SHIKSHA CLASSES, BHANDARA

TEST-2

CHEMISTRY , PHYSICS, MATHEMATICS

Time : - 3 Hours **Max. Marks:- 300** **Date : .....**

INSTRUCTIONS :

1. The test is of 3 hours duration.
2. The Test Booklet consists of 90 questions. The maximum marks are **300.**
3. There are three parts in the question paper A, B, C consisting of Chemistry, Physics and Mathematics having **30questions** in each part of equal weightage. **20 questions** will be **MCQs** and **10 questions** (**ATTEMPT ANY FIVE QUESTIONS OUT OF 10**)will have answer to be filled as **numerical value**.
   Marking Scheme for MCQs
   Correct Answer Four mark (+4), Incorrect Answer Minus one mark (–1), Unanswered No mark (0)
   Marking Scheme for questions for which answer is a **Numerical value**
   Correct Answer Four mark (+4), Incorrect Answer No mark (0), Unanswered No mark (0)
4. 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.

SYLLABUS

CHEMISTRY : THERMODYNAMICS, EQUILIBRIUM, REDOX REACTIONS.

PHYSICS : WORK, ENERGY AND POWER, CIRCULAR MOTION, ROTATIONAL MOTION, GRAVITATION, PROPERTIES OF SOLIDS AND LIQUIDS.

MATHEMATICS : PERMUTATIONS AND COMBINATIONS, MATHEMATICAL INDUCTION, BINOMIAL THEOREM AND ITS SIMPLE APPLICATIONS.

Creativity is intelligence having fun.

The surest way not to fail is to determine to succeed.

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PART A – CHEMISTRY

SECTION - 1 (Q.1 - Q.20)

Each question has FOUR options (1), (2), (3) and (4). ONLY ONE of these four options is correct.

Q.1 150 mL of 0.0008 M ammonium sulphate is mixed with 50 mL of 0.04 M calcium nitrate. The ionic product of $CaSO_4$ will be:-

($K_{sp} = 2.4 \times 10^{-5}$ for $CaSO_4$)

(1) $< K_{sp}$ (2) $> K_{sp}$

(3) $\approx K_{sp}$ (4) None of these

Q.2 In the reaction at 300 K

$$C_6H_6(\ell) + \frac{15}{2}O_2(g) \rightarrow 6CO_2(g) + 3H_2O(\ell)$$

$\Delta H = -3271$ kJ

What is the value of ΔU for combustion of 1.5 mol benzene at 27°C ?

(1) – 3267.25 kJ (2) – 4900.88 kJ

(3) – 4906.5 kJ (4) – 3274.75 kJ

Q.3 $P_4 + 3NaOH + 3H_2O \rightarrow 3NaH_2PO_2 + PH_3$ is an example of :-

(1) Inter molecular Redox reaction

(2) Intra molecular Redox reaction

(3) Disproportionation Redox reaction

(4) None of these

Q.4 The correct set of oxidation number of N in NH_4NO_2 is :

(1) –3, +5 (2) +5, –3

(3) –3, –3 (4) –3, +3

Q.5 For the equilibrium $H_2O(\ell)$ □ H_2O (ν), which of the following is correct ?

(1) $\Delta G = 0, \Delta H < 0, \Delta S < 0$

(2) $\Delta G < 0, \Delta H > 0, \Delta S > 0$

(3) $\Delta G > 0, \Delta H = 0, \Delta S > 0$

(4) $\Delta G = 0, \Delta H > 0, \Delta S > 0$

Q.6 If bond energy for $H_2(g)$, $Br_2(g)$ and HBr(g) is 433, 192 & 364 kJ mol^{-1} respectively then $\Delta H°$ for the reaction, $H_2(g) + Br_2(g) \rightarrow 2HBr(g)$ is :-

(1) + 261 kJ (2) – 103 kJ

(3) – 261 kJ (4) + 103 kJ

Q.7 The oxidation state of iodine in $H_4IO_6^-$ is :

(1) +7 (2) –1

(3) +5 (4) +1

Q.8 For silver, C_p ($JK^{-1}mol^{-1}$) = 23 + 0.01T. If the temperature (T) of 3 moles of silver is raised from 300K to 1000 K at 1 atm pressure, the value of ΔH will be close to

