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JEE Main

Time : 9:00 am to 12:00 am **Part Test-01 (XI)** **Max. Marks : 300**

IMPORTANT INSTRUCTION:

1. Immediately fill in the Admission number on this page of the Test Booklet with **Blue/Black** Ball Point **Pen** only.

2. The candidates should not write their Admission Number anywhere (except in the specified space) on the Test Booklet/ Answer Sheet.

3. The test is of **3 hours** duration.

4. The Test Booklet consists of 75 questions. The maximum marks are 300.

5. There are **three** parts in the question paper 1,2,3 consisting of **Physics, Chemistry** and **Mathematics** having **75 questions** in each subject and subject having two sections.
(I) Section -I contains 20 **multiple choice** questions with only one correct option.
Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases.

(II) Section-II contains **5 Numerical Value Type** questions.
The Answer should be within **0 to 9999**. If the Answer is in Decimal then round off to the nearest Integer value (Example i,e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11**).
Marking scheme: +4 for correct answer, 0 if **not attempt** and **–1** in all other cases.

6. Use **Blue / Black Point Pen only** for writing particulars / marking responses on the Answer Sheet. **Use of pencil is strictly prohibited.**

7. No candidate is allowed to carry any textual material, printed or written, bits of papers, mobile phone any electron device etc, except the Identity Card inside the examination hall.

8. Rough work is to be done on the space provided for this purpose in the Test Booklet only.

9. On completion of the test, the candidate must hand over the Answer Sheet to the invigilator on duty in the Hall. **However, the candidate are allowed to take away this Test Booklet with them.**

10. **Do not fold of make any stray marks on the Answer Sheet**

Name of the Candidate (in Captial) : _____

Admission Number : | | | | | | | |

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

PHYSICS
SECTION - A

Q.1 In an instrument there are 25 divisions on the vernier scale which have length of 24 divisions on the main scale. 1 cm on main scale is divided in 20 equal parts. Find the least count.

(1) 0.01 cm (2) 0.005 cm
(3) 0.001 cm (4) 0.002 cm

Q.2 In the relation $P = \frac{\alpha}{\beta} e^{\frac{\alpha Z}{k\theta}}$; P is pressure, Z is distance, k is Boltzmann constant and θ is the temperature. The dimensions of β will be :

(1) $[M^0L^2T^0]$ (2) $[ML^2T]$
(3) $[ML^0T^{-1}]$ (4) $[M^0L^2T^{-1}]$

Q.3 A body projected vertically upwards with a certain speed from top of a tower, reaches the ground in time t_1. If it is projected vertically downwards with same speed from same point, it reach the ground in the time t_2. Time required for it to reach the ground if it dropped from the same point and projected horizontally with same speed.

(1) $\sqrt{t_1 + t_2}, \sqrt{t_1 - t_2}$ (2) $\sqrt{t_1 + t_2}, \sqrt{t_1 + t_2}$
(3) $\sqrt{t_1 t_2}, \sqrt{t_1 + t_2}$ (4) $\sqrt{t_1 t_2}, \sqrt{t_1 t_2}$

Q.4 Three quantities A, B and C are measured as $A = 2 \pm 0.005$, $B = 1 \pm 0.001$ and $C = 4 \pm 0.01$. Then the percentage error in $R = \frac{AC^3}{B^2}$ is

(1) 1.2 (2) 0.8 (3) 0.7 (4) 1.05

Q.5 Equation of a particle moving along the x axis is $x = u(t - 2) + a(t - 2)^2$. Here t is time in seconds.
(a) The initial velocity of the particle is u
(b) The acceleration of the particle is a
(c) The acceleration of the particle is 2a
(d) At t = 2 particle is at origin.
Choose the correct statements.

