IIT- JEE-2011 PAPER - I

Time : 3 Hours **Maximum Marks : 240**

Please read the instructions carefully. You are allotted 5 mintues specifically for this purpose.

INSTRUCTIONS

A. General :

1. The question paper CODE is printed on the right hand top corner of this sheet and on the back page (page No. 36) of this booklet.
2. No additional sheets will be provided for rough work.
3. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets are NOT allowed.
4. Write your name and registration number in the space provided on the back page of this booklet.
5. The asnwer sheet, a machine-gradable Optical Respone Sheet (ORS), is provided separatly.
6. DO NOT TAMPER WITH/MUTILATE THE ORS OR THE BOOKLET.
7. Do not break the seals of the question-paper booklet before being instructed to do so by the invigilators.
8. This Question Paper contains 36 pages having 69 questions.
9. On breaking the seals, please check that all the questions are legible.

B. Filling the Right part of the ORS :

10. The ORS also has a **CODE** printed on its left and Right parts.
11. Make sure the CODE on the ORS is the same as that on this booklet **If the codes do not match ask for a change of the booklet.**
12. Write your Name, Registration No and the name of centre and sign **with pen** in the boxes provied. Do not write them anywhere else. Darken the appropriate bubble **UNDER** each digit of your Registration No. with a **good quality HB pencil.**

C. Question paper format and Marking Scheme :

13. The Question paper consists of **3 parts** (Chemistry, Physics and Mathematics). Each part consists of **four sections.**
14. In **Section I** (Total Marks : 21) for each question you will be awarded **3 marks** if you darken **ONLY** the bubble corresponding to the correct answer and **zero marks** if no bubble is darkened. In all other cases, **minus one (-1) mark** will be awarded.
15. I**n Section II** (Total Marks : 16) for each question you will be awarded **4 marks** of you darken ALL the bubbles(s) corresponding to the correct answer(s) **ONLY** and zero marks otherwise. There are no **negative marks** in this section.
16. In **Section III** (Toal Marks :) for each question you will be awarded **3 marks** if you darken **ONLY** the bubble corresponding to the correct answer and **zero marks** if no bubble is darkened. In all other cases, minus one (-1) mark will be awarded.
17. In Section IV (Total Marks: 28) for each question you will be awarded 4 marks if you darken ONLY the bubble corresponding to the correct answer and zero marks otherwise. There are no negative marks in this section.

DO NOT BREAK THE SEALS WITHOUT BEING INSTRUCTED TO DO SO BY THE INVIGILATOR

Useful data

$R = 8.314\ JK^{-1}\ mol^{-1}$ or $8.206 \times 10^{-2}\ L\ atm\ K^{-1}\ mol^{-1}$

$1F = 96500\ C\ mol^{-1}$

$h = 6.626 \times 10^{-3}\ Js$

$1\ eV = 1.602 \times 10^{-19}\ J$

$C = 3.0 \times 10^{8}\ ms^{-1}$

$N_A = 6.022 \times 10^{-23}$

Space of rough work

PART I : CHEMISTRY

SECTION - I (Total Marks : 21)

(Single Correct Answer Type)

This section contains **7 multiple choice question** Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

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1. Geometrical shapes of the complexes formed by the reaction of NI^{2+} With CI^-, CN^- and H_2O respectively, are

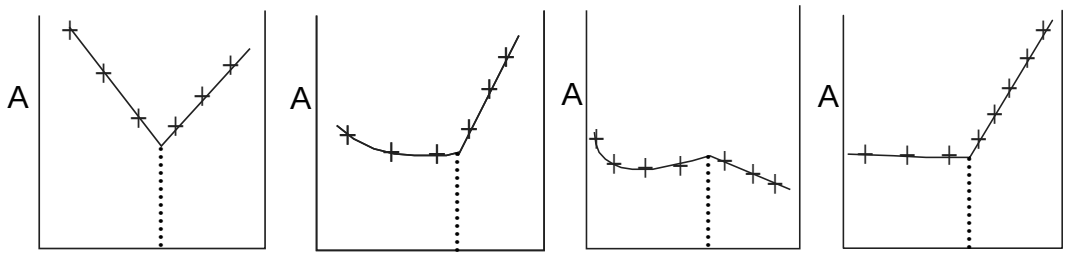
   (A) Octahedral, tetrachedral and square planer

   (B) Tetrahedral, square planer and octahedral

   (C) Square planar, tetrahedral and octahedral

   (D) Octahedral, square planar and octahedral

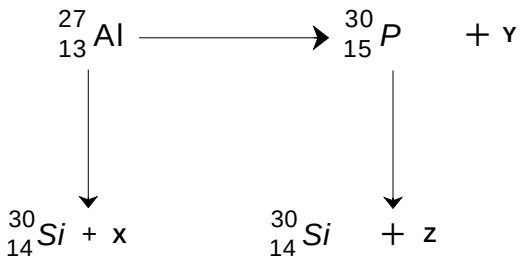
2. $AgNO_3$(aq) was added to an aqueous KCI solution gradually and the conductivity of the solution was measured. The plot of conductance (A) versus the volume of $AgNO_3$ is