(1) 21 kJ (2) 16 kJ

(3) 13 kJ (4) 62 kJ

Q.9 5.1g NH_4SH is introduced in 3.0 L evacuated flask at 327°C. 30% of the solid NH_4SH decomposed to NH_3 and H_2S as gases. The K_p of the reaction at 327°C is (R = 0.082 L atm $mol^{-1}K^{-1}$,

Molar mass of S = 32 g mol^{-1},

Molar mass of N = 14g mol^{-1})

(1) 1×10^{-4} atm^2 (2) 4.9×10^{-3} atm^2

(3) 0.242 atm^2 (4) 0.242×10^{-4} atm^2

Q.10 Iodine reacts with concentrated HNO_3 to yield Y along with other products. The oxidation state of iodine in Y, is :

(1) 5 (2) 3

(3) 1 (4) 7

Q.11 5 moles of an ideal gas at 100 K are allowed to undergo reversible compression till its temperature becomes 200 K. If C_V = 28 $JK^{-1}mol^{-1}$, calculate ΔU and ΔpV for this process. (R = 8.0 JK^{-1} mol^{-1}]

(1) ΔU = 14 kJ; Δ (pV) = 4 kJ

(2) ΔU = 14 kJ; Δ (pV) = 18 kJ

(3) ΔU = 2.8 kJ; Δ (pV) = 0.8 kJ

(4) ΔU = 14 kJ; Δ (pV) = 0.8 kJ

Q.12 At a definite temperature for which of the following the value of ($\Delta E - \Delta H$) will be maximum:

(1) $PCl_5(g) \rightarrow PCl_3(g) + Cl_2(g)$

(2) $NH_4HS(s) \rightarrow NH_3(g) + H_2S(g)$

(3) $N_2(g) + O_2(g) \rightarrow 2NO(g)$

(4) $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$

SPACE FOR ROUGH WORK

Q.13 Solid $KClO_3$ is taken in a container maintained at constant pressure of 1 atm. Upon heating following equilibrium is obtained

$2KClO_3(s) \rightleftharpoons 2KCl(s) + 3O_2(g)$

If $\Delta H° = 25$ kcal/mol and $\Delta S° = 50$ cal/K, at what temperature equilibrium will be established in the container. (Ignore variation of $\Delta H°$ and $\Delta S°$ with temperature.)

(1) 298 K (2) 500 K
(3) 5000 K (4) 300 K

Q.14 Oxidation number of C in HNC is :

(1) +2 (2) –3
(3) +3 (4) Zero

Q.15 What will be ΔS for reaction:

$2A + 3B \rightarrow 4C + 5D$

$\Delta S_A° = 100 \frac{J}{mol \times k}$; $\Delta S_C° = 200 \frac{J}{mol \times k}$

$\Delta S_B° = 120 \frac{J}{mol \times k}$; $\Delta S_D° = 150 \frac{J}{mol \times k}$

(1) 105 J/k (2) 990 J/k
(3) 300 J/k (4) 130 J/k

Q.16 The solubility of AgCl is minimum in :

(1) $AgNO_3$ (0.1 M) (2) H_2O (ℓ)
(3) NaCl (0.4 M) (4) $BaCl_2$ (0.3 M)

Q.17 17.4% (w/v) K_2SO_4 (M_w =174 g/mol) solution at 27°C is isotonic to 4% (w/v) NaOH solution at same temperature. If NaOH is 100% ionized, what is % ionization of K_2SO_4 in aqueous solution

(1) 20% (2) 60%
(3) 100% (4) 50%

Q.18 $HF + HClO_4 \rightleftharpoons H_2F^+ + ClO_4^-$ and

$H_2O + H_2PO_4^- \rightleftharpoons H_3O^+ + HPO_4^{-2}$

Select out the group of acidic species lying on the right side of the equilibrium :

(1) H_2F^+, HPO_4^{-2} (2) H_3O^+, H_2F^+
(3) ClO_4^-, H_3O^+ (4) ClO_4^-, HPO_4^{-2}

Q.19 The oxidation number of sulphur in S_8, S_2F_2 and H_2S respectively are :