(1) a, b, c, d (2) a, b
(3) c,d (4) a, b, d

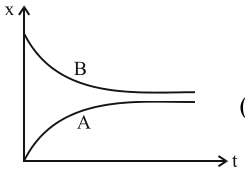
Q.6 A force is represents by $F = ax^2 + bt^{\frac{1}{2}}$ where x = distance and t = time. The dimensions of $\frac{b^2}{a}$:

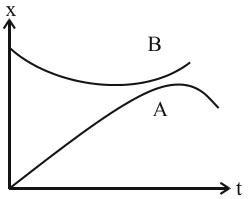
(1) $[ML^2T^{-3}]$ (2) $[ML^3T^{-3}]$
(2) $[MLT^{-2}]$ (4) $[ML^{-1}T^{-1}]$

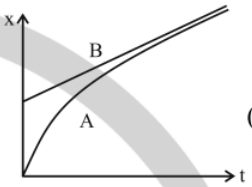
Q.7 The relation between time 't' and distance 'x' is $t = \alpha x^2 + \beta x$, where α and β are, constants. The relation between acceleration (a) and velocity (v) is :

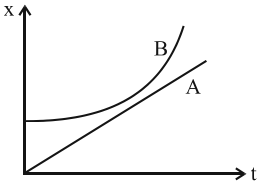
(1) $a = -2\alpha v^3$ (2) $a = -3\alpha v^2$
(3) $a = -5\alpha v^5$ (4) $a = -4\alpha v^4$

Q.8 Car A and B are moving due east and west on the same straight horizontal road. At the last minute the driver of each car slams on the brakes and a head on collision is narrowly averted. Assuming the east as the positive direction and location of car A at the moment when brakes are applied to be zero, suggest which one of the following graphs best represents position (x)-time (t) relationship for each car?

(1) 

(2) 

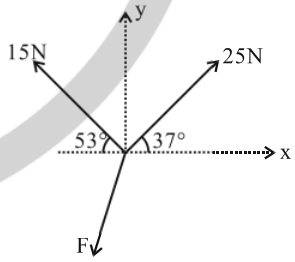
(3) 

(4) 

Q.9 A police party is chasing a dacoit in a jeep which is moving at a constant speed v. The dacoit is on a motor cycle. When he is at a distance x from the jeep, he accelerates at constant rate α(starting from rest). Which of the following relations is true, if the police is able to catch the dacoit?

(1) $v^2 \le \alpha x$ (2) $v^2 \le 2\alpha x$
(3) $v^2 \ge 2\alpha x$ (4) $v^2 \ge \alpha x$

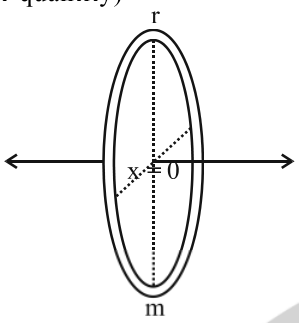
Q.10 Three forces are acting on an object shown in diagram. Their resultant is zero. The $\vec{F}$ is :-



(1) $\left(-11\hat{i} - 27\hat{j}\right)N$ (2) $\left(-20\hat{i} - 27\hat{j}\right)N$
(3) $\left(11\hat{i} - 3\hat{j}\right)N$ (4) $\left(20\hat{i} - 3\hat{j}\right)N$

Q.11 **Assertion (A) :** The accuracy of standard screw gauge is more than the accuracy of a standard vernier caliper.
Reason (R) : The least count of standard screw gauge is more than the least count of standard vernier caliper.
(1) A and R are true and R is the correct explanation of A
(2) A and R are true, but R is not the correct explanation of A
(3) A is true but R is false
(4) Both A and R are false

Q.12 A particle is performing SHM along the axis of a fixed ring. Due to gravitational force, its displacement at time t is given by x = a sin ωt.
In this equation ω is found to depend on radius of the ring (r), mass of the ring (m) and gravitational constant (G). Using dimensional analysis, find the expression of ω in terms of m, r and G. (Here k is a constant quantity)



