

**CLASSROOM CONTACT PROGRAMME**
(Academic Session : 2018 - 2019)**COMPUTER
BASED TEST**
आसान

JEE (Main + Advanced) : ENTHUSIAST COURSE

SCORE : II

Test Type : FULL SYLLABUS

Test Pattern : JEE-Main

TEST DATE : 27 - 01 - 2019**PAPER – 2**

Important Instructions

Do not open this Test Booklet until you are asked to do so.

1. Immediately fill in the form number on this page of the Test Booklet with *Blue/Black Ball Point Pen*. Use of pencil is strictly prohibited.
2. The candidates should not write their Form Number anywhere else (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 **90** questions. The maximum marks are **360**.
5. There are **three** parts in the question paper A,B,C consisting of **Physics, Chemistry and Mathematics** having **30 questions** in each part of equal weightage. Each question is allotted 4 (four) marks for **correct** response.
6. **One Fourth** mark will be deducted for indicated incorrect response of each question. **No deduction** from the total score will be made if no response is indicated for an item in the Answer Sheet.
7. Use **Blue/Black Ball Point Pen only** for writing particulars/markings responses on **Side-1** and **Side-2** of the Answer Sheet. **Use of pencil is strictly prohibited.**
8. No candidate is allowed to carry any textual material, printed or written, bits of papers, mobile phone any electronic device etc, except the Identity Card inside the examination hall/room.
9. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
10. On completion of the test, the candidate must hand over the Answer Sheet to the invigilator on duty in the Room/Hall. **However, the candidate are allowed to take away this Test Booklet with them.**
11. **Do not fold or make any stray marks on the Answer Sheet.**

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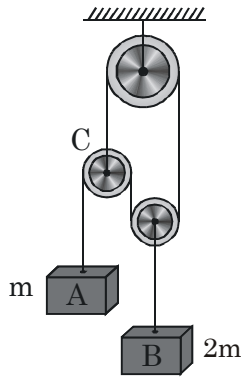
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PART A - PHYSICS

1. In the arrangement shown the pulleys and the strings are ideal. The respective accelerations of the blocks A and B are



- (1) $g, g/2$ (2) $g/2, g$
 (3) $3g/2, 3g/4$ (4) g, g
2. The tangential acceleration of a particle in a circular motion of radius $2m$ is $a_t = \alpha t$ m/s^2 (where α is a constant). Initially the particle is at rest. Net acceleration of the particle makes 45° with the radial acceleration after 2 sec. The value of constant α is:
- (1) $1/2 m/s^3$
 (2) $1 m/s^3$
 (3) $2 m/s^3$
 (4) Data are insufficient

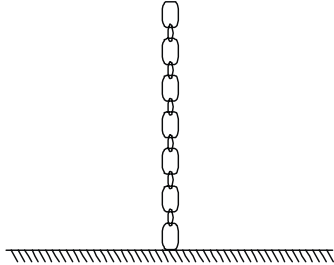
3. The potential energy of a diatomic molecule is given by $U = \frac{A}{r^{12}} - \frac{B}{r^6}$. A and B are positive constants. The distance r between them at equilibrium is :-

- (1) $\left(\frac{A}{B}\right)^{1/6}$ (2) $\left(\frac{2A}{B}\right)^{1/6}$
 (3) $\left(\frac{A}{2B}\right)^{1/6}$ (4) None of these

4. A bomb is projected upwards. At topmost point it explodes in three identical fragments. First fragment comes to ground in 10 sec. and others in 20 sec each. Then the height reached by the original bomb is :
- (1) 800 m
 (2) 1600 m
 (3) 1250 m
 (4) 1500 m

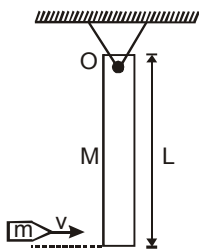
SPACE FOR ROUGH WORK

5. A uniform chain of mass m and length ℓ hangs on a thread and touches the surface of a table by its lower end. Find the force exerted by the table on the chain when half of its length has fallen on the table. The fallen part does not form heap.



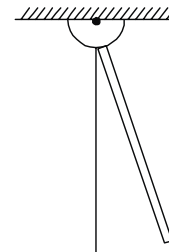
- (1) $\frac{3mg}{4}$ (2) $\frac{mg}{2}$ (3) $\frac{3mg}{2}$ (4) mg

6. A rod of mass M and length L is suspended by a frictionless hinge at the point O as shown in figure. A bullet of mass m moving with velocity v in a horizontal direction strikes the end of the rod and gets embedded in it. The angular velocity of the rod just after the collision is -



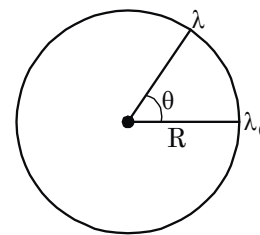
- (1) $\frac{mv}{(3m + M)L}$ (2) $\frac{2mv}{ML}$
(3) $\frac{2mv}{L}$ (4) $\frac{3mv}{(3m + M)L}$

7. A metre stick swinging in vertical plane about a fixed horizontal axis passing through its one end undergoes small oscillation of frequency f_0 . If the bottom half of the stick were cut off, then its new frequency of small oscillation would become :



- (1) f_0 (2) $\sqrt{2}f_0$ (3) $2f_0$ (4) $2\sqrt{2}f_0$

8. A thin non-conducting ring of radius R has a linear charge density $\lambda = \lambda_0 \cos \theta$, where λ_0 is the value of λ at $\theta = 0$. Find the net electric dipole moment for this charge distribution.



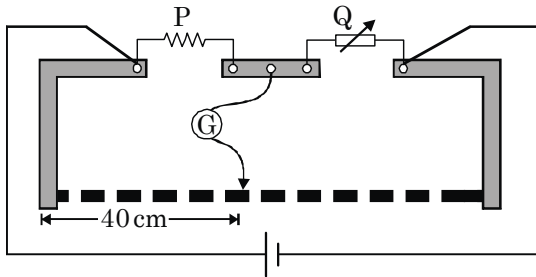
- (1) $\frac{\pi R^2 \lambda_0}{4}$ (2) $\frac{\pi R^2 \lambda_0}{2}$
(3) $\pi R^2 \lambda_0$ (4) $2\pi R^2 \lambda_0$

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9. A body is projected away from the earth's surface with a speed $3v_e$ where v_e is the escape velocity. The speed of the body at infinity will be :

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

10. In a metre bridge, the gaps are closed by two resistances P and Q and the balance point is obtained at 40 cm. When Q is shunted by a resistance of 10Ω , the balance point shifts to 50 cm. The values of P and Q are :-



- (1) $\frac{10}{3}\Omega, 5\Omega$ (2) $20\Omega, 30\Omega$
(3) $10\Omega, 15\Omega$ (4) $5\Omega, \frac{15}{2}\Omega$

11. A parallel plate capacitor having capacitance C_0 is connected to a battery of emf E. It is then disconnected from the battery and a dielectric slab of dielectric constant k completely filling the air gap of the capacitor is inserted in it. If ΔU indicates the change in energy, then

- (1) $\Delta U = 0$
(2) $\Delta U = \frac{1}{2} C_0 E^2 (k-1)$
(3) $\Delta U = \frac{1}{2} C_0 E^2 \left(1 - \frac{1}{2k}\right)$
(4) $\Delta U = \frac{1}{2} C_0 E^2 \left(\frac{1}{k} - 1\right)$

12. Given a ring of mass M, radius R resting on a rough horizontal plane, with coefficient of friction ' μ '. A cylindrical, vertical magnetic field passing through ring is switched on at $t = 0$ which varies with time as $B = Kt^2$. Ring has charge Q distributed uniformly over it. Find the time after which ring starts rotating.

- (1) $\frac{\mu Mg}{QKR}$ (2) $\frac{2\mu Mg}{QKR}$
(3) $\frac{\mu Mg}{2QKR}$ (4) $\frac{\mu Mg}{4QKR}$

SPACE FOR ROUGH WORK

13. Two moving coil galvanometers M_1 and M_2 having same spring constants have the following specifications:

for galvanometer M_1 , $R_1 = 10\Omega$, $N_1 = 30$,
 $A_1 = 3.6 \times 10^{-3} \text{ m}^2$, $B_1 = 0.25\text{T}$

for galvanometer M_2 , $R_2 = 14\Omega$, $N_2 = 42$,
 $A_2 = 1.8 \times 10^{-3} \text{ m}^2$, $B_2 = 0.5\text{T}$

Find the ratios of current sensitivity between galvanometer M_1 & galvanometer M_2

- (1) $5/7$ (2) $3/4$ (3) 1 (4) $7/5$

14. The wavelength of the K_α line for an element of atomic number 57 is α . What is the wavelength of the K_α line for the element of atomic number 29?

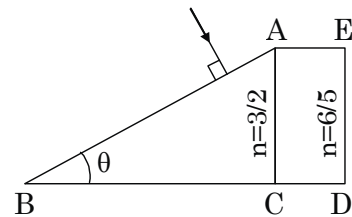
- (1) α (2) 2α (3) 4α (4) 8α

15. A heavy nucleus having mass number 200 gets disintegrated into two small fragments of mass number 80 and 120. If binding energy per nucleon for parent atom is 6.5 MeV and for daughter nuclei is 7 MeV and 8 MeV respectively, then the energy released in the decay will be:

- (1) 200 MeV (2) -220 MeV
(3) 220 MeV (4) 180 MeV

16. In the figure ABC is the cross section of a right angled prism and ACDE is the cross section of a glass slab. The value of θ so that light incident normally on the face AB does not cross the face AC is

(Given $\sin^{-1}(3/5) = 37^\circ$)



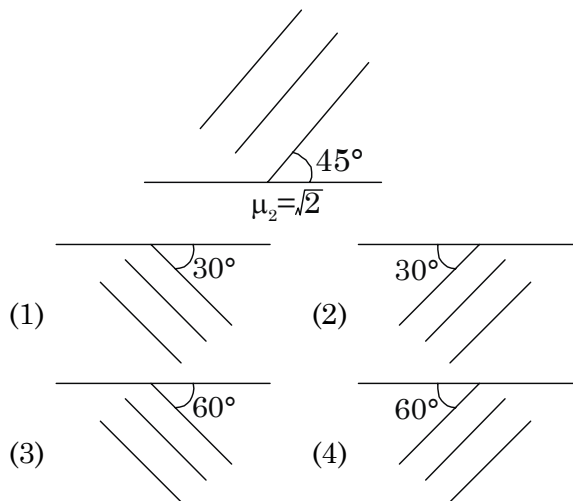
- (1) $\theta < 30^\circ$ (2) $\theta < 37^\circ$
(3) $\theta < 60^\circ$ (4) $\theta < 53^\circ$

17. A tuning fork having a frequency of 340 Hz is vibrated just above a cylindrical tube. The height of the tube is 120 cm. Water is slowly poured in it. What is the minimum height of water required for resonance? Velocity of sound in air = 340 m/s.

- (1) 5 cm
(2) 25 cm
(3) 45 cm
(4) 95 cm

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18. Wavefronts incident on an interface between the media are shown in the figure. The refracted wavefront will be as shown in



19. A fully filled hemispherical tank of radius R has an orifice of small area a at its bottom. Time required to completely empty the tank will be (Assuming that the top surface area of the liquid is always much greater than the orifice area)

- (1) $\frac{5\pi R^{5/2}}{\sqrt{2} ag}$
 (2) $\frac{9 \pi R^{5/2}}{\sqrt{2} ag}$
 (3) $\frac{7\sqrt{2} \pi R^{5/2}}{15a\sqrt{g}}$
 (4) Can't be calculated

20. The power radiated by a black body is P and it radiates maximum energy around the wavelength λ_0 . If the temperature of the black body is now changed so that it radiates maximum energy around wavelength $3/4\lambda_0$, the power radiated by it will increase by a factor of

- (1) 4/3 (2) 16/9
 (3) 64/27 (4) 256/81

21. One end of a 2.35m long and 2.0cm radius aluminium rod ($K = 235 \text{ W.m}^{-1}\text{K}^{-1}$) is held at 20°C. The other end of the rod is in contact with a block of ice at its melting point. The rate in kg.s^{-1} at which ice melts is [Take latent heat of fusion for ice as $1/3 \times 10^6 \text{ J.kg}^{-1}$]

- (1) $48\pi \times 10^{-6}$ (2) $24\pi \times 10^{-6}$
 (3) $2.4\pi \times 10^{-6}$ (4) $4.8\pi \times 10^{-6}$

SPACE FOR ROUGH WORK

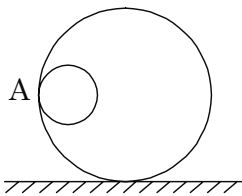
22. A steel wire of length 2.0 m is stretched through 2.0 mm. The cross-sectional area of the wire is 4.0 mm^2 . Calculate the elastic potential energy stored in the wire in the stretched condition. Young's modulus of steel = $2.0 \times 10^{11} \text{ N m}^{-2}$.
- (1) 0.04 J (2) 0.4 J
 (3) 0.8 J (4) 80 J
23. The efficiency of a carnot engine is 0.6. It rejects total 20 J of heat. The work done by the engine is :
- (1) 40 J (2) 50 J
 (3) 20 J (4) 30 J
24. Consider the following data:
 10 main scale division = 1 cm, 10 vernier division = 9 main scale divisions. Zero of vernier scale is to the right of the zero marking of the main scale with 6 vernier divisions coinciding with main scale divisions. The measured reading for length measurement is 4.3 cm on main scale with 2 vernier divisions coinciding with main scale graduations. Estimate the actual length.
- (1) 426 cm (2) 4.26 cm
 (3) 4.38 cm (4) 4.5 cm
25. At a point on earth surface horizontal component of earth's magnetic field is $40 \mu\text{T}$ and dip angle is 30° . Find the total magnetic field of earth at this point.
- (1) $34 \mu\text{T}$ (2) $40 \mu\text{T}$
 (3) $46 \mu\text{T}$ (4) $80 \mu\text{T}$
26. A spring-mass system has undamped natural angular frequency $\omega_0 = 100 \text{ rad s}^{-1}$. The solution $x(t)$ at critical damping is given by $x(t) = x_0(1 + \omega_0 t) e^{-\omega_0 t}$, where x_0 is a constant. The system experiences the maximum damping force at time
- (1) 0.01 s (2) 0.1 s
 (3) $0.01 \pi \text{ s}$ (4) $0.1 \pi \text{ s}$
27. In a single slit diffraction experiment first minima for $\lambda_1 = 660 \text{ nm}$ coincides with the first maxima for wavelength λ_2 . Calculate λ_2 (approximately).
- (1) 660 nm (2) 220 nm
 (3) 440 nm (4) 1320 nm

SPACE FOR ROUGH WORK

28. A telescope of aperture diameter $D = 32$ mm, and objective focal length $f = 24$ cm, forms images of two distant stars in the focal plane of the objective lens. If the stars have a minimum resolvable angular separation according to the Rayleigh criterion, then what is the distance, x , between the centers of the images in the focal plane? (Assume light of wavelength 550 nm is used.)

