JEE MAIN RANKERS

TEST SERIES - 2025

Topics Covered

Physics : Units and Measurements, Motion in a Straight Line, Motion in a Plane, Laws of Motion, Work, Energy and Power, System of Particles and Rotational Motion, Gravitation

Chemistry : Some basic Concepts of Chemistry, Atomic Structure, Classification of Elements, and Periodicity in Properties, Chemical bonding and Molecular Structure, Thermodynamics, Equilibrium.

Mathematics: Sets, Relations and Functions, Trigonometric Functions, Complex Numbers and Quadratic Equations, Linear Inequalities, Permutations and Combinations, Binomial Theorem, Sequences and Series

General Instructions:

- Immediately fill in the particulars on this page of the test booklet.
- The test is of **3 hours** duration.
- The test booklet consists of 90 questions. The maximum marks are **300.**
- There are three Sections in the question paper, Section I, II & III consisting of Section-I **(Physics)**, Section-II **(Chemistry)**, Section-III **(Mathematics)** and having **30 questions** in each part in which first **20** questions are compulsory and are of Objective Type and Last **10** questions are integers type in which you have to attempt **5** questions only.
- There is only one correct response for each question.
- Each correct answer will give **4** marks while **1** Mark will be deducted for a wrong MCQ response.
- No student is allowed to carry any textual material, printed or written, bits of papers, pager, mobile phone, any electronic device, etc. inside the examination room/hall.
- On completion of the test, the candidate must hand over the Answer Sheet to the Invigilator on duty in the Room/Hall. However, the candidates are allowed to take away this Test Booklet with them. Do not fold or make any stray mark on the Answer Sheet (OMR).
- **Do not fold or make any stray mark on the Answer Sheet (OMR).**

OMR Instructions:

- Use blue/black dark ballpoint pens.
- Darken the bubbles completely. Don't put a tick mark or a cross mark where it is specified that you fill the bubbles completely. Half-filled or over-filled bubbles will not be read by the software.
- Never use pencils to mark your answers.
- Never use whiteners to rectify filling errors as they may disrupt the scanning and evaluation process.
- Writing on the OMR Sheet is permitted on the specified area only and even small marks other than the specified area may create problems during the evaluation.
- Multiple markings will be treated as invalid responses.
- **Do not fold or make any stray mark on the Answer Sheet (OMR).**

Name of the Student (in Capitals) : _____

Roll Number : _____

OMR Bar Code Number: _____

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

Test Paper-01

SECTION-I (PHYSICS)

Single Correct Type Questions

1. The position co-ordinates of a particle moving in a space varries with time t as $x = a\cos\omega t$, $y = a\sin\omega t$ and $z = a\omega t$. The speed of particle is equal to

(1) $2a\omega$ (2) $\sqrt{2}a\omega$

(3) $\sqrt{3}a\omega$ (4) insufficient data

2. The diameter and height of a cylinder are measured by a meter scale to be 12.0 ± 0.1 cm and 35.0 ± 0.1 cm, respectively. What will be the value of its volume in appropriate significant figure? $\left(\pi = \frac{22}{7}\right)$

(1) $3264 \pm 81\ cm^3$ (2) $3900 \pm 80\ cm^3$

(3) $3960 \pm 80\ cm^3$ (4) $3264.4 \pm 81\ cm^3$

3. An equilateral triangle is constructed by joining three identical thin uniform rods. Consider two axes 1 and 2, perpendicular to the plane of the triangle, and passing respectively through the mid-point of a side and the centroid of the triangle. The moment of inertia of the triangle about these two axes, I_1 and I_2, is in the ratio:

(1) 2 : 1 (2) 3 : 2

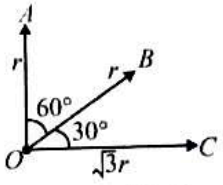
(3) 5 : 3 (4) 4 : 3

4. A particle initially at rest moves in a straight line with constant acceleration. The instantaneous power being delivered to the particle is proportional to s^N, where s is the distance travelled by the particle. Then, N is equal to:

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

(3) 1 (4) 3

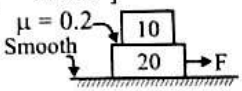
5. The resultant magnitude of the three vectors $\overrightarrow{OA}, \overrightarrow{OB}$ and $\overrightarrow{OC}$ with their magnitudes mentioned as shown in adjoining figure, is:



(1) r (2) $3r$

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

6. Initially, the system is at rest. Find out maximum value of F for which the blocks move together. [Take $g = 10\ m/s^2$]



(1) 200 N (2) 60 N

(3) 100 N (4) 50 N

7. A block of mass $m_1 = m$ is connected to another block of mass $m_2 = 2m$ by a mass less spring of force constant K. The blocks are kept on smooth horizontal surface and are at rest with the spring un stretched. If a constant horizontal force F starts acting on m_2 to pull it, find maximum extension in the spring.