(A) (P) **(B) (Q)** **(C) (R)** **(D) (S)**

Space of rough work

3. Bombardment of aluminum by x-particle leads to its artificial disintegration in two ways (i) and (ii) as shown Products **X, Y** and **Z** respectively are



(A) Proton, neutron, positron
(B) Neutron, positron, proton
(C) Proton, positron
(D) positron, proton, neutron

4 Extra pure N_2 can be obtained by heating

(A) NH_3 with CuO
(B) NH_4NO_3
(C) $(NH_4)_2Cr_2O_7$
(D) $Ba(N_3)_2$

5 Among the following compounds, the most acidic is

(A) p-nitrophenol
(B) p-hydroxybenzoic acid
(C) o-hydroxybenzoic acid
(D) p-toluic acid

Space of rough work

6. The major product of the following reaction is

7. Dissolving 120 g of urea (mol. wt. 60) in 1000 g of water gave a solution of density 1.15 g/mL. The molarity of the solution is

(A) 1.78 M (B) 2.00 M (C) 2.05 M (D) 2.22 M

Space of rough work

SECTION - II (Total Marks : 16)

(Multiple Correct Answer Type)

This section contains **4 multiple choice question** Each question has four choices (A), (B), (C) and (D) out of which **ONE or MORE** may be correct.

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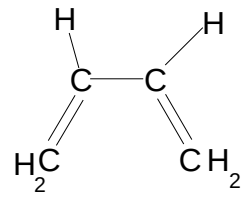
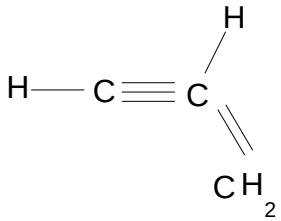
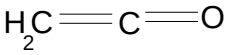
8. Extraction of metal from the are cassiterite involves

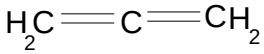
(A) carbon reduction of an oxide ore
B) Self-reduction of a sulphide ore
(C) removal of copper impurity
(D) removal of iron impurity

9. Amongst the given options, the compound(s) in which all the atoms are in one plane in all the possible conformations (if any), is (are

(A) 

(B) 

(C) 

(D) 

Space of rough work

10. The correct statement(s) pertaining to the adsorption of a gas on a solid surface is (are)

(A) Adsorption is always exothermic.

(B) Physisorption may transform into chemisorption at high temperatuer.

(C) Physisorption increases with increasing temperature but chemisorption decreases With increasing temperature.

(D) Chemisorption is more exothermic than physisorption, however it Is very slow due to higher energy of activation.

11. Accroding to kinetic theory of gases

(A) Collisions are always elastic.

(B) heavier molecules transfer more momentum to the wall of the container.

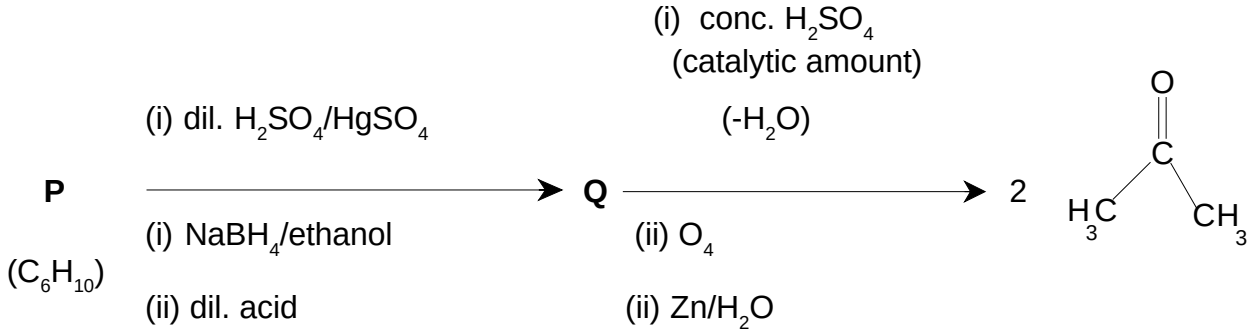
(C) only a small number of molecules have very high velocity.

(D) between collisions, the molecules move in straight lines with constant velocities.

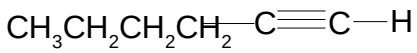
Space of rough work

Paragraph for Question Nos. 15 and 16

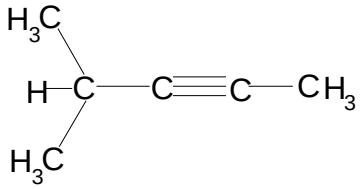
An acyclic hydrocarbon **P,** having molecular foumula C_6H_{10} gave acetone as the only Organic product through the following sequence of reations in which **Q** is an intermediate organic compound

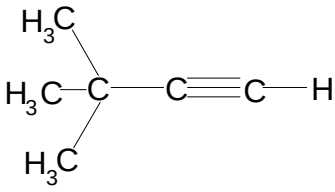


15. The structure of compound **P** is

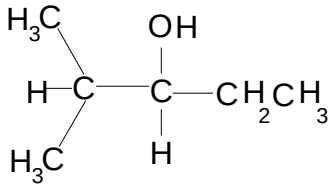
(A) 