- (1) $5 \mu\text{m}$ (2) $50 \mu\text{m}$
(3) 0.5 mm (4) 5 mm

29. A ring of radius $3a$ is fixed rigidly on a table. A small ring whose mass is m and radius a , rolls without slipping inside it as shown in the figure. The small ring is released from position A. When it reaches at the lowest point, the speed of the centre of the ring at that time would be -



(1) $\sqrt{2ga}$

(2) $\sqrt{3ga}$

(3) $\sqrt{6ga}$

(4) $\sqrt{4ga}$

30. At any point $(x, 0, 0)$ the electric potential

V is $\left(\frac{1000}{x} + \frac{1500}{x^2} + \frac{500}{x^3} \right)$ volt, then

electric field at $x = 1 \text{ m}$ -

(1) $5500(\hat{j} + \hat{k}) \text{ V/m}$

(2) $5500 \hat{i} \text{ V/m}$

(3) $\frac{5500}{\sqrt{2}}(\hat{j} + \hat{k}) \text{ V/m}$

(4) $\frac{5500}{\sqrt{2}}(\hat{i} + \hat{k}) \text{ V/m}$

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PART B - CHEMISTRY

31. The distance of spherical nodes from nucleus for the given orbital are

$$\psi_{\text{radial}} = \frac{1}{9\sqrt{2}} \left(\frac{Z}{a_0} \right)^{3/2} [(\sigma^2 - 4\sigma + 3)] \exp(-\sigma/2)$$

where a_0 & Z are the constants and

$$\sigma = \frac{2Zr}{a_0}$$

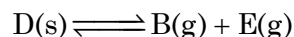
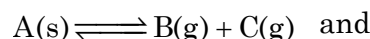
- (1) Zero, infinity (2) $\frac{a_0}{Z}, \frac{1}{2} \frac{a_0}{Z}$
- (3) $\frac{3}{2} \frac{a_0}{Z}, \frac{1}{2} \frac{a_0}{Z}$ (4) $\frac{a_0}{Z}, \frac{3}{2} \frac{a_0}{Z}$
32. For a real gas obeying Vander Waal equation, the values of critical pressure and critical temperature are 73.89 atm and 300 K. What will be the volume occupied, only by the molecules of 24 moles of the gas in millilitres.

($R = 0.0821$ atm-lit/mol-kelvin)

- (1) 175 (2) 250
 (3) 350 (4) 326
33. A definite amount of gaseous hydrocarbon was burnt with just sufficient amount of O_2 . The volume of all reactants was 600 ml, after the explosion the volume of the products [$CO_2(g)$ and $H_2O(g)$] was found to be 700 ml under the similar conditions. The molecular formula of the compound is

- (1) C_3H_8 (2) C_3H_6
 (3) C_3H_4 (4) C_4H_{10}

34. The pressure over pure solid A is 60 mm of Hg at a certain temperature T and the pressure over pure solid D is 80 mm of Hg at same temperature T , if A and D dissociate as



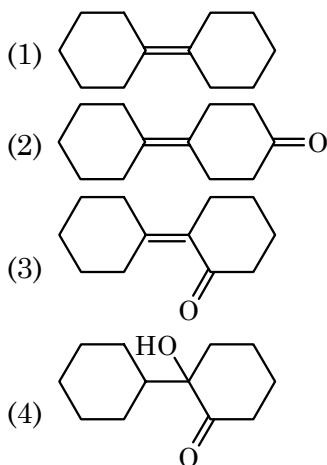
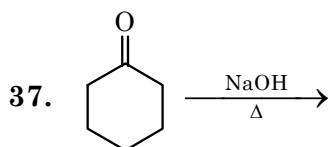
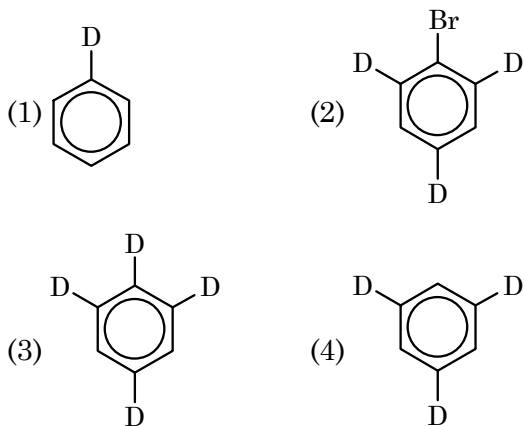
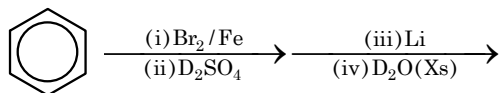
then the total pressure over a mixture of excess of A(s) and D(s) at same temperature will be

- (1) 60 mm of Hg
 (2) 140 mm of Hg
 (3) 50 mm of Hg
 (4) 100 mm of Hg
35. A real gas is subjected to an adiabatic process causing a change in state from (3 bar, 50 L, 500 K) to (5 bar, 40 L, 600 K) against a constant pressure of 4 bar. The magnitude of enthalpy change for the process is :

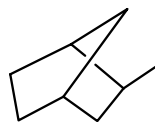
- (1) 4000 J
 (2) 5000 J
 (3) 9000 J
 (4) 1000 J

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36. Major product of given reaction is :



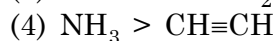
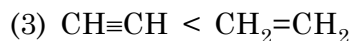
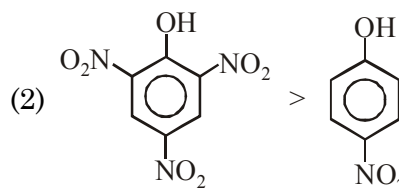
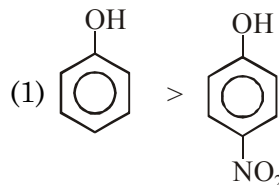
38.



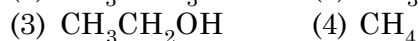
How many stereoisomers are possible for this compound.

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

39. Identify correct acidic strength order ?



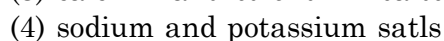
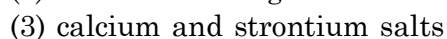
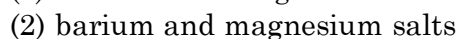
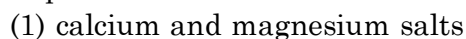
40. Which of the following has maximum boiling point ?



41. Which of the following molecule is linear ?



42. Hardness of water is due to dissolved impurities of-



SPACE FOR ROUGH WORK

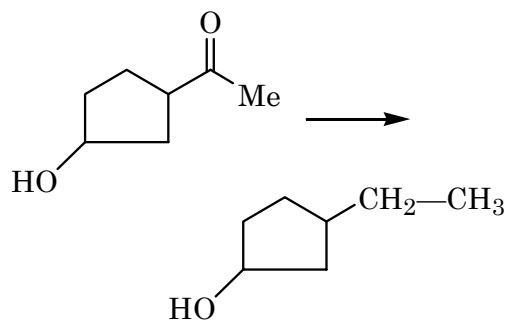
43. The most soluble salt in water is
 (1) CaC_2O_4 (2) CaCO_3
 (3) CaI_2 (4) CaSO_3
44. Which of the following will show Fac–Mer isomerism ?
 (1) $[\text{PtCl}_2(\text{NH}_3)_2]$ (2) $[\text{Co}(\text{NH}_3)_3(\text{NO}_2)_3]$
 (3) $[\text{Co}(\text{en})_3]^{3+}$ (4) $[\text{CoCl}_2(\text{en})_2]^+$
45. On strong heating AgNO_3 we get
 (1) AgNO_2 (2) Ag_2O (3) Ag (4) Ag_3N
46. Silane (SiH_4) burns in air forming SiO_2 and H_2O as

$$\text{SiH}_4(\text{g}) + 2\text{O}_2(\text{g}) \longrightarrow \text{SiO}_2(\text{s}) + 2\text{H}_2\text{O}(\text{g})$$
 what is the value of ΔG° of reaction if ΔG_f° for the formation of $\text{SiH}_4(\text{g})$, $\text{SiO}_2(\text{s})$ and $\text{H}_2\text{O}(\text{g})$ are $+52.3$, -805 , -228.6 kJmol^{-1} respectively.
 (1) -805 kJmol^{-1} (2) -833 kJmol^{-1}
 (3) -1314.5 kJmol^{-1} (4) 1033 kJmol^{-1}
47. Solid AgNO_3 is slowly added to a solution that has 0.0001 M each in NaCl , NaBr and NaI . K_{sp} of AgCl is 1.7×10^{-10} , K_{sp} of $\text{AgBr} = 3.3 \times 10^{-13}$, K_{sp} of $\text{AgI} = 1.5 \times 10^{-16}$. The concentration of Ag^+ required to initiate the precipitation of AgCl is
 (1) 1.7×10^{-6} M (2) 1.7×10^{-7} M
 (3) 1.7×10^{-8} M (4) 1.7×10^{-9} M
48. In a cubic close packing, the unit cell has...
 (1) 4 tetrahedral voids each of which is shared by four unit cells.
 (2) 4 tetrahedral voids within the unit cell
 (3) 8 tetrahedral voids each of the which is shared by four unit cells
 (4) 8 tetrahedral voids within the unit cells

49. Osmotic pressure of a solution containing 2 gm dissolved protein per 300 cm^3 of solution is 20 mm of Hg at 27°C . The molecular mass of protein is :
 ($R = 0.08 \text{ L-atm/mol-K}$)
 (1) 6080 gm mol^{-1}
 (2) $12160 \text{ gm mol}^{-1}$
 (3) 3040 gm mol^{-1}
 (4) 7460 gm mol^{-1}
50. For consecutive first order reaction:

$$\text{A} \xrightarrow{k_1} \text{B} \xrightarrow{k_2} \text{C}, \text{ at } 300 \text{ K}$$

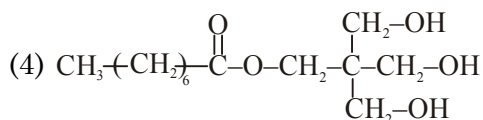
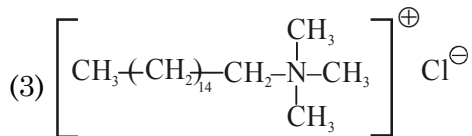
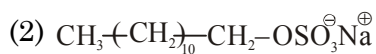
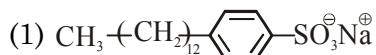
$$k_1 = 2 \times 10^{-3} \text{ s}^{-1} \text{ and } k_2 = 5 \times 10^{-5} \text{ s}^{-1}$$
 (Given : $\ln 2 = 0.7, \ln 10 = 2.5$)
 The time at which $[\text{B}]$ will be maximum is—
 (1) 200 s (2) 2000 s
 (3) 0 s (4) ∞
51. The appropriate reagent for the transformation is



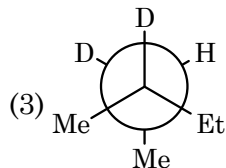
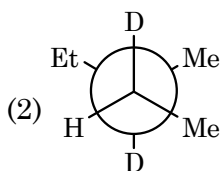
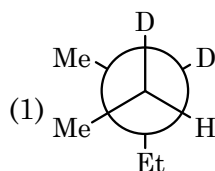
- (1) Zn-Hg, HCl
 (2) $\text{NH}_2\text{-NH}_2, \text{OH}^-$
 (3) H_2/Ni
 (4) NaBH_4

SPACE FOR ROUGH WORK

52. Which of the following is an example of cationic detergent ?



53. Identify major product of reaction of (E)-3-methyl-2-pentene with D_2/Ni .



(4) Both (1) and (3)

54. Which of the following is responsible for transition of hereditary character ?

- (1) Glucose (2) Fructose
(3) DNA (4) Haemoglobin

55. Which carbohydrate is used for silvering of mirror ?

- (1) Sucrose (2) Cellulose
(3) Starch (4) Glucose

56. Which of the following statements is NOT correct ?

- (1) Nitrogen forms triple bonds whereas phosphorus does not exist as $\text{P} \equiv \text{P}$.
(2) The N-N bond is stronger than P-P bond
(3) Red phosphorus is less reactive than white phosphorus
(4) Sulphur exhibits catenation.

57. Total number of electrons having $\ell = 2$ in Fe^{2+} according to Aufbau principle ($n + \ell$ rule)

- (1) 5 (2) 4
(3) 3 (4) 6

58. The role of calcination in metallurgical process is

- (1) To remove moisture
(2) To decompose carbonate into oxide
(3) To remove volatile organic matter (impurity)
(4) All of these

59. The electronegativity of the following elements increases in the order

- (1) C, N, Si, P (2) N, Si, C, P
(3) Si, P, C, N (4) P, Si, N, C

60. Which of the following is INCORRECT ?

- (1) Classical smog occurs in cool humid climate
(2) Photochemical smog is reducing smog
(3) Mixture of smoke, fog and SO_2 form classical smog
(4) Photochemical smog occurs in warm, dry and sunny climate

SPACE FOR ROUGH WORK

PART C - MATHEMATICS

61. The value of $\sum_{r=1}^9 \sin^2 \frac{r\pi}{10}$ is :
- (1) 1 (2) $\frac{5}{2}$ (3) 5 (4) $\frac{9}{2}$
62. Sum of roots of the equation $\sin^{-1}x - \cos^{-1}x = \sin^{-1}(3x - 2)$ is :
- (1) $\frac{3}{2}$ (2) 1 (3) $\frac{1}{2}$ (4) 2
63. Locus of mid point of the chords of contact of $x^2 + y^2 = 2$ from the points on the line $3x + 4y = 10$ is a circle with centre P. If O is the origin then OP is equal to :
- (1) 2 (2) 1 (3) $\frac{1}{3}$ (4) $\frac{1}{2}$
64. If the tangent and the normal to the hyperbola $x^2 - y^2 = 4$ at a point cut off intercepts a_1, a_2 on X-axis and b_1, b_2 on Y-axis respectively then the value of $a_1 a_2 + b_1 b_2$ is:
- (1) 1 (2) -1 (3) 0 (4) 4
65. If the point $(\cos \theta, \sin \theta)$ lies in the right angle between the rays $y = |x - 1|$, then θ belongs to
- (1) $\left(0, \frac{\pi}{2}\right)$ (2) $\left(0, \frac{\pi}{4}\right)$
 (3) $\left(0, \frac{\pi}{6}\right)$ (4) $\left(0, \frac{\pi}{3}\right)$
66. The number of common chords of the parabolas $x = y^2 - 6y - 17$ and $y = x^2 - 6x + 1$ are :
- (1) 1 (2) 2 (3) 4 (4) 6
67. If $x + \frac{1}{x} = \frac{1 + \sqrt{5}}{2}$, then the value of $x^{90} + \frac{1}{x^{90}}$ is :
- (1) 8 (2) 4 (3) 2 (4) 1
68. The value of the sum $\sum_{k=1}^{\infty} \sum_{n=1}^{\infty} \frac{k}{2^{n+k}}$ is :
- (1) 5 (2) 4 (3) 3 (4) 2
69. If the system of linear equations $x + y + z = 6$, $x + 2y + 3z = 14$ and $2x + 5y + \lambda z = \mu$ ($\lambda, \mu \in \mathbb{R}$) has a unique solution, then :
- (1) $\lambda \neq 8$ (2) $\lambda = 8, \mu \neq 36$
 (3) $\lambda = 8, \mu = 36$ (4) $\lambda \neq 8, \mu \neq 36$
70. The sum of the coefficients of even power of x in the expansion of $(1 + x + x^2 + x^3)^5$ is:
- (1) 256 (2) 128 (3) 512 (4) 64
71. If $A = \begin{bmatrix} \sin \alpha & -\cos \alpha & 0 \\ \cos \alpha & \sin \alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then A^{-1} is equal to :
- (1) $2A^T$ (2) A
 (3) $\text{adj } A$ (4) None of these