(1) $\frac{F}{3K}$

(2) $\frac{5F}{3K}$

(3) $\frac{2F}{3K}$

(4) $\frac{4F}{3K}$

8. A rod of length L is held vertically on a smooth horizontal surface. The top end of the rod is given a gentle push. At a certain instant of time, when the rod makes an angle θ with horizontal the velocity of COM of the rod is v_0. The velocity of the end of the rod in contact with the surface at that instant is

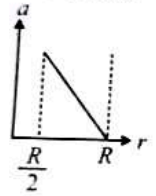
(1) $v_0 \cot\theta$

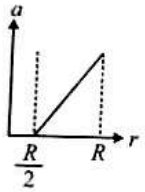
(2) $v_0 \cos\theta$

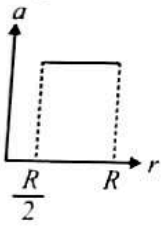
(3) $v_0 \sin\theta$

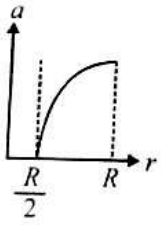
(4) $v_0 \tan\theta$

9. A frictionless tunnel is dug along a chord of the earth at a perpendicular distance $\frac{R}{2}$ from the centre of earth (where R is radius of earth). An object is released from one end of the tunnel. The correct graph, showing the variation of acceleration of particle with its distance r from centre of earth is

(1) 

(2) 

(3) 

(4) 

10. A 16gm ball is shot from a spring gun whose spring has a force constant of 640 N/m. The spring is compressed by 5 cm. The greatest possible horizontal range of the ball for this compression is ($g = 10\ m/s^2$)

(1) 6.0 m

(2) 12.0 m

(3) 10.0 m

(4) 8.0 m

11. When someone jumps, one always bends one's knees to lower the centre of mass. A student at PW lowers her centre of mass of the body by 40 cm and then jumps up. She can usually reach a height of 50 cm above her normal height. If she is of mass 50 kg and jumps as described above, the work done by the her is (Take $g = 10\ m/s^2$)

(1) 450 J

(2) 400 J

(3) 320 J

(4) 0

12. The mean radius of earth is R, its angular speed on its own axis is ω and the acceleration due to gravity at earth's surface is g. What will be the radius of the orbit of a geostationary satellite?

(1) $(R^2g/\omega^2)^{1/3}$

(2) $(Rg/\omega^2)^{1/3}$

(3) $(R^2\omega^2/g)^{1/3}$

(4) $(R^2g/\omega)^{1/3}$

13. A particle moving along x-axis has acceleration f, at time t, given by $f = f_0\left(1-\frac{t}{T}\right)$, where f_0 and T are constants. The particle at $t = 0$ has zero velocity. In the time interval between $t = 0$ and the instant when $f = 0$, the change in particle's velocity (v_x) is

(1) $\frac{1}{2}f_0T^2$

(2) f_0T^2

(3) $\frac{1}{2}f_0T$

(4) f_0T

14. A body of mass M is kept on a rough horizontal surface (friction coefficient μ). A person is trying to pull the body by applying a horizontal force but the body is not moving. The force by the surface on the body is F, then

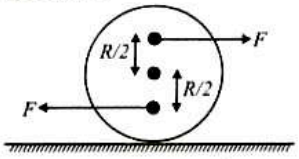
(1) $F = Mg$

(2) $F = \mu Mg$

(3) $Mg \le F \le Mg\sqrt{1+\mu^2}$

(4) $Mg \ge F \ge Mg\sqrt{1+\mu^2}$

15. Two horizontal forces are applied on a sphere placed on rough horizontal ground. If sphere rolls without slipping, then friction force acting on the sphere, is



