



CLASSROOM CONTACT PROGRAMME

(Academic Session : 2016 - 2017)

JEE (Main + Advanced) : ENTHUSIAST COURSE

PHASE : I

Test Type : MINOR

Test Pattern : JEE-Main

TEST DATE : 29 - 05 - 2016

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.**
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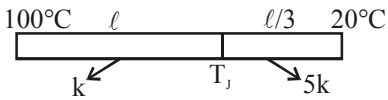
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PART A - PHYSICS

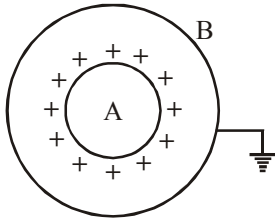
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|---|--|
| <p>1. The maximum electric field intensity on the axis of a uniformly charged ring of charge q and radius R will be :-</p> <p>(1) $\frac{1}{4\pi\epsilon_0} \frac{q}{3\sqrt{3}R^2}$ (2) $\frac{1}{4\pi\epsilon_0} \frac{2q}{3R^2}$</p> <p>(3) $\frac{1}{4\pi\epsilon_0} \frac{2q}{3\sqrt{3}R^2}$ (4) $\frac{1}{4\pi\epsilon_0} \frac{3q}{2\sqrt{2}R^2}$</p> <p>2. A half ring of radius R has a charge of λ per unit length. The potential at the center of the half ring is :-</p> <p>(1) $k \frac{\lambda}{R}$ (2) $k \frac{\lambda}{\pi R}$</p> <p>(3) $k \frac{\pi\lambda}{R}$ (4) $k\pi\lambda$</p> <p>3. Two large metal plates each of area A carry charges $+q$ and $-q$ and face each other. The plates are separated by a small distance d the electric field between the plates would be</p> <p>(1) $\frac{2q}{\epsilon_0 A}$ (2) $\frac{2A}{\epsilon_0 q}$ (3) $\frac{q}{\epsilon_0 A}$ (4) $\frac{A}{\epsilon_0 q}$</p> | <p>4. A charge q is uniformly distributed on the surface of a disc of radius R. Then a circular hole of radius $R/2$ is punched taking one of the radii as the diameter of the hole. Calculate the potential V due to remaining portion of the disc at the center of the disc. $\left[V_0 = \frac{q}{2\epsilon_0 R} \left(1 - \frac{1}{\pi} \right) \right]$</p> <p>(1) $V = 2V_0$ (2) $V = V_0$</p> <p>(3) $V = 3V_0$ (4) $V = \frac{V_0}{2}$</p> <p>5. The potential field of an electric field $\vec{E} = (y\hat{i} + x\hat{j})$ is :-</p> <p>(1) $V = -xy + \text{constant}$</p> <p>(2) $V = -2(x + y) + \text{constant}$</p> <p>(3) $V = -2xy + \text{constant}$</p> <p>(4) $V = \text{constant}$</p> <p>6. A spherical conductor A of radius r is placed concentrically inside a conducting shell B of radius R ($R > r$). A charge Q is given to A, and then A is joined to B by a metal wire. The charge flowing from A to B will be :-</p> <p>(1) $Q \left(\frac{R}{R+r} \right)$ (2) $Q \left(\frac{r}{R+r} \right)$</p> <p>(3) Q (4) Zero</p> |
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SPACE FOR ROUGH WORK

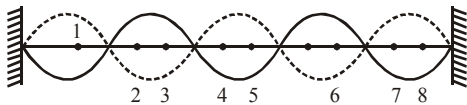
7. Two point charge $-q$ and $+q/2$ are situated at the origin and at the point $(a, 0, 0)$ respectively. The point along the x -axis where the electric field vanishes is :-
- (1) $x = a/\sqrt{2}$ (2) $x = \sqrt{2}a$
- (3) $x = \frac{\sqrt{2}a}{\sqrt{2}-1}$ (4) $x = \frac{\sqrt{2}a}{\sqrt{2}+1}$
8. In a certain charge distribution, all points having zero potential can be joined by a circle S . Points inside S have positive potential, and points outside S have negative potential. A positive charge, which is free to move, is placed inside S , then :-
- (1) It will remain in equilibrium
 (2) It can move inside S , but it cannot cross S .
 (3) It must cross S at some time.
 (4) It may move but will ultimately return to its starting point
9. A large flat metal surface has a uniform charge density $+\sigma$. An electron of mass m and charge e leaves the surface at point A with speed u , and returns to at point B . Assuming there is no gravity, the maximum value of AB is :-
- (1) $\frac{u^2 m \epsilon_0}{\sigma e}$ (2) $\frac{u^2 e \epsilon_0}{m \sigma}$ (3) $\frac{u^2 e}{\epsilon_0 \sigma m}$ (4) $\frac{u^2 \sigma e}{\epsilon_0 m}$
10. An electric dipole in a uniform electric field has potential energy U . The magnitude of the torque acting on the dipole due to the field is τ .
- (1) U is minimum and τ is zero when the dipole is perpendicular to the field
 (2) U is zero and τ is a maximum when the dipole is perpendicular to the field.
 (3) U is a minimum and τ is a maximum when the dipole is perpendicular to the field.
 (4) U is a minimum and τ is zero when the dipole is antiparallel to the field.
11. 1000 small water drops each of the radius r and charge q coalesce together to form one spherical drop. The potential of the bigger drop is larger than of the smaller ones by a factor :-
- (1) 1000 (2) 100 (3) 10 (4) 500
12. Two rods of same area of cross section and length ℓ & $\frac{\ell}{3}$ with thermal conductivity k & $5k$ respectively are placed in contact with the given temperature difference as shown. Find the temperature of the junction :
- 
- (1) 30°C (2) 25°C (3) 35°C (4) 40°C

SPACE FOR ROUGH WORK

13. A and B are two concentric conducting shells. If A is given a charge Q while B is earthed as shown in figure:



- (1) The field inside A and outside B is zero, but the field between A and B is not zero.
 (2) The field inside A and outside B is not zero, but the field between A and B is zero.
 (3) The field inside A is zero but the field outside B as well as between A and B is not zero.
 (4) The field inside A and the field between A and B is non zero, but outside B is zero.
14. A stretched string is vibrating in its 5th harmonic as shown. Consider a particle 1 (figure). At an instant this particle is at mean positions and is moving towards its negative extreme. Which of the following set of particles, are in same phase with particle 1.



- (1) 2, 4, 7 (2) 3, 5, 6 (3) 5, 7, 8 (4) 2, 4, 6

15. In the Millikan's oil droplet experiment, the horizontal plates are 0.8 cm apart, the radius of the oil droplet is 2.8×10^{-4} cm and the density of oil is 0.92 g/cm^3 . If a single excess electron is attached to the droplet, and the droplet is held stationary in the field, the potential difference between the plates is :-

- (1) $4.20 \times 10^3 \text{ V}$ (2) 420 V
 (3) $420 \times 10^4 \text{ V}$ (4) $4.20 \times 10^4 \text{ V}$

16. A charged particle q is shot towards another charged particle Q which is fixed, with a speed v . It approaches Q upto a closest distance r and then returns. If q were given a speed $2v$, the closest distance of approach would be -



- (1) r (2) $2r$ (3) $r/2$ (4) $r/4$

17. If a glass rod is rubbed with silk, it acquires a positive charge because -

- (1) Protons are added to it.
 (2) Protons are removed from it.
 (3) Electrons are added to it.
 (4) Electrons are removed from it.

18. A satellite of mass m moves around the earth in a circular orbit with speed v . The potential energy of the satellite is :-

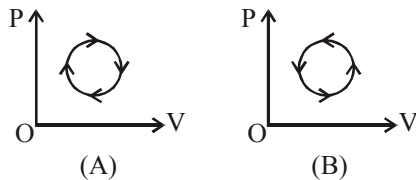
- (1) mv^2 (2) $-mv^2$
 (3) $\frac{3}{2} mv^2$ (4) $-\frac{3}{2} mv^2$

SPACE FOR ROUGH WORK

19. Two particles each of mass m are placed at A and C as such $AB = BC = L$ and A, B & C are collinear. The gravitational force on the third particle of mass m placed at D at a distance L on the perpendicular bisector of the line AC, is:-
- (1) $\frac{Gm^2}{\sqrt{2}L^2}$ along BD
 (2) $\frac{Gm^2}{\sqrt{2}L^2}$ along DB
 (3) $\frac{Gm^2}{L^2}$ along AC
 (4) none of these
20. A geostationary satellite is orbiting the earth at a height of $6R$ above the surface of the earth, R being the radius of the earth. The time period of another satellite at a height of $2.5R$ from the surface of earth is :-
- (1) $6\sqrt{2}$ hr (2) 6 hr (3) $5\sqrt{2}$ hr (4) 10 hr
21. Two particles A and B execute simple harmonic motion with periods of T and $\frac{5T}{4}$ respectively. They start simultaneously from mean position. The phase difference between them when A completes one oscillation will be -
- (1) 0 (2) $\frac{\pi}{2}$ (3) $\frac{\pi}{4}$ (4) $\frac{2\pi}{5}$
22. A tunnel is drilled along the diameter of the earth. A particle executes S.H.M. in this tunnel and another particle performs uniform circular motion along the orbit near earth's surface. The two particles start their journey simultaneously from one end of the tunnel.
- (1) They will reach the other end of tunnel simultaneously
 (2) when the particle reaches the other end of the tunnel, the first particle will cover one fourth of the circle
 (3) when the particle reaches the other end of the tunnel, the first particle will cover complete circle
 (4) when the particle reaches the other end of the tunnel, the first particle will cover three fourth of the circle
23. Which of the following cylindrical rods will conduct most heat, when their ends are maintained at the same steady temperature.
- (1) length 100 cm, radius 1 cm
 (2) length 100 cm, radius 2 cm
 (3) length 200 cm, radius 2 cm
 (4) length 200 cm, radius 1 cm
24. A wire is 4 m long and has a mass 0.2 kg. The wire is kept horizontally. A transverse pulse is generated by plucking one end of the taut (tight) wire. The pulse makes four trips back and forth along the cord in 0.8 sec. The tension in the cord will be :-
- (1) 80 N (2) 160 N (3) 240 N (4) 320 N

SPACE FOR ROUGH WORK

25. The equation of a standing wave produced on a string fixed at both the ends is -
 $y = (0.4) \sin [(0.314 \text{ cm}^{-1})x] \cos [(600 \pi \text{ s}^{-1})t]$
 What would be the smallest length of the string?
 (1) 20 cm (2) 30 cm
 (3) 10 cm (4) 5 cm
26. If the P-V diagrams of two thermodynamics devices working in a cyclic process are as shown in the figure, then :-



- (1) A is a heat engine, B is a heat pump/refrigerator
 (2) B is a heat engine, A is a heat pump/refrigerator
 (3) both A and B are heat engines
 (4) both A and B are heat pumps/refrigerator
27. An ideal gas is expanded so that amount of heat given is equal to the decrease in internal energy. The gas undergoes the process $TV^{1/5} = \text{constant}$. The adiabatic compressibility of gas when pressure is P, is :-