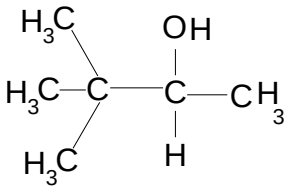
(B) 

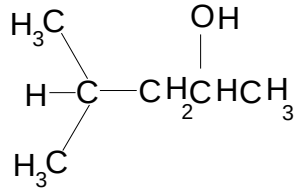
(C) 

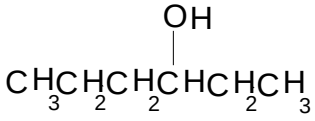
(D) 

16. The structure of the conpound **Q** is

(A) 

(B) 

(C) 

(D) 

Space of rough work

SECTION - IV (Total Marks : 28)

(Integer Answer Type)

This section contains **7 question** The answer to each of the questions is a single-digit integer, reanging from 0 to 0. The bubble corresponding to the correct answer is to be darkened in the ORS.

17. Reaction of Br_2 with Na_2CO_3 in aqueous solution gives sodium bromide and sodium bromate with evolution of CO_2 gas. The number of sodium bromide molecules involved in the balanced chemical equation is.

18. The differeance in the oxidation numbers of the two types of sulphur atoms in $Na_2S_4O_6$ is

19. The maximum number of electrons that can have principal quantum number, n = 3 and spin quantum number m8 = -1/2, is

Space of rough work

20. A decapeptide (Mol. Wt. 796) on complete hydrolysis gives glycine (Mol. Wt. 75), alanine and phenylalanine. Glycine contributes 47.0 % to the total weight of the hydrolysed products. The number of glycine units present in the decapeptide is.

21. To an evacuated vessel with movable piston under external pressure of 1 atm. , 0.1 mol of He and 1.0 mol of an unknown compound (vapour pressure of 1 atm., 0.1 mol of He and 1.0 mol of an unknown compound (vapour pressure 0.68 atm. at 0 ^{0}C) are introduced Considering the ideal gas behaviour, the total volume (in litre) of the gases at o ^{0}C is close to. **********

22. The total number of alkenes possible by dehydrobromination of 3-bromo-3-cyclopentylhexane using alcoholic KHO is.

23. The work function (ϕ) of some metals is listed below. Yhe number of metals which will show photoelectric effect when light of 300 nm wavelength falls on the metal is

Metal	Li	Na	K	Mg	Cu	Ag	Fe	Pt	W
ϕ (eV)	2.4	2.3	2.2	3.7	4.8	4.3	4.7	6.3	4.75

Space of rough work

PART II : PHYSICS

SECTION - I (Total Marks : 21)

(Single Correct Answer Type)

This section contains **7 multiple choice question** Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

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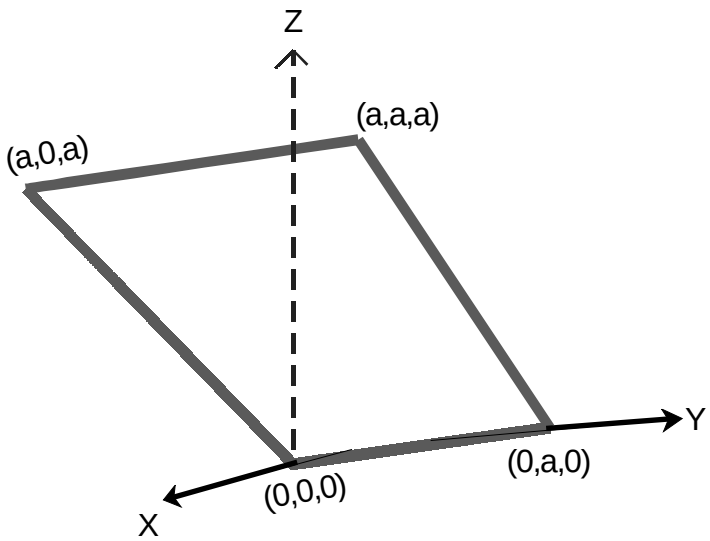
24. 5.6 liter of helium gas at STP is adiabatically compressed to 0.7 liter. Taking the initial temperature to be T_1' the work done in the process is

(A) $\frac{9}{8}RT_1$ (B) $\frac{3}{2}RT_1$ (C) $\frac{15}{8}RT_1$ (D) $\frac{9}{2}RT_1$

25. Consider an electric filed $\bar{E} = E_0\alpha$ where E_0 is a constant. The flux through the shaded area (as show in the figure) due to this field is



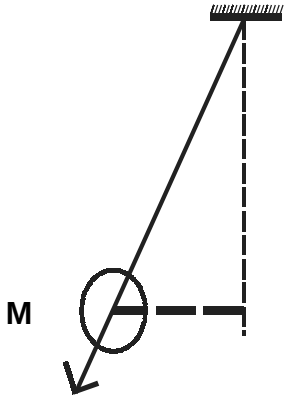
(A) $2E_0a^2$ (B) $\sqrt{2E_0}a^2$ (C) E_0a^2 (D) $\frac{E_0a^2}{\sqrt{2}}$

26. The wavelength of the first spectral line in the Balmer series of hydrogen atom is 6561A The wavelength of the second spectral line in the Balmer series of singly-ionized helium atom is