(1) $\frac{2}{5}F$ (2) $\frac{2}{7}F$

(3) $\frac{5}{7}F$ (4) $\frac{3}{7}F$

16. Kinetic energy of a rod of mass M having velocity of its ends as shown, is

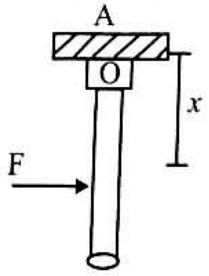
(1) $\frac{13}{6}Mv_0^2$

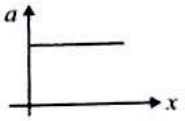
(2) $\frac{7}{6}Mv_0^2$

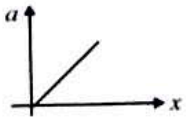
(3) $\frac{19}{6}Mv_0^2$

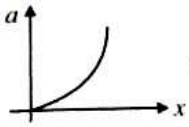
(4) $\frac{6}{7/4}Mv_0^2$

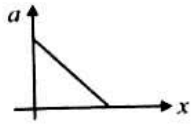
17. A rod of mass m and length l is hinged at one of its end A as shown in figure. A force F is applied at a distance x from A. The acceleration of centre of mass (a) varies with x as:



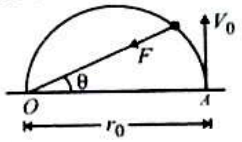
(1) 

(2) 

(3) 

(4) 

18. A particle of mass m is projected from point A with an initial velocity V_0 perpendicular to line OA and moves under a central force F (directed toward origin O) along a semicircular path of diameter $OA = r_0$ as shown. Its velocity at an angle θ: (Assume no other force



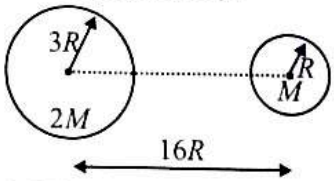
(1) $V_0 \cos\theta$

(2) $\frac{V_0}{\cos\theta}$

(3) $\frac{V_0}{\cos^2\theta}$

(4) $\frac{V_0 \sin 2\theta}{2}$

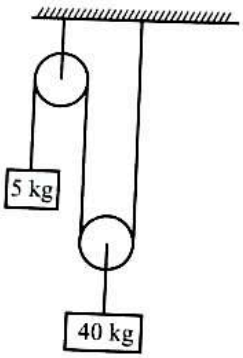
19. As shown two spherical bodies of mass $2M$, M and of radii $3R$ and R respectively are held at distance $16R$ from each other in free space. When they are released, they start approaching each other due to the gravitational force of attraction. Then their velocities at the time of impact will be respectively:



(1) $\sqrt{\frac{GM}{8R}}, 2\sqrt{\frac{GM}{8R}}$ (2) $\frac{3}{2}\sqrt{\frac{GM}{R}}, 3\sqrt{\frac{GM}{R}}$

(3) $\sqrt{\frac{GM}{R}}, \sqrt{\frac{GM}{R}}$ (4) $\sqrt{\frac{GM}{3R}}, \sqrt{\frac{GM}{R}}$

20. The magnitude of acceleration of centre of mass of the system shown in figure will be: (Pulleys and strings are massless, g is acceleration due to gravity)

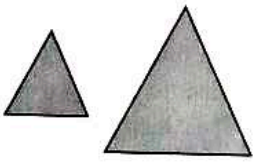


(1) $\frac{g}{2}$ (2) $\frac{g}{3}$

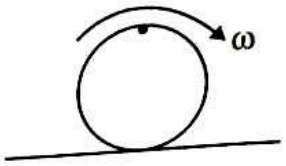
(3) $\frac{g}{6}^2$ (4) g

Integer Type Questions

21. Two equilateral triangles of side lengths a and $2a$ respectively are cut out from a large thin, uniform metallic sheet. The moment of inertia of the first triangle about one of its sides is I_1 and the moment of inertia of the second triangle about one of its sides is I_2. The ratio $\frac{I_2}{I_1}$ is equal to



22. A small particle of mass m is fixed rigidly to the rim of a uniform circular ring of mass m and radius R. The composite body is made to roll without slipping on a horizontal surface. At a particular instant, the particle is at the top most point in its trajectory and the angular velocity of the composite body is ω. The kinetic energy of the body at this instant is $X(mR^2\omega^2)$. The value of X is _____.



23. Two cyclists, A and B, are moving on a straight road in the same direction, both at constant velocity 15 km/h with cyclist B 100 m behind cyclist A. A man is walking on the same road in the same direction as the cyclists at constant velocity 5 km/h. At $t = 0$, A overtakes the man. Then, B overtakes the man at t = _____ seconds.