(1) 0, +1, –2 (2) +2, +1, –2
(3) 0, +1, +2 (4) –2, +1, –2

Q.20 0.1M CH_3COOH is titrated against 0.1M NaOH. What would be the difference in pH between 1/4 and 3/4 stages of neutralisation of acid :

(1) 2 log (3/4) (2) 2 log (1/4)
(3) log (8/3) (4) 2 log 3

SECTION - 2 (Q.21 - Q.30)

This section contains TEN (10) questions. ATTEMPT ANY FIVE (05) QUESTIONS. The answer to each question is NUMERICAL VALUE. If the numerical value has more than two decimal places truncate/round-off the value upto TWO decimal places.

Q.21 For a chemical reaction,

$2A(g) + 3B(g) \rightleftharpoons 4C(g) + 5D(g)$

equilibria was established by taking 4 moles of A and 6 moles of B initially. If at equilibrium total pressure is 10 atm and equilibrium constant of the reaction is $10^{39}/6$ atm^4 then find value of $\frac{P_C + P_D}{2}$ at equilibrium.

Q.22 AB_2 is a salt of strong base $A(OH)_2$ and weak acid, HB. The saturated solution of AB_2 contains 0.6 moles in 2L solution. If pOH of the solution is 5.6 and 90% dissociation of the salt takes place then what is pK_a of weak acid.

[Given : log (0.54) = – 0.27]

Q.23 Given $H_2(g) + S(s) \rightleftharpoons H_2S(g)$;

$\Delta G°_f(H_2S, gas) = – 6.909$ kcal

If K_p for this reaction is 1×10^x at 300K calculate the value of x.

SPACE FOR ROUGH WORK

Q.24 $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ at 300 K,
Given

Gas	NH_3	N_2	H_2
$\Delta_f H°(J)$	-45×10^3	0	0
$\Delta_f S°(Jk^{-1})$	+200	+190	130

Calculate the value of Z, where

$$z = \left|\frac{(\Delta_r G° \text{in kJ})}{4}\right|$$

Q.25 Calculate the percent dissociation of $H_2S(g)$ if 0.1 mole of H_2S is kept in 0.4 litre vessel at 1000 K. For the following reaction :
$2H_2S(g) \rightarrow 2H_2(g) + S_2(g)$; $K_c = 1.0 \times 10^{-6}$.

Q.26 1 mole of an ideal gas is allowed to expand isothermally at 27ºC till its volume is tripled . If the expansion is carried out reversibly then the $\Delta S_{universe}$ will be ?

Q.27 Consider the equilibrium $A(g) + 2B(g) \rightarrow C(g)$ when the reaction was carried out at 120°C the equilibrium concentration of A and B were 3M and 4M respectively. When the volume of the vessel was doubled and system allowed to reach equilibrium the concentration of B was found to be 3M. The original concentration of C will be –

Q.28 Amongst the following, the total number of compounds whose aqueous solution turns red litmus paper blue is
KCN K_2SO_4 $(NH_4)_2C_2O_4$ NaCl $Zn(NO_3)_2$
$FeCl_3$ K_2CO_3 NH_4NO_3 LiCN

Q.29 For an isomerisation reaction A $\rightarrow$ B the temperature dependence of equilibrium constant is given by $\log_e K = 4.0 - \frac{2000}{T}$.
Find the numerical value of ΔS in cal/mol at 500K (R = 2 cal/mol/K)

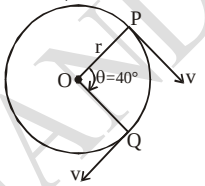
Q.30 A decinormal solution of potassium ferrocyanide is 50% dissociated at 300 K. The van der Waals' i factor is

PART B – PHYSICS

SECTION - 1 (Q.31 - Q.50)

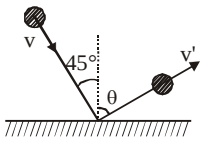
Each question has FOUR options (1), (2), (3) and (4). ONLY ONE of these four options is correct.