- (1) $\frac{7}{5P}$ (2) $\frac{5}{7P}$ (3) $\frac{2}{5P}$ (4) $\frac{7}{3P}$

28. For a gas sample with N_0 number of molecules, function $N(V)$ is given by :

$$N(V) = \frac{dN}{dV} = \left[\frac{3N_0}{V_0^3} \right] V^2 \text{ for } 0 \leq V \leq V_0 \text{ and}$$

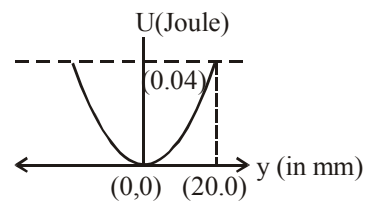
$N(V) = 0$ for $V > V_0$ where dN is number of molecules in speed range V to $V + dV$. The rms speed of the molecules is -

- (1) $\sqrt{\frac{2}{5}} V_0$ (2) $\sqrt{\frac{3}{5}} V_0$ (3) $\sqrt{2} V_0$ (4) $\sqrt{3} V_0$

29. Let E_1 and E_2 denotes magnitude of gravitational field at distance ' r_1 ' and ' r_2 ' from axis of infinitely long solid cylinder of radius ' R '. Which of the following must hold true :-

- (1) $E_1 < E_2$ if $r_1 < r_2 < R$
 (2) $E_1 > E_2$ if $R < r_1 < r_2$
 (3) $E_1 < E_2$ if $r_1 = R - E$, $r_2 = R + E$ (E is positive constant $< R$)
 (4) All of the above

30. The variation in potential energy of a harmonic oscillator is as shown in fig. The spring constant is :-



- (1) $1 \times 10^2 \text{ Nm}^{-1}$ (2) $2 \times 10^2 \text{ Nm}^{-1}$
 (3) $0.667 \times 10^2 \text{ Nm}^{-1}$ (4) $3 \times 10^2 \text{ Nm}^{-1}$

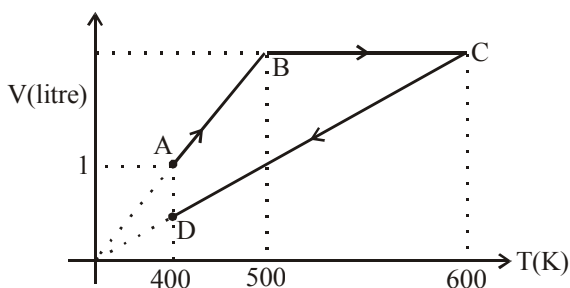
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PART B - CHEMISTRY

31. Which of the following property is not the property of system -

- (1) Temperature (2) Pressure
(3) Internal energy (4) Heat

32. 2 mol of He gas is undergoing through following process -



work during the process ABCD is -

- (1) +100 R (2) + 200 R
(3) 300 R (4) 400 R

33. Which of the following changes will double the mean free path of gas in closed container

- (1) Increasing temperature two times at constant volume
(2) Increasing temperature four times at constant volume
(3) Increasing temperature two times at constant pressure
(4) Increasing temperature four times at constant pressure

34. Average velocity (in m/s) of oxygen gas at 120π Kelvin is -

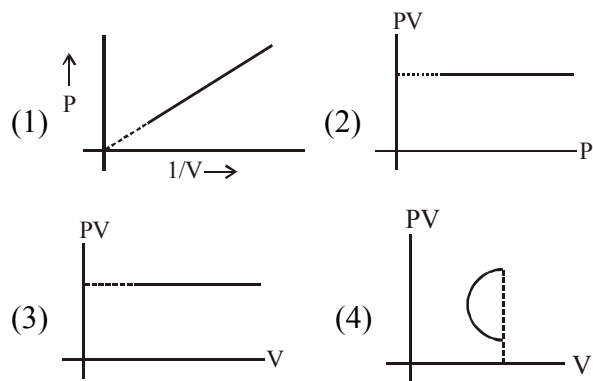
[Given $R = \frac{25}{3}$ J/mole-K]

- (1) 707 (2) 500
(3) $5\sqrt{10}$ (4) 316.2

35. 2 mole of He gas are expanded from 1 litre to (2 litre , 1 atm) in a single step adiabatic process then ratio of final temperature to initial temperature is-

- (1) $\frac{1}{2^{2/3}}$ (2) $2^{2/3}$
(3) $\frac{3}{4}$ (4) $\frac{1}{2^{2/5}}$

36. In which of the following process involving ideal gas in a closed container internal energy does not remains constant during the entire process



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37. If all octahedral and tetrahedral voids are occupied in FCC arrangement without disturbing the lattice, then maximum possible packing fraction that can be achieved is (r is radius of sphere forming FCC lattice)

$$(1) \frac{[8 \times (0.414r)^3 + 4(0.225r)^3 + 4r^3] \frac{4}{3} \pi}{\left(\frac{4r}{\sqrt{2}}\right)^3}$$

$$(2) \frac{[4 \times (0.225r)^3 + 8(0.414r)^3 + 4r^3] \frac{4}{3} \pi}{\left(\frac{4r}{\sqrt{3}}\right)^3}$$

$$(3) \frac{[4 \times (0.414r)^3 + 8(0.225r)^3 + 4r^3] \frac{4}{3} \pi}{\left(\frac{4r}{\sqrt{2}}\right)^3}$$

$$(4) \frac{[4 \times (0.414r)^3 + 4(0.225r)^3 + 4r^3] \frac{4}{3} \pi}{\left(\frac{4r}{\sqrt{2}}\right)^3}$$

38. White phosphorous (solid) reacts with excess of dry chlorine gas so as to form $\text{PCl}_5(\text{g})$ at 300K. If the reaction is carried out at constant pressure 1 bar, heat transfer is x for one mole PCl_5 formation, while if carried out in a closed rigid container heat transfer is y for one mole PCl_5 formation. $|x - y|$ is-

- (1) 450 R (2) 900 R
 (3) 1800 R (4) 225 R

39. Select the correct statement -
- (1) Frenkel defect is a non-stoichiometric defect
 - (2) F-centres are due to Frenkel defect
 - (3) ZnO shows yellow colour on heating due to metal excess defect
 - (4) Schottky defect is more probable if difference in radius of cation and anion are large.

40. Select the correct statement -
- (1) In semiconductors, valence band is partially filled.
 - (2) Si doped with group 15 elements shows n-type semiconductance
 - (3) Cobalt shows ferrimagnetic nature.
 - (4) Diamagnetic character of a substance is due to presence of unpaired electron.

41. Which of the following order of bond angle is **CORRECT**.

- (1) $\text{NH}_3 < \text{PH}_3 < \text{AsH}_3 < \text{SbH}_3$
- (2) $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$
- (3) $\text{OF}_2 < \text{H}_2\text{O} < \text{Cl}_2\text{O}$
- (4) $\text{SiF}_4 < \text{SiCl}_4 < \text{SiBr}_4 < \text{SiI}_4$

42. Molecule in which central atom has sp^3d^2 hybridization is present.

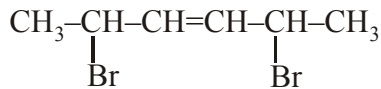
- (1) IF_7 (2) IO_6^{-5}
 (3) XeF_2 (4) XeO_4

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43. Which of the following compound is most basic.
- (1) $P(SiH_3)_3$ (2) $N(CH_3)_3$
(3) $N(GeH_3)_3$ (4) $N(SiH_3)_3$
44. Find the molecule involving $3C-2e$ type of bridge bond from the following :-
- (1) Be_2H_4 (2) $(BeH_2)_n$
(3) $Al_2(CH_3)_6$ (4) All of these
45. Find the odd electron specie in which odd electron is present in pure 'p' atomic orbital.
- (1) $\cdot NO_2$ (2) $\cdot ClO_2$
(3) $\cdot CF_3$ (4) $\cdot CH_3$
46. If four SiO_4 units are forming single chain type arrangement then find the total number of unshared 'O' atom.
- (1) 10 (2) 6
(3) 2 (4) 8
47. In which of the following reactions is **INCORRECT** according to its products formed.
- (1) $PCl_3 + 3H_2O \rightarrow H_3PO_3 + 3HCl$
(2) $NCl_3 + 3H_2O \rightarrow NH_3 + 3HOCl$
(3) $ICl + H_2O \rightarrow HClO + HI$
(4) $N_2O_4 + H_2O \rightarrow HNO_3 + HNO_2$
48. Which of the following has highest covalent character.
- (1) $CaCl_2$ (2) $ZnCl_2$
(3) KCl (4) $CuCl$
49. Which of the following order is **CORRECT**
- (1) $BeF_2 < BaF_2 \rightarrow$ Solubility
(2) $BeO < BeF_2 \rightarrow$ Melting point
(3) $BeO < MgO \rightarrow$ Acidic character
(4) $MgF_2 < AlF_3 \rightarrow$ Covalent character
50. Which of the following order is **CORRECT** about thermal stability.
- (1) $Li_2CO_3 < Cs_2CO_3$ (2) $BeCO_3 < BaCO_3$
(3) $LiNO_3 < CsNO_3$ (4) All of these
51. Which of following is optically active in nature
- (1)
- (2)
- (3)
- (4)

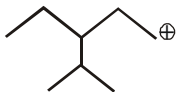
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52. Total number of stereoisomer possible by given compound is :



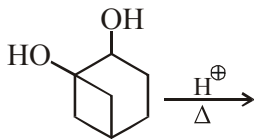
- (1) 4 (2) 8
(3) 6 (4) 10

53. How many 1,2-shift takes place in following carbocation.



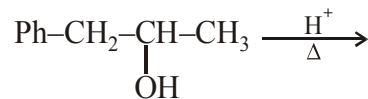
- (1) 2 (2) 1
(3) 3 (4) 4

54. Major product of reaction is :



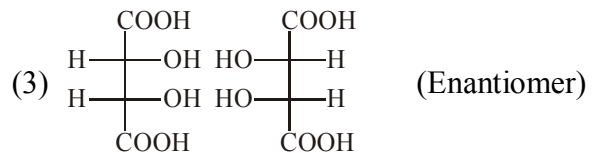
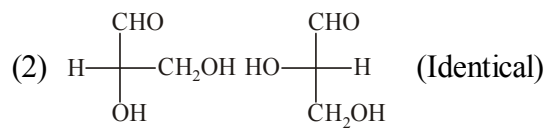
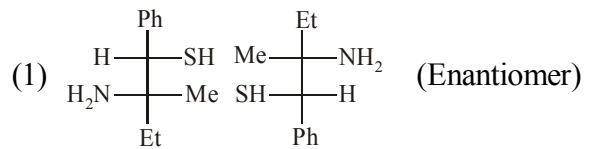
- (1) (2)
- (3) (4)

55. Major product of reaction is :



- (1) $\text{Ph}-\text{CH}_2-\text{CH}=\text{CH}_2$ (2)
- (3) (4) All

56. Which one is correct in a given isomeric pair :

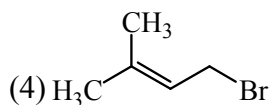
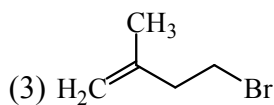
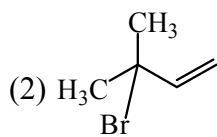
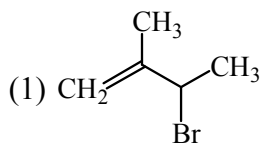
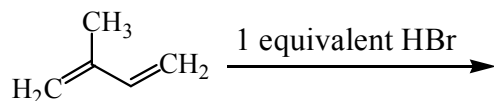