(1) $\omega = k\sqrt{\frac{r^3}{Gm}}$ (2) $\omega = k\sqrt{\frac{Gm}{r^2}}$

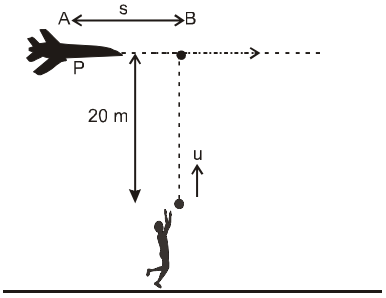
(3) $\omega = k\sqrt{\frac{Gm}{r^3}}$ (4) $\omega = k\sqrt{\frac{G}{mr^2}}$

Q.13 Match the following :

Physical quantity		Dimension	
(i)	Stefan's constant 'σ'	(P)	$M^1L^{-1}T^{-1}$
(ii)	Wien's constant 'b'	(Q)	$M^1L^0T^{-3}K^{-4}$
(iii)	Coefficient of viscosity 'η'	(R)	$M^1L^0T^{-3}$
(iv)	Emissive power of radiation (Intensity emitted)	(S)	$M^0L^1T^0K^1$

(1) (i) - (Q), (ii) - (S), (iii) - (P), (iv) - (R)
(2) (i) - (P), (ii) - (Q), (iii) - (R), (iv) - (S)
(3) (i) - (Q), (ii) - (R), (iii) - (S), (iv) - (P)
(4) (i) - (R), (ii) - (P), (iii) - (Q), (iv)- (S)

Q.14 A toy plane P starts flying from point A along a straight horizontal line 20 m above ground level starting with zero initial velocity and acceleration 2 m/s^2 as shown. At the same instant, a man P throws a ball vertically upwards with initial velocity 'u'. Ball touches (coming to rest) the base of the plane at point B of plane's journey when it is vertically above the man. 's' is the distance of point B from point A. Just after the contact of ball with the plane, acceleration of plane increases to 4 m/s^2. Find:

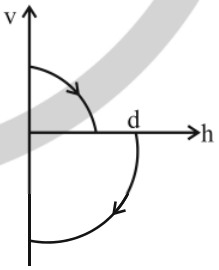


Initial velocity 'u' of ball.
(1) 10 m/s (2) 20 m/s (3) 30 m/s (4) 40 m/s

Q.15 **STATEMENT-1 :** A particle moves in a straight line with constant acceleration. The average velocity of this particle cannot be zero in any time interval
STATEMENT-2 : For a particle moving in straight line with constant acceleration, the average velocity in a time interval is $\frac{u+v}{2}$, where u and v are initial and final velocity of the particle in the given time interval.
(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(2) Statement-1 is True, Statement-2 is True; Statement-2 is not a correct explanation for Statement-1
(3) Statement-1 is True, Statement-2 is False
(4) Statement-1 is False, Statement-2 is True

Q.16 A space craft flying in a straight course at 75 km/s fires its rocket motors for 6.0 s and then moves with the constant speed attained. At the end of this time its speed is 120 km/s in the same direction. How far did the space craft travel in the first 10 s after the rocket motors were started, the motors having been in action for only 6.0 s ? (Assume rocket motors produce constant acceleration)
(1) 850 km (2) 650 km (3) 950 km (4) 1065 km

Q.17 A ball is dropped vertically from a height d above the ground. It hits the ground and bounces up vertically to a height $\frac{d}{2}$. Neglecting subsequent motion and air resistance, its velocity v varies with height h above the ground as :-

(1)


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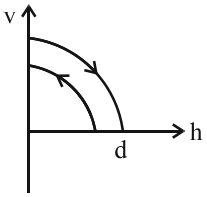
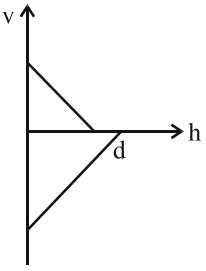


(3)


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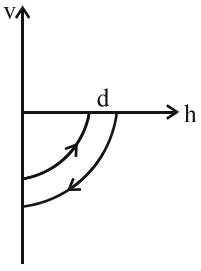


Q.18 Two vectors $\vec{a}$ & $\vec{b}$ are varying with time as $\vec{a} = 3t\,\hat{i} + 4t^2\hat{j}$ & $\vec{b} = (6t+3)\,\hat{i} + (7\sin t)\hat{j}$ Find the magnitude of the rate of change of $\vec{a}.\vec{b}$ at $t = \frac{\pi}{2}$ sec.