SPACE FOR ROUGH WORK

72. If x_1, x_2, x_3 and x_4 are the roots of the equation $x^4 + x^3 + 2 = 0$, then the value of $\prod_{i=1}^4 (3x_i - 1)$ is equal to :
- (1) 160 (2) 166 (3) 172 (4) 162
73. A coin is tossed 7 times. Then the probability that atleast 4 consecutive heads appear is :
- (1) $\frac{3}{16}$ (2) $\frac{5}{32}$ (3) $\frac{1}{16}$ (4) $\frac{1}{8}$
74. Let $f(x) = x^2 - 2x$, $x \in \mathbb{R}$ and $g(x) = f(f(x) - 1) + f(5 - f(x))$, then the minimum integral value in the range of $g(x)$ is :
- (1) 0 (2) 1 (3) 2 (4) 3
75. Let $f(x) = x^3 + bx^2 + ax + 12$ ($b \neq 0$). If $(-3, 2)$ is the largest possible interval for which $f(x)$ is decreasing function then the value of 'a' is :
- (1) 3 (2) 9 (3) -9 (4) -18
76. $\lim_{x \rightarrow 0} \left(\tan \left(\frac{\pi}{4} - x \right) \right)^{\frac{1}{x}}$ is equal to :
- (1) 1 (2) e (3) e^2 (4) e^{-2}
77. The area of region enclosed by curves $y = x^2$ and $y = \sqrt{|x|}$ is:
- (1) $\frac{1}{3}$ (2) $\frac{2}{3}$ (3) $\frac{4}{3}$ (4) $\frac{16}{3}$
78. The sum of values of x satisfying the equation $(31 + 8\sqrt{15})^{x^2-3} + 1 = (32 + 8\sqrt{15})^{x^2-3}$ is :
- (1) 3 (2) 0 (3) 2 (4) 4
79. $\int \frac{x^9 dx}{(4x^2 + 1)^6}$ is equal to :
- (1) $\frac{1}{5x} \left(4 + \frac{1}{x^2} \right)^{-5} + C$
- (2) $\frac{1}{5} \left(4 + \frac{1}{x^2} \right)^{-5} + C$
- (3) $\frac{1}{10} (1 + 4x^2)^{-5} + C$
- (4) $\frac{1}{10} \left(4 + \frac{1}{x^2} \right)^{-5} + C$
80. If $f(x) = x^3 \operatorname{sgn}(x)$, then :
- (1) f is derivable at $x = 0$
- (2) f is continuous but not derivable at $x = 0$
- (3) L.H.D. at $x = 0$ is 1
- (4) R.H.D. at $x = 0$ is 1
81. $\int_{-3}^3 x^8 \{x^{11}\} dx$ is equal to (where $\{ \}$ is fractional part function).
- (1) 3^8 (2) 3^7 (3) 3^9 (4) 3^{10}

SPACE FOR ROUGH WORK

82. The solution of the differential equation $(x + 2y^3) \frac{dy}{dx} = y$ is :
- (1) $\frac{x}{y^2} = y + c$ (2) $\frac{x}{y} = y^2 + c$
- (3) $\frac{x^2}{y} = y^2 + c$ (4) $\frac{y}{x} = x^2 + c$
83. Let $f(x) = (x - 1)(x - 2)(x - 3) \dots (x - n)$ and $f'(n) = 5040$ then the value of n is :
- (1) 6 (2) 7 (3) 9 (4) 8
84. If a variable X takes value $0, 1, 2, \dots, n$ with frequency ${}^n C_0, {}^n C_1, \dots, {}^n C_n$ respectively, then the $\text{Var}(X)$ is :
- (1) $\frac{n^2 - 1}{12}$ (2) $\frac{n}{2}$
- (3) $\frac{n}{4}$ (4) None of these
85. $(p \vee q) \wedge \sim p$ is equivalent to :
- (1) $\sim p \wedge q$ (2) $p \wedge q$
- (3) $p \wedge (\sim q)$ (4) $\sim p \wedge \sim q$
86. Let N denotes the set of all natural numbers and R be the relation on $N \times N$ defined by : $(a, b) R (c, d) \Rightarrow ad(b + c) = bc(a + d)$, then R is :
- (1) Reflexive, Symmetric but not Transitive
- (2) Symmetric, Transitive but not Reflexive
- (3) Transitive, Reflexive but not Symmetric
- (4) Equivalence
87. Negation of the statement $p \rightarrow (q \wedge r)$ is :
- (1) $\sim p \rightarrow \sim (q \wedge r)$
- (2) $\sim p \vee (q \wedge r)$
- (3) $(q \wedge r) \rightarrow p$
- (4) $p \wedge (\sim q \vee \sim r)$
88. If P is any arbitrary point on the circumcircle of the equilateral triangle of side length ℓ units, then $|\overline{PA}|^2 + |\overline{PB}|^2 + |\overline{PC}|^2$ is always equal to :
- (1) $2\ell^2$ (2) $2\sqrt{3}\ell^2$
- (3) ℓ^2 (4) $3\ell^2$
89. The equation of a plane which passes through the point of intersection of lines $\frac{x-3}{1} = \frac{y-1}{2} = \frac{z-2}{3}$ and $\frac{x-1}{3} = \frac{y-2}{1} = \frac{z-3}{2}$ and at greatest distance from origin is :
- (1) $4x + 3y + 5z = 25$
- (2) $4x + 3y + 5z = 50$
- (3) $3x + 4y + 5z = 49$
- (4) $x + 7y - 5z = 2$
90. Let $f(x) = \cos 2x \cdot \cos 4x \cdot \cos 6x \cdot \cos 8x$, then $\lim_{x \rightarrow 0} \frac{1 - (f(x))^3}{5x^2}$ is equal to :
- (1) 36 (2) 56
- (3) 60 (4) 66

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK



CLASSROOM CONTACT PROGRAMME
(Academic Session : 2018 - 2019)

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SCORE : II

Test Type : FULL SYLLABUS

Test Pattern : JEE-Main

TEST DATE : 27 - 01 - 2019

PAPER – 2

Important Instructions

महत्वपूर्ण निर्देश

Do not open this Test Booklet until you are asked to do so.

1. Immediately fill in the form number on this page of the Test Booklet with *Blue/Black Ball Point Pen*. Use of pencil is strictly prohibited.
2. The candidates should not write their Form Number anywhere else (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 **90** questions. The maximum marks are **360**.
5. There are **three** parts in the question paper A,B,C consisting of **Physics, Chemistry and Mathematics** having **30 questions** in each part of equal weightage. Each question is allotted 4 (four) marks for **correct** response.
6. **One Fourth** mark will be deducted for indicated incorrect response of each question. **No deduction** from the total score will be made if no response is indicated for an item in the Answer Sheet.
7. Use **Blue/Black Ball Point Pen only** for writing particulars/markings responses on **Side-1** and **Side 2** of the Answer Sheet.
Use of pencil is strictly prohibited.
8. No candidate is allowed to carry any textual material, printed or written, bits of papers, mobile phone any electronic device etc, except the Identity Card inside the examination hall/room.
9. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
10. On completion of the test, the candidate must hand over the Answer Sheet to the invigilator on duty in the Room/Hall. **However, the candidate are allowed to take away this Test Booklet with them.**
11. **Do not fold or make any stray marks on the Answer Sheet.**

इस परीक्षा पुस्तिका को तब तक न खोलें जब तक कहा न जाए।

1. परीक्षा पुस्तिका के इस पृष्ठ पर आवश्यक विवरण *नीले/काले बॉल पाइंट पेन* से तत्काल भरें। *पेन्सिल का प्रयोग बिल्कुल वर्जित है।*
2. परीक्षार्थी अपना फार्म नं. (निर्धारित जगह के अतिरिक्त) परीक्षा पुस्तिका / उत्तर पत्र पर कहीं और न लिखें।
3. परीक्षा की अवधि **3 घंटे** है।
4. इस परीक्षा पुस्तिका में **90** प्रश्न हैं। अधिकतम अंक **360** हैं।
5. इस परीक्षा पुस्तिका में तीन भाग A, B, C हैं, जिसके प्रत्येक भाग में **भौतिक विज्ञान, रसायन विज्ञान एवं गणित** के **30 प्रश्न** हैं और सभी प्रश्नों के अंक समान हैं। प्रत्येक प्रश्न के **सही** उत्तर के लिए 4 (चार) अंक निर्धारित किये गये हैं।
6. प्रत्येक गलत उत्तर के लिए उस प्रश्न के कुल अंक का **एक चौथाई अंक** काटा जायेगा। उत्तर पुस्तिका में कोई भी उत्तर नहीं भरने पर कुल प्राप्तांक में से **ऋणात्मक अंकन** नहीं होगा।
7. उत्तर पत्र के **पृष्ठ-1** एवं **पृष्ठ-2** पर वांछित विवरण एवं उत्तर अंकित करने हेतु केवल *नीले/काले बॉल पाइंट पेन* का ही प्रयोग करें।
पेन्सिल का प्रयोग सर्वथा वर्जित है।
8. परीक्षार्थी द्वारा परीक्षा कक्ष/हॉल में परिचय पत्र के अलावा किसी भी प्रकार की पाठ्य सामग्री मुद्रित या हस्तलिखित कागज की पर्चियों, मोबाइल फोन या किसी भी प्रकार के इलेक्ट्रॉनिक उपकरणों या किसी अन्य प्रकार की सामग्री को ले जाने या उपयोग करने की अनुमति नहीं है।
9. रफ कार्य परीक्षा पुस्तिका में केवल निर्धारित जगह पर ही कीजिये।
10. परीक्षा समाप्त होने पर, परीक्षार्थी कक्ष/हॉल छोड़ने से पूर्व उत्तर पत्र कक्ष निरीक्षक को अवश्य सौंप दें। **परीक्षार्थी अपने साथ इस परीक्षा पुस्तिका को ले जा सकते हैं।**
11. उत्तर पत्र को न मोड़ें एवं न ही उस पर अन्य निशान लगाएँ।

Your Target is to secure Good Rank in JEE (Main) 2019

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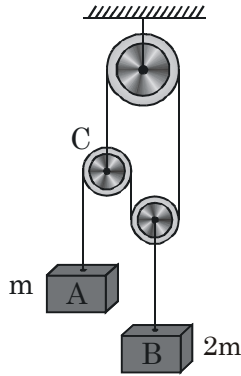
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BEWARE OF NEGATIVE MARKING

PART A - PHYSICS

1. In the arrangement shown the pulleys and the strings are ideal. The respective accelerations of the blocks A and B are

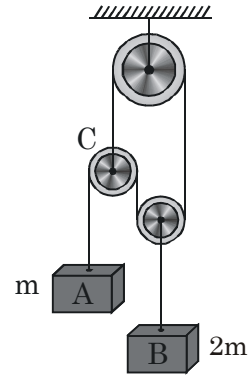


- (1) $g, g/2$ (2) $g/2, g$
(3) $3g/2, 3g/4$ (4) g, g

2. The tangential acceleration of a particle in a circular motion of radius $2m$ is $a_t = \alpha t \text{ m/s}^2$ (where α is a constant). Initially the particle is at rest. Net acceleration of the particle makes 45° with the radial acceleration after 2 sec. The value of constant α is:

- (1) $1/2 \text{ m/s}^3$
(2) 1 m/s^3
(3) 2 m/s^3
(4) Data are insufficient

1. प्रदर्शित चित्र में घिरनियों तथा रस्सियाँ आदर्श हैं। ब्लॉक A तथा B के संगत त्वरण हैं:-



- (1) $g, g/2$ (2) $g/2, g$
(3) $3g/2, 3g/4$ (4) g, g

2. किसी कण का $2m$ त्रिज्या वाली वृत्ताकार गति में स्पर्शरेखीय त्वरण $a_t = \alpha t \text{ m/s}^2$ है जहाँ α एक नियतांक है। प्रारम्भ में कण विरामावस्था में है। कण का कुल त्वरण 2sec पश्चात् त्रिज्यीय त्वरण के साथ 45° कोण बनाता है। नियतांक α का मान है:-

- (1) $1/2 \text{ m/s}^3$
(2) 1 m/s^3
(3) 2 m/s^3
(4) आँकड़े अपर्याप्त हैं।

कच्चे कार्य के लिए स्थान

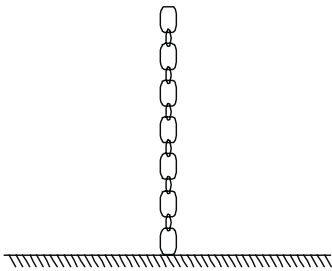
3. The potential energy of a diatomic molecule is given by $U = \frac{A}{r^{12}} - \frac{B}{r^6}$. A and B are positive constants. The distance r between them at equilibrium is :-

- (1) $\left(\frac{A}{B}\right)^{1/6}$ (2) $\left(\frac{2A}{B}\right)^{1/6}$
(3) $\left(\frac{A}{2B}\right)^{1/6}$ (4) None of these

4. A bomb is projected upwards. At topmost point it explodes in three identical fragments. First fragment comes to ground in 10 sec and others in 20 sec each. Then the height reached by the original bomb is :

- (1) 800 m (2) 1600 m
(3) 1250 m (4) 1500 m

5. A uniform chain of mass m and length ℓ hangs on a thread and touches the surface of a table by its lower end. Find the force exerted by the table on the chain when half of its length has fallen on the table. The fallen part does not form heap.