24. If x denotes the position of ak particle then,

$$\int \frac{dx}{\sqrt{2ax - x^2}} = a^n \sin^{-1}\left[\frac{x}{a} - 1\right],$$

find the value of n.

(a is a physical constant of appropriate dimension and all other integers used is equation are dimens less)

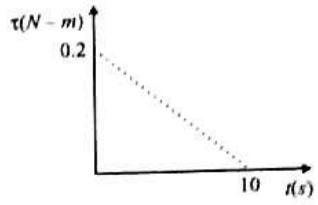
25. The speed of a uniform solid sphere in metre/sec after rolling down an inclined plane of vertical height 7 m from rest without sliding is (g =10 m/s^2)

26. A small sphere tied to the string of length 0.7 m is describing a vertical circle so that the maximum and minimum tensions in the strings are in the ratio 4 : 1. What will be the velocity of the sphere (in metre/sec) at the lowest position. (g = 10 m/s^2)

27. A man standing in a lift throws a ball with a speed of 24 m/s in upward direction relative to lift and lift is moving upwards with an acceleration a = 2 m/s^2. Find the time t (in seconds) when ball comes back to man in seconds. {Take g = 10 m/s^2}. {Assume the ball does not hit the roof of lift}.

28. From top of a tower of height 80 m two stones are projected horizontally with 20 m/s & 40 m/s in opposite directions. The distance between these two stones will be $10x$ meters when they reach ground. Find the value of x. {Take g =10 m/s^2}

29. A solid cylinder of mass 2 kg and diameter 40 cm mounted to rotate about its central axis is initially at rest. A torque begins to act on the cylinder at
$t = 0$. The variation with time of this torque is given in the graph. The angular speed (in rad/s) of the cylinder at $t = 10$ s is _____



30. A block of mass 1 kg is suspended vertically by an ideal spring of spring constant 300 N/m as shown, and the upper end of the spring is fixed. The block is released from rest when the spring is in its natural length. If the velocity of the block after it has moved down by a distance 5 cm is X cm/s, then X is _____ ($g = 10\ m/s^2$)

SECTION-II (CHEMISTRY)

Single Correct Type Questions

31. Based on equation $E = -2.178 \times 10^{-18}\ J\left(\frac{Z^2}{n^2}\right)$, certain conclusions are written. Which of them is not correct?

(1) Equation can be used to calculate the change in energy when the electron changes orbit.

(2) For n = 1, the electron has a more negative energy than it does for n = 6 which means that the electron is more loosely bound in the smallest allowed orbit.

(3) The negative sign in equation simply means that the energy of electron bound to the nucleus is lower than it would be if the electrons were at the infinite distance from the nucleus.

(4) Larger the value of n, the larger is the orbit radius.

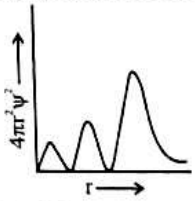
32. For the gaseous reaction,

$$K + F \longrightarrow K^{\oplus} + F^{\oplus}$$

ΔH = 19 kcal mol^{-1} under the conditions when cations and anions are prevented by electrostatic separation from combining with each other. The IE_1 of K is 4.3 eV. The $\Delta_{eg}H$ of F (eV atom^{-1}) is

(1) −3.48
(2) −6.42
(3) −4.24
(4) −2.86

33. The following graph is plotted for a ns-orbital.



The value of n will be

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

34. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): In the bonding molecular orbital (MO) of H_2 electron density is increased between the nuclei.

Reason (R): The bonding MO is $\psi_A + \psi_B$, which shows destructive interference of the combining electron waves. In the light of above statements chose the most appropriate answer from the option given below.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

(2) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).

(3) (A) is correct but (R) is incorrect.

(4) (A) is incorrect but (R) is correct.

35. **Assertion (A):** Among the two O – H bonds in H_2O molecule, the energy required to break the first

O – H bond and the other O – H bond is same.

Reason (R): This is because the electronic environment around oxygen is the same even after breakage of one O – H bond.

(1) A and R both are correct, and R is correct explanation of A.

(2) A and R both are correct, but R is not the correct explanation of A.

(3) A is true not R is false.

(4) A and R both are false.

36. Consider a solution consisting of the following two buffer systems.

$$H_2CO_3 \rightleftharpoons HCO_3^- + H^+, pK_a = 6.4$$

$$H_2PO_4^- \rightleftharpoons HPO_4^{2-} + H^+, pK_a = 7.2$$

At pH = 6.4, which one of the following is true for the concentration of acid and conjugate base present in the solution?