57. Which of the following decolorise Br_2 water solution :

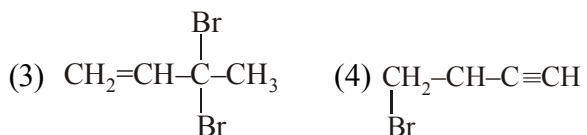
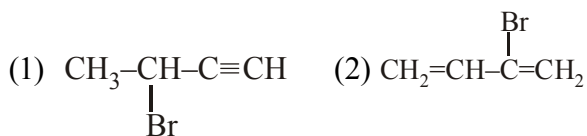
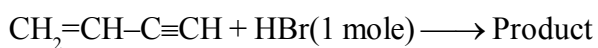
- (1) (2) $\text{CH}_3-\text{CH}_2-\text{OH}$
(3) $\text{HC}\equiv\text{CH}$ (4) $\text{CH}_3-\text{CH}_2-\text{Cl}$

SPACE FOR ROUGH WORK

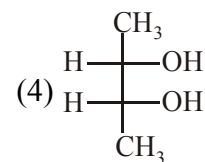
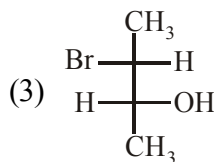
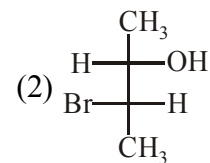
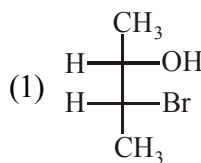
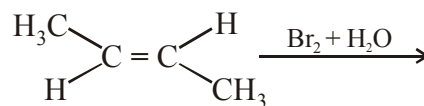
58. In the following reaction, the major product is



59. Major product of reaction is :



60. Major product of reaction is :



SPACE FOR ROUGH WORK

PART C - MATHEMATICS

61. Let $f(x)$ is a polynomial function such that

$$f(x) + f\left(\frac{1}{x}\right) = f(x) \cdot f\left(\frac{1}{x}\right) \forall x \in \mathbb{R} - \{0\} \text{ and}$$

$f(5) = 126$, then value of $\int f(x) dx$ is-

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

(3) $-\frac{x^4}{4} + x - C$ (4) $-\frac{x^4}{4} - x - C$

(where C is an integration constant)

62. The letters of the word MUNNAR are permuted and all the permutations are arranged in an alphabetical order as in an English dictionary, then number of words that appear before the word MUNNAR

(1) 359 (2) 719

(3) 113 (4) 53

63. If $x = a \left[\cos t + \log \left(\tan \frac{t}{2} \right) \right]$ & $y = a \sin t$,

where t is a parameter and 'a' is constant, then

$\frac{dy}{dx}$ is equal to-

(1) $\sin t$ (2) $\cos t$

(3) $\tan t$ (4) $\tan^2 t$

64. Let $f(x) = \begin{cases} A + B \cos x & ; x \leq \frac{\pi}{2} \\ x & ; x > \frac{\pi}{2} \end{cases}$

is differentiable function, then-

(1) $A = \frac{\pi}{2}, B = 1$ (2) $A = \frac{\pi}{2} - 1, B = -1$

(3) $A = \frac{\pi}{2} + 1; B = 1$ (4) $A = \frac{\pi}{2}; B = -1$

65. Let p be the coefficient of x^{15} in the expansion of $(1 - x^3)^{15}$ and q be the term independent of x

in the expansion of $\left(x^2 - \frac{2}{x}\right)^{15}$, then $\left|\frac{p}{q}\right|$ is-

(1) 1024 (2) 512

(3) $\frac{1}{512}$ (4) $\frac{1}{1024}$

66. If $f(x) = 1 - \sin x$, $g(x)$ be antiderivative of $f(x)$ such that $g(0) = 1$ and $h(x)$ be inverse of $g(x)$, then $h'(\pi - 1)$ is

(1) -1 (2) 0

(3) 1 (4) 4

SPACE FOR ROUGH WORK

67. $\int \frac{(\sin x + \cos x) dx}{3 + \sin 2x}$ is equal to-

(1) $\frac{1}{2} \sin^{-1}(\sin x + \cos x) + C$

(2) $\frac{1}{2} \tan^{-1} \left(\frac{\sin x + \cos x}{\sin x - \cos x} \right) + C$

(3) $\frac{1}{4} \sin^{-1} \left(\frac{1}{\sin x + \cos x} \right) + C$

(4) $\frac{1}{4} \ln \left| \frac{2 + \sin x - \cos x}{2 - \sin x + \cos x} \right| + C$

(where C is constant of integration)

68. If $f(xy) = f(x)f(y) \forall x, y \in \mathbb{R}$ and $f(x)$ is differentiable function such that $f'(1) = 4$, $f(1) \neq 0$, then $f(5)$ is equal to

(1) 5^4 (2) $\left(\frac{5}{4}\right)^4$

(3) $\left(\frac{5}{2}\right)^4$ (4) $\left(\frac{4}{5}\right)^4$

69. If $f(x) = \begin{cases} a \frac{|x^2 - 15x + 56|}{x - 8} & x > 9 \\ b & x = 9 \\ \frac{x - [x]}{x - 8} & x < 9 \end{cases}$

(where $[.]$ denotes greatest integer function) and function is continuous at $x = 9$, then-

(1) $a = -\frac{1}{2}, b = 1$ (2) $a = \frac{1}{2}, b = 1$

(3) $a = 0, b = 1$ (4) $a = -\frac{1}{2}, b = -1$

70. The number of points where the function

$f(x) = \frac{\sin |x|}{1 - |x|^2}, x \in (-\pi, \pi)$ is not differentiable

is-

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

71. $\int \frac{dx}{16 + x^2} = f(x)$ where $f(4) = \frac{\pi}{16}$, then value

of $f(2) + f\left(\frac{4}{3}\right)$ is -

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{8}$

(3) $\frac{\pi}{16}$ (4) $\frac{\pi}{2}$

SPACE FOR ROUGH WORK

72. $\lim_{x \rightarrow \infty} \sqrt[3]{x} \left[(x+1)^{2/3} - (x-1)^{2/3} \right]$ is equal to-

- (1) $\frac{2}{3}$ (2) $\frac{4}{3}$
 (3) $\frac{1}{3}$ (4) Does not exist

73. If $f(x) = \begin{cases} px^2 - q & 0 \leq x < 2 \\ x + 2 & 2 \leq x \end{cases}$ be a continuous

function at $x = 2$, then (p, q) **CAN NOT** be-

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

74. If $(1 + 2x + 3x^2)^{15} = a_0 + a_1x + a_2x^2 + \dots + a_{30}x^{30}$,

then $\sum_{k=1}^{30} k \cdot a_k$ is-

- (1) $20 \cdot 6^{15}$ (2) 6^{15}
 (3) $20 \cdot 3^{15}$ (4) 3^{15}

75. Let F is anti-derivative of f defined by

$f(x) = 5(x^4 - 1)$ where $F(1) = 20$, then value of $F(2)$ is

- (1) 160 (2) 46
 (3) 120 (4) 72

76. Let $5 < n_1 < n_2 < n_3 < n_4$ be integers such that $n_1 + n_2 + n_3 + n_4 = 35$. The number of such distinct arrangements (n_1, n_2, n_3, n_4) is-

- (1) ${}^{38}C_3$ (2) 8C_3 (3) 5 (4) 6

77. The differentiation of $\cos \left(2 \tan^{-1} \sqrt{\frac{1-x}{1+x}} \right)$

with respect to $\cos^{-1} \left(\sqrt{\frac{1-x}{2}} \right)$ is-

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

78. $\int e^{\sin x} (\sin 2x + 2 \cos x) dx$ is equal to -

- (1) $e^{\sin x} \left(\frac{\sin x + \cos x}{\sin x - \cos x} \right) + C$
 (2) $e^{\sin x} (\sin x + \cos x) + C$
 (3) $e^{\sin x} \cos x + C$
 (4) $2 \sin x \cdot e^{\sin x} + C$

where C is constant of integration

SPACE FOR ROUGH WORK

79. Let $f(x)$ be a function defined by

$$f(x) = \lim_{n \rightarrow \infty} \frac{x}{1 + (2 \sin x)^{2n}}$$
 then which of the following is **INCORRECT**-

- (1) $f(x) = x \forall x \in \left(n\pi - \frac{\pi}{6}, n\pi + \frac{\pi}{6} \right), n \in I$
 (2) $f(x) = \frac{x}{2} \forall x = n\pi \pm \frac{\pi}{6}, n \in I$
 (3) $f(x) = 0 \forall x \in \mathbb{R} - \left[n\pi - \frac{\pi}{6}, n\pi + \frac{\pi}{6} \right], n \in I$
 (4) $f(x)$ is continuous function at $x = n\pi \pm \frac{\pi}{6}, n \in I$

80. If $f(x)$ is a non constant polynomial function such that $f'(2x) = f''(3x) \cdot f'''(x)$, then leading coefficient of $f(x)$ is-

- (1) $\frac{1}{216}$ (2) $\frac{1}{36}$
 (3) $\frac{1}{27}$ (4) $\frac{1}{81}$

81. If $\int \sqrt{\frac{1-\sqrt{x}}{1+\sqrt{x}}} \cdot \frac{1}{x} dx = A \ln \left| \frac{1+\sqrt{1-x}}{\sqrt{x}} \right| + B \cos^{-1} \sqrt{x} + C$,
 then value of $A + B$ is-
 (where C is an integration constant)

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

82. If nZ_m denote the number of m sided polygon which can be formed using the vertices of a regular polygon of n sides, then ${}^{12}Z_4 - {}^{11}Z_3$ is-

- (1) 0 (2) $2 \cdot {}^{11}Z_3$
 (3) 297 (4) ${}^{13}Z_5$

83. If $f(x) = \begin{cases} \frac{4}{1+x^2} & x \in \mathbb{R} - \mathbb{Q} \\ b & x \in \mathbb{Q} \end{cases}$ has exactly two distinct points of continuity then range of b is-

- (1) (0,4) (2) [0,4]
 (3) (0,4] (4) [2,2]

84. If $R(m, n) = \begin{cases} R(m-n, n) & m \geq n \\ m & m < n \end{cases}$,

then $R(7^{2016}, 4)$ is

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

SPACE FOR ROUGH WORK

85. Let $f(x) = 7\tan^8x + 7\tan^6x - 4\tan^5x - 4\tan^3x$
 and $\int f(x) dx = g(x)$ where $g(0) = 0$, then value

of $g\left(\frac{\pi}{4}\right)$ is-

- (1) 1 (2) π
 (3) 0 (4) None of these

86. $\lim_{x \rightarrow 0} \left(\sin^2 \left(\frac{\pi}{2-3x} \right) \right)^{\sec^2 \left(\frac{\pi}{2-3x} \right)}$ is -