- (1) $\frac{3mg}{4}$ (2) $\frac{mg}{2}$ (3) $\frac{3mg}{2}$ (4) mg

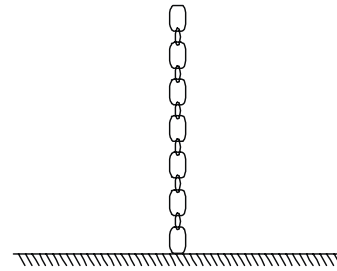
3. किसी द्विपरमाण्विक अणु की स्थितिज ऊर्जा $U = \frac{A}{r^{12}} - \frac{B}{r^6}$ द्वारा दी जाती है, जहाँ A तथा B धनात्मक अचर हैं। साम्यावस्था पर इनके मध्य दूरी r होगी:-

- (1) $\left(\frac{A}{B}\right)^{1/6}$ (2) $\left(\frac{2A}{B}\right)^{1/6}$
(3) $\left(\frac{A}{2B}\right)^{1/6}$ (4) इनमें से कोई नहीं

4. एक बम को ऊपर की ओर प्रक्षेपित किया जाता है। उच्चतम बिन्दु पर यह तीन एकजैसे टुकड़ों में विस्फोटित होता है। प्रथम टुकड़ा 10 sec में धरातल पर आता है जबकि शेष दोनों टुकड़ों में से प्रत्येक 20 sec समय में धरातल पर आते हैं। मूल बम द्वारा प्राप्त ऊँचाई होगी:-

- (1) 800 m (2) 1600 m
(3) 1250 m (4) 1500 m

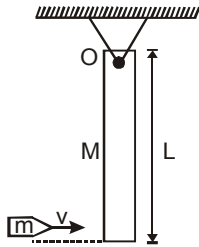
5. द्रव्यमान m तथा लम्बाई ℓ वाली एक समरूप जंजीर किसी धागे पर लटकती है तथा इसका निचला सिरा टेबल की सतह को छूता है। जंजीर पर टेबल द्वारा आरोपित बल ज्ञात कीजिये जब इसकी आधी लम्बाई टेबल पर गिर चुकी है। गिरा हुआ भाग ढेर नहीं बनाता है।



- (1) $\frac{3mg}{4}$ (2) $\frac{mg}{2}$ (3) $\frac{3mg}{2}$ (4) mg

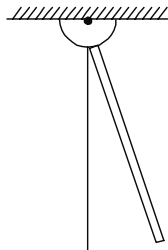
कच्चे कार्य के लिए स्थान

6. A rod of mass M and length L is suspended by a frictionless hinge at the point O as shown in figure. A bullet of mass m moving with velocity v in a horizontal direction strikes the end of the rod and gets embedded in it. The angular velocity of the rod just after the collision is -



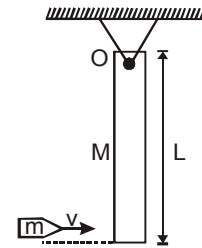
- (1) $\frac{mv}{(3m + M)L}$ (2) $\frac{2mv}{ML}$
(3) $\frac{2mv}{L}$ (4) $\frac{3mv}{(3m + M)L}$

7. A metre stick swinging in vertical plane about a fixed horizontal axis passing through its one end undergoes small oscillation of frequency f_0 . If the bottom half of the stick were cut off, then its new frequency of small oscillation would become :



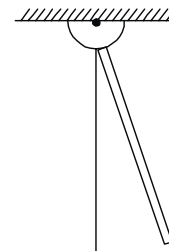
- (1) f_0 (2) $\sqrt{2}f_0$ (3) $2f_0$ (4) $2\sqrt{2}f_0$

6. द्रव्यमान M तथा लम्बाई L वाली एक छड़ को बिन्दु O पर चित्रानुसार एक घर्षणरहित कीलक द्वारा लटकाया गया है। क्षैतिज दिशा में v वेग से गतिशील m द्रव्यमान की एक गोली छड़ के सिरे से टकराती है तथा इसमें धंस जाती है। टक्कर के ठीक पश्चात् छड़ का कोणीय वेग होगा:-



- (1) $\frac{mv}{(3m + M)L}$ (2) $\frac{2mv}{ML}$
(3) $\frac{2mv}{L}$ (4) $\frac{3mv}{(3m + M)L}$

7. एक मीटर छड़ ऊर्ध्वाधर तल में इसके एक सिरे से गुजरने वाली स्थिर क्षैतिज अक्ष के सापेक्ष f_0 आवृत्ति के अल्प दोलनों वाली गति करती है। यदि इस छड़ का निचला आधा भाग काट दिया जाये तो अब अल्प दोलन की नयी आवृत्ति हो जायेगी:-



- (1) f_0 (2) $\sqrt{2}f_0$ (3) $2f_0$ (4) $2\sqrt{2}f_0$

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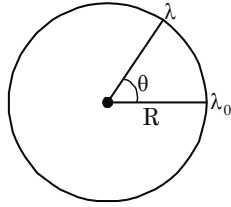
8. A thin non-conducting ring of radius R has a linear charge density $\lambda = \lambda_0 \cos \theta$, where λ_0 is the value of λ at $\theta = 0$. Find the net electric dipole moment for this charge distribution.

(1) $\frac{\pi R^2 \lambda_0}{4}$

(2) $\frac{\pi R^2 \lambda_0}{2}$

(3) $\pi R^2 \lambda_0$

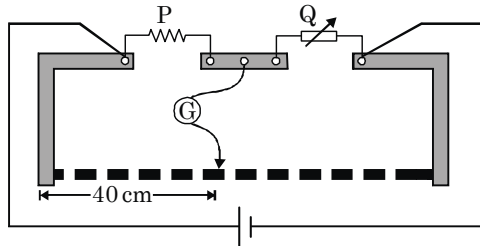
(4) $2\pi R^2 \lambda_0$



9. A body is projected away from the earth's surface with a speed $3v_e$ where v_e is the escape velocity. The speed of the body at infinity will be :

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

10. In a metre bridge, the gaps are closed by two resistances P and Q and the balance point is obtained at 40 cm . When Q is shunted by a resistance of 10Ω , the balance point shifts to 50 cm . The values of P and Q are :-



(1) $\frac{10}{3}\Omega, 5\Omega$

(2) $20\Omega, 30\Omega$

(3) $10\Omega, 15\Omega$

(4) $5\Omega, \frac{15}{2}\Omega$

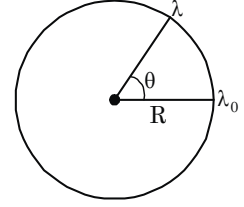
8. त्रिज्या R वाली एक पतली अचालक वलय पर रेखीय आवेश घनत्व $\lambda = \lambda_0 \cos \theta$ विद्यमान है जहाँ $\lambda_0, \theta = 0$ पर λ का मान है। इस आवेश वितरण के लिये कुल विद्युत द्विध्रुव आघूर्ण ज्ञात कीजिये।

(1) $\frac{\pi R^2 \lambda_0}{4}$

(2) $\frac{\pi R^2 \lambda_0}{2}$

(3) $\pi R^2 \lambda_0$

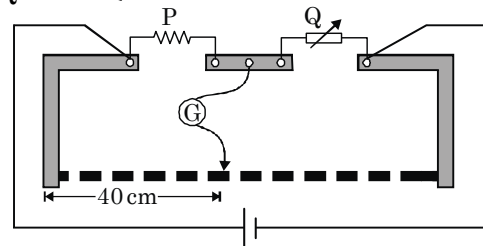
(4) $2\pi R^2 \lambda_0$



9. एक पिण्ड को $3v_e$ चाल के साथ पृथ्वी की सतह से दूर प्रक्षेपित किया जाता है जहाँ v_e पलायन वेग है। अनन्त पर पिण्ड की चाल होगी:-

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

10. एक मीटर सेतु में रिक्त स्थानों को दो प्रतिरोधों P तथा Q द्वारा बंद किया गया है तथा संतुलन बिन्दु 40 cm पर प्राप्त होता है। जब Q को 10Ω प्रतिरोध द्वारा शंटित किया जाता है तो संतुलन बिन्दु 50 cm पर विस्थापित हो जाता है। P व Q के मान है:-



(1) $\frac{10}{3}\Omega, 5\Omega$

(2) $20\Omega, 30\Omega$

(3) $10\Omega, 15\Omega$

(4) $5\Omega, \frac{15}{2}\Omega$

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11. A parallel plate capacitor having capacitance C_0 is connected to a battery of emf E . It is then disconnected from the battery and a dielectric slab of dielectric constant k completely filling the air gap of the capacitor is inserted in it. If ΔU indicates the change in energy, then

(1) $\Delta U = 0$

(2) $\Delta U = \frac{1}{2} C_0 E^2 (k - 1)$

(3) $\Delta U = \frac{1}{2} C_0 E^2 \left(1 - \frac{1}{2k}\right)$

(4) $\Delta U = \frac{1}{2} C_0 E^2 \left(\frac{1}{k} - 1\right)$

12. Given a ring of mass M , radius R resting on a rough horizontal plane, with coefficient of friction ' μ '. A cylindrical, vertical magnetic field passing through ring is switched on at $t = 0$ which varies with time as $B = Kt^2$. Ring has charge Q distributed uniformly over it. Find the time after which ring starts rotating.

(1) $\frac{\mu Mg}{QKR}$

(2) $\frac{2\mu Mg}{QKR}$

(3) $\frac{\mu Mg}{2QKR}$

(4) $\frac{\mu Mg}{4QKR}$

11. धारिता C_0 वाले एक समान्तर पट्ट संधारित्र को E विद्युत वाहक बल वाली बैटरी के साथ जोड़ा जाता है। अब इसे बैटरी से हटा कर परावैद्युतांक k वाली एक परावैद्युत पट्टिका को संधारित्र के रिक्त स्थान में पूर्णतया भर दिया जाता है। यदि ΔU ऊर्जा में परिवर्तन हो तो

(1) $\Delta U = 0$

(2) $\Delta U = \frac{1}{2} C_0 E^2 (k - 1)$

(3) $\Delta U = \frac{1}{2} C_0 E^2 \left(1 - \frac{1}{2k}\right)$

(4) $\Delta U = \frac{1}{2} C_0 E^2 \left(\frac{1}{k} - 1\right)$

12. द्रव्यमान M , त्रिज्या R वाली एक वलय घर्षण गुणांक ' μ ' वाले खुरदरे क्षैतिज तल पर स्थित है। वलय से गुजरने वाले एक बेलनाकार ऊर्ध्वाधर चुम्बकीय क्षेत्र को $t = 0$ पर चालू किया जाता है जो समय के साथ $B = Kt^2$ के अनुसार परिवर्तित होता है। इस वलय पर आवेश Q एकसमान रूप से वितरित है। यह वलय कितने समय पश्चात् घूर्णन करना प्रारम्भ करेगी ?

(1) $\frac{\mu Mg}{QKR}$

(2) $\frac{2\mu Mg}{QKR}$

(3) $\frac{\mu Mg}{2QKR}$

(4) $\frac{\mu Mg}{4QKR}$

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13. Two moving coil galvanometers M_1 and M_2 having same spring constants have the following specifications:

for galvanometer M_1 , $R_1 = 10\Omega$, $N_1 = 30$,
 $A_1 = 3.6 \times 10^{-3} \text{ m}^2$, $B_1 = 0.25\text{T}$

for galvanometer M_2 , $R_2 = 14\Omega$, $N_2 = 42$,
 $A_2 = 1.8 \times 10^{-3} \text{ m}^2$, $B_2 = 0.5\text{T}$

Find the ratios of current sensitivity between galvanometer M_1 & galvanometer M_2

- (1) 5/7 (2) 3/4 (3) 1 (4) 7/5

14. The wavelength of the K_α line for an element of atomic number 57 is α . What is the wavelength of the K_α line for the element of atomic number 29?

- (1) α (2) 2α (3) 4α (4) 8α

15. A heavy nucleus having mass number 200 gets disintegrated into two small fragments of mass number 80 and 120. If binding energy per nucleon for parent atom is 6.5 MeV and for daughter nuclei is 7 MeV and 8 MeV respectively, then the energy released in the decay will be:

- (1) 200 MeV (2) -220 MeV
 (3) 220 MeV (4) 180 MeV

13. समान स्प्रिंग नियतांक वाले दो चलकुण्डली धारामापी M_1 तथा M_2 के बारे में निम्न जानकारी दी गयी है :

धारामापी M_1 के लिये, $R_1 = 10\Omega$, $N_1 = 30$,
 $A_1 = 3.6 \times 10^{-3} \text{ m}^2$, $B_1 = 0.25\text{T}$

धारामापी M_2 के लिये, $R_2 = 14\Omega$, $N_2 = 42$,
 $A_2 = 1.8 \times 10^{-3} \text{ m}^2$, $B_2 = 0.5\text{T}$

धारामापी M_1 तथा M_2 के मध्य धारा सुग्राहिता का अनुपात ज्ञात कीजिये।

- (1) 5/7 (2) 3/4 (3) 1 (4) 7/5

14. परमाणु क्रमांक 57 वाले एक तत्व की K_α रेखा की तरंगदैर्घ्य α है। परमाणु क्रमांक 29 वाले तत्व की K_α रेखा की तरंगदैर्घ्य क्या होगी ?

- (1) α (2) 2α (3) 4α (4) 8α

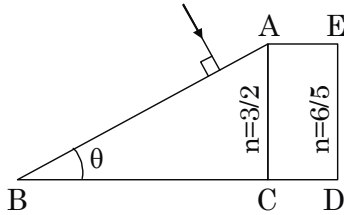
15. द्रव्यमान संख्या 200 वाला एक भारी नाभिक द्रव्यमान संख्या 80 तथा 120 वाले दो छोटे टुकड़ों में विघटित होता है। यदि संतति परमाणु के लिये प्रति न्यूक्लियॉन बंधन ऊर्जा 6.5 MeV तथा पुत्री नाभिकों के लिये क्रमशः 7 MeV व 8 MeV हो तो विघटन में उत्सर्जित ऊर्जा होगी:-

- (1) 200 MeV (2) -220 MeV
 (3) 220 MeV (4) 180 MeV

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16. In the figure ABC is the cross section of a right angled prism and ACDE is the cross section of a glass slab. The value of θ so that light incident normally on the face AB does not cross the face AC is

(Given $\sin^{-1}(3/5) = 37^\circ$)



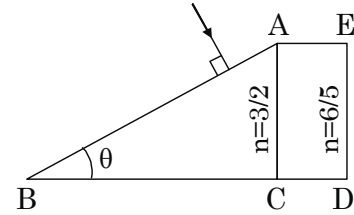
- (1) $\theta < 30^\circ$ (2) $\theta < 37^\circ$
(3) $\theta < 60^\circ$ (4) $\theta < 53^\circ$

17. A tuning fork having a frequency of 340 Hz is vibrated just above a cylindrical tube. The height of the tube is 120 cm. Water is slowly poured in it. What is the minimum height of water required for resonance? Velocity of sound in air = 340 m/s.

- (1) 5 cm
(2) 25 cm
(3) 45 cm
(4) 95 cm

16. प्रदर्शित चित्र में ABC एक समकोण प्रिज्म का अनुप्रस्थकाट तथा ACDE काँच की पट्टिका का अनुप्रस्थकाट है। θ का मान क्या होना चाहिये ताकि फलक AB पर लम्बवत् आपतित प्रकाश फलक AC से होकर नहीं गुजरे ?