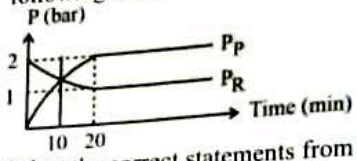
(1) $[H_2CO_3] > [HCO_3^-] \& [H_2PO_4^-] > [HPO_4^{2-}]$

(2) $[H_2CO_3] = [HCO_3^-] \& [H_2PO_4^{2-}] > [H_2PO_4^-]$

(3) $[HCO_3^-] > [H_2CO_3] \& [HPO_4^{2-}] > [H_2PO_4^-]$

(4) $[H_2CO_3] = [HCO_3^-] \& [H_2PO_4^-] > [HPO_4^{2-}]$

37. For the reaction $R(g) \rightarrow 2P(g)$ following observation is made at 300 K.



Select the correct statements from the following

(1) $(\Delta_r G)$ at 10 min = 0

(2) $(\Delta_r G)$ at 20 min = 0

(3) $\Delta_r G$ at 10 min = +ve

(4) $\Delta_r G^0$ at 20 min = 0

38. In which one of the following molecules, the O – O bond length is shortest?

(1) O_3 (2) O_2

(3) H_2O_2 (4) KO_2

39. The emission spectrum of hydrogen in the visible region consists of

(1) a continuous band of light

(2) a series of equally spaced lines

(3) a series of lines that are closer at low energies

(4) a series of lines that are closer at high energies

40. **Statement-I:** Ice $\rightleftharpoons$ water, if pressure is applied then water will evaporate.

Statement-II: Increase of pressure pushes the equilibrium towards the side in which number of gaseous molecules increases.

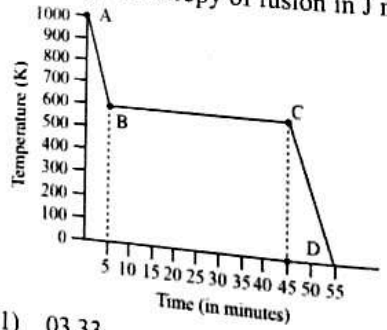
(1) Both Statement-I and Statement-II are correct

(2) Statement-I is incorrect and Statement-II is correct

(3) Statement-I is correct and Statement-II is incorrect

(4) Neither Statement-I nor Statement-II is correct

41. Two moles of a substance are cooled at the rate of 0.4 kJ min^{-1} as shown in graph. Curve AB, point B and point C and curve CD represent respectively, the cooling of liquid, start of freezing, completion of freezing and cooling of the solid. Based on this data the change in entropy of fusion in J mol^{-1} K^{-1} will be



(1) 03.33 (2) 13.33

(3) 23.33 (4) 33.33

42. At 25°C dissociation constants of acid HA and base BOH in aqueous solution are same. The pH of 0.01M solution of HA is 5. The pOH of 10^{-4}M solution of BOH at the same temperature will be

(1) 3.5
(2) 4
(3) 6
(4) 9

43. In which one of the following options bond angles are correctly matched?

	Bond angle: 120°	106.6°	110.9°
(1)	$N(SiH_3)_3$	$(NCH_3)_3$	NH_3
(2)	$N(CH_3)_3$	NH_3	$N(SiH_3)_3$
(3)	$N(SiH_3)_3$	NH_3	$N(CH_3)_3$
(4)	$N(CH_3)_3$	$N(SiH_3)_3$	NH_3

44. 27 kg of SO_2Cl_2 is reacted with excess of NaOH completely. If the difference between masses of Na_2SO_4 and NaCl produced is x kg, then the value of x is

[Given: $M_{SO_2Cl_2} = 135\,g\,mol^{-1}, M_{Na_2SO_4} = 142\,g\,mol^{-1}$, $M_{NaCl} = 58.5\,g\,mol^{-1}$]

(Reaction involved is $SO_2Cl_2 + NaOH \rightarrow Na_2SO_4 + NaCl + H_2O$)

(1) 5
(2) 3
(3) 2
(4) None of these

45. Regarding the structure of compound, $PBr_2Cl(CH_3)_2$, which one of the following statements is correct?

(1) Both CH_3 occupy axial position.
(2) Both Br occupy axial position.
(3) One Cl and one Br occupy axial position.
(4) One CH_3 and one Br occupy axial position.