(1) $42\pi + 6$ (2) $46\pi + 6$
(3) $42\pi + 9$ (4) $46\pi + 9$

Q.19 Position vector of a particle is given by $\vec{r} = \vec{r}_0(1-at)$ t , t is time and r_0 and a are constants. The velocity of particle when it returns to starting point:-

(1) $-\vec{r}_0$ (2) $\vec{r}_0$ (3) $2\vec{r}_0$ (4) $-a\vec{r}_0$

Q.20 The velocity of a particle varies with time as $\vec{v} = -t\hat{i} - e^{-t}\hat{j} + \frac{c}{t}\hat{k}$. If the particle accelerates perpendicular to the direction of its motion after one second. The value of c is :

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

SECTION - B

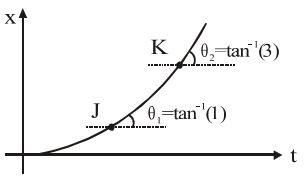
Q.21 $a = \frac{b^3c}{\sqrt{d}}$ where a, b, c and d are physical quantities. If errors in measurements of b, c and d are 2%, 1% and 6% respectively, then the error in calculation of a (in percentage) is __

Q.22 A particle is moving in straight line, it's velocity (v) with time (t) is given as $v = (t^2 - 1)$m/s. The distance travelled by the particle between $t = 0$ to $t = 2$ sec. is _____cm

Q.23 If two vectors $\vec{P} = \hat{i} + 2m\hat{j} + m\hat{k}$ and $\vec{Q} = 4\hat{i} - 2\hat{j} + m\hat{k}$ are perpendicular to each other. Then, the value of m will be _____

Q.24 For the given vector $\vec{A} = 3\hat{i} - 4\hat{j} + 10\hat{k}$, the ratio of magnitude of its component on z–axis and component on the x-y plane is _____

Q.25 x–t graph for a uniformly accelerated motion is as shown in the figure. Then find the average velocity (in m/s) between points J and K will be _____



CHEMISTRY
SECTION - A

Q.26 The value of $(n_2 + n_1)$ and $\left(n_2^2 - n_1^2\right)$ for He^+ ion in atomic spectrum are 4 and 8 respectively. The wavelength of emitted photon when electron jump from n_2 to n_1 is

(1) $\frac{32}{9}R_H$ (2) $\frac{9}{32}R_H$ (3) $\frac{9}{32R_H}$ (4) $\frac{32}{9R_H}$

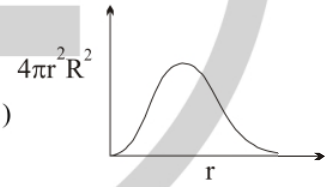
Q.27 Calculate the maximum and minimum number of electrons. Which may have magnetic quantum number m = +1 and spin quantum number $s = +\frac{1}{2}$ in Chromium (Cr).

(1) 3, 2 (2) 6, 4 (3) 4, 2 (4) 2, 1

Q.28 Photons of equal energy were allowed to strike on two different gas samples. H-atoms in one sample is in some excited state with a principal quantum number 'n' and H-atoms in other sample is in ground state. The photonic beams totally ionise the H-atoms in both samples. If the difference in the kinetic energy of the ejected electrons in the two different cases is 12.75 eV. Then the principal quantum number 'n' of the excited state is

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

Q.29 The graph representing radial charge density of 3s electron

(1)