($\sin^{-1}(3/5) = 37^\circ$)



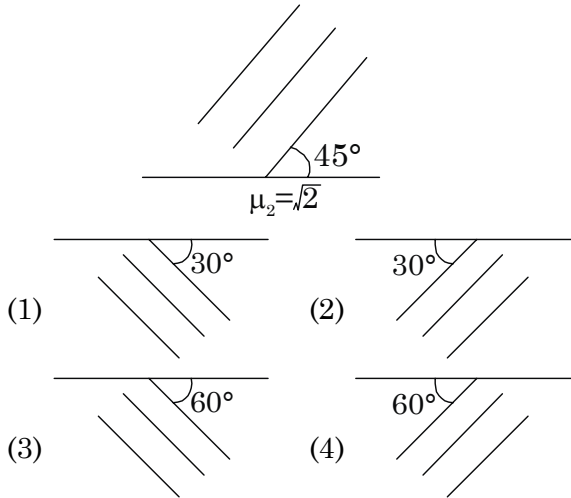
- (1) $\theta < 30^\circ$ (2) $\theta < 37^\circ$
(3) $\theta < 60^\circ$ (4) $\theta < 53^\circ$

17. आवृत्ति 340 Hz वाला एक स्वरित्र किसी बेलनाकार नली के ठीक ऊपर कंपित किया जाता है। नली की ऊँचाई 120 cm है। इसमें जल धीरे-धीरे डाला जाता है। अनुनाद के लिये जल की आवश्यक न्यूनतम ऊँचाई क्या होगी ? वायु में ध्वनि का वेग 340 m/s है।

- (1) 5 cm
(2) 25 cm
(3) 45 cm
(4) 95 cm

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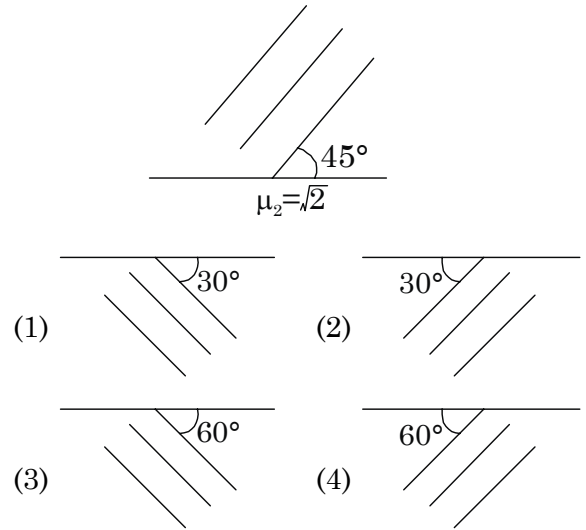
18. Wavefronts incident on an interface between the media are shown in the figure. The refracted wavefront will be as shown in



19. A fully filled hemispherical tank of radius R has an orifice of small area a at its bottom. Time required to completely empty the tank will be (Assuming that the top surface area of the liquid is always much greater than the orifice area)

- (1) $\frac{5\pi R^{5/2}}{\sqrt{2} ag}$
- (2) $\frac{9\pi R^{5/2}}{\sqrt{2} ag}$
- (3) $\frac{7\sqrt{2}\pi R^{5/2}}{15a\sqrt{g}}$
- (4) Can't be calculated

18. चित्र में प्रदर्शित माध्यमों के मध्य स्थित किसी अंतरापृष्ठ पर तरंगग्र आपतित होते हैं। अपवर्तित तरंगग्र होगा:-



19. त्रिज्या R वाले एक पूर्णतया भरे अर्धगोलाकार टैंक के पैंदे पर अल्प क्षेत्रफल a वाला एक छिद्र बना हुआ है। इस टैंक को पूर्णतया खाली होने में लगा आवश्यक समय होगा:- (माना द्रव का शीर्ष सतही क्षेत्रफल सदैव छिद्र के क्षेत्रफल से अधिक होता है।)

- (1) $\frac{5\pi R^{5/2}}{\sqrt{2} ag}$
- (2) $\frac{9\pi R^{5/2}}{\sqrt{2} ag}$
- (3) $\frac{7\sqrt{2}\pi R^{5/2}}{15a\sqrt{g}}$
- (4) गणना नहीं की जा सकती।

कच्चे कार्य के लिए स्थान

20. The power radiated by a black body is P and it radiates maximum energy around the wavelength λ_0 . If the temperature of the black body is now changed so that it radiates maximum energy around wavelength $3/4\lambda_0$, the power radiated by it will increase by a factor of
- (1) $4/3$ (2) $16/9$
(3) $64/27$ (4) $256/81$
21. One end of a 2.35m long and 2.0cm radius aluminium rod ($K = 235 \text{ W.m}^{-1}\text{K}^{-1}$) is held at 20°C . The other end of the rod is in contact with a block of ice at its melting point. The rate in kg.s^{-1} at which ice melts is [Take latent heat of fusion for ice as $1/3 \times 10^6 \text{ J.kg}^{-1}$]
- (1) $48\pi \times 10^{-6}$ (2) $24\pi \times 10^{-6}$
(3) $2.4\pi \times 10^{-6}$ (4) $4.8\pi \times 10^{-6}$
22. A steel wire of length 2.0 m is stretched through 2.0 mm. The cross-sectional area of the wire is 4.0 mm^2 . Calculate the elastic potential energy stored in the wire in the stretched condition. Young's modulus of steel = $2.0 \times 10^{11} \text{ N m}^{-2}$.
- (1) 0.04 J (2) 0.4 J
(3) 0.8 J (4) 80 J
20. एक कृष्ण पिण्ड द्वारा विकिरित शक्ति P है तथा यह λ_0 तरंगदैर्घ्य पर अधिकतम ऊर्जा विकिरित करता है। अब यदि कृष्ण पिण्ड का तापमान इस प्रकार परिवर्तित किया जाये कि यह $3/4\lambda_0$ तरंगदैर्घ्य पर अधिकतम ऊर्जा विकिरित करे तो इसके द्वारा विकिरित शक्ति कितनी गुना बढ़ जायेगी ?
- (1) $4/3$ (2) $16/9$
(3) $64/27$ (4) $256/81$
21. लम्बाई 2.35m तथा त्रिज्या 2.0cm वाली एक एल्युमिनियम छड़ ($K = 235 \text{ W.m}^{-1}\text{K}^{-1}$) के एक सिरे को 20°C पर रखा गया है। छड़ का दूसरा सिरा गलनांक पर स्थित बर्फ के एक ब्लॉक के संपर्क में है। बर्फ किस दर (kg.s^{-1}) से पिघलती है? [बर्फ के लिये संगलन की गुप्त ऊष्मा = $1/3 \times 10^6 \text{ J.kg}^{-1}$ लें]
- (1) $48\pi \times 10^{-6}$ (2) $24\pi \times 10^{-6}$
(3) $2.4\pi \times 10^{-6}$ (4) $4.8\pi \times 10^{-6}$
22. एक 2.0 m लम्बे स्टील के तार को 2.0 mm विस्तारित किया जाता है। तार का अनुप्रस्थकाट क्षेत्रफल 4.0 mm^2 है। तनित स्थिति में तार में संचित प्रत्यास्थ स्थितिज ऊर्जा की गणना कीजिये। स्टील का यंग गुणांक = $2.0 \times 10^{11} \text{ N m}^{-2}$ होता है।
- (1) 0.04 J (2) 0.4 J
(3) 0.8 J (4) 80 J

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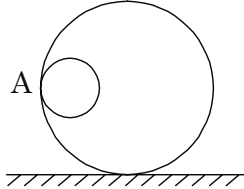
- | | |
|--|--|
| <p>23. The efficiency of a carnot engine is 0.6. It rejects total 20 J of heat. The work done by the engine is :</p> <p>(1) 40 J (2) 50 J
(3) 20 J (4) 30 J</p> <p>24. Consider the following data:
10 main scale division = 1 cm, 10 vernier division = 9 main scale divisions. Zero of vernier scale is to the right of the zero marking of the main scale with 6 vernier divisions coinciding with main scale divisions. The measured reading for length measurement is 4.3 cm on main scale with 2 vernier divisions coinciding with main scale graduations. Estimate the actual length.</p> <p>(1) 426 cm (2) 4.26 cm
(3) 4.38 cm (4) 4.5 cm</p> <p>25. At a point on earth surface horizontal component of earth's magnetic field is $40 \mu\text{T}$ and dip angle is 30°. Find the total magnetic field of earth at this point.</p> <p>(1) $34 \mu\text{T}$ (2) $40 \mu\text{T}$
(3) $46 \mu\text{T}$ (4) $80 \mu\text{T}$</p> | <p>23. एक कार्नो ईंजन की दक्षता 0.6 है। यह कुल 20 J ऊष्मा उत्सर्जित करता है। ईंजन द्वारा किया गया कार्य है:-</p> <p>(1) 40 J (2) 50 J
(3) 20 J (4) 30 J</p> <p>24. निम्न आँकड़ों पर विचार कीजिये :
मुख्य पैमाने के 10 भाग = 1 cm, वर्नियर पैमाने के 10 भाग = मुख्य पैमाने के 9 भाग। वर्नियर पैमाने का शून्य मुख्य पैमाने के शून्य चिन्ह के दांयी ओर है तथा वर्नियर पैमाने के 6 भाग मुख्य पैमाने के भागों के संपाती है। लम्बाई मापन के लिये मापा गया पाठ्यांक मुख्य पैमाने पर 4.3 cm है तथा वर्नियर पैमाने के 2 भाग मुख्य पैमाने के अंशांकन के साथ संपाती है। वास्तविक लम्बाई परिकलित कीजिये।</p> <p>(1) 426 cm (2) 4.26 cm
(3) 4.38 cm (4) 4.5 cm</p> <p>25. पृथ्वी की सतह पर किसी बिन्दु पर पृथ्वी के चुम्बकीय क्षेत्र का क्षैतिज घटक $40 \mu\text{T}$ तथा नति कोण 30° है। इस बिन्दु पर पृथ्वी का कुल चुम्बकीय क्षेत्र ज्ञात कीजिये।</p> <p>(1) $34 \mu\text{T}$ (2) $40 \mu\text{T}$
(3) $46 \mu\text{T}$ (4) $80 \mu\text{T}$</p> |
|--|--|

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26. A spring-mass system has undamped natural angular frequency $\omega_0 = 100 \text{ rad s}^{-1}$. The solution $x(t)$ at critical damping is given by $x(t) = x_0(1 + \omega_0 t) e^{-\omega_0 t}$, where x_0 is a constant. The system experiences the maximum damping force at time
- (1) 0.01 s (2) 0.1 s
 (3) 0.01 π s (4) 0.1 π s
27. In a single slit diffraction experiment first minima for $\lambda_1 = 660 \text{ nm}$ coincides with the first maxima for wavelength λ_2 . Calculate λ_2 (approximately).
- (1) 660 nm (2) 220 nm
 (3) 440 nm (4) 1320 nm
28. A telescope of aperture diameter $D = 32 \text{ mm}$, and objective focal length $f = 24 \text{ cm}$, forms images of two distant stars in the focal plane of the objective lens. If the stars have a minimum resolvable angular separation according to the Rayleigh criterion, then what is the distance, x , between the centers of the images in the focal plane? (Assume light of wavelength 550 nm is used.)
- (1) 5 μm (2) 50 μm
 (3) 0.5 mm (4) 5 mm
26. एक स्प्रिंग द्रव्यमान निकाय की अन-अवमंदित प्राकृतिक कोणीय आवृत्ति $\omega_0 = 100 \text{ rad s}^{-1}$ है। क्रांतिक अवमंदन पर हल $x(t) = x_0(1 + \omega_0 t) e^{-\omega_0 t}$ द्वारा दिया जाता है जहाँ x_0 एक नियतांक है। निकाय पर अधिकतम अवमंदन बल किस समय लगेगा ?
- (1) 0.01 s (2) 0.1 s
 (3) 0.01 π s (4) 0.1 π s
27. किसी एकल स्लिट विवर्तन प्रयोग में $\lambda_1 = 660 \text{ nm}$ के लिये प्रथम निम्निष्ठ, तरंगदैर्घ्य λ_2 के लिये प्रथम उच्चिष्ठ के साथ संपाती होता है। λ_2 का लगभग मान होगा:-
- (1) 660 nm (2) 220 nm
 (3) 440 nm (4) 1320 nm
28. द्वारक व्यास $D = 32 \text{ mm}$ तथा अभिदृश्यक फोकस दूरी $f = 24 \text{ cm}$ वाला एक दूरदर्शी दो दूरस्थ तारों के प्रतिबिम्ब अभिदृश्यक लेंस के फोकस तल में बनाता है। यदि इन तारों का रैले के सिद्धान्त के अनुसार न्यूनतम विभेदन कोणीय विस्थापन हो तो फोकस तल में प्रतिबिम्बों के केन्द्रों के मध्य दूरी x क्या होगी ? (माना प्रयुक्त प्रकाश की तरंगदैर्घ्य 550 nm है)
- (1) 5 μm (2) 50 μm
 (3) 0.5 mm (4) 5 mm

कच्चे कार्य के लिए स्थान

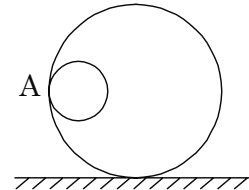
29. A ring of radius $3a$ is fixed rigidly on a table. A small ring whose mass is m and radius a , rolls without slipping inside it as shown in the figure. The small ring is released from position A. When it reaches at the lowest point, the speed of the centre of the ring at that time would be -



- (1) $\sqrt{2ga}$ (2) $\sqrt{3ga}$
(3) $\sqrt{6ga}$ (4) $\sqrt{4ga}$
- 30 At any point $(x, 0, 0)$ the electric potential V is $\left(\frac{1000}{x} + \frac{1500}{x^2} + \frac{500}{x^3}\right)$ volt, then electric field at $x = 1$ m -

- (1) $5500(\hat{j} + \hat{k})$ V / m
(2) $5500 \hat{i}$ V / m
(3) $\frac{5500}{\sqrt{2}}(\hat{j} + \hat{k})$ V / m
(4) $\frac{5500}{\sqrt{2}}(\hat{i} + \hat{k})$ V / m

29. त्रिज्या $3a$ वाली एक वलय को किसी टेबल पर दृढ़ता पूर्वक स्थिर किया गया है। द्रव्यमान m तथा त्रिज्या a वाली एक छोटी वलय इसके अंदर चित्रानुसार बिना फिसले लुढ़कती है। छोटी वलय को स्थिति A से विरामावस्था से छोड़ा जाता है। जब यह निम्नतम बिन्दु पर पहुँचती है, उस समय वलय के केन्द्र की चाल होगी:-



- (1) $\sqrt{2ga}$ (2) $\sqrt{3ga}$
(3) $\sqrt{6ga}$ (4) $\sqrt{4ga}$
- 30 किसी बिन्दु $(x, 0, 0)$ पर विद्युत विभव V का मान $\left(\frac{1000}{x} + \frac{1500}{x^2} + \frac{500}{x^3}\right)$ वोल्ट है। $x = 1$ m पर विद्युत क्षेत्र होगा:-

- (1) $5500(\hat{j} + \hat{k})$ V / m
(2) $5500 \hat{i}$ V / m
(3) $\frac{5500}{\sqrt{2}}(\hat{j} + \hat{k})$ V / m
(4) $\frac{5500}{\sqrt{2}}(\hat{i} + \hat{k})$ V / m

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PART B - CHEMISTRY

31. The distance of spherical nodes from nucleus for the given orbital are

$$\Psi_{\text{radial}} = \frac{1}{9\sqrt{2}} \left(\frac{Z}{a_0} \right)^{3/2} [(\sigma^2 - 4\sigma + 3)] \exp(-\sigma/2)$$

where a_0 & Z are the constants and

$$\sigma = \frac{2Zr}{a_0}$$

(1) Zero, infinity (2) $\frac{a_0}{Z}, \frac{1}{2} \frac{a_0}{Z}$

(3) $\frac{3}{2} \frac{a_0}{Z}, \frac{1}{2} \frac{a_0}{Z}$ (4) $\frac{a_0}{Z}, \frac{3}{2} \frac{a_0}{Z}$

32. For a real gas obeying Vander Waal equation, the values of critical pressure and critical temperature are 73.89 atm and 300 K. What will be the volume occupied, only by the molecules of 24 moles of the gas in millilitres.