46. For the given cell reaction

$2AgCl + H_2 \rightarrow 2Ag + 2H^+ + 2Cl^-$

Temperature coefficient of emf of the cell is $0.02\ VK^{-1}$. ΔS° for the above reaction in KJ/K will be

(1) 4.27
(2) 3.86
(3) 2.62
(4) 8.54

47. If 150kJ of energy is need for muscular work to walk a distance of one km, then how much of glucose (in grams) one has to consume to walk a distance of 5km, provided only 30% of energy is available for muscular work? (The enthalpy of combustion of glucose is 3000 kJ mol^{-1})

(1) 200
(2) 300
(3) 150
(4) 400

48. Match the atomic number given in Column-I with the IUPAC official name given in Column-II

Column-II		Column-II	
A.	101	(i)	Oganesson
B.	106	(ii)	Moscovium
C.	115	(iii)	Seaborgium
D.	118	(iv)	Mendelevium

Choose the correct answer form the codes given below.

(1) A - (ii), B - (iv), C - (i), D - (iii)
(2) A - (i), B) - (iii), C - (ii), D - (iv)
(3) A - (iv), B - (iii), C - (ii), D - (i)
(4) A - (iii), B- (iv), C - (i), D - (iii)

49. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): The kinetic energy of the ejected photoelectron increases with increase in intensity of incident light.

Reason (R): Increase in intensity of incident light increases the number of ejected photoelectrons.

In the light of above statement choose the most appropriate answer form the option given below.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(2) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).
(3) (A) is correct but (R) is incorrect
(4) (A) is incorrect but (R) is correct.

50. The increasing order of bond angles in OF_2, OCl_2, ClO_2 and H_2O is

(1) $OF_2 < H_2O < OCl_2 < ClO_2$
(2) $H_2O < OF_2 < ClO_2 < OCl_2$
(3) $OF_2 < OCl_2 < H_2O < ClO_2$
(4) $OCl_2 < OF_2 < ClO_2 < H_2O$

Integer Type Questions

51. $X_{(s)}$ and $Y_{(s)}$ are taken in a closed vessel and are decomposed as follows:

$X_{(s)} \rightleftharpoons A_{(g)} + B_{(g)} \quad k_{P_1} = 500\,atm$

$Y_{(s)} \rightleftharpoons A_{(g)} + C_{(g)} \quad k_{P_2} = 2000\,atm$

Determine the total pressure developed in the vessel.

52. Among alkali metals, only Li reacts directly with N_2 (present in air) to form lithium nitride as per equation:

$6Li(s) + N_2(g) \rightarrow 2Li_3N(s)$

The amount of product formed (in grams) when 21 g of Li reacts with 14.4 g of air (having molar composition 20% O_2 and 80% N_2) is____.

53. The wave number of electromagnetic radiation emitted during the transition of electron between two levels of Li^{2+} ion whose principal quantum number sum is four and difference is 2, is $n \times R_H$. What is the value of n?

54. Among $NO, CN^-, H_2, He_2^+, Li_2, Be_2, B_2, C_2, N_2, O_2^-, NO^+, O_2^{2-}$ and F_2, the number of diamagnetic species is_____.

55. Three moles of an ideal gas ($C_{p,m}$ = 2.5R) and 2 moles of another ideal gas ($C_{p,m}$ = 3.5R) are taken in a vessel and compressed reversibly and adiabatically. In this process, the temperature of gaseous mixture increased from 300 K to 400 K. The increase in internal energy of gaseous mixture (in kcal) is____. [R = 2 cal/mol/K] (Round off to nearest integer)

56. One mole of an ideal gas (γ = 1.4) is expanded isothermally and reversibly at 27°C till its volume is doubled. It is then adiabatically compressed reversibly to its original volume. The magnitude of total work done (in J) by the gas is _____.

$\left(2^{0.4} = \frac{4}{3}, R = 8.3\,JK^{-1}mol^{-1}\right)$ (ln 2 = 0.7)

57. The sum of IE_1 and IE_2 and those of IE_3 and IE_4 in (kJ mol^{-1}) for Ni and Pt are given blow.

	$(IE_1 + IE_2)$	$(IE_3 + IE_4)$	Total
Ni	2.5×10^3	8.8×10^3	11.3×10^3
Pt	2.7×10^3	6.7×10^3	9.4×10^3

The sum of most common oxidation state (O.S.) of Ni and Pt will be _____.

58. Element X reacts with oxygen to produce a pure sample of X_2O_3. In an experiment it is found that 1.00 g of X produces 1.16 g of X_2O_3. Calculate the atomic weight of X (Given atomic weight of oxygen 16.0 g mol^{-1}).