(A) 1215 Å (B) 1640 Å (C) 2430 Å (D) 4687 Å

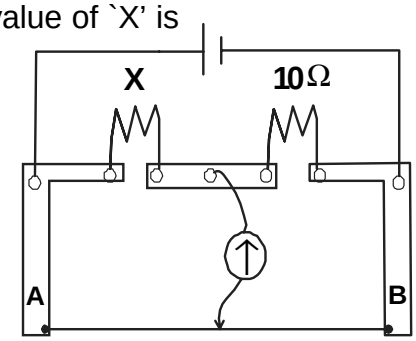
Space of rough work

27. A ball of mass (m) 0.5 kg is attached to the end of a string having length (L) 0.5 m. The ball is rotated on a horizontal circular path about vertical axis. The maximum tension that the string can bear is 324 N. The maximum possible value of angular velocity of ball (in redian/s) is.



(A) 9 (B) 18 (C) 27 (D) 36

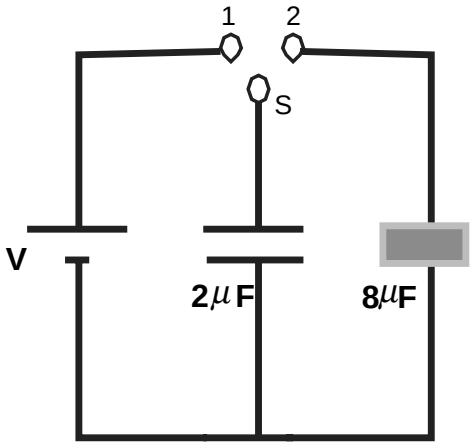
28 A meter bridge is set-up as shown, to determine an unknown resistance `X' using a standared 10 ohm resistor. The galvanometer shows null point when tapping-key is at 52 cm mark. The end-corrections are 1 cm and 2 cm respectively for the ends A and B The determinded value of `X' is



(A) 10.2 ohm (B) 10.6 ohm (C) 10.8 (D) 11.1 ohm

Space of rough work

29. A 2 F capacitor is charged as shown in figure. The percentage of its stored energy dissipated after the switch S is turned to position 2 is



(A) 0% (B) 20% (C) 75% (D) 80%

30 A police car with a siren of frequency 8 KHz is moving with uniform velocity 36 km/hr towards a tall building which refects the sound waves. The speed of sound in air is 320 m/s. The frequency of the siren heard by the car drive is

(A) 8.50 kHz (B) 8.25 kHz (C) 7.75 kHz (D) 7.50 kHz

Space of rough work

SECTION - II (Total Marks : 16)

(Multiple Correct Answer Type)

This section contains **4 multiple choice question** Each question has four choices (A), (B), (C) and (D) out of which **ONE or MORE** may be correct.

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31. An electron and a proton are moving on straight parallel paths with same velocity. They enter a semi-infinite regionof uniform magnetic field perpendicular to the velocity. When of the following statement(s) is/are true?

(A) They will never come out of the magnetic field region.

(B) They will come out travelling along parallel paths.

(C) They will come out at the same time.

(D) They will come out at different times.

32. A spherical metal shell A of radius R_A and a soild metal sphere B of radius R_B ($<R_A$) are kept far apart and each is given charge `+Q' Now they are connected by a thin metal wire Then.

(A) $E_A^{inside} = 0$

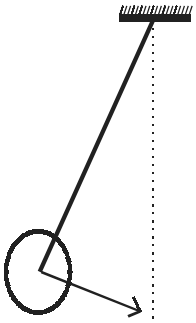
(B) $Q_A > Q_B$

(C) $\frac{\sigma_A}{\sigma_B} = \frac{R_B}{R_A}$

(D) $\underline{E_A^{onsurface}} < E_B^{on\ surface}$

Space of rough work

33. A metal rod of length `L` and mass `m` is pivoted at one end. A thin disk of mass `M` and radius `R`(<L) is attached at its center to the free end of the rod. Consider two ways the disc is attached: (case A) The disc is not free to rotate about its center and (case B) the disc is free to rotate about its center. The rod-disc system performs SHM in vertical plane after being released from the same displaced position. Which of the following statements(s) is (are) true?



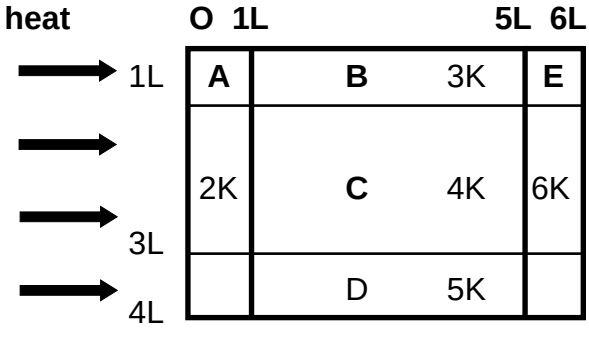
(A) Restoring troque n case A= Restoring torque in case B

(B) Restoring troque in case A < Restoring torque in case B.

(C) Angular frequency for case A> Angular frequency for case B.

(D) Angular frequency for case A < Angular frequency for case B.