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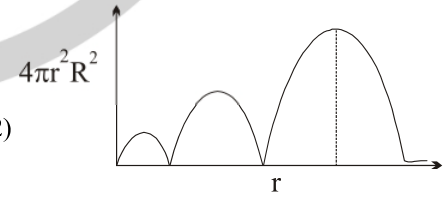
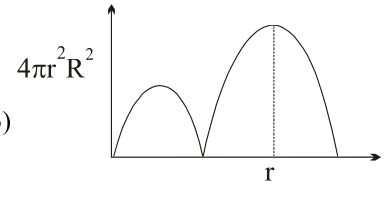
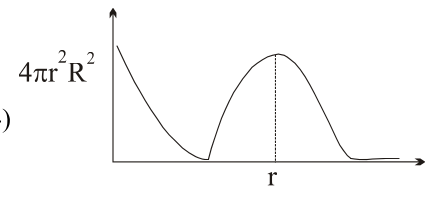


(3)


(4)


Q.30 Which is / are **incorrect** statement.
(1) Energy of a photon having wavelength 2480 Å is 5 eV
(2) Maximum kinetic energy a photoelectron emitted from a metal [work function= 2eV] by a photon of wavelength 310 nm is 3.2×10^{-19} J
(3) Energy of a particle of mass 2μ amu, converted into energy is 3.0×10^{-16} J
(4) All are incorrect

Q.31 In a hydrogen atom, in transition of electron a photon of energy 2.55 eV is emitted, then the change in wavelength of the electron is
(1) 3.32 Å (2) 6.64 Å
(3) 9.97 Å (4) None of these

Q.32 **Statement-1:** The angular momentum of an electron in n^{th} orbit is same for all H-like species.
Statement-2: The velocity of electron in n^{th} orbit is equal for all H-like species.
(1) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
(2) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
(3) Statement-1 is true, statement-2 is false.
(4) Statement-1 is false, statement-2 is true.

Q.33 The wavelength of the electron emitted by a metal sheet of work function 4 eV when photons from EMR of wavelength 124 nm strike the metal plate.
(1) 10 nm (2) 206.67 nm
(3) 50 nm (4) 0.5 nm

Q.34 Which of the following options is **incorrect** regarding Bohr's Model of an atom?
(1) Ionisation energy (I.E.) order :
$$I.E._{H} < I.E._{He^+} < I.E._{Li^{+2}}$$
(2) Angular Momentum (AM) order of electron in n^{th} shell : $AM_{2nd\ shell} < AM_{4th\ shell} < AM_{6th\ shell}$
(3) If PE at the infinity is assigned as 13.6 eV then ratio of magnitude of KE to that of PE of Ist Bohr orbit in hydrogen will be in the ratio 1 : 2.
(4) Order of speed (V) of electron in n^{th} shell of hydrogen : $V_{2nd\ shell} > V_{5th\ shell} > V_{6th\ shell}$

Q.35 Which of the following transition will have a wavelength different than that observed in rest of the transitions?
(1) H-atoms, transition from 3rd level to 1st level.
(2) He^+ ion, transition from 5th excited state to 1st excited state.
(3) Li^{2+} ion, transition from 9th level to 3rd level.
(4) Be^{+3} ion, transition from 11th excited state to 3rd level.

Q.36 74 gm of a sample on complete combustion gives 132 gm CO_2 and 54 gm of H_2O. The molecular formula of the compound may be
(1) C_5H_{12} (2) $C_4H_{10}O$ (3) $C_3H_6O_2$ (4) $C_3H_7O_2$

Q.37 The pair of species having same percentage (mass) of carbon is:
(1) CH_3COOH and $C_6H_{12}O_6$
(2) CH_3COOH and C_2H_5OH
(3) $HCOOCH_3$ and $C_{12}H_{22}O_{11}$
(4) $C_6H_{12}O_6$ and $C_{12}H_{22}O_{11}$

Q.38 Number of moles of NH_3 produced if 140 gm of N_2 reacts with 40 gm of hydrogen.
[Given % yield of reaction is 50%]
(1) 12 (2) 10 (3) 5 (4) 6