59. How many of the following species contain one or more lone pair(s) on central atom, that is present in an orbital having contribution from d-orbital?

SOF_4 $SeOCl_2$ SeF_3^+ ICl_4^-

XeF_5^+ BeF_6^- TeF_5^-

60. A given solution is saturated with both Ag_2CrO_4 and $Ag_2C_2O_4$. The K_{sp} of $Ag_2CrO_4 = 9 \times 10^{-12}$ and K_{sp} of $Ag_2C_2O_4 = 6 \times 10^{-12}$. In the resulting solution determine $[Ag^+] \times 10^5$ in the nearest possible integer. [Given: $(240)^{1/3} = 6.214$]

SECTION-III (MATHEMATICS)

Single Correct Type Questions

61. $\sin47° - \sin25° + \sin61° - \sin11° =$

(1) $\cos7°$

(2) $\sin7°$

(3) $2\cos7°$

(4) $2\sin7°$

62. The complete solution set of the inequality $(|x-1|-3)(|x-2|-5) < 0$ is $(a,b) \cup (c,d)$ then the value of $|a| + |b| + |c| + |d|$ is

(1) 12 (2) 14

(3) 16 (4) 18

63. If $\alpha+i\beta=\left(\frac{-1+i\sqrt{3}}{2}\right)^{3n_1/4}(1-i)^{-2n_2}$ (where n_1 and n_2 are positive integer) then which of the following is false

(1) $\alpha=0$ if only one of n_1 and n_2 is odd
(2) $\beta=0$ if both n_1 and n_2 are odd
(3) $\alpha=0$ if both n_1 and n_2 are even
(4) $\beta=0$ if both n_1 and n_2 are even

64. In ΔABC, if

$$p=\tan\frac{B-C}{2}\cot\frac{B+C}{2} \quad q=\tan\frac{C-A}{2}\cot\frac{C+A}{2}$$

$$r=\tan\frac{A-B}{2}\cot\frac{A+B}{2} \text{ then } \Sigma p=:$$

(1) 1
(2) Σpq
(3) $-pqr$
(4) None of these

65. The number of values of r satisfying the equation ${}^{69}C_{3r-1}-{}^{69}C_{r^2}={}^{69}C_{r^2-1}-{}^{69}C_{3r}$ is

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

66. The coefficient of x^{n-2} in the polynomial $(x-1)(x-2)(x-3)\ldots\ldots(x-n)$ is

(1) $\frac{n(n^2+2)(3n+1)}{24}$ (2) $\frac{n(n^2-1)(3n+2)}{24}$

(3) $\frac{n(n^2+1)(3n+2)}{24}$ (4) $\frac{n(n^2+1)(3n-2)}{24}$

67. **Assertion (A):** Coefficient of $a^2b^3c^4$ in the expansion of $(a+b+c)^8$ is $\frac{8!}{2!3!4!}$.

Reason (R): Coefficient of $a^\alpha b^\beta c^\gamma$, where $\alpha+\beta+\gamma=n$, in the expansion of $(a+b+c)^n$ is $\frac{n!}{\alpha!\beta!\gamma!}$

(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 and (R) is true.

68. If a, b $(a>b>0)$ be 2 numbers such that the ratio of their H.M. and G.M. is $(4r^2-1):(4r^2+1)$ and r is so large that square and higher powers of $1/r$ may be neglected then $\sqrt{a:b}$ is equal to

(1) $\frac{r-1}{r}$

(2) $\frac{r+1}{r}$

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

(4) None of these

69. If $\frac{(x-3)^{\frac{-|x|}{x}}\sqrt{(x-4)^2}(17-x)}{\sqrt{-x}\left(-x^2+x-1\right)\left(|x|-32\right)}<0$ then no. of integers x satisfying the inequality is:

(1) 29 (2) 30
(3) 31 (4) 32

70. Given $\log_{10}2=a$ and $\log_{10}3=b$. If $3^{x+2}=45$, then the value of $\frac{1-a}{b}$ is equal to

(1) $x/2$
(2) x
(3) $2x$
(4) $x/6$

71. A seven digit number is in the form of *abcdefg* (g, f, e etc. are digit at units, tens, hundreds place etc.) where $a<b<c<d>e>f>g$. Then number of such possible numbers is

