ENGINEERING

(SAMPLE PAPER)

SESSION: 2026-2027

CSRL
TRANSFORMING LIVES

A-33, 2nd & 3rd Floor Swasthya Vihar, New Delhi-110092

IMPORTANT INSTRUCTIONS

A. GENERAL INSTRUCTIONS

1. The Test is of **2 hours duration.**
2. The Test Paper contains 60 Questions. **The Maximum Marks are 240.**
3. The Test Paper consists of Four Parts - **Part I (Aptitude), Part II (Physics), Part III (Chemistry) and Part IV (Mathematics).**
4. Each Part contains 15 Questions. Part I (Aptitude) consists of 15 Multiple Choice Type Questions.
5. Part II (Physics), Part III (Chemistry) and Part IV (Mathematics) are further divided into Two Sections i.e. **Section A** and **Section B**. Section A consists of 10 Multiple Choice Type Questions.
6. Section B consists of 5 Integer Type Questions and an internal choice has been provided in each question. The answer to each of the question is a double digit integer ranging from 00 to 99.
7. +4 marks will be given for each correct answer and –1mark for each wrong answer in Multiple choice type questions only. There is no negative marking for Integer type questions. In all other cases, no marks will be given.
8. There is only one correct response for each question. Filling up more than one response in each question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instruction 7 above.

B. HOW TO ANSWER THE QUESTION

1. **Use HB pencil/ Ball Pen (Blue or Black) only to mark your answer in the OMR sheet.**
2. For each question in **Part I (Aptitude) and Section A of Part II (Physics), Part III (Chemistry) and Part IV (Mathematics)** there are multiple choices. One of them is the correct answer.
3. Fill appropriate bubble like this ⬬ wherever and not like this ∅ ⊗ ◒.
4. Mark your response by filling correct option.
5. For each question in section B of each Part there are two columns in the OMR Sheet as shown in the figure 1. The answer to each of the question is a double digit integer ranging from 00 to 99. Darken the bubble for digit at ten's place of the integer in the left column and for the digit at unit's place of the integer in the right column. For example, if answer is 50, it should be marked as shown in figure 2.

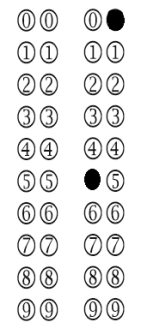


Figure 1 Figure 2

6. Please ensure that you fill answer against the correct question number.
7. Use the rough area provided for rough work.

C. RESTRICTIONS DURING THE TEST

1. Calculators are not allowed in this test.
2. Use of mobile phones in the examination hall is strictly prohibited.
3. Log tables and electronic gadgets in any form are not allowed.
4. No additional sheets will be provided for rough work.

D. HELPFUL HINTS

1. Work quickly and accurately.
2. If you are not sure of an answer, mark your best choice and avoid wild guessing.

E. ON COMPLETION OF THE TEST

1. Please ensure your details are properly filled.
2. Handover the test booklet to the invigilator.
3. Ensure that your details are properly filled in the OMR sheet.

SAMPLE TEST PAPER

APTITUDE (SECTION - I)

1. In a certain code language, the word NUMERICAL is written as LMUIREACN. How will the word PUBLISHED be written in that language?

(a) DBUSLIHEP (b) DBUSILEHP
(c) DUBSLIEHP (d) DUBILSEHP

2. The area of the greatest circle, which can be inscribed in a square whose perimeter is 120 cm.

(a) $\frac{22}{7}\times(15)^2$ sq. cm (b) $\frac{22}{7}\times\left(\frac{7}{2}\right)^2$ sq. cm

(c) $\frac{22}{7}\times\left(\frac{15}{2}\right)^2$ sq. cm (d) $\frac{22}{7}\times\left(\frac{9}{2}\right)^2$ sq. cm

3. The average of 5 consecutive integers starting with "n" is m. What is the average of 6 consecutive integers starting with (n + 2)?