Q.39 1 litre of a gaseous organic compound $C_nH_{3n}O_m$ is completely burnt in an excess of oxygen. The contraction in volume in litre is (assume water get condensed out).
(1) $\left(1+\frac{n}{2}-\frac{3m}{4}\right)$ (2) $\left(1+\frac{3n}{4}-\frac{m}{4}\right)$
(3) $\left(1-\frac{n}{2}-\frac{3m}{4}\right)$ (4) $\left(1+\frac{3n}{4}-\frac{m}{2}\right)$

Q.40 The mass of Mg_3N_2 produced if 48 gm of Mg metal is reacted with 34 gm NH_3 gas is
$$Mg + NH_3 \longrightarrow Mg_3N_2 + H_2$$
(1) $\frac{200}{3}$ (2) $\frac{100}{3}$ (3) $\frac{400}{3}$ (4) $\frac{150}{3}$

Q.41 Rearrange the following I to IV in order of increasing masses and choose the correct answer.
(I) 1 molecule of oxygen
(II) 1 molecule of nitrogen
(III) 1×10^{-10} gm-molecule of oxygen
(IV) 1×10^{-10} gm-molecule of copper
(1) II < I < III < IV (2) IV < III < II < I
(3) II > I > III > IV (4) I < II < III < IV

Q.42 The sample containing same number of 'H' atoms as there are 'H' atoms in 3 moles of H_2
(1) 74.5 gm of $(NH_4)_3PO_4$
(2) 10 ml of CH_3COOH (d = 3 gm / ml)
(3) 22.4ℓ of NH_3 at 1 atm and 273 K
(4) 3.01×10^{23} molecules of C_6H_5OH

Q.43 The **incorrect** statement(s) regarding 2M $CaCl_2$ aqueous solution is/are ($d_{solution}$ = 1.222 gm/ml)
(1) Molality of Cl^- is 4m
(2) Mole fraction of $CaCl_2$ is 0.034
(3) % w/v of $CaCl_2$ solution is 44.4
(4) % w/w of $CaCl_2$ solution is 18.166

Q.44 Calculate the volume of Cl_2 gas (in ml) liberated at 1 atm & 273 K when 1.74 gm MnO_2 reacts with 2.19 gm HCl according to the following reaction with % yield 40.

$MnO_2 + HCl \longrightarrow MnCl_2 + Cl_2 + H_2O$

(1) 336 ml (2) 112 ml (3) 134.4 ml (4) 44.8 ml

Q.45 The relationship between mole fraction 'X_A' of the solute and molality 'm' of its solution in ammonia would be

(1) $58.82\dfrac{(1-X_A)}{X_A} = m$ (2) $\dfrac{58.82X_A}{(1-X_A)} = m$

(3) $\dfrac{55.56X_A}{(1-X_A)} = m$ (4) $\dfrac{55.56(1-X_A)}{X_A} = m$

SECTION - B

Q.46 In a sample of H-atom if only 3 atoms are present and all are in 6th excited state then maximum possible photons of different wavelengths are

Q.47 Photon's of wavelength 350 nm are incident on the surface of a metal with work function 4eV. What will be the photocurrent generated ?

Q.48 A charged particle accelerated from rest by a potential difference of 30 volts, is projected towards the nucleus of a dipositive atom. If the closest distance of approach is 14.4 Å, then calculate atomic number of the atom.

Q.49 CO_2 is an acidic gas, therefore on dissolving it in NaOH solution, $NaHCO_3$ and Na_2CO_3 may be obtained, depending upon amount of CO_2 and NaOH taken. Calculate weight (in gm) of Na_2CO_3 Obtained when 440 gm if CO_2 is reacted with 6L of 2M NaOH, leaving none of the reactants.