34. A composite block is made of slabs A, B, C, D, and E of different thermal conductivities (given in terms of a constant K) and sizes (given in terms of length, L) as shown in the figure. All slabs are of same width. Heat `Q` flows only from left to right through the blocks. Then in steady state.



(A) heat flow through A and E slabs are same.

(B) heat flow through slabs E is maximum.

(C) temperature difference across slab E is smallest.

(D) heat flow through C = heat flow through B + heat flow through D.

Space of rough work

SECTION - II (Total Marks : 15)

(Paragrap Type)

This section contains **2 Paragraphs.** Based upon one of the paragraph **2 multiple choice question** and based on the other paragrap **3 multiple choice questions** have to be andswer Each of these questions has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

Paragraph for Question Nos. 35 and 36

A dense collection of qual number of electrons and postive ions is called netural plasma. Certain solids containing fixed positive ions surrounded by fee electrons can be treated as neutral plasma. Let `N` be the number density of free electrons. each of mass`m` When the electrons are subjected to an electric field, they are displaced relatively away from the heavy positive ions. with a natural angular frequency `$\omega$p` which is called the plasma fre quency. To sustain the oscillations, a time varying electric field needs to be applied that has an angular frequency w, where a part of the energy is absorbed and a part of it is reflected. As ω approaches ωp all the free electrons are set to resonance together an all the energy is reflected. This is the explanation of high reflectivity of metals.

35 Taking the electronic charge as `e` and the permittivity as `$\varepsilon$o` use dimensional analysis to determine the correct expression for ωp

(A) $\sqrt{\frac{Ne}{m\varepsilon_0}}$ (B) $\sqrt{\frac{m\varepsilon_0}{Ne}}$ (C) $\sqrt{\frac{Ne^2}{m\varepsilon_0}}$ (D) $\sqrt{\frac{m\varepsilon_0}{Ne_2}}$

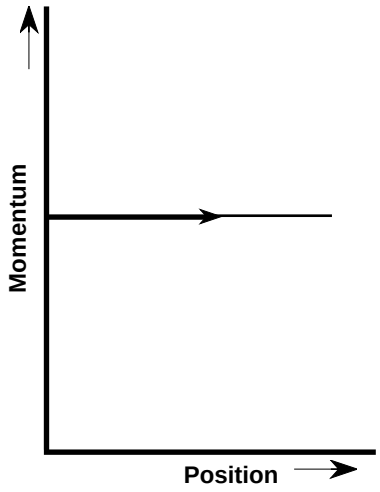
36. Estimate the wavelength at which plasma reflection will occur for a metal having the density of electrons N = 4 x 10^{27} m^{-3}, Take eo = 10^{-11} and m = 10^{-30}, where these quantities are in proper SI units.

(A) 800 nm (B) 600 nm (C) 300 nm (D) 200 nm

Space of rough work

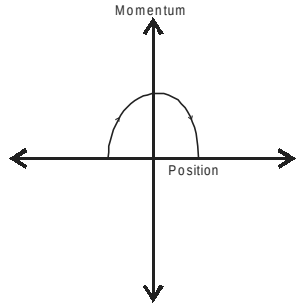
Paragraph for Question Nos. 37 to 39

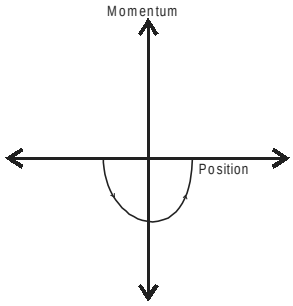
Phase space diagrams are useful tools in analyzing all kinds of dynamical problems. They are especially useful in studying the changes in motion as initial position and momentum are changed Here we consider some simple dynamical systems in one-dimension. For such systems, phase space is a planein which position is plotted along along horizontal axis and momentum is plotted along vertical axis. The phase space diagram is x(t) vs. p(t) curve in this plane. The arrow on the curve indicates the time flow. For example, the phase space diagram for a particle moving with constant velocity is a straight line as show in the figure. We use the sign converntion in which position or momentum upwards (or to right) is positive and downwards (or to left) is negative.

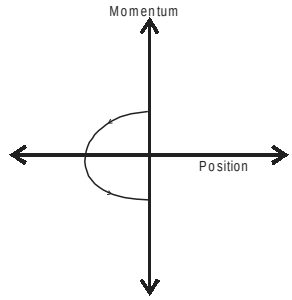


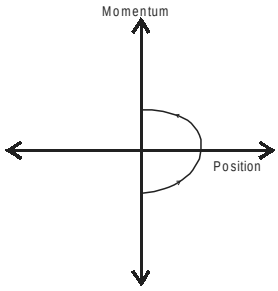
Space of rough work

37. The phase space diagram for a ball thrown vertically up from ground is

(A) 

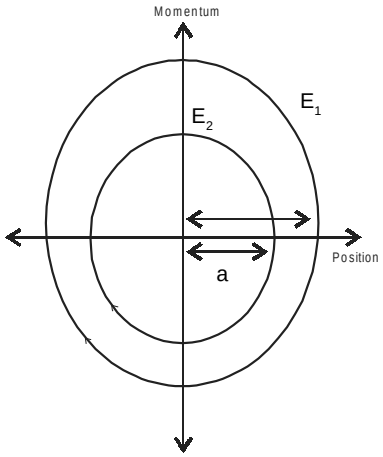
(B) 