Q.31 A particle is moving on a circular path of radius r with uniform speed v. The magnitude of change in velocity when the particle moves from P to Q is :- ($\angle$ POQ = 40°)



(1) 2v cos 40° (2) 2v sin 40°
(3) 2v sin 20° (4) 2v cos 20°

Q.32 A ball strikes a horizontal surface as shown in figure. If co-efficient of restitution e = $1/\sqrt{3}$, then angle θ is :-



(1) 45° (2) 60°
(3) 30° (4) 0°

Q.33 The mass per unit length of a rod of length ℓ is given by : $\lambda = \frac{M_0 x}{\ell}$, where M_0 is a constant and x is the distance from one end of the rod. The position of centre of mass of the rod is :-
(1) 4ℓ / 3 (2) ℓ/3
(3) 2ℓ / 3 (4) 5ℓ / 3

Q.34 A particle of mass m travelling along x-axis with speed v_0 shoots out 1/3rd of its mass with a speed $2v_0$ along y-axis. The velocity of remaining piece is:-
(1) $v_0\left(\frac{3}{2}\hat{i} - \hat{j}\right)$ (2) $\frac{v_0}{2}(3\hat{i} - \hat{j})$
(3) $v_0\left(\frac{1}{2}\hat{i} - 3\hat{j}\right)$ (4) $\frac{v_0}{2}(\hat{i} + 3\hat{j})$

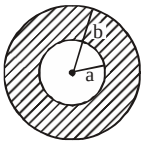
SPACE FOR ROUGH WORK

Q.35 A thin circular plate of mass M and radius R has its density varying as $\rho(r) = \rho_0 r$ with ρ_0 as constant and r is the distance from its centre. The moment of Inertia of the circular plate about an axis perpendicular to the plate and passing through its edge is $I = aMR^2$. The value of the coefficient a is:

(1) 3/2 (2) 1/2

(3) 3/5 (4) 8/5

Q.36 A circular disc of radius b has a hole of radius a at its centre (see figure). If the mass per unit area of the disc varies as (σ_0/r), then the radius of gyration of the disc about its axis passing through the centre is :



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

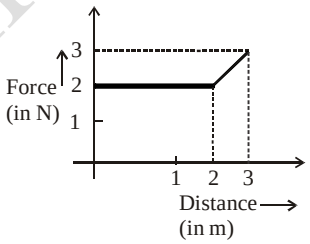
(3) $\sqrt{\frac{a^2+b^2+ab}{2}}$ (4) $\sqrt{\frac{a^2+b^2+ab}{3}}$

Q.37 In a certain region of space, the gravitational field is given by –k/r, where r is the distance and k is a constant. If the gravitational potential at $r = r_0$ be V_0, then what is the expression for the gravitational potential (V) :

(1) $V_0 + k \ln (r/r_0)$ (2) $V_0 + k \ln (r_0/r)$

(3) $V_0 + k \log (r/r_0)$ (4) $V_0 + k \log (r_0/r)$

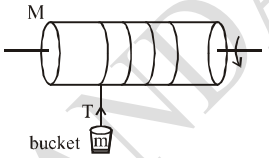
Q.38 A particle moves in one dimension from rest under the influence of a force that varies with the distance travelled by the particle as shown in the figure. The kinetic energy of the particle after it has travelled 3m is :



(1) 6.5 J (2) 2.5 J

(3) 4 J (4) 5 J

Q.39 A cylinder of mass M and radius r is mounted on a frictionless axle over a well. A rope of negligible mass is wrapped around the solid cylinder and a bucket of mass m is suspended from the rope. The linear acceleration of the bucket will be :-



(1) $a = \frac{2mg}{M+2m}$ (2) $a = \frac{mg}{M+m}$

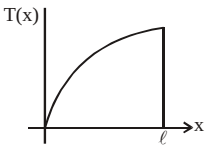
(3) $a = \frac{mg}{M+2m}$ (4) $a = \frac{Mg}{M+2m}$

Q.40 A compressive force is applied to a uniform rod of rectangular cross-section so that its length decreases by 1%. If the Poisson's ratio for the material of the rod be 0.2, which of the following statements is correct ? "The volume approximately ....."