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

87. $\int \frac{2x^2 + 5}{x^4 + 5x^2 + 4} dx$ is

(1) $\tan^{-1} x + \frac{1}{2} \tan^{-1} \frac{x}{2} + C$

(2) $\tan^{-1} x - \frac{1}{2} \tan^{-1} \frac{x}{2} + C$

(3) $\tan^{-1} x - \tan^{-1} \frac{x}{2} + C$

(4) $\tan^{-1} x + 2 \tan^{-1} \frac{x}{2} + C$

(where C is an integration constant)

88. $\int \frac{6}{x^2(x^3 + 3x)^{\frac{1}{3}}} dx$ is

(1) $\frac{3}{2} \left(1 + \frac{3}{x^2} \right)^{2/3} + C$

(2) $\frac{1}{2} \left(1 + \frac{3}{x^2} \right)^{3/2} + C$

(3) $\frac{5}{2} \left(1 + \frac{3}{x^2} \right)^{3/2} + C$

(4) $-\frac{3}{2} \left(1 + \frac{3}{x^2} \right)^{2/3} + C$

(where C is an integration constant)

89. If $\sin x + \sin y = 1$ where $x, y \in \left(0, \frac{\pi}{2} \right)$ and

$\lim_{x \rightarrow 0^+} x^\alpha \frac{dy}{dx}$ exists and non-zero then value of α is-

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

90. If $\int \frac{x}{x^8 + 1} dx = \frac{1}{k_1} \tan^{-1} \left(\frac{x^4 - 1}{k_2 x^2} \right) - \frac{1}{2} \int \frac{x^5 - x}{x^8 + 1} + C$,

then value of $k_1 \cdot k_2$ is-

(where C is an integration constant)

- (1) 8 (2) 2

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

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK



CLASSROOM CONTACT PROGRAMME

(Academic Session : 2016 - 2017)

JEE (Main + Advanced) : ENTHUSIAST COURSE

PHASE : I

Test Type : MINOR

Test Pattern : JEE-Main

TEST DATE : 29 - 05 - 2016

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/ marking 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) 2017

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BEWARE OF NEGATIVE MARKING

PART A - PHYSICS

- | | |
|---|---|
| <p>1. The maximum electric field intensity on the axis of a uniformly charged ring of charge q and radius R will be :-</p> <p>(1) $\frac{1}{4\pi\epsilon_0} \frac{q}{3\sqrt{3}R^2}$ (2) $\frac{1}{4\pi\epsilon_0} \frac{2q}{3R^2}$</p> <p>(3) $\frac{1}{4\pi\epsilon_0} \frac{2q}{3\sqrt{3}R^2}$ (4) $\frac{1}{4\pi\epsilon_0} \frac{3q}{2\sqrt{2}R^2}$</p> <p>2. A half ring of radius R has a charge of λ per unit length. The potential at the center of the half ring is :-</p> <p>(1) $k \frac{\lambda}{R}$ (2) $k \frac{\lambda}{\pi R}$</p> <p>(3) $k \frac{\pi\lambda}{R}$ (4) $k\pi\lambda$</p> <p>3. Two large metal plates each of area A carry charges $+q$ and $-q$ and face each other. The plates are separated by a small distance d the electric field between the plates would be</p> <p>(1) $\frac{2q}{\epsilon_0 A}$ (2) $\frac{2A}{\epsilon_0 q}$ (3) $\frac{q}{\epsilon_0 A}$ (4) $\frac{A}{\epsilon_0 q}$</p> | <p>1. आवेश q तथा त्रिज्या R वाली समरूप आवेशित वलय की अक्ष पर अधिकतम विद्युत क्षेत्र तीव्रता होगी:-</p> <p>(1) $\frac{1}{4\pi\epsilon_0} \frac{q}{3\sqrt{3}R^2}$ (2) $\frac{1}{4\pi\epsilon_0} \frac{2q}{3R^2}$</p> <p>(3) $\frac{1}{4\pi\epsilon_0} \frac{2q}{3\sqrt{3}R^2}$ (4) $\frac{1}{4\pi\epsilon_0} \frac{3q}{2\sqrt{2}R^2}$</p> <p>2. त्रिज्या R वाली अर्ध वलय की प्रति इकाई लम्बाई पर आवेश λ है। अर्ध वलय के केन्द्र पर विभव होगा:-</p> <p>(1) $k \frac{\lambda}{R}$ (2) $k \frac{\lambda}{\pi R}$</p> <p>(3) $k \frac{\pi\lambda}{R}$ (4) $k\pi\lambda$</p> <p>3. प्रत्येक A क्षेत्रफल वाली दो बड़ी धात्विक प्लेटों पर आवेश $+q$ व $-q$ है तथा ये एक-दूसरे के सामने स्थित हैं। प्लेटों को अल्प दूरी d तक विस्थापित करने पर प्लेटों के मध्य विद्युत क्षेत्र होगा:-</p> <p>(1) $\frac{2q}{\epsilon_0 A}$ (2) $\frac{2A}{\epsilon_0 q}$ (3) $\frac{q}{\epsilon_0 A}$ (4) $\frac{A}{\epsilon_0 q}$</p> |
|---|---|

कच्चे कार्य के लिए स्थान

4. A charge q is uniformly distributed on the surface of a disc of radius R . Then a circular hole of radius $R/2$ is punched taking one of the radii as the diameter of the hole. Calculate the potential V due to remaining portion of the disc at the

$$\text{center of the disc. } \left[V_0 = \frac{q}{2\epsilon_0 R} \left(1 - \frac{1}{\pi} \right) \right]$$

(1) $V = 2V_0$

(2) $V = V_0$

(3) $V = 3V_0$

(4) $V = \frac{V_0}{2}$

5. The potential field of an electric field $\vec{E} = (y\hat{i} + x\hat{j})$ is :-

(1) $V = -xy + \text{constant}$

(2) $V = -2(x + y) + \text{constant}$

(3) $V = -2xy + \text{constant}$

(4) $V = \text{constant}$

6. A spherical conductor A of radius r is placed concentrically inside a conducting shell B of radius R ($R > r$). A charge Q is given to A, and then A is joined to B by a metal wire. The charge flowing from A to B will be :-

(1) $Q \left(\frac{R}{R+r} \right)$

(2) $Q \left(\frac{r}{R+r} \right)$

(3) Q

(4) 0

4. आवेश q को त्रिज्या R वाली चकती की सतह पर एकसमान रूप से वितरित किया गया है। अब इसमें $R/2$ त्रिज्या का वृत्ताकार छिद्र इस प्रकार किया जाता है कि एक त्रिज्या को छिद्र के व्यास के रूप में लिया गया है। चकती के शेष भाग के कारण चकती के केन्द्र पर विभव V का मान

$$\text{होगा:- } \left[V_0 = \frac{q}{2\epsilon_0 R} \left(1 - \frac{1}{\pi} \right) \right]$$

(1) $V = 2V_0$

(2) $V = V_0$

(3) $V = 3V_0$

(4) $V = \frac{V_0}{2}$

5. विद्युत क्षेत्र $\vec{E} = (y\hat{i} + x\hat{j})$ का विभव क्षेत्र होता है:-

(1) $V = -xy + \text{नियतांक}$

(2) $V = -2(x + y) + \text{नियतांक}$

(3) $V = -2xy + \text{नियतांक}$

(4) $V = \text{नियतांक}$

6. त्रिज्या r वाला एक गोलीय चालक A त्रिज्या R ($R > r$) वाले चालक कोश B के अंदर संकेन्द्रीय रूप से रखा जाता है। A को आवेश Q दिया जाता है तथा अब A को धात्विक तार द्वारा B से जोड़ दिया जाता है। A से B की ओर प्रवाहित आवेश होगा:-

(1) $Q \left(\frac{R}{R+r} \right)$

(2) $Q \left(\frac{r}{R+r} \right)$

(3) Q

(4) 0

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7. Two point charge $-q$ and $+q/2$ are situated at the origin and at the point $(a, 0, 0)$ respectively. The point along the x -axis where the electric field vanishes is :-

- (1) $x = a/\sqrt{2}$ (2) $x = \sqrt{2}a$
(3) $x = \frac{\sqrt{2}a}{\sqrt{2}-1}$ (4) $x = \frac{\sqrt{2}a}{\sqrt{2}+1}$

8. In a certain charge distribution, all points having zero potential can be joined by a circle S . Points inside S have positive potential, and points outside S have negative potential. A positive charge, which is free to move, is placed inside S , then :-

- (1) It will remain in equilibrium
(2) It can move inside S , but it cannot cross S .
(3) It must cross S at some time.
(4) It may move but will ultimately return to its starting point

9. A large flat metal surface has a uniform charge density $+\sigma$. An electron of mass m and charge e leaves the surface at point A with speed u , and returns to at point B . Assuming there is no gravity, the maximum value of AB is :-

- (1) $\frac{u^2 m \epsilon_0}{\sigma e}$ (2) $\frac{u^2 e \epsilon_0}{m \sigma}$ (3) $\frac{u^2 e}{\epsilon_0 \sigma m}$ (4) $\frac{u^2 \sigma e}{\epsilon_0 m}$

7. दो बिन्दु आवेश $-q$ व $+q/2$ क्रमशः मूलबिन्दु व बिन्दु $(a, 0, 0)$ पर स्थित है। x -अक्ष पर वह बिन्दु ज्ञात कीजिये जहाँ विद्युत क्षेत्र समाप्त हो जाता है:-

- (1) $x = a/\sqrt{2}$ (2) $x = \sqrt{2}a$
(3) $x = \frac{\sqrt{2}a}{\sqrt{2}-1}$ (4) $x = \frac{\sqrt{2}a}{\sqrt{2}+1}$

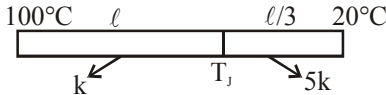
8. किसी आवेश वितरण में शून्य विभव वाले सभी बिन्दुओं को वृत्त S द्वारा जोड़ा जा सकता है। S के अंदर स्थित बिन्दुओं का विभव धनात्मक तथा S के बाहर स्थित बिन्दुओं का विभव ऋणात्मक है। एक धनावेश जो गति के लिये स्वतंत्र है, S के अंदर रखा जाता है तब :-

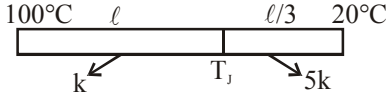
- (1) यह साम्यावस्था में बना रहेगा।
(2) यह S के अंदर गति कर सकता है परन्तु S को पार नहीं कर सकता है।
(3) यह किसी क्षण S को निश्चित रूप से पार करेगा।
(4) यह गति कर सकता है परन्तु अंत में यह इसके प्रारम्भिक बिन्दु पर लौट आयेगा।

9. एक बड़ी समतल धात्विक सतह पर समरूप आवेश घनत्व $+\sigma$ विद्यमान है। द्रव्यमान m व आवेश e वाला एक इलेक्ट्रॉन सतह को बिन्दु A से u चाल से छोड़ता है तथा यह बिन्दु B पर लौट आता है। माना गुरुत्व अनुपस्थित है तब AB का अधिकतम मान है:-

- (1) $\frac{u^2 m \epsilon_0}{\sigma e}$ (2) $\frac{u^2 e \epsilon_0}{m \sigma}$ (3) $\frac{u^2 e}{\epsilon_0 \sigma m}$ (4) $\frac{u^2 \sigma e}{\epsilon_0 m}$