(C) 

(D) 

Space of rough work

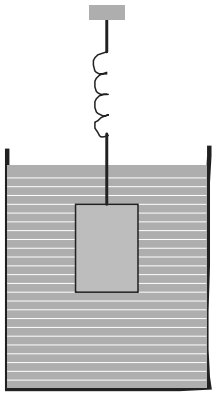
38. The phase space diagram for simple hamonic motion is a circle centered at the origin I the figure, the two circles represent the same oscillator but for different initial conditions, and E1 and E2 are the total mechanical energies respectively. Then

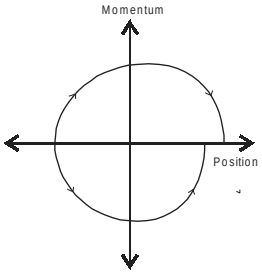


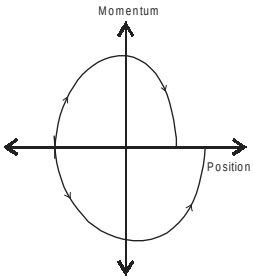
(A) $N\ \mu_0\ I_0$ (B) $E_1 = 2E_2$

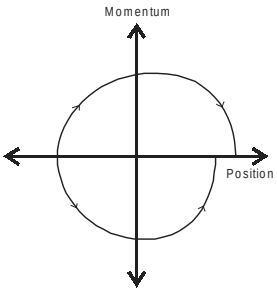
(C) $E_1 = 4E_2$ (D) $E_1 = 16E_2$

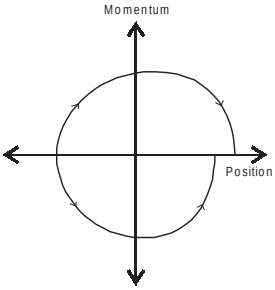
39 Consider the spring-mass system, with the mass submerged in water as shown in the figure. The phase space diagram for one cycle of this system is



(A) 

(B) 

(C) 

(D) 

Space of rough work

SECTION - IV (Total Marks : 28)

(Interger Answer Type)

This section contains **7 questions.** The asnwer to each of the questions is **a single-digit integer,** ranging from 0 to 9. The bubble corresponding to the correct answer is to be darkened in the ORS.

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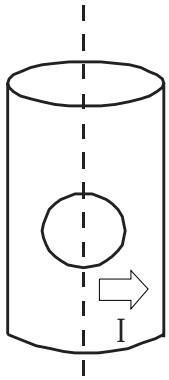
40. A block is moving on an inclined plane making an angle 45^0 with the horixontal and the coefficient of friction is μ The force required to just push it up the inclined plane is 3 times the force required to just prevent it from sliding down. If we define N = 10 μ then N is 5

41. Four soild spheres each of diameter $\sqrt{5}$ cm and mass 0.5 kg are placed with their centers at the corners of a square of side 4 cm. The moment of inertia of the system about the diagonal of the square is N x 10^{-4} kg-m^2, then N is 2

42. A long circular tube of length 10 m and radius 0.3 m carries a current I along its curved surface as shown. A eire-loop of resistance 0.005 ohm and of radius 0.1 m is placed inside the tube with its axis coinciding with the axis of the tube. The current varies as $I = I_0 \cos(300\ t)$ where I_0 is constant. If the magnetic moment of the loop is $N\mu_0 I_0 \sin(300t)$, then `N` is



Space of rough work

43. The activity of a freshly prepared radiocative sample is 10^{10} disintegrations per second, whose mean life is 10^9 s. The mass of an atom of this radioisotope is 10^{-25}kg The mass (in mg.) of the radioactive sample is /

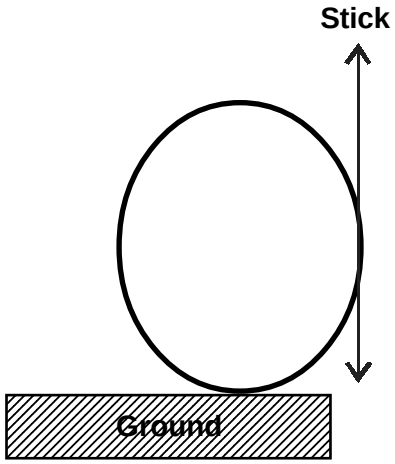
44. Steel wire of length `L` at 40^0C is suspended from the ceilling and then a mass `m` is hung from its free end. The wire is cooled down from 40^0C to 30^0 C to regain its original length `L`. The coefficient if linear thermal expansion of the steel is 10^{-5} / ^{0}C, Young's modulus of steel is 10^{11} N/m^2 and radius of the wire is 1 mm. Assume that L >> diameter of the wire. Then the value of `m` in kg is nearly

45. Four point charge, each of +q, are rigidly fixed at the four corners of a square planar soap film of side `a` The surface tension of the soap film is The system of charges and planar film are in equilibrium, and a=k $a = \kappa \left[\frac{q^2}{\gamma} \right]^{l/n}$ where `k` is a constant. Then N is