(a) $\frac{2m+5}{2}$ (b) m + 2
(c) m + 3 (d) None of these

4. Sachin is five times as old as his daughter Teena and Sachin's wife Anjali's age is 26 years more than Teena. The difference between thrice age of Sachin ten years ago and twice the age of Angali ten years ago was 42 years. What will be the respective ratio of Angali's age 12 years hence and Sachin's age 12 years hence?

(a) 23 : 26 (b) 24 : 29
(c) 19 : 23 (d) 21 : 25

5. A watch is 1 minute slow at 1 pm on Tuesday and 2 minutes fast at 1 pm on Thursday. When did it show it show the correct time?

(a) 1.00 am on Wednesday
(b) 5.00 am on Wednesday
(c) 1.00 pm on Wednesday
(d) 5.00 pm on Wednesday

6. Saritha's expenditure and savings are in the ratio 3 : 2. Her income increases by 10% and her expenditure increases by 12%. By how much percent do her savings increase?

(a) 7% (b) 9%
(c) 10% (d) 13%

7. Two trains of equal length take 10 seconds and 15 seconds respectively to cross a telegraph post. If the length of each train be 120 metres, in what time will they cross each other traveling in opposite direction?

(a) 16 (b) 15
(c) 12 (d) 10

8. 8 litres are drawn from a container full of wine and is then filled with water. This operation is performed three more times. The ratio of the Quantity of wine now left in the cask to that of the water is 16:65. How much wine did the container hold originally?

(a) 24 litres (b) 18 litres
(c) 32 litres (d) 42 litres

Space for rough work

9. Pointing to a girl in the photograph, Ajay said, "Her mother's brother is the only son of my mother's father". How is the girl's mother related to Ajay?

(a) Mother (b) Sister
(c) Aunt (d) Grand Mother

10. How many squares on a chess board?

(a) 204 (b) 206
(c) 208 (d) 205

11. Insert the missing number in the series

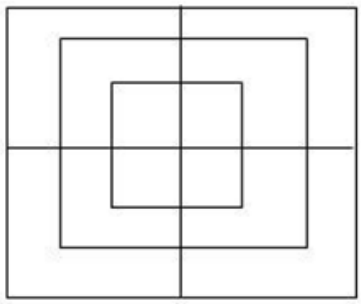
3 6 24 29 174, _____

(a) 870 (b) 151
(c) 290 (d) 181

12. A publisher sells copies of books to a retail dealer a Rs 5 per copy but allows 25 copies to be counted as 24. If the retailer sells each of the 25 copies at Rs 6, his profit % is

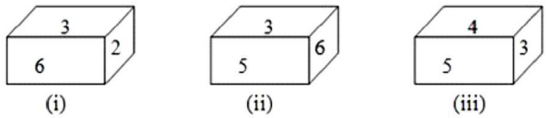
(a) 20% (b) 24%
(c) 25% (d) 40%

13. How many squares are there in the given figures?



(a) 13 (b) 14
(c) 15 (d) 16

14. Three positions of a dice are given below. Identify the number on the face opposite to 6.



(a) 1 (b) 4
(c) 5 (d) 7

15. In a plane, a set of 8 parallel lines intersects a set of 'n' other parallel lines, giving rise to 420 parallelograms. Find the value of n.

(a) 8 (b) 7
(c) 6 (d) 5

Space for rough work

PHYSICS (SECTION - II)