($R = 0.0821 \text{ atm-lit/mol-kelvin}$)

(1) 175 (2) 250 (3) 350 (4) 326

33. A definite amount of gaseous hydrocarbon was burnt with just sufficient amount of O_2 . The volume of all reactants was 600 ml, after the explosion the volume of the products [$CO_2(g)$ and $H_2O(g)$] was found to be 700 ml under the similar conditions. The molecular formula of the compound is

(1) C_3H_8 (2) C_3H_6 (3) C_3H_4 (4) C_4H_{10}

31. गोलीय नोडों की नाभिक से दूरी दिये कक्षक के लिए क्या होगी ?

$$\Psi_{\text{radial}} = \frac{1}{9\sqrt{2}} \left(\frac{Z}{a_0} \right)^{3/2} [(\sigma^2 - 4\sigma + 3)] \exp(-\sigma/2)$$

जहाँ a_0 एवं Z नियत है तथा $\sigma = \frac{2Zr}{a_0}$

(1) शून्य, अनन्त (2) $\frac{a_0}{Z}, \frac{1}{2} \frac{a_0}{Z}$

(3) $\frac{3}{2} \frac{a_0}{Z}, \frac{1}{2} \frac{a_0}{Z}$ (4) $\frac{a_0}{Z}, \frac{3}{2} \frac{a_0}{Z}$

32. वास्तविक गैस के लिए वॉन्डर वाल समीकरण का पालन करते हुये, क्रांतिक दाब और क्रांतिक ताप का मान 73.89 atm तथा 300 K है। गैस के केवल 24 मोल अणु द्वारा कितना आयतन (मिली. में) घेरा जायेगा।

($R = 0.0821 \text{ atm-lit/mol-kelvin}$)

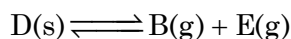
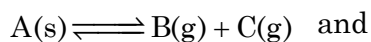
(1) 175 (2) 250 (3) 350 (4) 326

33. एक निश्चित मात्रा के गैसीय हाइड्रोकार्बन को पर्याप्त मात्रा की O_2 के साथ जलाया जाता है। सभी अभिकारकों का आयतन 600 ml है। जलाने के पश्चात समान अवस्था में उत्पादों [$CO_2(g)$ एवं $H_2O(g)$] का आयतन 700 ml पाया जाता है। यौगिक का आण्विक सूत्र है-

(1) C_3H_8 (2) C_3H_6 (3) C_3H_4 (4) C_4H_{10}

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34. The pressure over pure solid A is 60 mm of Hg at a certain temperature T and the pressure over pure solid D is 80 mm of Hg at same temperature T, if A and D dissociate as



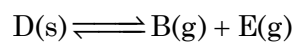
then the total pressure over a mixture of excess of A(s) and D(s) at same temperature will be

- (1) 60 mm of Hg
- (2) 140 mm of Hg
- (3) 50 mm of Hg
- (4) 100 mm of Hg

35. A real gas is subjected to an adiabatic process causing a change in state from (3 bar, 50 L, 500 K) to (5 bar, 40 L, 600 K) against a constant pressure of 4 bar. The magnitude of enthalpy change for the process is :

- (1) 4000 J
- (2) 5000 J
- (3) 9000 J
- (4) 1000 J

34. निश्चित तापमान T पर एक शुद्ध ठोस A पर दाब 60 mm Hg है तथा समान ताप T पर शुद्ध ठोस D पर दाब 80 mm Hg है। यदि A तथा D निम्न प्रकार अपघटित होते हैं



तो समान ताप पर A(s) तथा D(s) की अधिकता वाले मिश्रण पर कुल दाब होगा-

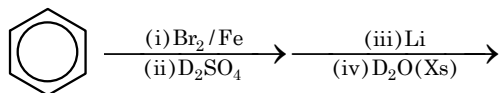
- (1) 60 mm Hg
- (2) 140 mm Hg
- (3) 50 mm Hg
- (4) 100 mm Hg

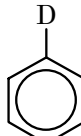
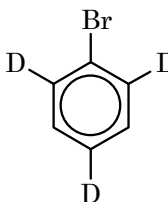
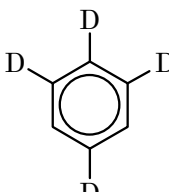
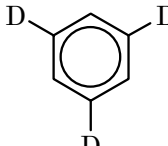
35. एक वास्तविक गैस को रूद्धोष्म प्रक्रम में डालने पर नियत दाब 4 बार (Bar) के विरुद्ध उसकी अवस्था में (3 bar, 50 L, 500 K) से (5 bar, 40 L, 600 K) तक परिवर्तन आता है। प्रक्रम के ऐन्थेल्पी परिवर्तन का परिमाण होगा ?

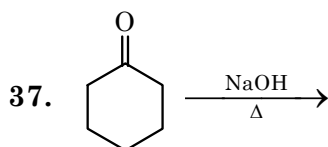
- (1) 4000 J
- (2) 5000 J
- (3) 9000 J
- (4) 1000 J

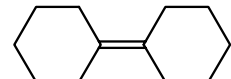
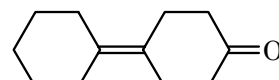
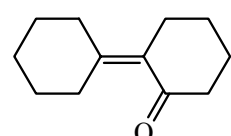
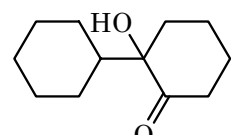
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36. Major product of given reaction is :

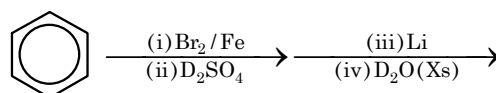


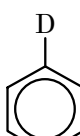
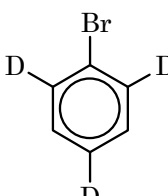
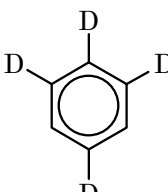
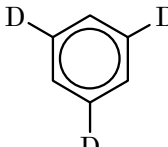
- (1)  (2) 
- (3)  (4) 

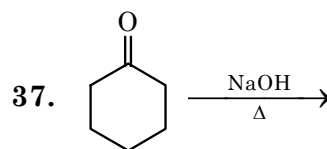


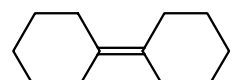
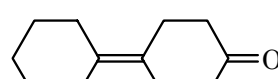
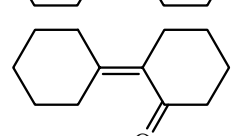
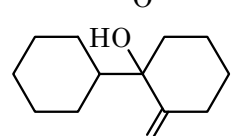
- (1)  (2) 
- (3)  (4) 

36. दी गई अभिक्रिया का मुख्य उत्पाद है-



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



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

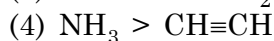
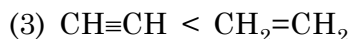
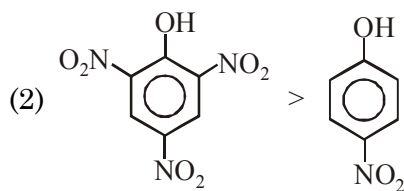
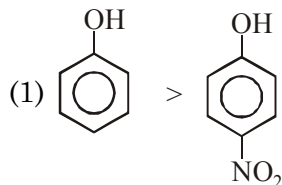
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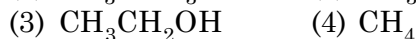
How many stereoisomers are possible for this compound.

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

39. Identify correct acidic strength order ?



40. Which of the following has maximum boiling point ?



41. Which of the following molecule is linear ?



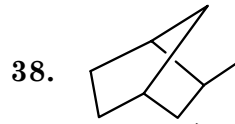
42. Hardness of water is due to dissolved impurities of-

(1) calcium and magnesium salts

(2) barium and magnesium salts

(3) calcium and strontium salts

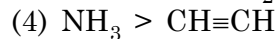
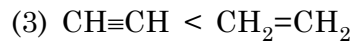
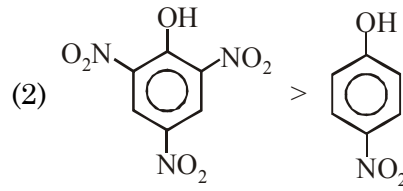
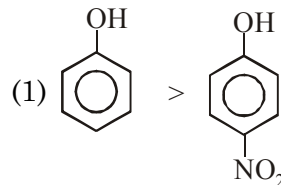
(4) sodium and potassium salts



उपरोक्त यौगिक के लिये संभव त्रिविम समावयवी की संख्या होगी-

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

39. अम्लीय सामर्थ्य का सही क्रम पहचाने-



40. निम्न में से कौन उच्चतम क्वथनांक बिन्दु रखता है?



41. निम्न में से कौनसा अणु रेखीय है?



42. जल की कठोरता किन अशुद्धियों के घुलने से होती है?

(1) कैल्शियम एवं मैग्नीशियम लवण

(2) बेरियम एवं मैग्नीशियम लवण

(3) कैल्शियम एवं स्ट्रॉन्शियम लवण

(4) सोडियम एवं पोटेशियम लवण

कच्चे कार्य के लिए स्थान

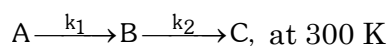
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| <p>43. The most soluble salt in water is</p> <p>(1) CaC_2O_4</p> <p>(2) CaCO_3</p> <p>(3) CaI_2</p> <p>(4) CaSO_3</p> <p>44. Which of the following will show Fac–Mer isomerism ?</p> <p>(1) $[\text{PtCl}_2(\text{NH}_3)_2]$</p> <p>(2) $[\text{Co}(\text{NH}_3)_3(\text{NO}_2)_3]$</p> <p>(3) $[\text{Co}(\text{en})_3]^{3+}$</p> <p>(4) $[\text{CoCl}_2(\text{en})_2]^+$</p> <p>45. On strong heating AgNO_3 we get</p> <p>(1) AgNO_2 (2) Ag_2O</p> <p>(3) Ag (4) Ag_3N</p> <p>46. Silane (SiH_4) burns in air forming SiO_2 and H_2O as</p> $\text{SiH}_4(\text{g}) + 2\text{O}_2(\text{g}) \longrightarrow \text{SiO}_2(\text{s}) + 2\text{H}_2\text{O}(\text{g})$ <p>what is the value of ΔG° of reaction if ΔG_f° for the formation of $\text{SiH}_4(\text{g})$, $\text{SiO}_2(\text{s})$ and $\text{H}_2\text{O}(\text{g})$ are $+52.3$, -805, $-228.6 \text{ kJmol}^{-1}$ respectively.</p> <p>(1) -805 kJmol^{-1}</p> <p>(2) -833 kJmol^{-1}</p> <p>(3) $-1314.5 \text{ kJmol}^{-1}$</p> <p>(4) 1033 kJmol^{-1}</p> | <p>43. जल में सर्वाधिक घुलनशील लवण है?</p> <p>(1) CaC_2O_4</p> <p>(2) CaCO_3</p> <p>(3) CaI_2</p> <p>(4) CaSO_3</p> <p>44. निम्न में से कौन, फेक-मर (Fac–Mer) समावयवता प्रदर्शित करता है?</p> <p>(1) $[\text{PtCl}_2(\text{NH}_3)_2]$</p> <p>(2) $[\text{Co}(\text{NH}_3)_3(\text{NO}_2)_3]$</p> <p>(3) $[\text{Co}(\text{en})_3]^{3+}$</p> <p>(4) $[\text{CoCl}_2(\text{en})_2]^+$</p> <p>45. उच्च ताप पर AgNO_3 को गर्म करने पर प्राप्त होता है-</p> <p>(1) AgNO_2 (2) Ag_2O</p> <p>(3) Ag (4) Ag_3N</p> <p>46. सिलेन (SiH_4) वायु की उपस्थिति में जलाने पर SiO_2 और H_2O इस प्रकार बनाता है</p> $\text{SiH}_4(\text{g}) + 2\text{O}_2(\text{g}) \longrightarrow \text{SiO}_2(\text{s}) + 2\text{H}_2\text{O}(\text{g})$ <p>अभिक्रिया के लिए ΔG° का मान क्या होगा यदि $\text{SiH}_4(\text{g})$, $\text{SiO}_2(\text{s})$ एवं $\text{H}_2\text{O}(\text{g})$ के निर्माण के लिए ΔG_f° का मान क्रमशः $+52.3$, -805, $-228.6 \text{ kJmol}^{-1}$ है-</p> <p>(1) -805 kJmol^{-1}</p> <p>(2) -833 kJmol^{-1}</p> <p>(3) $-1314.5 \text{ kJmol}^{-1}$</p> <p>(4) 1033 kJmol^{-1}</p> |
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कच्चे कार्य के लिए स्थान