---

Space of rough work

46. A boy is pushing a ring of mass 2 kg and radius 0.5 m with a stick as shown in the flgure The stick applies a force of 2 N on the ring and rolls it without slipping with an acceleration of 0.3 m/s^2. The coefficient of friction between the ground and the ring is large enough that rolling always occurs and the coefficient of friction between tghe stick and the ring is (P/10). The value of P is



Space of rough work

PART III : MATHEMATICS

SECTION - I (Total Marks : 21)

(Single Correct Answer Type)

This section contains **7 multiple choice question** Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

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47. The value of $\int_{\sqrt{ln2}}^{\sqrt{ln3}} \frac{\chi \sin \chi^2}{\sin \chi^2 + \sin(ln6 - \chi^2)}$ dx is

(A) $\frac{1}{4} in \frac{3}{2}$ (B) $\frac{1}{2} in \frac{3}{2}$

(C) $in \frac{3}{2}$ (D) $\frac{1}{6} in \frac{3}{2}$

48 Let the straight line x = b divide the area enclosed by $\gamma = (1-\chi)2, \gamma = 0$ and $\alpha = 0$ into two parts $R_1(0 \le \alpha \ge b)$ and $R_2(b \le \alpha \ge 1)$ such that $R_1 - R_2 = \frac{1}{4}$) Then *b* equals

(A) $\frac{3}{4}$ (B) $\frac{1}{2}$ (C) $\frac{1}{3}$ (D) $\frac{1}{4}$

Space of rough work

49. Let $\bar{a} = \hat{i} + \hat{j} + \hat{k}, \bar{b} = \hat{i} - \hat{j} + \hat{k}$ and $\bar{c} = \hat{i} - \hat{j} - \hat{k}$ be three vectors. A vector in the plane of $\bar{a}$ and $\bar{b}$, whose projection on $\bar{c}$ is given by $\frac{1}{\sqrt{3}}$ is given by

(A) $\hat{i} - 3\hat{j} + 3\hat{k}$ (B) $-3\hat{i} - 3\hat{j} - \hat{k}$

(C) $3\hat{i} - \hat{j} + 3\hat{k}$ (D) $\hat{i} + 3\hat{j} + 3\hat{k}$

(50) Let α_0, y_0 be the solution of the following equations

$$(2\alpha)^{ln2} = (3y)^{ln2}$$
$$3^{ln\alpha} = 2^{lny}$$

Then α_0 is

(A) $\frac{1}{6}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) 6

Space of rough work

51. Let α and β be the roots of $\alpha^2 - 6_\alpha - 2 = 0$ with $\alpha > \beta.If a_n = \alpha^n - \beta^2$ for $n \geq 1$ then the Value of $\frac{a_{10-2a_8}}{2a_9}$ is

(A) 1 (B) 2 (C) 3 (D) 4

52. A straight line L through the point (3-2) is inclined at an angle 60^0 to the line $\sqrt{3}\alpha + y = 1$ If L also intersects the x-axis, then the equation of L is

(A) $y+\sqrt{3}\alpha + 2 - 3\sqrt{3} = 0$ (B) $y-\sqrt{3}\alpha + 2 + 3\sqrt{3} = 0$

(C) $\sqrt{3}y - \alpha + 3 + 2\sqrt{3} = 0$ (D) $\sqrt{3}y + \alpha - 3 + 2\sqrt{3} = 0$

53. Let P = $\{\theta : \sin\theta - \cos\theta = \sqrt{2}\cos\theta\}$ and Q = $\{\theta : \sin\theta + \cos\theta = \sqrt{2}\cos\theta\}$ be two sets. then

(A) $P \subset Q$ and $Q - P \neq \varnothing$ (B) $Q \not\subset P$

(C) $P \not\subset Q$ (D) $P = Q$

Space of rough work

SECTION - II (Total Marks : 16)

(Multiple Correct Answer Type)

This section contains **4 multiple choice question** Each question has four choices (A), (B), (C) and (D) out of which **ONE or MORE** may be correct.

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54. The vector(s) which is/are coplanar with vectors $\hat{i}+\hat{j}+2\hat{k}$ and $\hat{i}+2\hat{j}+\hat{k}$ and $\hat{i}+\hat{j}+\hat{k}$ and perpendicular to the vector $\hat{i}+\hat{j}+\hat{k}$ is/are

(A) $\hat{j}-\hat{k}$ (B) $-\hat{i}+\hat{j}$ (C) $\hat{i}-\hat{j}$ (D) $-\hat{j}+\hat{k}$

55. Let $f:\mathbb{R}\to\mathbb{R}$ be a function such that

$$f(\alpha+y)=f(\alpha)+f(y),\forall\alpha,y\in\mathbb{R}$$

If f (α) is differentiable at α = o, then

(A) f (α) is differentiable only in a finite interval containing zero.