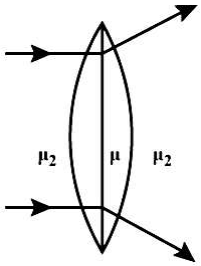
SECTION - A

16. The measurement of radius of a circle has error of 1%. The error in measurement of its area is

(a) 1% (b) 2%

(c) 3% (d) None of these

17. If the behavior of light rays through a convex lens is as shown in the adjoining figure, then;



(a) $\mu = \mu_2$ (b) $\mu < \mu_2$

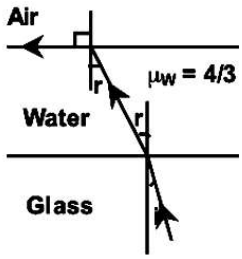
(c) $\mu > \mu_2$ (d) $\mu \leq \mu_2$

18. The dimensions of latent heat are -

(a) $M^0L^2T^{-2}$ (b) $M^0L^1T^{-2}$

(c) $M^2L^0T^{-2}$ (d) $M^0L^2T^{-2}$

19. A ray of light is incident at the glass-water interface at an angle *i*, it emerges finally parallel to the surface of water, then the value of μ_g would be (where μ_g is the refractive index of glass with respect to water):



(a) $\left(\frac{4}{3}\right)\sin(i)$ (b) $\left[\frac{1}{\sin(i)}\right]$

(c) $\frac{4}{3}$ (d) 1

20. The velocity of a body moving in viscous medium is given by $V = \frac{P}{Q}(1 - e^{Qt})$ where *t* is time; P and Q are constants. Then the dimensions of P are

(a) M^0LT^{-2} (b) $M^0L^2T^{-2}$

(c) $M^{-1}LT^{-2}$ (d) $M^0L^0T^{-2}$

Space for rough work

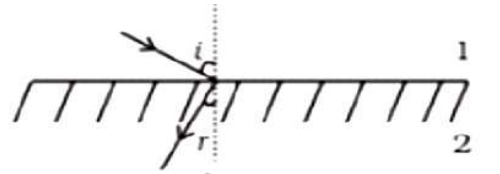
21. The table gives the initial length ℓ_0, change in temperature ΔT and change in length $\Delta \ell$ of four rods. Which rod has greatest coefficient of linear expansion?

Rod	ℓ_0(m)	ΔT(C)	$\Delta\ell$(m)
A1	1	100	1
A2	1	100	2
A3	1.5	50	3
A4	2.5	20	4

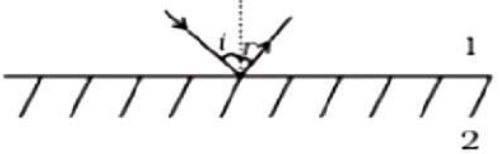
(a) A1 (b) A2

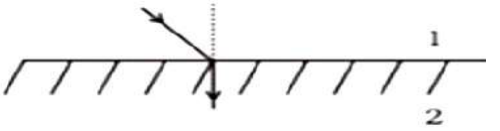
(c) A3 (d) A4

22. There are certain materials developed in laboratories which have a negative refractive index. A ray incident from air (medium 1) into such a medium (medium 2) shall follow a path given by

(a) 

(b) 

(c) 

(d) 

23. A hockey player is moving northward and suddenly turns westward with the same speed to avoid an opponent. The force that acts on the player is

(a) frictional force along westward

(b) muscle force along southward.

(c) frictional force along south-west

(d) muscle force along south-west.

24. A certain simple harmonic vibrator of mass 0.1 kg has a total energy of 10 J. Its displacement from the mean position is 1 cm when it has equal kinetic and potential energies. The amplitude A and frequency v of vibration of the vibrator are

(a) $A = 0.0141\,\text{m},\ v = 159.13\,\text{Hz}$

(b) $A = 0.0141\,\text{m},\ v = 318.26\,\text{Hz}$

(c) $A = 0.007\,\text{m},\ v = 159.13\,\text{Hz}$

(d) $A = 0.007\,\text{m},\ v = 318.26\,\text{Hz}$

25. A clear transparent glass sphere (m = 1.5) of radius R immersed in a liquid of refractive index 1.25. A parallel beam of light incident on it will converge to a point. The distance of this point from the center will be