47. Solid AgNO_3 is slowly added to a solution that has 0.0001 M each in NaCl, NaBr and NaI. K_{sp} of AgCl is 1.7×10^{-10} , K_{sp} of AgBr = 3.3×10^{-13} , K_{sp} of AgI = 1.5×10^{-16} . The concentration of Ag^+ required to initiate the precipitation of AgCl is
- (1) 1.7×10^{-6} M
 - (2) 1.7×10^{-7} M
 - (3) 1.7×10^{-8} M
 - (4) 1.7×10^{-9} M
48. In a cubic close packing, the unit cell has...
- (1) 4 tetrahedral voids each of which is shared by four unit cells.
 - (2) 4 tetrahedral voids within the unit cell
 - (3) 8 tetrahedral voids each of the which is shared by four unit cells
 - (4) 8 tetrahedral voids within the unit cells
49. Osmotic pressure of a solution containing 2 gm dissolved protein per 300 cm^3 of solution is 20 mm of Hg at 27°C . The molecular mass of protein is :
 ($R = 0.08 \text{ L-atm/mol-K}$)
- (1) 6080 gm mol^{-1}
 - (2) $12160 \text{ gm mol}^{-1}$
 - (3) 3040 gm mol^{-1}
 - (4) 7460 gm mol^{-1}
47. AgNO_3 ठोस को NaCl, NaBr तथा NaI प्रत्येक के 0.0001 M वाले विलयन में धीरे-धीरे मिलाया जाता है। AgCl का $K_{sp} = 1.7 \times 10^{-10}$ तथा AgBr का $K_{sp} = 3.3 \times 10^{-13}$ तथा AgI का $K_{sp} = 1.5 \times 10^{-16}$ है तो AgCl का अवक्षेपण प्रारम्भ करने के लिए Ag^+ की आवश्यक सान्द्रता होगी-
- (1) 1.7×10^{-6} M
 - (2) 1.7×10^{-7} M
 - (3) 1.7×10^{-8} M
 - (4) 1.7×10^{-9} M
48. धनीय निबिड़ संकुलन में इकाई सेल रखती है-
- (1) 4 चतुष्फलकीय रिक्तियाँ जिनमें प्रत्येक चार इकाई सैल द्वारा साझित है।
 - (2) 4 चतुष्फलकीय रिक्तियाँ एक ही इकाई सैल के अन्दर
 - (3) 8 चतुष्फलकीय रिक्तियाँ जिनमें से प्रत्येक चार इकाई सैल द्वारा साझित हैं
 - (4) 8 चतुष्फलकीय रिक्तियाँ इकाई सैलों के अन्दर
49. एक विलयन में प्रति 300 cm^3 विलयन में 2g प्रोटीन घुला हुआ है इसका 27°C पर परासरण दाब 20 mm Hg है तो प्रोटीन का अणुभार होगा ($R = 0.08 \text{ L-atm/mol-K}$)-
- (1) 6080 gm mol^{-1}
 - (2) $12160 \text{ gm mol}^{-1}$
 - (3) 3040 gm mol^{-1}
 - (4) 7460 gm mol^{-1}

कच्चे कार्य के लिए स्थान

50. For consecutive first order reaction:



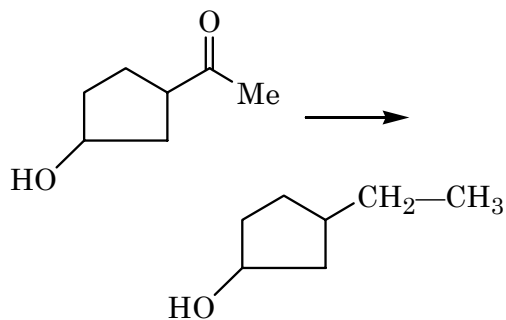
$$k_1 = 2 \times 10^{-3} \text{ s}^{-1} \text{ and } k_2 = 5 \times 10^{-5} \text{ s}^{-1}$$

(Given : $\ln 2 = 0.7, \ln 10 = 2.5$)

The time at which [B] will be maximum is—

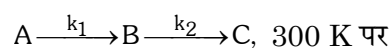
- (1) 200 s
- (2) 2000 s
- (3) 0 s
- (4) ∞

51. The appropriate reagent for the transformation is



- (1) Zn-Hg, HCl
- (2) $\text{NH}_2\text{-NH}_2, \text{OH}^-$
- (3) H_2/Ni
- (4) NaBH_4

50. क्रमागत प्रथम कोटि अभिक्रिया के लिए



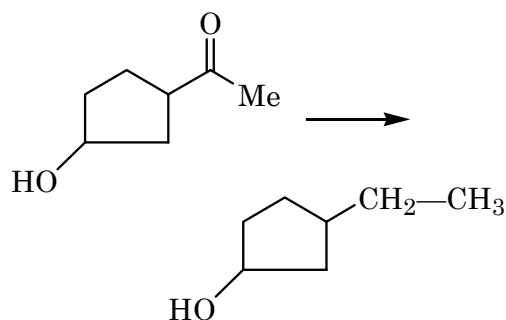
$$k_1 = 2 \times 10^{-3} \text{ s}^{-1} \text{ एवं } k_2 = 5 \times 10^{-5} \text{ s}^{-1}$$

(दिया है : $\ln 2 = 0.7, \ln 10 = 2.5$)

कौनसे समय [B] उच्चतम होगा ?

- (1) 200 s
- (2) 2000 s
- (3) 0 s
- (4) ∞

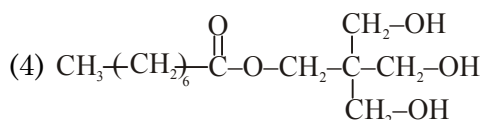
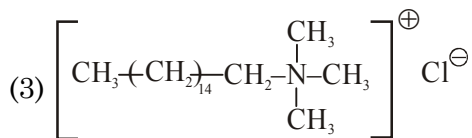
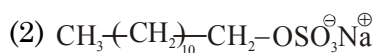
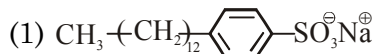
51. निम्न परिवर्तन के लिए सर्वाधिक उपयुक्त अभिकर्मक होगा—



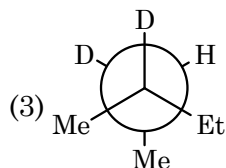
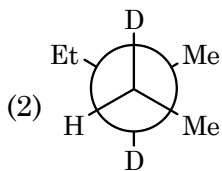
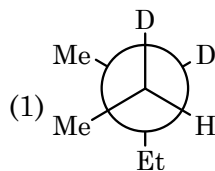
- (1) Zn-Hg, HCl
- (2) $\text{NH}_2\text{-NH}_2, \text{OH}^-$
- (3) H_2/Ni
- (4) NaBH_4

कच्चे कार्य के लिए स्थान

52. Which of the following is an example of cationic detergent ?



53. Identify major product of reaction of (E)-3-methyl-2-pentene with D_2/Ni .



(4) Both (1) and (3)

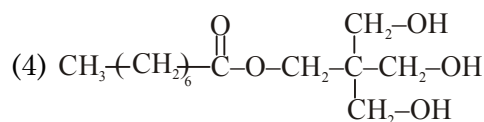
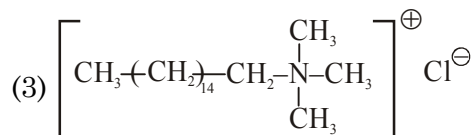
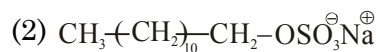
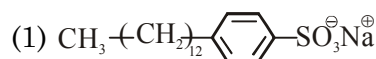
54. Which of the following is responsible for transition of heredity character ?

- (1) Glucose (2) Fructose
(3) DNA (4) Haemoglobin

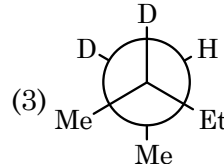
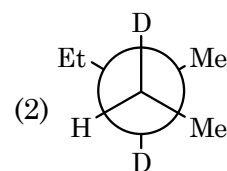
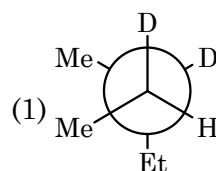
55. Which carbohydrate is used for silvering of mirror ?

- (1) Sucrose (2) Cellulose
(3) Starch (4) Glucose

52. निम्न में से कौनसा धनायनिक अपमार्जक का एक उदाहरण है?



53. (E)-3-मेथिल-2-पेन्टिन की D_2/Ni के साथ अभिक्रिया का मुख्य उत्पाद पहचाने-



(4) (1) एवं (3) दोनों

54. निम्न में से कौन, आनुवांशिक गुणों के संक्रमण के लिये उत्तरदायी होता है?

- (1) ग्लूकोज (2) फ्रक्टोस
(3) DNA (4) हीमोग्लोबिन

55. कौनसा कार्बोहाइड्रेट दर्पण के रजतीकरण में उपयोग होता है?

- (1) सुक्रोस (2) सेल्यूलोज
(3) स्टार्च (4) ग्लूकोज

कच्चे कार्य के लिए स्थान

56. Which of the following statements is **NOT** correct ?
- Nitrogen forms triple bonds whereas phosphorus does not exist as $P \equiv P$.
 - The N–N bond is stronger than P–P bond
 - Red phosphorus is less reactive than white phosphorus
 - Sulphur exhibits catenation.
57. Total number of electrons having $l = 2$ in Fe^{2+} according to Aufbau principle ($n + l$ rule)
- 5
 - 4
 - 3
 - 6
58. The role of calcination in metallurgical process is
- To remove moisture
 - To decompose carbonate into oxide
 - To remove volatile organic matter (impurity)
 - All of these
59. The electronegativity of the following elements increases in the order
- C, N, Si, P
 - N, Si, C, P
 - Si, P, C, N
 - P, Si, N, C
60. Which of the following is **INCORRECT** ?
- Classical smog occurs in cool humid climate
 - Photochemical smog is reducing smog
 - Mixture of smoke, fog and SO_2 form classical smog
 - Photochemical smog occurs in warm, dry and sunny climate
56. निम्न कथनों में से कौनसा कथन सही नहीं है ?
- नाइट्रोजन त्रिबंध का निर्माण करता है परन्तु फास्फोरस $P \equiv P$ के रूप में नहीं पाया जाता।
 - N–N बंध P–P बंध की तुलना में प्रबल होता है।
 - लाल फास्फोरस, सफेद फास्फोरस से कम क्रियाशील होता है।
 - सल्फर श्रृंखलन प्रदर्शित करता है।
57. ऑफबाऊ सिद्धांत ($n + l$ नियम) के अनुसार Fe^{2+} में $l = 2$ मान रखने वाले इलेक्ट्रॉनों की कुल संख्या होगी ?
- 5
 - 4
 - 3
 - 6
58. धातुकर्म प्रक्रम में निस्तापन का क्या योगदान होता है ?
- आर्द्रता घटाने के लिए
 - कार्बोनेट को ऑक्साइड में विघटित करने के लिए
 - वाष्पशील कार्बनिक पदार्थ (अशुद्धि) हटाने के लिए
 - उपरोक्त सभी
59. निम्न तत्वों की विद्युतऋणता का बढ़ता क्रम क्या होगा ?
- C, N, Si, P
 - N, Si, C, P
 - Si, P, C, N
 - P, Si, N, C
60. निम्न में से असत्य कथन चुनिये-
- क्लासिकल धूम कोहरा ठण्डे व नम जलवायु में पाया जाता है।
 - प्रकाश रसायनिक धूम कोहरा, अपचायक धूम कोहरा है।
 - धुंआ, कोहरा तथा SO_2 का मिश्रण क्लासिकल धूम कोहरा बनाता है।
 - प्रकाश रसायनिक धूम कोहरा गर्म, शुष्क तथा धूप वाली जलवायु में पाया जाता है।

कच्चे कार्य के लिए स्थान

PART C - MATHEMATICS

- | | |
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| <p>61. The value of $\sum_{r=1}^9 \sin^2 \frac{r\pi}{10}$ is :</p> <p>(1) 1 (2) $\frac{5}{2}$ (3) 5 (4) $\frac{9}{2}$</p> <p>62. Sum of roots of the equation $\sin^{-1}x - \cos^{-1}x = \sin^{-1}(3x - 2)$ is :</p> <p>(1) $\frac{3}{2}$ (2) 1 (3) $\frac{1}{2}$ (4) 2</p> <p>63. Locus of mid point of the chords of contact of $x^2 + y^2 = 2$ from the points on the line $3x + 4y = 10$ is a circle with centre P. If O is the origin then OP is equal to :</p> <p>(1) 2 (2) 1 (3) $\frac{1}{3}$ (4) $\frac{1}{2}$</p> <p>64. If the tangent and the normal to the hyperbola $x^2 - y^2 = 4$ at a point cut off intercepts a_1, a_2 on X-axis and b_1, b_2 on Y-axis respectively then the value of $a_1 a_2 + b_1 b_2$ is:</p> <p>(1) 1 (2) -1 (3) 0 (4) 4</p> <p>65. If the point $(\cos \theta, \sin \theta)$ lies in the right angle between the rays $y = x - 1$, then θ belongs to</p> <p>(1) $\left(0, \frac{\pi}{2}\right)$ (2) $\left(0, \frac{\pi}{4}\right)$</p> <p>(3) $\left(0, \frac{\pi}{6}\right)$ (4) $\left(0, \frac{\pi}{3}\right)$</p> | <p>61. $\sum_{r=1}^9 \sin^2 \frac{r\pi}{10}$ का मान ज्ञात कीजिए-</p> <p>(1) 1 (2) $\frac{5}{2}$ (3) 5 (4) $\frac{9}{2}$</p> <p>62. समीकरण $\sin^{-1}x - \cos^{-1}x = \sin^{-1}(3x - 2)$ के मूलों का योग है- :</p> <p>(1) $\frac{3}{2}$ (2) 1 (3) $\frac{1}{2}$ (4) 2</p> <p>63. रेखा $3x + 4y = 10$ पर स्थित बिन्दुओं से $x^2 + y^2 = 2$ पर खींची गई स्पर्श जीवाओं के मध्य बिन्दु का बिन्दुपथ एक वृत्त है जिसका केन्द्र P है। यदि O मूल बिन्दु है तब OP का मान है।</p> <p>(1) 2 (2) 1 (3) $\frac{1}{3}$ (4) $\frac{1}{2}$</p> <p>64. यदि अतिपरवलय $x^2 - y^2 = 4$ के एक बिन्दु पर स्पर्श रेखा तथा अभिलम्ब X-अक्ष पर क्रमशः a_1, a_2 एवं Y-अक्ष पर क्रमशः b_1, b_2 अन्तःखण्ड काटते हैं, तब $a_1 a_2 + b_1 b_2$ मान होगा-</p> <p>(1) 1 (2) -1 (3) 0 (4) 4</p> <p>65. यदि बिन्दु $(\cos \theta, \sin \theta)$ किरणों $y = x - 1$ के मध्य समकोण में स्थित है, तब θ निम्न में किस अन्तराल में होगा-</p> <p>(1) $\left(0, \frac{\pi}{2}\right)$ (2) $\left(0, \frac{\pi}{4}\right)$</p> <p>(3) $\left(0, \frac{\pi}{6}\right)$ (4) $\left(0, \frac{\pi}{3}\right)$</p> |
|---|--|