Q.50 Analysis of a gaseous compound CCl_xF_y, shows that it contains 11.79% C and 69.57% Cl. In another experiment, you find that 0.051 gm of compound fills a 224 ml flask at 0°C with a pressure of 19 mm Hg. The value of 'x' is :

MATHEMATICS

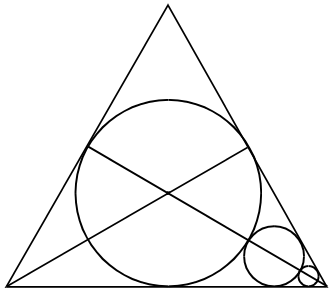
SECTION - A

Q.51 Let S_k be the sum from the first term to the k^{th} term of the arithmetic sequence with the first term unity and common difference 1. Then $\sum_{k=1}^{100}\left(\frac{1}{S_k}\right)$ equals

(1) $\dfrac{99}{50}$ (2) $\dfrac{200}{101}$ (3) $\dfrac{19}{10}$ (4) $\dfrac{100}{51}$

Q.52 If for an A.P. $a_1, a_2, a_3, \ldots, a_n, \ldots$
$a_1 + a_3 + a_5 = -12$ and $a_1 a_2 a_3 = 8$
then the value of $a_2 + a_4 + a_6$ equals
(1) –12 (2) –16 (3) –18 (4) –21

Q.53 A circle is inscribed in an equilateral triangle whose side length is 2. Then another circle is inscribed externally tangent to the first circle but inside the triangle as shown, and then another and another. If this process continues indefinitely, the total area of all the circles is



(1) $\dfrac{3\pi}{8}$ (2) $\dfrac{4\pi}{8}$ (3) $\dfrac{5\pi}{8}$ (4) $\dfrac{6\pi}{8}$

Q.54 For $x \in (1, \infty)$, if $P = x^3 - \dfrac{1}{x^3}$ and $Q = x - \dfrac{1}{x}$ then the minimum value of $\dfrac{P}{Q^2}$ equals

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

Q.55 The sequence $\log_{12}162$, $\log_{12}x$, $\log_{12}y$, $\log_{12}z$, $\log_{12}1250$ is an arithmetic progression. The value of x is

(1) $125\sqrt{3}$ (2) 270 (3) $162\sqrt{5}$ (4) 434

Q.56 The value of $\log_{(\underbrace{333....3}_{50\text{ times}})}\sqrt{\underbrace{1111....1}_{100\text{ times}} - \underbrace{222.....2}_{50\text{ times}}}$, is

(1) 1 (2) 2 (3) 0 (4) $\dfrac{1}{2}$

Q.57 If 1, x, y is a geometric progression and x, y, 3 is an arithmetic progression, then the maximum value of $(x + y)$ is

(1) 0 (2) $\dfrac{9}{2}$ (3) $\dfrac{15}{4}$ (4) 1

Q.58 If x, y, z are positive reals such that $x^2 + y^2 + z^2 = 7$; $xy + yz + zx = 4$ then the minimum value of xy is $\dfrac{p}{q}$ (p, q are relatively prime). Then the value of $(p + q)$.

(1) 2 (2) 5 (3) $\dfrac{15}{4}$ (4) 6

Q.59 Find the value of

$$2002+\frac{1}{2}\left(2001+\frac{1}{2}\left(2000+.....+\frac{1}{2}\left(3+\frac{1}{2}(2)\right)\right)\right).....\Bigg).$$

(1) 4002 (2) 3010 (3) 2950 (4) 2700

Q.60 If a, b and c are the roots of $x^3 + 3x + 1 = 0$, then $(a-b)^2 + (b-c)^2 + (c-a)^2$ is equal to
(1) –18 (2) –12 (3) 18 (4) 12

Q.61 If the quadartic equation $4^{\sec^2\alpha}.x^2 + 2x + \left(\beta^2 - \beta + \frac{1}{2}\right) = 0$ has real roots, then the value of $2^{\log_\beta\left(3+\cos^2\alpha\right)}$, is
(1) $\frac{1}{16}$ (2) $\frac{1}{4}$ (3) 1 (4) $\frac{1}{8}$