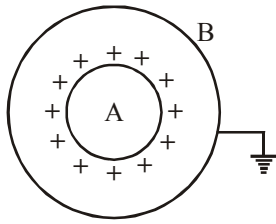
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10. An electric dipole in a uniform electric field has potential energy U . The magnitude of the torque acting on the dipole due to the field is τ .
- (1) U is minimum and τ is zero when the dipole is perpendicular to the field
 (2) U is zero and τ is a maximum when the dipole is perpendicular to the field.
 (3) U is a minimum and τ is a maximum when the dipole is perpendicular to the field.
 (4) U is a minimum and τ is zero when the dipole is antiparallel to the field.
11. 1000 small water drops each of the radius r and charge q coalesce together to form one spherical drop. The potential of the bigger drop is larger than of the smaller ones by a factor :-
 (1) 1000 (2) 100 (3) 10 (4) 500
12. Two rods of same area of cross section and length ℓ & $\frac{\ell}{3}$ with thermal conductivity k & $5k$ respectively are placed in contact with the given temperature difference as shown. Find the temperature of the junction :
- 
- (1) 30°C (2) 25°C (3) 35°C (4) 40°C

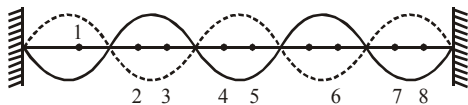
10. समरूप विद्युत क्षेत्र में स्थित एक विद्युत द्विध्रुव की स्थितिज ऊर्जा U है। क्षेत्र के कारण द्विध्रुव पर कार्यरत बलाघूर्ण का परिमाण τ है:-
- (1) U न्यूनतम तथा τ शून्य होगा जब द्विध्रुव क्षेत्र के लम्बवत् है।
 (2) U शून्य तथा τ अधिकतम होगा जब द्विध्रुव क्षेत्र के लम्बवत् है।
 (3) U न्यूनतम तथा τ अधिकतम होगा जब द्विध्रुव क्षेत्र के लम्बवत् है।
 (4) U न्यूनतम तथा τ शून्य होगा जब द्विध्रुव क्षेत्र के प्रतिसमान्तर है।
11. प्रत्येक त्रिज्या r तथा आवेश q वाली 1000 छोटी जल बूंदें मिलकर एक बड़ी गोलाकार बूंद बनाती है। बड़ी बूंद का विभव छोटी बूंद की तुलना में कितना अधिक होगा ?
 (1) 1000 (2) 100 (3) 10 (4) 500
12. समान अनुप्रस्थकाट क्षेत्रफल, लम्बाई ℓ व $\frac{\ell}{3}$ तथा तापीय चालकता क्रमशः k व $5k$ वाली दो छड़ों को सम्पर्क में दिये गये तापान्तर के साथ चित्रानुसार रखा जाता है। संधि का तापमान होगा:-
- 
- (1) 30°C (2) 25°C (3) 35°C (4) 40°C

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13. A and B are two concentric conducting shells. If A is given a charge Q while B is earthed as shown in figure:

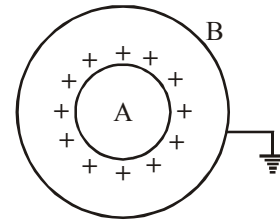


- (1) The field inside A and outside B is zero, but the field between A and B is not zero.
 - (2) The field inside A and outside B is not zero, but the field between A and B is zero.
 - (3) The field inside A is zero but the field outside B as well as between A and B is not zero.
 - (4) The field inside A and the field between A and B is non zero, but outside B is zero.
14. A stretched string is vibrating in its 5th harmonic as shown. Consider a particle 1 (figure). At an instant this particle is at mean positions and is moving towards its negative extreme. Which of the following set of particles, are in same phase with particle 1.

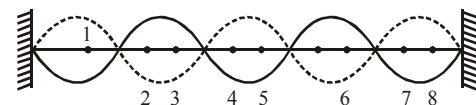


- (1) 2, 4, 7 (2) 3, 5, 6 (3) 5, 7, 8 (4) 2, 4, 6

13. चित्र में A व B दो संकेन्द्रीय चालक कोश है। A को Q आवेश दिया जाता है जबकि B भूसम्पर्कित है।



- (1) A के अन्दर तथा B के बाहर क्षेत्र शून्य है परन्तु A व B के मध्य क्षेत्र अशून्य है।
 - (2) A के अन्दर तथा B के बाहर क्षेत्र अशून्य है परन्तु A व B के मध्य क्षेत्र शून्य है।
 - (3) A के अन्दर क्षेत्र शून्य है परन्तु B के बाहर तथा A व B के मध्य क्षेत्र अशून्य है।
 - (4) A के अन्दर तथा A व B के मध्य क्षेत्र अशून्य है परन्तु B के बाहर शून्य है।
14. एक तनी हुयी रस्सी इसकी 5^{वीं} गुणावृत्ति में चित्रानुसार कम्पन कर रही है। चित्रानुसार एक कण 1 पर विचार कीजिये। किसी क्षण यह कण माध्य स्थिति पर है तथा इसकी ऋणात्मक सीमान्त स्थिति की ओर गतिशील है। कणों का निम्न में से कौनसा समूह कण 1 के साथ समान कला में है?



- (1) 2, 4, 7 (2) 3, 5, 6 (3) 5, 7, 8 (4) 2, 4, 6

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15. In the Millikan's oil droplet experiment, the horizontal plates are 0.8 cm apart, the radius of the oil droplet is 2.8×10^{-4} cm and the density of oil is 0.92 g/cm^3 . If a single excess electron is attached to the droplet, and the droplet is held stationary in the field, the potential difference between the plates is :-

- (1) $4.20 \times 10^3 \text{ V}$ (2) 420 V
(3) $420 \times 10^4 \text{ V}$ (4) $4.20 \times 10^4 \text{ V}$

16. A charged particle q is shot towards another charged particle Q which is fixed, with a speed v. It approaches Q upto a closest distance r and then returns. If q were given a speed 2v, the closest distance of approach would be -



- (1) r (2) 2r (3) r/2 (4) r/4

17. If a glass rod is rubbed with silk, it acquires a positive charge because -

- (1) Protons are added to it.
(2) Protons are removed from it.
(3) Electrons are added to it.
(4) Electrons are removed from it.

18. A satellite of mass m moves around the earth in a circular orbit with speed v. The potential energy of the satellite is :-

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

15. मिलिकन के तेल बूंद प्रयोग में क्षैतिज प्लेटें 0.8 cm की दूरी पर स्थित हैं तथा तेल बूंद की त्रिज्या 2.8×10^{-4} cm व तेल का घनत्व 0.92 g/cm^3 है। यदि बूंद पर एक अतिरिक्त इलेक्ट्रॉन जोड़ दिया जाये तथा बूंद को क्षेत्र में स्थिर रखा जाये तो प्लेटों के मध्य विभवान्तर होगा:-

- (1) $4.20 \times 10^3 \text{ V}$ (2) 420 V
(3) $420 \times 10^4 \text{ V}$ (4) $4.20 \times 10^4 \text{ V}$

16. एक आवेशित कण q को एक अन्य स्थिर आवेशित कण Q की ओर v चाल से दागा जाता है। यह Q की ओर निकटतम दूरी r तक पहुँच कर वापस लौट जाता है। यदि q को 2v चाल दी जाये तो अब इसकी उपरोक्त निकटतम दूरी होगी:-



- (1) r (2) 2r (3) r/2 (4) r/4

17. यदि एक काँच की छड़ को रेशम के साथ रगड़ा जाये तो यह धनात्मक आवेश प्राप्त कर लेती है क्योंकि :-

- (1) इस पर प्रोटोन जुड़ जाते हैं।
(2) इसमें से प्रोटोन निकल जाते हैं।
(3) इस पर इलेक्ट्रॉन जुड़ जाते हैं।
(4) इसमें से इलेक्ट्रॉन निकल जाते हैं।

18. पृथ्वी के चारों ओर वृत्ताकार कक्षा में v चाल से गतिशील m द्रव्यमान वाले उपग्रह की स्थितिज ऊर्जा होती है:-

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

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19. Two particles each of mass m are placed at A and C as such $AB = BC = L$ and A, B & C are collinear. The gravitational force on the third particle of mass m placed at D at a distance L on the perpendicular bisector of the line AC, is:-

(1) $\frac{Gm^2}{\sqrt{2}L^2}$ along BD

(2) $\frac{Gm^2}{\sqrt{2}L^2}$ along DB

(3) $\frac{Gm^2}{L^2}$ along AC

(4) none of these

20. A geostationary satellite is orbiting the earth at a height of $6R$ above the surface of the earth, R being the radius of the earth. The time period of another satellite at a height of $2.5R$ from the surface of earth is :-

(1) $6\sqrt{2}$ hr (2) 6 hr (3) $5\sqrt{2}$ hr (4) 10 hr

21. Two particles A and B execute simple harmonic motion with periods of T and $\frac{5T}{4}$ respectively.

They start simultaneously from mean position. The phase difference between them when A completes one oscillation will be -

(1) 0 (2) $\frac{\pi}{2}$ (3) $\frac{\pi}{4}$ (4) $\frac{2\pi}{5}$

19. प्रत्येक m द्रव्यमान वाले दो कण A तथा C पर इस प्रकार स्थित है कि $AB = BC = L$ है तथा A, B एवं C सररेखीय है। रेखा AC के लम्बसमद्विभाजक पर L दूरी पर बिन्दु D पर स्थित m द्रव्यमान के एक तीसरे कण पर गुरुत्वाकर्षण बल होगा:-

(1) $\frac{Gm^2}{\sqrt{2}L^2}$, BD के अनुदिश

(2) $\frac{Gm^2}{\sqrt{2}L^2}$, DB के अनुदिश

(3) $\frac{Gm^2}{L^2}$, AC के अनुदिश

(4) उपरोक्त में से कोई नहीं

20. एक भूस्थिर उपग्रह त्रिज्या R वाली पृथ्वी की सतह से $6R$ ऊँचाई पर पृथ्वी के चारों ओर चक्कर लगा रहा है। पृथ्वी की सतह से $2.5R$ ऊँचाई पर एक अन्य उपग्रह का आवर्तकाल होगा:-

(1) $6\sqrt{2}$ hr (2) 6 hr (3) $5\sqrt{2}$ hr (4) 10 hr

21. दो कण A तथा B क्रमशः T व $\frac{5T}{4}$ आवर्तकाल वाली सरल आवर्त गतियाँ कर रहे हैं। ये माध्य स्थिति से एकसाथ गति करना प्रारम्भ करते हैं। इनके मध्य कलान्तर क्या होगा जब A एक दोलन पूर्ण कर लेता है?