(a) –3 R (b) +3 R

(c) – R (d) None of these

Space for rough work

SECTION - B

26. An automobile travelling with a speed of 60 km/h, can brake to stop within a distance of 20 m. If the car is going twice as fast, i.e., 120 km/h, the stopping distance will be (in m)

OR

If a body loses half of its velocity on penetrating 3 cm in a wooden block, then how much will it penetrate more before coming to rest? (in mm)

27. Two particles A and B, initially at rest, move towards each other under the mutual force of attraction. At the instant when the speed of A is v m/s and the speed of B is 2v m/s, the speed of the centre of mass of the system is X m/s. Find (X +15)

OR

Two blocks of masses 10kg and 4 kg are connected by a spring of negligible mass and placed on a frictionless horizontal surface. An impulse gives a velocity of 14 m/s to the heavier block in the direction of the lighter block. The velocity of the centre of mass is _____ m/s.

28. A hydrogen-like atom has one electron revolving around a stationary nucleus. The energy required to excite the electron from the second orbit to the third orbit is 47.2 eV. The atomic number of the atom is

OR

The equation of motion of a projectile is $y = 12x - \frac{3}{4}x^2$. If the horizontal component of velocity is 3 ms^{-1}, the range of the projectile (in m) is _____.

29. The horizontal range of a projectile fired at an angle of 15° is 44 m. If it is fired with the same speed at an angle of 45°, its range will be

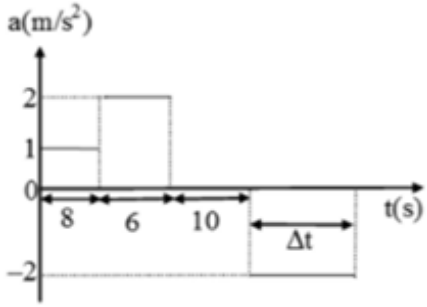
OR

A conveyor belt is moving at a constant speed of 2 m s^{-1}. A box of mass 1 Kg is gently dropped on it. The coefficient of friction between them is $\mu = 0.5$. The distance (in cm) that the box will move relative to the belt before coming to rest on it taking $g = 10$ m s^{-2}, is

30. If a body loses half of its velocity on penetrating 30 cm in a wooden block, then how much will it penetrate more before coming to rest (in cm)?

OR

A train starts from rest from a station and comes to a stop at the next station. Variation in acceleration is as shown in the graph. Find the time (Δt) for which the brakes is applied.



Space for rough work

CHEMISTRY (SECTION-III)

SECTION - A

31. Which of the following statements is false about covalent bonds?

(a) The electrons are shared between atoms to get stable electronic arrangement.

(b) The bonds are non-directional.

(c) The strength of the bond depends upon the extent of overlapping.

(d) The bond may or may not be polar

32. $CH_2 = \underset{\displaystyle CH_3}{\overset{|}{C}} - CH = CH_2$ on treatment with ozone followed by zinc powder and water produces

(a) One mole of methanal, one mole of ethanal and $CH_3 - \overset{\displaystyle O}{\overset{\|}{C}} - CHO$

(b) Two moles of methanal one mole of propanal

(c) Two moles of methanal and CH_3COCHO

(d) Two moles of methanol and CH_3COCHO

33. Which of the following species is incorrectly matched with their shape?

(a) ClF_3 = trigonal planar

(b) SF_4 = see-saw

(c) XeF_6 = capped octahedral

(d) BCl_3 – trigonal planar

34. Which of the following is not correct regarding the diagonal relationship between A*l* and B*e*?

(a) Oxides of both are amphoteric in nature

(b) Carbides of both produce same gas an hydrolysis

(c) Hydrides of both are electron deficient covalent compounds

(d) Both show +2 oxidation states in their compounds

35. The density of O_2 is 16 at STP. At what temperature (in °C) its density will be 14? Consider that the pressure remains constant.