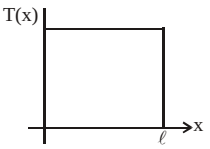
(1) decreases by 1% (2) decreases by 0.8%

(3) decreases by 0.6% (4) increases by 0.2%

Q.41 A uniform rod of length ℓ is being rotated in a horizontal plane with a constant angular speed about an axis passing through one of its ends. If the tension generated in the rod due to rotation is T(x) at a distance x from the axis, then which of the following graphs depicts it most closely?



(1)



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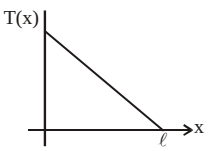

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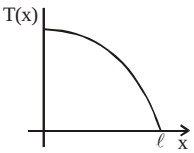


(4)

SPACE FOR ROUGH WORK

Q.42 A stationary horizontal disc is free to rotate about its axis. When a torque is applied on it, its kinetic energy as a function of θ, where θ is the angle by which it has rotated, is given as $k\theta^2$. If its moment of inertia is I then the angular acceleration of the disc is :

(1) $\frac{k\theta}{2I}$ (2) $\frac{k\theta}{I}$

(3) $\frac{k\theta}{4I}$ (4) $\frac{2k\theta}{I}$

Q.43 A simple pendulum, made of a string of length ℓ and a bob of mass m, is released from a small angle θ_0. It strikes a block of mass M, kept on a horizontal surface at its lowest point of oscillations, elastically. It bounces back and goes up to an angle θ_1. Then M is given by :

(1) $\frac{m}{2}\left(\frac{\theta_0-\theta_1}{\theta_0+\theta_1}\right)$ (2) $\frac{m}{2}\left(\frac{\theta_0+\theta_1}{\theta_0-\theta_1}\right)$

(3) $m\left(\frac{\theta_0+\theta_1}{\theta_0-\theta_1}\right)$ (4) $m\left(\frac{\theta_0-\theta_1}{\theta_0+\theta_1}\right)$

Q.44 A satellite is moving with a constant speed v in circular orbit around the earth. An object of mass 'm' is ejected from the satellite such that it just escapes from the gravitational pull of the earth. At the time of ejection, the kinetic energy of the object is :

(1) $(3/2)\,mv^2$ (2) mv^2

(3) $2mv^2$ (4) $(1/2)\,mv^2$

Q.45 A solid sphere, of radius R acquires a terminal velocity v_1 when falling (due to gravity) through a viscous fluid having a coefficient of viscosity η. The sphere is broken into 27 identical solid spheres. If each of these spheres acquires a terminal velocity, v_2, when falling through the same fluid, the ratio (v_1/v_2) equals :

(1) 1/27 (2) 1/9

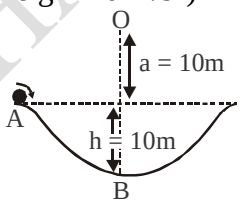
(3) 27 (4) 9

Q.46 A wedge of mass M = 4m lies on a frictionless plane. A particle of mass m approaches the wedge with speed v. There is no friction between the particle and the plane or between the particle and the wedge. The maximum height climbed by the particle on the wedge is given by :

(1) $2v^2/7g$ (2) v^2/g

(3) $2v^2/5g$ (4) $v^2/2g$

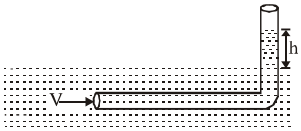
Q.47 A particle of mass 20 g is released with an initial velocity 5 m/s along the curve from the point A, as shown in the figure. The point A is at height h from point B. The particle slides along the frictionless surface. When the particle reaches point B, its angular momentum about O will be (Take g = 10 m/s^2)



(1) 8 kg-m^2/s (2) 6 kg-m^2/s

(3) 3 kg-m^2/s (4) 2 kg-m^2/s

Q.48 An L-shaped glass tube is just immersed in flowing water towards tube as shown. If speed of water current is V, then the height h upto which water rises will be :-