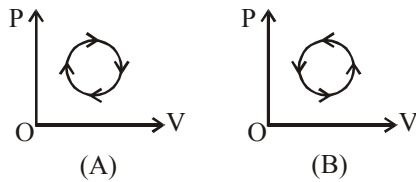
(1) 0 (2) $\frac{\pi}{2}$ (3) $\frac{\pi}{4}$ (4) $\frac{2\pi}{5}$

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22. A tunnel is drilled along the diameter of the earth. A particle executes S.H.M. in this tunnel and another particle performs uniform circular motion along the orbit near earth's surface. The two particles start their journey simultaneously from one end of the tunnel.
- (1) They will reach the other end of tunnel simultaneously
 (2) when the particle reaches the other end of the tunnel, the first particle will cover one fourth of the circle
 (3) when the particle reaches the other end of the tunnel, the first particle will cover complete circle
 (4) when the particle reaches the other end of the tunnel, the first particle will cover three fourth of the circle
23. Which of the following cylindrical rods will conduct most heat, when their ends are maintained at the same steady temperature.
- (1) length 100 cm, radius 1 cm
 (2) length 100 cm, radius 2 cm
 (3) length 200 cm, radius 2 cm
 (4) length 200 cm, radius 1 cm
24. A wire is 4 m long and has a mass 0.2 kg. The wire is kept horizontally. A transverse pulse is generated by plucking one end of the taut (tight) wire. The pulse makes four trips back and forth along the cord in 0.8 sec. The tension in the cord will be :-
 (1) 80 N (2) 160 N (3) 240 N (4) 320 N
22. पृथ्वी के व्यास के अनुदिश एक सुरंग खोदी जाती है। इस सुरंग में एक कण सरल आवर्त गति करता है तथा एक अन्य कण पृथ्वी की सतह के नजदीक कक्षा के अनुदिश समरूप वृत्ताकार गति दर्शाता है। दोनों कण सुरंग के एक सिरे से एकसाथ अपनी गति प्रारम्भ करते हैं।
- (1) दोनों कण सुरंग के दूसरे सिरे पर एकसाथ पहुँचेंगे।
 (2) जब कण सुरंग के दूसरे सिरे पर पहुँचता है तो प्रथम कण वृत्त का एक चौथाई भाग पूरा कर लेता है।
 (3) जब कण सुरंग के दूसरे सिरे पर पहुँचता है तो प्रथम कण सम्पूर्ण वृत्त पूरा कर लेता है।
 (4) जब कण सुरंग के दूसरे सिरे पर पहुँचता है तो प्रथम कण वृत्त का तीन चौथाई भाग पूरा कर लेता है।
23. निम्न में से कौनसी बेलनाकार छड़ अधिकतम ऊष्मा का चालन करेगी जब इनके सिरों को समान स्थायी तापमान पर रखा जाता है?
- (1) लम्बाई 100 cm, त्रिज्या 1 cm
 (2) लम्बाई 100 cm, त्रिज्या 2 cm
 (3) लम्बाई 200 cm, त्रिज्या 2 cm
 (4) लम्बाई 200 cm, त्रिज्या 1 cm
24. एक 4 m लम्बे तार का द्रव्यमान 0.2 kg है। तार को क्षैतिज रखा जाता है। तने हुये तार के एक सिरे को झटका देकर एक अनुप्रस्थ स्पंद उत्पन्न किया जाता है। यह स्पंद तार के अनुदिश 0.8 sec में चार बार आगे-पीछे गति करता है। तार में तनाव होगा:-
 (1) 80 N (2) 160 N (3) 240 N (4) 320 N

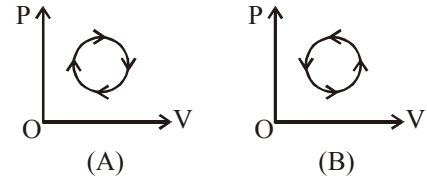
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25. The equation of a standing wave produced on a string fixed at both the ends is -
 $y = (0.4) \sin [(0.314 \text{ cm}^{-1})x] \cos [(600 \pi \text{ s}^{-1})t]$
 What would be the smallest length of the string?
 (1) 20 cm (2) 30 cm
 (3) 10 cm (4) 5 cm
26. If the P-V diagrams of two thermodynamics devices working in a cyclic process are as shown in the figure, then :-



- (1) A is a heat engine, B is a heat pump/refrigerator
 (2) B is a heat engine, A is a heat pump/refrigerator
 (3) both A and B are heat engines
 (4) both A and B are heat pumps/refrigerator
27. An ideal gas is expanded so that amount of heat given is equal to the decrease in internal energy. The gas undergoes the process $TV^{1/5} = \text{constant}$. The adiabatic compressibility of gas when pressure is P, is :-
 (1) $\frac{7}{5P}$ (2) $\frac{5}{7P}$ (3) $\frac{2}{5P}$ (4) $\frac{7}{3P}$

25. दोनों सिरो से बंधी हुयी एक रस्सी पर उत्पन्न अप्रगामी तरंग की समीकरण निम्न प्रकार लिखी जाती है:
 $y = (0.4) \sin [(0.314 \text{ cm}^{-1})x] \cos [(600 \pi \text{ s}^{-1})t]$
 रस्सी की न्यूनतम लम्बाई क्या होगी ?
 (1) 20 cm (2) 30 cm (3) 10 cm (4) 5 cm
26. एक चक्रीय प्रक्रम में कार्यरत दो ऊष्मागतिक युक्तियों के P-V आरेख चित्र में दर्शाये गये हैं:-



- (1) A एक ऊष्मा ईजन है, B एक ऊष्मा पम्प/प्रशीतक है।
 (2) B एक ऊष्मा ईजन है, A एक ऊष्मा पम्प/प्रशीतक है।
 (3) A तथा B दोनों ऊष्मा ईजन है।
 (4) A तथा B दोनों ऊष्मा पम्प/प्रशीतक है।
27. एक आदर्श गैस को इस प्रकार प्रसारित किया जाता है कि ऊष्मा की दी गयी मात्रा आंतरिक ऊर्जा में कमी के तुल्य है। गैस प्रक्रम $TV^{1/5} = \text{नियत}$ से गुजरती है। दाब P होने पर गैस की रूद्धोष्म सम्पीड्यता होगी:-
 (1) $\frac{7}{5P}$ (2) $\frac{5}{7P}$ (3) $\frac{2}{5P}$ (4) $\frac{7}{3P}$

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28. For a gas sample with N_0 number of molecules, function $N(V)$ is given by :

$$N(V) = \frac{dN}{dV} = \left[\frac{3N_0}{V_0^3} \right] V^2 \text{ for } 0 \leq V \leq V_0 \text{ and}$$

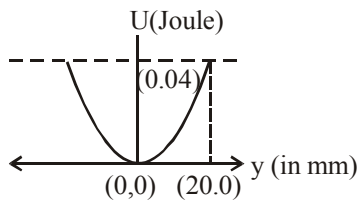
$N(V) = 0$ for $V > V_0$ where dN is number of molecules in speed range V to $V + dV$. The rms speed of the molecules is -

(1) $\sqrt{\frac{2}{5}} V_0$ (2) $\sqrt{\frac{3}{5}} V_0$ (3) $\sqrt{2} V_0$ (4) $\sqrt{3} V_0$

29. Let E_1 and E_2 denotes magnitude of gravitational field at distance ' r_1 ' and ' r_2 ' from axis of infinitely long solid cylinder of radius ' R '. Which of the following must hold true :-

- (1) $E_1 < E_2$ if $r_1 < r_2 < R$
 (2) $E_1 > E_2$ if $R < r_1 < r_2$
 (3) $E_1 < E_2$ if $r_1 = R - E$, $r_2 = R + E$ (E is positive constant $< R$)
 (4) All of the above

30. The variation in potential energy of a harmonic oscillator is as shown in fig. The spring constant is :



- (1) $1 \times 10^2 \text{ Nm}^{-1}$ (2) $2 \times 10^2 \text{ Nm}^{-1}$
 (3) $0.667 \times 10^2 \text{ Nm}^{-1}$ (4) $3 \times 10^2 \text{ Nm}^{-1}$

28. गैस के एक प्रतिदर्श, जिसमें अणुओं की संख्या N_0 है, के लिये फलन $N(V)$ निम्न प्रकार लिखा जाता है:

$$0 \leq V \leq V_0 \text{ के लिये } N(V) = \frac{dN}{dV} = \left[\frac{3N_0}{V_0^3} \right] V^2 \text{ तथा}$$

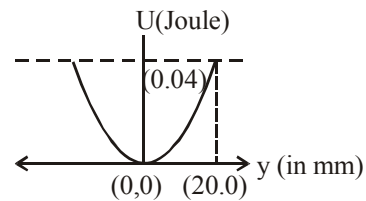
$V > V_0$ के लिये $N(V) = 0$ है जहाँ dN चाल परास V से $V + dV$ में अणुओं की संख्या है। अणुओं की वर्ग माध्य मूल चाल है:-

(1) $\sqrt{\frac{2}{5}} V_0$ (2) $\sqrt{\frac{3}{5}} V_0$ (3) $\sqrt{2} V_0$ (4) $\sqrt{3} V_0$

29. माना E_1 तथा E_2 त्रिज्या R वाले अनन्त लम्बे ठोस बेलन की अक्ष से क्रमशः ' r_1 ' व ' r_2 ' दूरी पर गुरुत्वाकर्षण क्षेत्र का परिमाण है। निम्न में से कौनसा निश्चित रूप से सत्य है?

- (1) $E_1 < E_2$ यदि $r_1 < r_2 < R$
 (2) $E_1 > E_2$ यदि $R < r_1 < r_2$
 (3) $E_1 < E_2$ यदि $r_1 = R - E$, $r_2 = R + E$ (E एक धनात्मक अचर $< R$)
 (4) उपरोक्त सभी

30. एक आवर्ती दौलित्र की स्थितिज ऊर्जा में परिवर्तन चित्र में दर्शाया गया है। स्प्रिंग नियतांक का मान है:-



- (1) $1 \times 10^2 \text{ Nm}^{-1}$ (2) $2 \times 10^2 \text{ Nm}^{-1}$
 (3) $0.667 \times 10^2 \text{ Nm}^{-1}$ (4) $3 \times 10^2 \text{ Nm}^{-1}$

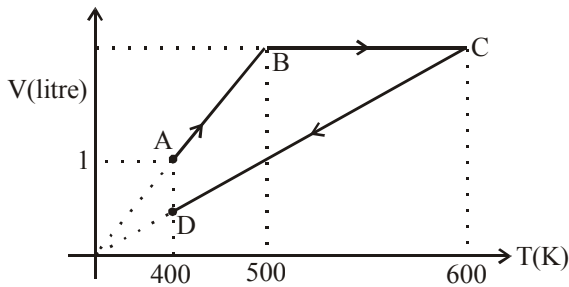
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PART B - CHEMISTRY

31. Which of the following property is not the property of system -

- (1) Temperature (2) Pressure
(3) Internal energy (4) Heat

32. 2 mol of He gas is undergoing through following process -



work during the process ABCD is -

- (1) +100 R (2) + 200 R
(3) 300 R (4) 400 R

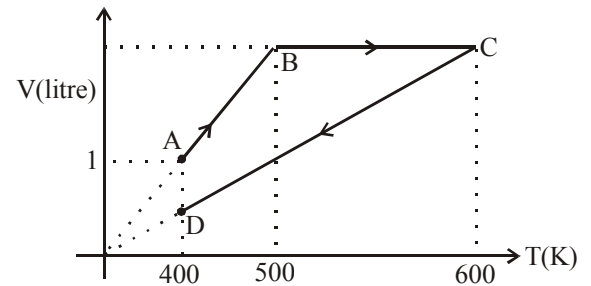
33. Which of the following changes will double the mean free path of gas in closed container