कच्चे कार्य के लिए स्थान

66. The number of common chords of the parabolas $x = y^2 - 6y - 17$ and $y = x^2 - 6x + 1$ are :
 (1) 1 (2) 2 (3) 4 (4) 6
67. If $x + \frac{1}{x} = \frac{1 + \sqrt{5}}{2}$, then the value of $x^{90} + \frac{1}{x^{90}}$ is :
 (1) 8 (2) 4 (3) 2 (4) 1
68. The value of the sum $\sum_{k=1}^{\infty} \sum_{n=1}^{\infty} \frac{k}{2^{n+k}}$ is :
 (1) 5 (2) 4 (3) 3 (4) 2
69. If the system of linear equations $x + y + z = 6$, $x + 2y + 3z = 14$ and $2x + 5y + \lambda z = \mu$ ($\lambda, \mu \in \mathbb{R}$) has a unique solution, then :
 (1) $\lambda \neq 8$ (2) $\lambda = 8, \mu \neq 36$
 (3) $\lambda = 8, \mu = 36$ (4) $\lambda \neq 8, \mu \neq 36$
70. The sum of the coefficients of even power of x in the expansion of $(1 + x + x^2 + x^3)^5$ is:
 (1) 256 (2) 128
 (3) 512 (4) 64
71. If $A = \begin{bmatrix} \sin \alpha & -\cos \alpha & 0 \\ \cos \alpha & \sin \alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then A^{-1} is equal to :
 (1) $2A^T$ (2) A
 (3) $\text{adj } A$ (4) None of these
66. परवलय $x = y^2 - 6y - 17$ तथा $y = x^2 - 6x + 1$ के उभयनिष्ठ जीवाओं की संख्या है-
 (1) 1 (2) 2 (3) 4 (4) 6
67. यदि $x + \frac{1}{x} = \frac{1 + \sqrt{5}}{2}$, तो $x^{90} + \frac{1}{x^{90}}$ का मान होगा-
 (1) 8 (2) 4 (3) 2 (4) 1
68. योगफल $\sum_{k=1}^{\infty} \sum_{n=1}^{\infty} \frac{k}{2^{n+k}}$ का मान होगा-
 (1) 5 (2) 4 (3) 3 (4) 2
69. यदि समीकरण निकाय $x + y + z = 6$, $x + 2y + 3z = 14$ तथा $2x + 5y + \lambda z = \mu$ ($\lambda, \mu \in \mathbb{R}$) का एक अद्वितीय हल है, तब
 (1) $\lambda \neq 8$ (2) $\lambda = 8, \mu \neq 36$
 (3) $\lambda = 8, \mu = 36$ (4) $\lambda \neq 8, \mu \neq 36$
70. $(1 + x + x^2 + x^3)^5$ के प्रसार में x की सम घातों के गुणांकों का योगफल ज्ञात कीजिए ?
 (1) 256 (2) 128
 (3) 512 (4) 64
71. यदि $A = \begin{bmatrix} \sin \alpha & -\cos \alpha & 0 \\ \cos \alpha & \sin \alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$ तब A^{-1} बराबर है ?
 (1) $2A^T$ (2) A
 (3) $\text{adj } A$ (4) इनमें से कोई नहीं

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72. If x_1, x_2, x_3 and x_4 are the roots of the equation $x^4 + x^3 + 2 = 0$, then the value of $\prod_{i=1}^4 (3x_i - 1)$ is equal to :
 (1) 160 (2) 166 (3) 172 (4) 162
73. A coin is tossed 7 times. Then the probability that atleast 4 consecutive heads appear is :
 (1) $\frac{3}{16}$ (2) $\frac{5}{32}$ (3) $\frac{1}{16}$ (4) $\frac{1}{8}$
74. Let $f(x) = x^2 - 2x, x \in \mathbb{R}$ and $g(x) = f(f(x) - 1) + f(5 - f(x))$, then the minimum integral value in the range of $g(x)$ is :
 (1) 0 (2) 1 (3) 2 (4) 3
75. Let $f(x) = x^3 + bx^2 + ax + 12$ ($b \neq 0$). If $(-3, 2)$ is the largest possible interval for which $f(x)$ is decreasing function then the value of 'a' is :
 (1) 3 (2) 9 (3) -9 (4) -18
76. $\lim_{x \rightarrow 0} \left(\tan \left(\frac{\pi}{4} - x \right) \right)^{\frac{1}{x}}$ is equal to :
 (1) 1 (2) e (3) e^2 (4) e^{-2}
77. The area of region enclosed by curves $y = x^2$ and $y = \sqrt{|x|}$ is :
 (1) $\frac{1}{3}$ (2) $\frac{2}{3}$ (3) $\frac{4}{3}$ (4) $\frac{16}{3}$
72. यदि x_1, x_2, x_3 व x_4 समीकरण $x^4 + x^3 + 2 = 0$ के मूल हैं, तो $\prod_{i=1}^4 (3x_i - 1)$ का मान ज्ञात करो ?
 (1) 160 (2) 166
 (3) 172 (4) 162
73. एक सिक्का 7 बार उछाला जाता है, तब कम से कम 4 क्रमागत चित आने की प्रायिकता क्या होगी ?
 (1) $\frac{3}{16}$ (2) $\frac{5}{32}$ (3) $\frac{1}{16}$ (4) $\frac{1}{8}$
74. माना $f(x) = x^2 - 2x, x \in \mathbb{R}$ और $g(x) = f(f(x) - 1) + f(5 - f(x))$, तब $g(x)$ की परिसर का न्यूनतम पूर्णांक मान क्या होगा ?
 (1) 0 (2) 1 (3) 2 (4) 3
75. माना $f(x) = x^3 + bx^2 + ax + 12$ ($b \neq 0$) यदि $f(x)$ के हासमान फलन होने के लिए सबसे बड़ा सम्भव अन्तराल $(-3, 2)$ है, तब 'a' का मान है-
 (1) 3 (2) 9 (3) -9 (4) -18
76. $\lim_{x \rightarrow 0} \left(\tan \left(\frac{\pi}{4} - x \right) \right)^{\frac{1}{x}}$ का मान ?
 (1) 1 (2) e (3) e^2 (4) e^{-2}
77. $y = x^2$ और $y = \sqrt{|x|}$ से परिबद्ध क्षेत्र का क्षेत्रफल है-
 (1) $\frac{1}{3}$ (2) $\frac{2}{3}$ (3) $\frac{4}{3}$ (4) $\frac{16}{3}$

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78. The sum of values of x satisfying the equation

$$(31 + 8\sqrt{15})^{x^2-3} + 1 = (32 + 8\sqrt{15})^{x^2-3} \text{ is :}$$

- (1) 3 (2) 0 (3) 2 (4) 4

79. $\int \frac{x^9 dx}{(4x^2 + 1)^6}$ is equal to :

(1) $\frac{1}{5x} \left(4 + \frac{1}{x^2}\right)^{-5} + C$

(2) $\frac{1}{5} \left(4 + \frac{1}{x^2}\right)^{-5} + C$

(3) $\frac{1}{10} (1 + 4x^2)^{-5} + C$

(4) $\frac{1}{10} \left(4 + \frac{1}{x^2}\right)^{-5} + C$

80. If $f(x) = x^3 \operatorname{sgn}(x)$, then :

- (1) f is derivable at $x = 0$
 (2) f is continuous but not derivable at $x = 0$
 (3) L.H.D. at $x = 0$ is 1
 (4) R.H.D. at $x = 0$ is 1

81. $\int_{-3}^3 x^8 \{x^{11}\} dx$ is equal to (where $\{.\}$ is

fractional part function).

- (1) 3^8 (2) 3^7 (3) 3^9 (4) 3^{10}

78. समीकरण $(31 + 8\sqrt{15})^{x^2-3} + 1 = (32 + 8\sqrt{15})^{x^2-3}$ को संतुष्ट करने वाले x के मानों का योग होगा-

- (1) 3 (2) 0 (3) 2 (4) 4

79. समाकल $\int \frac{x^9 dx}{(4x^2 + 1)^6}$ का मान है-

(1) $\frac{1}{5x} \left(4 + \frac{1}{x^2}\right)^{-5} + C$

(2) $\frac{1}{5} \left(4 + \frac{1}{x^2}\right)^{-5} + C$

(3) $\frac{1}{10} (1 + 4x^2)^{-5} + C$

(4) $\frac{1}{10} \left(4 + \frac{1}{x^2}\right)^{-5} + C$

80. यदि $f(x) = x^3 \operatorname{sgn}(x)$, तब

- (1) f , $x = 0$ पर अवकलनीय है
 (2) f , $x = 0$ पर सतत् है लेकिन अवकलनीय नहीं है
 (3) $x = 0$ पर बायीं तरफ का अवकलन 1 है
 (4) $x = 0$ पर दायीं तरफ का अवकलन 1 है

81. $\int_{-3}^3 x^8 \{x^{11}\} dx$ का मान होगा (जहाँ $\{.\}$ भिन्नात्मक भाग

फलन है)

- (1) 3^8 (2) 3^7 (3) 3^9 (4) 3^{10}

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82. The solution of the differential equation

$$(x + 2y^3) \frac{dy}{dx} = y \text{ is :}$$

(1) $\frac{x}{y^2} = y + c$ (2) $\frac{x}{y} = y^2 + c$

(3) $\frac{x^2}{y} = y^2 + c$ (4) $\frac{y}{x} = x^2 + c$

83. Let $f(x) = (x - 1)(x - 2)(x - 3) \dots (x - n)$ and $f'(n) = 5040$ then the value of n is :

(1) 6 (2) 7 (3) 9 (4) 8

84. If a variable X takes value $0, 1, 2, \dots, n$ with frequency ${}^n C_0, {}^n C_1, \dots, {}^n C_n$ respectively, then the $\text{Var}(X)$ is :

(1) $\frac{n^2 - 1}{12}$ (2) $\frac{n}{2}$

(3) $\frac{n}{4}$ (4) None of these

85. $(p \vee q) \wedge \sim p$ is equivalent to :

(1) $\sim p \wedge q$ (2) $p \wedge q$

(3) $p \wedge (\sim q)$ (4) $\sim p \wedge \sim q$

86. Let N denotes the set of all natural numbers and R be the relation on $N \times N$ defined by : $(a, b) R (c, d) \Rightarrow ad(b + c) = bc(a + d)$, then R is :

(1) Reflexive, Symmetric but not Transitive

(2) Symmetric, Transitive but not Reflexive

(3) Transitive, Reflexive but not Symmetric

(4) Equivalence

82. अवकलनीय समीकरण $(x + 2y^3) \frac{dy}{dx} = y$ का हल है-

(1) $\frac{x}{y^2} = y + c$ (2) $\frac{x}{y} = y^2 + c$

(3) $\frac{x^2}{y} = y^2 + c$ (4) $\frac{y}{x} = x^2 + c$

83. माना $f(x) = (x - 1)(x - 2)(x - 3) \dots (x - n)$ और $f'(n) = 5040$, तब n का मान होगा-

(1) 6 (2) 7 (3) 9 (4) 8

84. यदि एक चर X ; जिसके मान $0, 1, 2, \dots, n$ हैं जिनकी आवृत्तियां क्रमशः ${}^n C_0, {}^n C_1, \dots, {}^n C_n$ हैं, तब $\text{Var}(X)$ का मान है-

(1) $\frac{n^2 - 1}{12}$ (2) $\frac{n}{2}$

(3) $\frac{n}{4}$ (4) इनमें से कोई नहीं

85. $(p \vee q) \wedge \sim p$ का मान बराबर है?

(1) $\sim p \wedge q$ (2) $p \wedge q$

(3) $p \wedge (\sim q)$ (4) $\sim p \wedge \sim q$

86. माना N सभी प्राकृतिक संख्याओं के समुच्चय को निरूपित करता है तथा R समुच्चय $N \times N$ में एक सम्बन्ध है जो कि $(a, b) R (c, d) \Rightarrow ad(b + c) = bc(a + d)$ द्वारा परिभाषित है, तब R है-

(1) स्वतुल्य, सममित है लेकिन सक्रामक नहीं है

(2) सममित, सक्रामक है लेकिन स्वतुल्य नहीं है

(3) सक्रामक, स्वतुल्य है लेकिन सममित नहीं है

(4) तुल्यता सम्बन्ध है

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87. Negation of the statement $p \rightarrow (q \wedge r)$ is :

- (1) $\sim p \rightarrow \sim (q \wedge r)$
 (2) $\sim p \vee (q \wedge r)$
 (3) $(q \wedge r) \rightarrow p$
 (4) $p \wedge (\sim q \vee \sim r)$

88. If P is any arbitrary point on the circumcircle of the equilateral triangle of side length ℓ

units, then $|\overline{PA}|^2 + |\overline{PB}|^2 + |\overline{PC}|^2$ is always equal to :

- (1) $2\ell^2$ (2) $2\sqrt{3}\ell^2$
 (3) ℓ^2 (4) $3\ell^2$

89. The equation of a plane which passes through the point of intersection of lines

$$\frac{x-3}{1} = \frac{y-1}{2} = \frac{z-2}{3} \quad \text{and} \quad \frac{x-1}{3} = \frac{y-2}{1} = \frac{z-3}{2}$$

and at greatest distance from origin is :

- (1) $4x + 3y + 5z = 25$
 (2) $4x + 3y + 5z = 50$
 (3) $3x + 4y + 5z = 49$
 (4) $x + 7y - 5z = 2$

90. Let $f(x) = \cos 2x \cdot \cos 4x \cdot \cos 6x \cdot \cos 8x$,

then $\lim_{x \rightarrow 0} \frac{1 - (f(x))^3}{5x^2}$ is equal to :

- (1) 36 (2) 56
 (3) 60 (4) 66

87. कथन $p \rightarrow (q \wedge r)$ का निषेध है-

- (1) $\sim p \rightarrow \sim (q \wedge r)$
 (2) $\sim p \vee (q \wedge r)$
 (3) $(q \wedge r) \rightarrow p$
 (4) $p \wedge (\sim q \vee \sim r)$

88. यदि P, एक समबाहु त्रिभुज जिसकी भुजा की लम्बाई ℓ इकाई है, के परिवृत्त पर एक स्वैच्छिक बिन्दु है, तब

$|\overline{PA}|^2 + |\overline{PB}|^2 + |\overline{PC}|^2$ का मान सदैव है-

- (1) $2\ell^2$ (2) $2\sqrt{3}\ell^2$
 (3) ℓ^2 (4) $3\ell^2$

89. उस समतल का समीकरण जो रेखा

$$\frac{x-3}{1} = \frac{y-1}{2} = \frac{z-2}{3}, \quad \frac{x-1}{3} = \frac{y-2}{1} = \frac{z-3}{2}$$

के प्रतिच्छेद बिन्दु से गुजरती है और मूलबिन्दू से अधिकतम दूरी है, होगा-

- (1) $4x + 3y + 5z = 25$
 (2) $4x + 3y + 5z = 50$
 (3) $3x + 4y + 5z = 49$
 (4) $x + 7y - 5z = 2$

90. माना $f(x) = \cos 2x \cdot \cos 4x \cdot \cos 6x \cdot \cos 8x$, तब

$\lim_{x \rightarrow 0} \frac{1 - (f(x))^3}{5x^2}$ का मान होगा

- (1) 36 (2) 56
 (3) 60 (4) 66

कच्चे कार्य के लिए स्थान

कच्चे कार्य के लिए स्थान