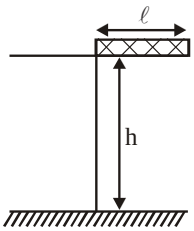


(1) $V^2/2g$ (2) $g/2V^2$

(3) $V^2/4g$ (4) $2V^2/g$

Q.49 A rectangular solid box of length 0.3 m is held horizontally, with one of its sides on the edge of a platform of height 5m. When released, it slips off the table in a very short time t = 0.01s, remaining essentially horizontal. The angle by which it would rotate when it hits the ground will be (in radians) close to :

SPACE FOR ROUGH WORK



(1) 0.02 (2) 0.28
(3) 0.5 (4) 0.3

Q.50 To mop-clean a floor, a cleaning machine presses a circular mop of radius R vertically down with a total force F and rotates it with a constant angular speed about its axis. If the force F is distributed uniformly over the mop and if coefficient of friction between the mop and the floor is μ, the torque, applied by the machine on the mop is :

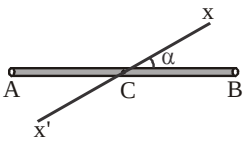
(1) (2/3) μFR (2) μFR/3
(3) μFR/2 (4) μFR/6

SECTION - 2 (Q.51 - Q.60)

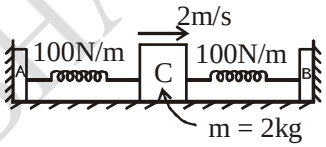
This section contains TEN (10) questions. ATTEMPT ANY FIVE (05) QUESTIONS. The answer to each question is NUMERICAL VALUE. If the numerical value has more than two decimal places truncate/round-off the value upto TWO decimal places.

Q.51 A uniform solid sphere of mass M and radius R is surrounded symmetrically by a uniform thin spherical shell of equal mass and radius 2R. The value of gravitational potential at a distance (3/2)R from the centre is $-\frac{(A)}{6}\frac{GM}{R}$. Then find the value of A.

Q.52 The moment of inertia of a uniform rod of length 2ℓ and mass m about an axis xx' passing through its centre and inclined at an angle α is $\frac{m\ell^2}{(X)}\sin^2\alpha$. Then find the value of X.

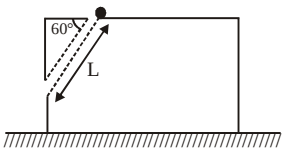


Q.53 A and B are massless supports attached to two springs (A and B not attached with wall), both the springs are identical and light. Friction coefficient between block C and horizontal surface is 0.5 and its mass is 2 kg. When both the springs are in their natural length block C was given a velocity of 2m/s towards right. Then the distance travelled by block before coming to rest for the first time is (x/10) m then x is:



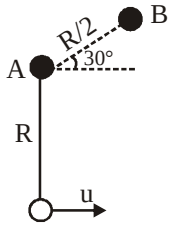
Q.54 A spherical soap bubble has internal pressure P_0 and radius r_0 and is equilibrium in an enclosure with pressure is $P_1 = 8P_0/9$. The enclosure is gradually evacuated. Assuming temperature and surface tension of soap bubble to be fixed find the value of $\frac{\text{final radius}}{\text{initial radius}}$ of soap bubble.

Q.55 Shown in the figure is a block having an inclined smooth groove in vertical plane. A ball of same mass is released at rest from top end. Time when ball will leave groove is $\sqrt{\frac{nL}{2g\sqrt{3}}}$. Find n.

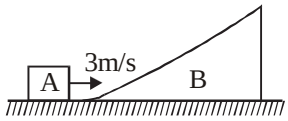


SPACE FOR ROUGH WORK

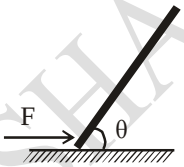
Q.56 A ball is hanging vertically by a string of length R = 10 cm from peg A. There is another peg B at a distance R/2 at an angle of 30° with the horizontal as shown in the figure. Find the minimum horizontal velocity (in m/s) given at the lowest position so that the string always remains taut.



Q.57 In the figure shown A is of mass 1 kg and B of mass 2 kg. A moves with velocity 3 m/s and rises on B which is initially at rest. All the surfaces are smooth. By the time A reaches the highest point on B, find the work done by A on B in joule.



Q.58 A force F is applied to a uniform, thin rod of mass 4 kg and length ℓ = 50 cm. The rod has pure translational motion in the vertical plane along a smooth, horizontal surface as shown. If F = 60 N, the angle θ for translation of rod in the given orientation comes to be $\theta = \tan^{-1}(2/X)$. Find X.