(1) 1960
(2) 4800
(3) 7608
(4) 4708

72. The value of

$$\frac{\left(1^4+\frac{1}{4}\right)\left(3^4+\frac{1}{4}\right)\cdots\left((2n-1)^4+\frac{1}{4}\right)}{\left(2^4+\frac{1}{4}\right)\left(4^4+\frac{1}{4}\right)\cdots\left((2n)^4+\frac{1}{4}\right)}$$ is equal to

(1) $\frac{1}{4n^2+2n+1}$ (2) $\frac{1}{8n^2+4n+1}$

(3) $\frac{1}{4\left(2n^2+n+1\right)}$ (4) $\frac{n}{8n^2-4n+1}$

73. If a_i; i = 1, 2, 3, 4 be four real numbers of the same sign then the minimum value of $\sum\frac{a_i}{a_j}$

$i,j\in\{1,2,3,4\}, i\neq j$ is

(1) 8
(2) 6
(3) 12
(4) None of these

74. The equation $|2\alpha x-3|+|\alpha x+1|+|5-\alpha x|=1/2$ possesses -

(1) infinite number of real solution for some $a\in R$
(2) finitely many real solution for some $a\in R$
(3) no real solution for some $a\in R$
(4) no real solution for all a $a\in R$

75. 'p' is a prime number and $n < p < 2n$, if $N = {}^{2n}C_n$, then -

(1) p divides N
(2) p^2 divides N
(3) p cannot divides N
(4) None of these

76. If $S_n=\sum_{r=1}^{n}\frac{2r+1}{r^4+2r^3+r^2}$ then S_{20} is equal to

(1) $\frac{220}{221}$ (2) $\frac{420}{441}$

(3) $\frac{439}{221}$ (4) $\frac{440}{441}$

77. The coefficient of x^5 in the expansion of $\left(x^2-x-2\right)^5$ is

(1) -83 (2) -82
(3) -86 (4) -81

78. The equation $2\cos^2\left(\frac{x}{2}\right)\sin^2 x=x^2+x^{-2}, x\leq\frac{\pi}{2}$ has

(1) No real solution
(2) One real solution
(3) More than one real solution
(4) None of the above

79. The value of ${}^{20}C_0-\frac{{}^{20}C_1}{2}+\frac{{}^{20}C_2}{3}-\frac{{}^{20}C_3}{4}+\ldots$ is $\lambda/21$ then λ is ...

(1) 1 (2) 21

(3) $\frac{1}{21}$ (4) 20

80. Number of ways to arrange 13 boys and 4 girls in a row so that exactly 3 boys sits between 2 girls is $p!\,q!$ then $|p-q|$ is equal to

(1) 4 (2) 6
(3) 8 (4) 10

Integer Type Questions

81. Three non zero real number form an A.P. and the square of the number taken in the same order form a G.P.. Then the sum of all possible value of common difference, is

82. A five digit number is formed by digits 1, 2, 3, 4 and 5 without repetition. If number of numbers which are divisible by 4 is k. Then value of k is

83. The number of integral values of 'a' for which $f(x) = ax^2-(3+2a)x+6$, $a\neq 0$ is positive for exactly three distinct negative integral values of x, is

84. Value of integer x $(x > 2)$ satisfying the equation $\frac{e^{\ln x+\ln(x-1)+\ln(x-2)...+\ln 1}}{(x-2)!} = 20$ is

85. If equation $x^4 - (3m + 2)x^2 + m^2 = 0$ $(m > 0)$ has four real solutions which are in A.P. then m equals to

86. A number of teams participated in a round robin competition of football world cup where each team played other once. All teams scored same no. of points except four whose total was 17.5. Then no. of teams participated in tournament are (Assume each win given 1 point, a draw gives 1/2 point & loss 0 point)

87. If maximum value of $\log_3(4x + 5 - x^2)$ is α, then no. of solution of equation $\log_\alpha(\alpha x - 5) = \log_\alpha(3 - \alpha x)$ is

88. Last digit in $(1! + 2! + 3! ... + 2005!)^{500}$ is

89. Polynomial $P(x)$ contains only terms of odd degree. When $P(x)$ is divided by $x - 3$, the remainder is 6. If $P(x)$ is divided by $x^2 - 9$, then remainder is $g(x)$, so $g(2)$ will be.

90. If $z_1 z_2 \in C$, $z_1^2 + z_2^2 \in R$, $z_1\left(z_1^2 - 3z_2^2\right) = 2$ and $z_2\left(3z_1^2 - z_2^2\right) = 11$, then the value of $z_1^2 + z_2^2$ is