(a) 30º (b) 35º

(c) 39º (d) 45º

36. Which of the following structure is square pyramidal?

(a) PCl_5 (b) PF_5

(c) BrF_5 (d) All of these

37. Bottles containing C_6H_5I and $C_6H_5CH_2I$ lost their original labels. They were labelled A and B for testing. A and B were separately taken in test tubes and boiled with NaOH solution. The end solution in each tube was made acidic with dilute HNO_3 and then some $AgNO_3$ solution was added. Substance B gave a yellow precipitate. Which one of the following statements is true for this experiment?

(a) A was $C_6H_5CH_2I$

(b) B was C_6H_5I

(c) Addition of HNO_3 was unnecessary

(d) A was C_6H_5I

38. Alkyl halides react with Mg reagents to give

(a) alkenes (b) alkyl Mg halides

(c) alkanes (d) alkenyl halides

39. The first, second and third ionization potentials (E_1, E_2 and E_3) for an element are 7 eV, 12.5 eV and 142.3 eV respectively. The most stable oxidation state of the element will be

(a) 1 (b) 2

(c) 3 (d) 4

40. In the following reaction,

$R_2CuLi \xrightarrow{R'X} R — R' + RCu + LiX$

Nature of R and R' should be

(a) any alkyl, 2° alkyl

(b) any alkyl, methyl /l° alkyl/ 2° cycloalkyl

(c) 1° alkyl, methyl /1° alkyl /2° cycloalkyl

(d) 2° alkyl, any alkyl

Space for rough work

SECTION - B

41. Calculate the standard enthalpy of formation of $N_2H_{4(g)}$ (in kJ) given that the standard bond energies of N – N; H – H; N ≡ N; and N – H are 159, 436, 941 and 398 kJ mol^{-1} respectively.

OR

Consider the following reaction

$$a\,MnO^-_{4(aq)} + bC_2O^{2-}_{4\,(aq)} + cH^+_{(aq)} \longrightarrow pMn^{2+}_{(aq)} + q\,CO_2(aq) + rH_2O(l)$$

Value of c if the above reaction is balanced with simplest integer coefficients.

42. Sum of number of unpaired electrons present in all of the following ions

Sc^{3+} , Cr^{3+} , Mn^{3+} , Fe^{3+}

OR

How many of the following contains coloured ions?

1. Cu^-. 2. Ti^{4-} 3. Co^{2+} 4. Fe^{2-}

43. The number of d-electrons retained in Fe^{2+} (At.no. of Fe = 26) ion is

OR

Report atomic number of the element having largest size among the following:

Ni, Cu, Zn

44. The work function for a metal is 40 eV. To emit photo electrons of zero velocity from the surface of the metal the wavelength of incident light should be ____ nm.(hc = 12,400 eV • Å)

OR

If S^o for H_2, Cl_2 and HCl are 0.13, 0.22 and 0.19 kJ K^{-1} mol^{-1} respectively. The total change in standard entropy for the reaction, is

$$H_2 + Cl_2 \rightarrow 2HCl$$

45. The number of unpaired electrons in $[CoF_6]^{3-}$ are x. Find the value of $10x$ is

OR

The number of orbitals associated with quantum number n = 4, $m_s = +\frac{1}{2}$ is :

Space for rough work

MATHEMATICS (SECTION-IV)

SECTION - A

46. The solution set of the inequation $\frac{x^2-3x+4}{x+1} > 1$; $x \in R$, is

(a) $(3, \infty)$ (b) $(-1, 1) \cup (3, \infty)$

(c) $[-1, 1] \cup [3, \infty)$ (d) None of these

47. Two balls are drawn from an urn containing 2 white, 3 red and 4 black balls one by one without replacement. The probability that at least one ball is red?