- (1) Increasing temperature two times at constant volume
(2) Increasing temperature four times at constant volume
(3) Increasing temperature two times at constant pressure
(4) Increasing temperature four times at constant pressure

31. निम्न में से कौनसा गुण, तंत्र का गुणधर्म नहीं है

- (1) तापमान (2) दाब
(3) आंतरिक ऊर्जा (4) ऊष्मा

32. 2 मोल He गैस निम्न प्रक्रम में है -



ABCD प्रक्रम के दौरान कार्य है -

- (1) +100 R (2) + 200 R
(3) 300 R (4) 400 R

33. निम्न में से कौनसा परिवर्तन बंद पात्र में उपस्थित गैस के माध्य मुक्त पथ को दुगुना करेगा

- (1) नियत आयतन पर ताप दोगुना करने पर
(2) नियत आयतन पर ताप चार गुना करने पर
(3) नियत दाब पर ताप दोगुना करने पर
(4) नियत दाब पर ताप चार गुना करने पर

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34. Average velocity (in m/s) of oxygen gas at 120π Kelvin is -

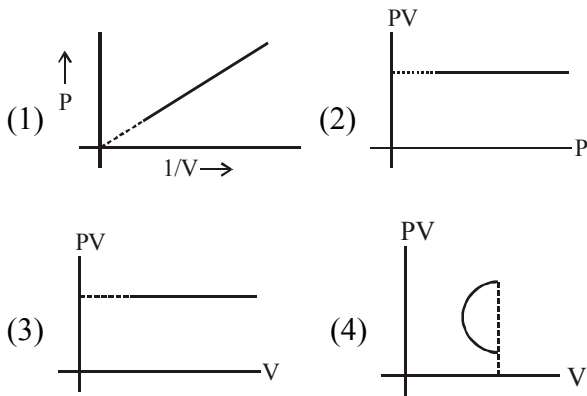
[Given $R = \frac{25}{3}$ J/mole-K]

- (1) 707 (2) 500
(3) $5\sqrt{10}$ (4) 316.2

35. 2 mole of He gas are expanded from 1 litre to (2 litre, 1 atm) in a single step adiabatic process then ratio of final temperature to initial temperature is-

- (1) $\frac{1}{2^{2/3}}$ (2) $2^{2/3}$
(3) $\frac{3}{4}$ (4) $\frac{1}{2^{2/5}}$

36. In which of the following process involving ideal gas in a closed container internal energy does not remain constant during the entire process



34. 120π केल्विन पर ऑक्सीजन का औसत वेग (m/s में) है-

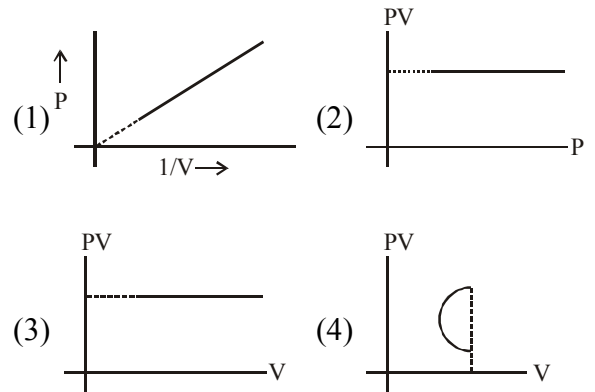
[दिया है $R = \frac{25}{3}$ J/mole-K]

- (1) 707 (2) 500
(3) $5\sqrt{10}$ (4) 316.2

35. 2 मोल He गैस को 1 लीटर से (2 litre, 1 atm) तक एकल पदीय रूद्धोष्मीय प्रक्रम में प्रसारित किया गया है तो अंतिम ताप का प्रारम्भिक ताप से अनुपात है-

- (1) $\frac{1}{2^{2/3}}$ (2) $2^{2/3}$
(3) $\frac{3}{4}$ (4) $\frac{1}{2^{2/5}}$

36. निम्न में से कौनसे प्रक्रम में जिसमें आदर्श गैस एक बंद पात्र में सम्मिलित है, की आंतरिक ऊर्जा सम्पूर्ण प्रक्रम के दौरान नियत नहीं रहती है-



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37. If all octahedral and tetrahedral voids are occupied in FCC arrangement without disturbing the lattice, then maximum possible packing fraction that can be achieved is (r is radius of sphere forming FCC lattice)

$$(1) \frac{[8 \times (0.414r)^3 + 4(0.225r)^3 + 4r^3] \frac{4}{3} \pi}{\left(\frac{4r}{\sqrt{2}}\right)^3}$$

$$(2) \frac{[4 \times (0.225r)^3 + 8(0.414r)^3 + 4r^3] \frac{4}{3} \pi}{\left(\frac{4r}{\sqrt{3}}\right)^3}$$

$$(3) \frac{[4 \times (0.414r)^3 + 8(0.225r)^3 + 4r^3] \frac{4}{3} \pi}{\left(\frac{4r}{\sqrt{2}}\right)^3}$$

$$(4) \frac{[4 \times (0.414r)^3 + 4(0.225r)^3 + 4r^3] \frac{4}{3} \pi}{\left(\frac{4r}{\sqrt{2}}\right)^3}$$

38. White phosphorous (solid) reacts with excess of dry chlorine gas so as to form $\text{PCl}_5(\text{g})$ at 300K. If the reaction is carried out at constant pressure 1 bar, heat transfer is x for one mole PCl_5 formation, while if carried out in a closed rigid container heat transfer is y for one mole PCl_5 formation. $|x - y|$ is -

- (1) 450 R (2) 900 R
 (3) 1800 R (4) 225 R

37. FCC व्यवस्था में जालक को परिवर्तित किये बिना यदि सभी अष्टफलकीय तथा चतुष्फलकीय रिक्तियाँ घेरी जाती है तो सर्वाधिक सम्भावित संकुलन गुणांक, जिसे प्राप्त किया जा सकता है (r गोलों की त्रिज्या है जो FCC जालक बनाते हैं)

$$(1) \frac{[8 \times (0.414r)^3 + 4(0.225r)^3 + 4r^3] \frac{4}{3} \pi}{\left(\frac{4r}{\sqrt{2}}\right)^3}$$

$$(2) \frac{[4 \times (0.225r)^3 + 8(0.414r)^3 + 4r^3] \frac{4}{3} \pi}{\left(\frac{4r}{\sqrt{3}}\right)^3}$$

$$(3) \frac{[4 \times (0.414r)^3 + 8(0.225r)^3 + 4r^3] \frac{4}{3} \pi}{\left(\frac{4r}{\sqrt{2}}\right)^3}$$

$$(4) \frac{[4 \times (0.414r)^3 + 4(0.225r)^3 + 4r^3] \frac{4}{3} \pi}{\left(\frac{4r}{\sqrt{2}}\right)^3}$$

38. श्वेत फास्फोरस (ठोस) शुष्क क्लोरिन गैस के आधिक्य के साथ क्रिया करता है जिससे 300K पर $\text{PCl}_5(\text{g})$ निर्मित होती है। यदि अभिक्रिया 1 bar के नियत दाब पर करायी जाती है, तो स्थानान्तरित ऊष्मा x है, यदि इसे एक बंद दृढ़ पात्र में कराये जाये तो एक मोल PCl_5 के निर्माण के लिए स्थानान्तरित ऊष्मा y है, तो $|x - y|$ है।

- (1) 450 R (2) 900 R
 (3) 1800 R (4) 225 R

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39. Select the correct statement -
- (1) Frenkel defect is a non-stoichiometric defect
 - (2) F-centres are due to Frenkel defect
 - (3) ZnO shows yellow colour on heating due to metal excess defect
 - (4) Schottky defect is more probable if difference in radius of cation and anion are large.
40. Select the correct statement-
- (1) In semiconductors, valence band is partially filled.
 - (2) Si doped with group 15 elements shows n-type semiconductance
 - (3) Cobalt shows ferrimagnetic nature.
 - (4) Diamagnetic character of a substance is due to presence of unpaired electron.
41. Which of the following order of bond angle is **CORRECT**.
- (1) $\text{NH}_3 < \text{PH}_3 < \text{AsH}_3 < \text{SbH}_3$
 - (2) $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$
 - (3) $\text{OF}_2 < \text{H}_2\text{O} < \text{Cl}_2\text{O}$
 - (4) $\text{SiF}_4 < \text{SiCl}_4 < \text{SiBr}_4 < \text{SiI}_4$
42. Molecule in which central atom has sp^3d^2 hybridization is present.
- | | |
|--------------------|------------------------|
| (1) IF_7 | (2) IO_6^{-5} |
| (3) XeF_2 | (4) XeO_4 |
39. सही कथन का चयन कीजिये-
- (1) फ्रेंकल दोष, नॉन स्टॉइकियोमेट्रिक दोष है
 - (2) F-केन्द्र, फ्रेंकल दोष के कारण है
 - (3) ZnO , धातु आधिक्य दोष के कारण गर्म करने पर पीला रंग दर्शाती है
 - (4) यदि धनायन तथा ऋणायन की त्रिज्या में अन्तर अधिक हो तो शॉट्की दोष अधिक सम्भावित है
40. सही कथन का चयन कीजिये -
- (1) अर्द्ध चालकों में संयोजी बैंड (band) आंशिक रूप से भरे हैं
 - (2) Si, समूह 15 के तत्वों के साथ डोप होने पर n-प्रकार का अर्द्धचालकत्व दर्शाता है
 - (3) कोबाल्ट, फेरीमैग्नेटिक प्रकृति प्रदर्शित करता है
 - (4) एक पदार्थ के प्रतिचुम्बकीय लक्षण, अयुग्मित इलैक्ट्रॉन की उपस्थिति के कारण होते हैं
41. बन्ध कोण का, निम्न में से कौनसा सा क्रम सही है :
- (1) $\text{NH}_3 < \text{PH}_3 < \text{AsH}_3 < \text{SbH}_3$
 - (2) $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$
 - (3) $\text{OF}_2 < \text{H}_2\text{O} < \text{Cl}_2\text{O}$
 - (4) $\text{SiF}_4 < \text{SiCl}_4 < \text{SiBr}_4 < \text{SiI}_4$
42. अणु जिसके केन्द्रीय परमाणु का संकरण sp^3d^2 है :
- | | |
|--------------------|------------------------|
| (1) IF_7 | (2) IO_6^{-5} |
| (3) XeF_2 | (4) XeO_4 |