Q.62 The solution set of the inequation $\sqrt{x^2+6x+5} > (8-x)$ is
(1) $(8, \infty)$ (2) $\left(\frac{59}{22}, 8\right]$ (3) $\left(\frac{59}{22}, \infty\right)$ (4) $(-1, \infty)$

Q.63 If one root is ten times the other root of the equation $2x^2 - 33x + p = 0$, then p equals
(1) 25 (2) 45 (3) 70 (4) 90

Q.64 If the quadratic equation formed by eliminating x from $x^2 + \alpha x + \beta = 0$ and $xy + l(x + y) + m = 0$ has the same roots as that of the given quadratic equation, then the set of values of β is
(1) $\{m, \alpha l - m\}$ (2) $\{m, l + m\}$
(3) $\{m, \alpha l + m\}$ (4) $\{m, l - m\}$

Q.65 If α, β are the roots of the equation $x^2 - 4x + 5 = 0$, then the quadratic equation whose roots are $\alpha^2 + \beta$ and $\alpha + \beta^2$ is
(1) $x^2 + 10x + 34 = 0$ (2) $x^2 - 10x + 34 = 0$
(3) $x^2 - 10x - 34 = 0$ (4) $x^2 + 10x - 34 = 0$

Q.66 If the roots of the equation $(p-3)x^2 + 2(p-3)x + 2p - 5 = 0$ are real and distinct for $\alpha < p < \beta$ and $(\beta - \alpha)$ is maximum, then the extreme value of the quadratic expression $-(\alpha + \beta)x^2 + \alpha\beta x + (\alpha - \beta)$ is
(1) $-\frac{4}{5}$ (2) 5 (3) –1 (4) $\frac{4}{5}$

Q.67 If $x^2 - 3ax + 14 = 0$ and $x^2 + 2ax - 16 = 0$ have a common root then $a^4 + a^2 =$
(1) 2 (2) 90 (3) 6 (4) 20

Q.68 If the roots of the equation $\sqrt{\frac{x}{1-x}} + \sqrt{\frac{1-x}{x}} = \frac{5}{2}$ are p and q (p > q) then the value of $\frac{p}{q(p+q)}$, is
(1) 1 (2) 2 (3) 4 (4) 2/5

Q.69 If $\left|\frac{x^2+kx+1}{x^2+x+1}\right| < 3$ for all real numbers x, then the range of the parameter k is
(1) (0, 4) (2) (–1, 5) (3) (–4, 0) (4) (–5, 1)

Q.70 Let α, β be the roots of the equation $x^2 - |a|x - |b| = 0$ such that $|\alpha| < |\beta|$. If $|\alpha| < \beta - 1$, then the positive root of $\log_{|\alpha|}\left(\frac{x^2}{\beta^2}\right) - 1 = 0$, is
(1) $< |\alpha|$ (2) $< \alpha$ (3) $< \beta$ (4) $> \beta$

SECTION - B

Q.71 The number of ways in which three distinct numbers can be chosen from the set S = {10, 11, 12, ..., 100} such that they form a G.P. with common ratio an integer greater than 1, is

Q.72 Let a, b, c, d be four distinct real numbers in A.P. Find the smallest positive value of k satisfying $2(a-b) + k(b-c)^2 + (c-a)^3 = 2(a-d) + (b-d)^2 + (c-d)^3$.

Q.73 Let $R - (\alpha, \beta)$ be the range of $\frac{x+3}{(x-1)(x+2)}$. Then $\left(\frac{1}{\alpha} - \frac{1}{\beta}\right)$ is equal to

Q.74 If α, β are the irrational roots of the equation $x^5 - 5x^4 + 9x^3 - 9x^2 + 5x - 1 = 0$, then $(\alpha^4 + \beta^4)$, is

Q.75 The roots α and β of a quadratic equation are the square of two consecutive natural numbers. The geometric mean of the two roots is 1 greater than the difference of the roots. If α and β lies between the roots of $x^2 - cx + 1 = 0$, then find the minimum integral value of c.