Q.59 A uniform rod is kept at smooth horizontal surface, a constant force is applied on the rod in horizontal direction at end 'A'. Find the ratio of energy stored per unit volume at end A to the energy stored per unit volume in the middle of rod.

Q.60 A large open tank is filled with water upto a height H. A small hole is made at the base of the tank. It takes T_1 time to decrease the height of water to H/n (n > 1) and it takes T_2 time to take out the remaining water. If $T_1 = T_2$, then the value of n is :

PART C – MATHEMATICS

SECTION - 1 (Q.61 - Q.80)

Each question has FOUR options (1), (2), (3) and (4). ONLY ONE of these four options is correct.

Q.61 The sum of the coefficient of all even degree terms in x in the expansion of $(x+\sqrt{x^3-1})^6+(x-\sqrt{x^3-1})^6$, (x > 1) is equal to :

(1) 32 (2) 26
(3) 29 (4) 24

Q.62 A committee of 11 members is to be formed from 8 males and 5 females. If m is the number of ways the committee is formed with at least 6 males and n is the number of ways the committee is formed with at least 3 females, then :

(1) m = n = 78 (2) n = m – 8
(3) m + n = 68 (4) m = n = 68

Q.63 The number of ways of choosing 10 objects out of 31 objects of which 10 are identical and the remaining 21 are distinct, is :

(1) 2^{20} (2) $2^{20} - 1$
(3) $2^{20} + 1$ (4) 2^{21}

Q.64 Suppose that 20 pillars of the same height have been erected along the boundary of a circular stadium. If the top of each pillar has been connected by beams with the top of all its non-adjacent pillars, then the total number beams is

(1) 210 (2) 190
(3) 170 (4) 180

Q.65 The number of four-digit numbers strictly greater than 4321 that can be formed using the digits 0,1,2,3,4,5 (repetition of digits is allowed) is :

(1) 288 (2) 306 (3) 360 (4) 310

Q.66 The coefficient of x^{18} in the product $(1 + x)(1 - x)^{10}(1 + x + x^2)^9$ is :

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(1) –84 (2) 84
(3) 126 (4) –126

Q.67 The term independent of x in the expansion of $\left(\frac{1}{60}-\frac{x^8}{81}\right)\cdot\left(2x^2-\frac{3}{x^2}\right)^6$ is equal to :

(1) 36 (2) – 108
(3) – 72 (4) – 36

Q.68 The number of 6 digit numbers that can be formed using the digits 0, 1, 2, 5, 7 and 9 which are divisible by 11 and no digit is repeated, is :

(1) 36 (2) 60
(3) 48 (4) 72

Q.69 If the fourth term in the binomial expansion of $\left(\sqrt{\frac{1}{x^{1+\log_{10}x}}}+x^{1/12}\right)^6$ is equal to 200, and $x>1$, then the value of x is :

(1) 10^3 (2) 100
(3) 10^4 (4) 10

Q.70 The term independent of x in the product $(4+x+7x^2)\left(x-\frac{3}{x}\right)^{11}$ is -

(1) $7.{}^{11}C_6$ (2) $3^6.\ {}^{11}C_6$
(3) $3^5.\ {}^{11}C_5$ (4) $-12.\ 2^{11}$

Q.71 Let $R=(5\sqrt{5}+11)^{31}=I+f$, where I is an integer and f is the fractional part of R, then $R\cdot f$ is equal to -

(1) 2^{31} (2) 3^{31}
(3) 2^{62} (4) 1

Q.72 The total number of words which can be formed using all the letters of the word "AKSHI" if each word begins with vowel or terminates with vowel -

(1) 84 (2) 12
(3) 48 (4) 60

Q.73 The sum of the co–efficients in the expansion of $(1 – 2x + 5x^2)^n$ is 'a' and the sum of the coefficients in the expansion of $(1 + x)^{2n}$ is b. Then -

(1) a = b (2) $a = b^2$
(3) $a^2 = b$ (4) ab = 1

Q.74 Boxes numbered 1, 2, 3, 4 and 5 are kept in a row and they are necessarily to be filled with either a red or a blue ball such that no two adjacent boxes can be filled with blue balls. How many different arrangements are possible, given that the balls of a given colour are exactly identical in all respects ?