(B) f (α) is continuous $\forall\alpha\in\mathbb{R}$

(C) f (α) is continuous $\forall\alpha\in\mathbb{R}$

(D) f (α) is differentiable expect at finitely many points

Space of rough work

56. Let M and N be two 3 x 3 non-singular skew-symmetric materices such that MN = NM. It P denotes the transpose of P them is equal to $M^2 N^2 (M^T N)^{-1} (MN^{-1})^T$ is equal to

(A) M^2 (B) $-N^2$ (C) $-M^2$ (D) MN

57 Let the eccentricity of the hyperbola $\frac{\alpha^2}{a^2} - \frac{y^2}{b^2} = 1$ I be reciprocal to that of the ellipse $x^2 + 4y^2 = 4$ If the hyperbola passes through a focus of the ellipse, then

(A) the equation of the hyperbola is $\frac{\alpha^2}{3} - \frac{y^2}{2} = 1$

(B) a fous of the hyperbola is (2, 0)

(C) the eccentricity of the hyperbola is $\sqrt{\frac{5}{3}}$

(D) the equation of the hyperbola is $\alpha^2 - 3y^2 = 3$

Space of rough work

SECTION - III (Total Marks : 15)

(Paragrap Type)

This section contains **2 Paragraphs.** Based upon one of the paragraph **3 multiple choice question** and based on the other paragrap **2 multiple choice questions** have to be andswer Each of these questions has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

Paragraph for Question Nos. 58 and 60

Let a, b and c be three real numbers satisfying

$$[\,a \quad b \quad c\,]\begin{bmatrix}1 & 9 & 7\\ 8 & 2 & 7\\ 7 & 3 & 7\end{bmatrix} = [\,0 \quad 0 \quad 0\,] \qquad \text{.....(E)}$$

58. If the point P(a, b, c,) with reference to (E), lies on the plane I, then the value of 7a + b + c is $2x + y + Z = 1$

(A) 0 (B) 12 (C) 7 (D) 6

59. Let ω be a soluction of x^3-1=0 with Im (ω)>0. If a = 2 with b and c satisfying (E), then the value of

is equal to $\dfrac{3}{\omega^{\circ}} + \dfrac{1}{\omega^{\circ}} + \dfrac{3}{\omega^{\circ}}$

(A) -2 (B) 2 (C) 3 (D) -3

60. Let b=6, with a and c satisfying (E). If α and β are the root of the quadratic equation $ax^2 + bx + c = 0, then$

is $\sum_{n=0}^{09}\left(\dfrac{1}{\alpha} + \dfrac{1}{\beta}\right)^n$

(A) 6 (B) 7 (C) $\dfrac{6}{7}$ (D) ∞

Paragraph for Question Nos. 61 and 62

Let U_1 and U_2 be two urns such that U_1 contains 3 with and 2 red balls, and U_2 contains only 1 white ball. A fair coin is tossed, If head appears then I ball is drawn at random from U_1 and put into U_2 Howeyer, if tail appears then 2 balls are drawn at random from U_1 and put into U_2 Now I ball is drawn at random from U_2

61 Given that the draw ball from U2 is white, the probability that head appeared on the coin is

(A) $\frac{13}{30}$ (B) $\frac{23}{30}$ (C) $\frac{19}{30}$ (D) $\frac{11}{30}$

62. Given that drawn ball from U2 is white, the probability that head appeared on the coin is

(A) $\frac{17}{23}$ (B) $\frac{11}{23}$ (C) $\frac{15}{23}$ (D) $\frac{12}{23}$

Space of rough work

SECTION - III (Total Marks : 28)

(Integer Answer Type)

This section contains **7 question.** The answer to each of the questions is a Single-diglt Integer, ranging from 0 to 9. The bubble corresponding to the correct answer is to be darkened in the ORS.

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58. Let a_1, a_2, a_3, ... a_{100} be an arithmetic progression with $a_1 = 3$ and $S_p = \sum_{i=1}^{p} a_i, 1 \le p \le 100$

For any interger n with $1 \le n \le 20, let, m = 5n. if \frac{S_m}{S_m}$ does not depend on n_i then a_2 is

64. Consider the parabola $y^2 = 8x, Let, \Delta_1$ be the area of the triangle formed by the end points of its latus rectum and the point $p\left(\frac{1}{2}, 2\right)$ on the parabola and be the area of the triangle formed by drawing tangents at P and at the end points of the latus rectum.

Then $\frac{\Delta_1}{\Delta_2}$ is

65. The positive integer value of n > 3 satisfying the equation

$$\frac{1}{\sin\left(\frac{\pi}{n}\right)} = \frac{1}{\sin\left(\frac{2\pi}{n}\right)} + \frac{1}{\sin\left(\frac{3\pi}{n}\right)}$$

is

Space of rough work

66 Let Then the value of $f(\theta)=\sin\left(\tan^{-1}\left(\frac{\sin\theta}{\sqrt{\cos 2\theta n}}\right)\right)$ where $-\frac{\pi}{4}<\theta<\frac{\pi}{4}$ Then the the value of

$$\frac{d}{d(\tan\theta)}(f(\theta)$$

67 If is any complex number satisfying $|z-3-2i|\le 2$ then the minimum value of $|2z-6+5i|$ is

68 The minimum value of the sum of real number $a^{-5},a^{-1},3a^{-3},1,a^{8}$ and a^{10} with a>0 is

69 Let f : $[1,\infty)\to[2,\infty)$ be a differenatiable function such that f(1)=2. if

$$6\int_1^x f(t)dt=3xf(x)-x^3$$

for all $x\ge 1$, then the value of f(2) is

Space of rough work