(a) $\frac{7}{12}$ (b) $\frac{5}{12}$

(c) $\frac{2}{3}$ (d) $\frac{5}{8}$

48. If $x = 3 \tan t$ and $y = 3 \sec t$, the value of $\frac{d^2y}{dx^2}$ at $t = \frac{\pi}{4}$ is

(a) $\frac{3}{2\sqrt{2}}$ (b) $\frac{1}{3\sqrt{2}}$

(c) $\frac{1}{6}$ (d) $\frac{1}{6\sqrt{2}}$

49. If $\int \frac{1+\cos 8x}{\tan 2x - \cot 2x}\, dx = a \cos 8x + C$, then

(a) $-\frac{1}{16}$ (b) $\frac{1}{8}$

(c) $\frac{1}{16}$ (d) $-\frac{1}{8}$

50. Number of solutions of the equation $|z|^2 + 7\bar{z} = 0$ is/are

(a) 1 (b) 2

(c) 4 (d) 6

51. If $\sqrt{(1-x^{2n})} + \sqrt{(1-y^{2n})} = a(x^n - y^n)$, then $\sqrt{\left(\frac{1-x^{2n}}{1-y^{2n}}\right)} \frac{dy}{dx}$ is equal to

(a) $\frac{x^{n-1}}{y^{n-1}}$ (b) $\frac{y^{n-1}}{x^{n-1}}$

(c) $\frac{x}{y}$ (d) 1

52. The slope of the tangent to the curve $y = \int_0^x \frac{dx}{1+x^3}$ at the point where $x = 1$ is

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$

(c) 1 (d) None of these

53. Find the value of $\frac{\sin\theta + \sin 2\theta}{\cos\theta - \cos 2\theta}$

(a) $\cot\frac{\theta}{2}$ (b) $\tan\frac{\theta}{2}$

(c) $\sin\frac{\theta}{2}$ (d) $\cos\theta$

Space for rough work

54. Two imaginary numbers α and β are such that $\alpha + \beta = 2$ and $\alpha^4 + \beta^4 = 272$, then the quadratic equation whose roots are α and β is

(a) $x^2 - 2x + 16 = 0$

(b) $x^2 - 2x + 12 = 0$

(c) $x^2 - 2x + 8 = 0$

(d) None of these

55. The equation of the tangent to the curve $\left(\frac{x}{a}\right)^n + \left(\frac{y}{b}\right)^n = 2$ at (a, b) is

(a) $\frac{x}{a} + \frac{y}{b} = 2$

(b) $\frac{x}{a} + \frac{y}{b} = \frac{1}{2}$

(c) $\frac{x}{b} - \frac{y}{a} = 2$

(d) $ax + by = 2$

Space for rough work

SECTION - B

56. Find the minimum value of the given expression $9\tan^2 x + 16\cot^2 x$

OR

The solution of the equation

$\sin^{-1}\left(\tan\frac{\pi}{4}\right) - \sin^{-1}\left(\sqrt{\frac{3}{x}}\right) - \frac{\pi}{6} = 0$

is equal to _____.

57. If $\lim\limits_{x\to 0} \frac{x(1+a\cos x) - b\sin x}{x^3} = 1$, then the value of $4ab$ is equal to

OR

If the area bounded by $y = 2x^2$, $y = x + \frac{|x|}{x}$ and $x = 0$ is A, then $12 \times A = ?$

58. Find the minimum value of the given expression $9\tan^2 x + 16\cot^2 x$

OR

In how many ways 3 boys and 3 girls can be seated in a row such that boys and girls are alternate

59. If one root of the equation $z^2 + (a+i)z + b + ic = 0$ be real, when $a, b \in \mathrm{R}$, then $c^2 + b - ac + 15 =$ ____

OR

Find the value of $\omega^2(1-\omega+\omega^2)^4$, where ω is the cube root of unity.

60. The value of $\frac{72}{\pi}\int_0^{\frac{\pi}{2}} \frac{dx}{1+\cot x}$ is

OR

$\int \sec^2(3-2x)\,dx = \frac{1}{a}\tan(b-cx) + \text{constant}$, find the value of abc.

Space for rough work