(1) 8 (2) 10
(3) 13 (4) 22

Q.75 The greatest terms of the expansion $(2x + 5y)^{13}$ when x = 10, y = 2 is -

(1) ${}^{13}C_5 . 20^8 . 10^5$ (2) ${}^{13}C_6 . 20^7 . 10^4$
(3) ${}^{13}C_4 . 20^9 . 10^4$ (4) none of these

Q.76 If all the letters of the word "QUEUE" are arranged in all possible manner as they are in a dictionary, then the rank of the word QUEUE is -

(1) 15^{th} (2) 16^{th}
(3) 17^{th} (4) 18^{th}

Q.77 The sum of the cubes of three consecutive natural numbers is divisible by-

(1) 2 (2) 5
(3) 7 (4) 9

Q.78 Number of numbers greater than a million and divisible by 5 which can be formed by using only the digits 1, 2, 1, 2, 0, 5 & 2 is -

(1) 120 (2) 110
(3) 90 (4) none of these

Q.79 $\sum_{i=1}^{20}\left(\frac{{}^{20}C_{i-1}}{{}^{20}C_i+{}^{20}C_{i-1}}\right)^3=\frac{k}{21}$, then k equals :

(1) 200 (2) 50
(3) 100 (4) 400

Q.80 The value of r for which ${}^{20}C_r\,{}^{20}C_0+{}^{20}C_{r-1}\,{}^{20}C_1+{}^{20}C_{r-2}\,{}^{20}C_2+\ldots.\,{}^{20}C_0\,{}^{20}C_r$ is maximum, is

(1) 20 (2) 15
(3) 11 (4) 10

SECTION - 2 (Q.81 - Q.90)

SPACE FOR ROUGH WORK

This section contains TEN (10) questions. ATTEMPT ANY FIVE (05) QUESTIONS. The answer to each question is NUMERICAL VALUE. If the numerical value has more than two decimal places truncate/round-off the value upto TWO decimal places.

Q.81 The expression

$$\frac{1}{\sqrt{4x+1}}\left[\left[\frac{1+\sqrt{4x+1}}{2}\right]^7-\left[\frac{1-\sqrt{4x+1}}{2}\right]^7\right]$$

is a polynomial in x of degree -

Q.82 If the third term in the binomial expansion of $(1+x^{\log_2 x})^5$ equals 2560, then a possible value of x is (1/A). Find the value of A.

Q.83 If $\sum_{r=0}^{25}\{{}^{50}C_r \cdot {}^{50-r}C_{25-r}\} = K\,({}^{50}C_{25})$, then K is equal to $(X)^{25}$. Find the value of X.

Q.84 The positive value of λ for which the co-efficient of x^2 in the expression $x^2\left(\sqrt{x}+\frac{\lambda}{x^2}\right)^{10}$ is 720, is

Q.85 The sum of the real values of x for which the middle term in the binomial expansion of $\left(\frac{x^3}{3}+\frac{3}{8}\right)^8$ equals 5670 is :

Q.86 Let there be 4 boys and 4 girls are standing in a row. If m is the number of ways in which all the girls are consecutive and n is the number of ways in which exactly 3 boys are consecutive. If p denotes the number of ways in which 5 men and 5 women stand in a row such that men and women are alternate, then the value of $\frac{p}{m+n}$ is equal the –

Q.87 Number of non-empty subsets of {1, 2, 3, 4, 5, 6, 7, 8} having exactly k elements and do not contain the element k for some k = 1, 2, ...,8 is (120 + A). Find the value of A.

Q.88 The term independent of x in the expansion of $\left(\frac{1-x}{1+x}\right)^2$ is–

Q.89 $\left(x+\sqrt{x^3-1}\right)^5+\left(x-\sqrt{x^3-1}\right)^5$ is a polynomial of the order of -

Q.90 Find the unit digit in the expansion of $(101)^{202} + (202)^{101} – (107)^{99}$.

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK