the roots of the equation $x^2 + 60^{1/4}x + a = 0$. If $\alpha^4 + \beta^4 = -30$, then the product of all possible values of a is _____.

89. Let f(θ)= $3(\sin^4\left(\frac{3\pi}{2} - \theta\right) + \sin^4(3\pi + \theta) - 2(1 - \sin^2 2\theta)$ and S = $\{\theta \in [0, \pi]: f'(\theta) = -\frac{\sqrt{3}}{2}\}$
If $4\beta \sum_{\theta \in S} \theta$, thenf(β)is equal to_____

90. Let $\vec{a}, \vec{b}$, and $\vec{c}$ be three non-coplanar unit vectors such that the angle between every pair of them is 3π. If $\vec{a} \times \vec{b} + \vec{b} \times \vec{c} = p\vec{a}+q\vec{b}+r\vec{c}$, where p,q and r are scalars, then the value of $\frac{p^2+2q^2+r^2}{q^2}$ is