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- | | |
|---|---|
| <p>43. Which of the following compound is most basic.</p> <p>(1) $P(SiH_3)_3$ (2) $N(CH_3)_3$
(3) $N(GeH_3)_3$ (4) $N(SiH_3)_3$</p> <p>44. Find the molecule involving 3C–2e type of bridge bond from the following :-</p> <p>(1) Be_2H_4 (2) $(BeH_2)_n$
(3) $Al_2(CH_3)_6$ (4) All of these</p> <p>45. Find the odd electron specie in which odd electron is present in pure 'p' atomic orbital.</p> <p>(1) $\cdot NO_2$ (2) $\cdot ClO_2$
(3) $\cdot CF_3$ (4) $\cdot CH_3$</p> <p>46. If four SiO_4 units are forming single chain type arrangement then find the total number of unshared 'O' atom.</p> <p>(1) 10 (2) 6
(3) 2 (4) 8</p> <p>47. In which of the following reactions is INCORRECT according to its products formed.</p> <p>(1) $PCl_3 + 3H_2O \rightarrow H_3PO_3 + 3HCl$
(2) $NCl_3 + 3H_2O \rightarrow NH_3 + 3HOCl$
(3) $ICl + H_2O \rightarrow HClO + HI$
(4) $N_2O_4 + H_2O \rightarrow HNO_3 + HNO_2$</p> <p>48. Which of the following has highest covalent character.</p> <p>(1) $CaCl_2$ (2) $ZnCl_2$
(3) KCl (4) $CuCl$</p> | <p>43. निम्न में से कौनसा यौगिक सर्वाधिक क्षारीय है :</p> <p>(1) $P(SiH_3)_3$ (2) $N(CH_3)_3$
(3) $N(GeH_3)_3$ (4) $N(SiH_3)_3$</p> <p>44. निम्न में से वह अणु बताइये जिसमें 3C–2e प्रकार का सेतु बन्ध सम्मिलित है :</p> <p>(1) Be_2H_4 (2) $(BeH_2)_n$
(3) $Al_2(CH_3)_6$ (4) उपरोक्त सभी</p> <p>45. वह विषम इलेक्ट्रॉन स्पीशीज बताइये जिसमें विषम इलेक्ट्रॉन, शुद्ध 'p' परमाण्वीय कक्षक में उपस्थित है :</p> <p>(1) $\cdot NO_2$ (2) $\cdot ClO_2$
(3) $\cdot CF_3$ (4) $\cdot CH_3$</p> <p>46. यदि चार SiO_4 इकाईयाँ एकल श्रृंखला प्रकार की व्यवस्था बना रही हैं तो असाजित 'O' परमाणुओं की कुल संख्या बताइये :</p> <p>(1) 10 (2) 6
(3) 2 (4) 8</p> <p>47. निम्न में से कौनसी अभिक्रिया, इसमें निर्मित उत्पाद के अनुसार गलत है :</p> <p>(1) $PCl_3 + 3H_2O \rightarrow H_3PO_3 + 3HCl$
(2) $NCl_3 + 3H_2O \rightarrow NH_3 + 3HOCl$
(3) $ICl + H_2O \rightarrow HClO + HI$
(4) $N_2O_4 + H_2O \rightarrow HNO_3 + HNO_2$</p> <p>48. निम्न में से किसमें अधिकतम सहसंयोजक लक्षण उपस्थित हैं :</p> <p>(1) $CaCl_2$ (2) $ZnCl_2$
(3) KCl (4) $CuCl$</p> |
|---|---|

कच्चे कार्य के लिए स्थान

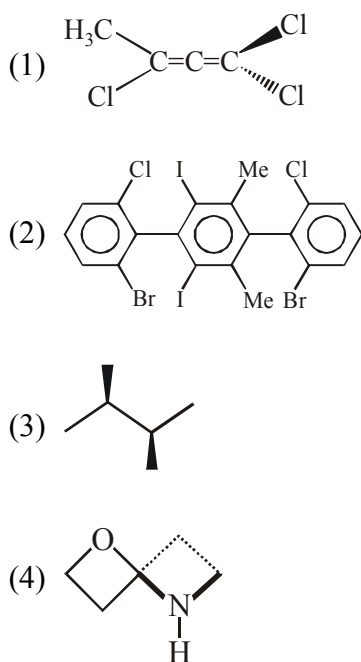
49. Which of the following order is **CORRECT**

- (1) $\text{BeF}_2 < \text{BaF}_2 \rightarrow$ Solubility
 (2) $\text{BeO} < \text{BeF}_2 \rightarrow$ Melting point
 (3) $\text{BeO} < \text{MgO} \rightarrow$ Acidic character
 (4) $\text{MgF}_2 < \text{AlF}_3 \rightarrow$ Covalent character

50. Which of the following order is **CORRECT** about thermal stability.

- (1) $\text{Li}_2\text{CO}_3 < \text{Cs}_2\text{CO}_3$ (2) $\text{BeCO}_3 < \text{BaCO}_3$
 (3) $\text{LiNO}_3 < \text{CsNO}_3$ (4) All of these

51. Which of following is optically active in nature



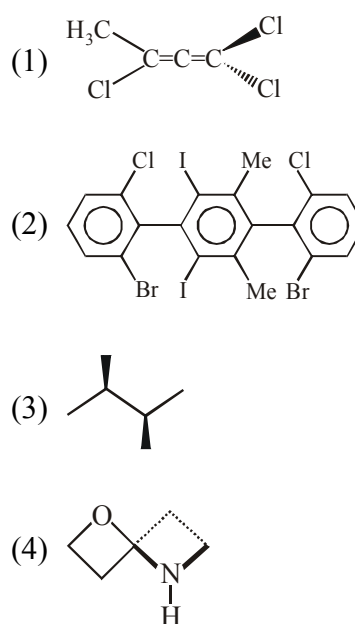
49. निम्न में से कौनसा क्रम सही है :

- (1) $\text{BeF}_2 < \text{BaF}_2 \rightarrow$ विलेयता
 (2) $\text{BeO} < \text{BeF}_2 \rightarrow$ गलनांक
 (3) $\text{BeO} < \text{MgO} \rightarrow$ अम्लीय लक्षण
 (4) $\text{MgF}_2 < \text{AlF}_3 \rightarrow$ सहसंयोजक लक्षण

50. तापीय स्थायित्व के सन्दर्भ में, निम्न में से कौनसा क्रम सही है :

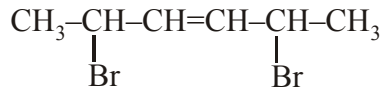
- (1) $\text{Li}_2\text{CO}_3 < \text{Cs}_2\text{CO}_3$ (2) $\text{BeCO}_3 < \text{BaCO}_3$
 (3) $\text{LiNO}_3 < \text{CsNO}_3$ (4) उपरोक्त सभी

51. निम्न में से कौनसा यौगिक प्रकाशिक सक्रिय प्रकृति का है-



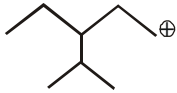
कच्चे कार्य के लिए स्थान

52. Total number of stereoisomer possible by given compound is :



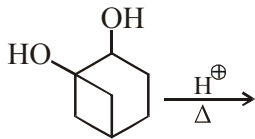
- (1) 4 (2) 8
(3) 6 (4) 10

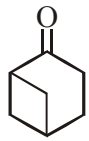
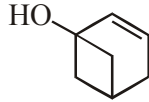
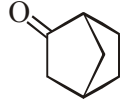

53. How many 1,2-shift takes place in following carbocation.



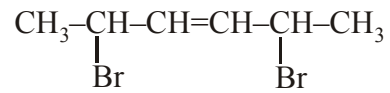
- (1) 2 (2) 1
(3) 3 (4) 4

54. Major product of reaction is :



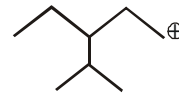
- (1)  (2) 
(3)  (4) 

52. दिये गये यौगिक के सम्भावित त्रिविम् समावयवियों की कुल संख्या है-



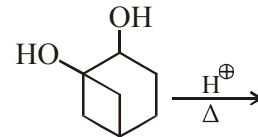
- (1) 4 (2) 8
(3) 6 (4) 10

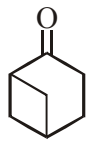
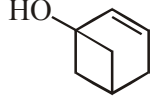
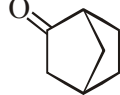

53. निम्न कार्बनधनायन में कितने 1,2-शिफ्ट होते हैं-



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

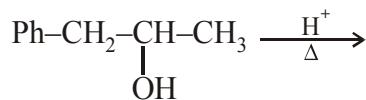
54. अभिक्रिया का मुख्य उत्पाद है-



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

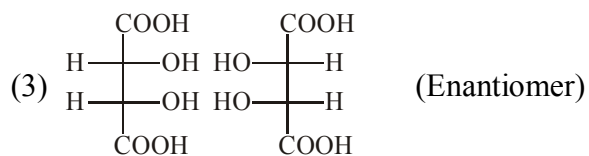
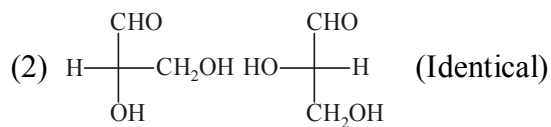
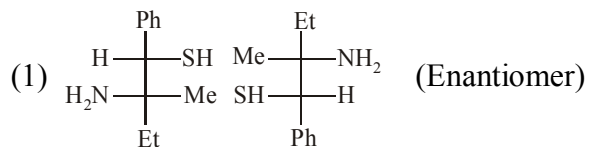
कच्चे कार्य के लिए स्थान

55. Major product of reaction is :



- (1) $\text{Ph}-\text{CH}_2-\text{CH}=\text{CH}_2$ (2) $\begin{array}{c} \text{Ph} \quad \quad \text{CH}_3 \\ \quad \quad \quad \diagdown \quad \diagup \\ \quad \quad \quad \text{C} = \text{C} \\ \quad \quad \quad \diagup \quad \diagdown \\ \text{H} \quad \quad \quad \text{H} \end{array}$
- (3) $\begin{array}{c} \text{Ph} \quad \quad \text{H} \\ \quad \quad \quad \diagdown \quad \diagup \\ \quad \quad \quad \text{C} = \text{C} \\ \quad \quad \quad \diagup \quad \diagdown \\ \text{H} \quad \quad \quad \text{CH}_3 \end{array}$ (4) All

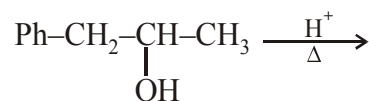
56. Which one is correct in a given isomeric pair :



57. Which of the following decolorise Br_2 water solution :

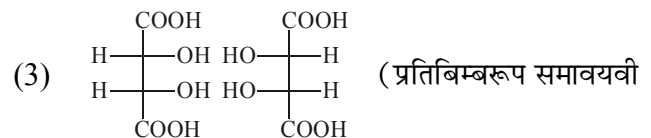
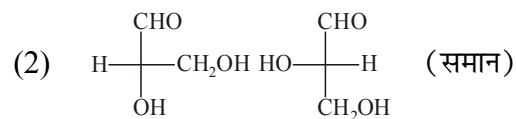
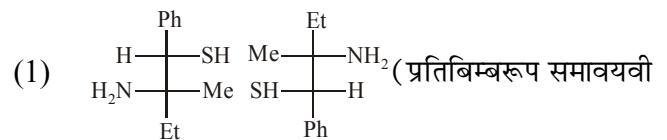
- (1)  (2) $\text{CH}_3-\text{CH}_2-\text{OH}$
- (3) $\text{HC}\equiv\text{CH}$ (4) $\text{CH}_3-\text{CH}_2-\text{Cl}$

55. अभिक्रिया का मुख्य उत्पाद है-



- (1) $\text{Ph}-\text{CH}_2-\text{CH}=\text{CH}_2$ (2) $\begin{array}{c} \text{Ph} \quad \quad \text{CH}_3 \\ \quad \quad \quad \diagdown \quad \diagup \\ \quad \quad \quad \text{C} = \text{C} \\ \quad \quad \quad \diagup \quad \diagdown \\ \text{H} \quad \quad \quad \text{H} \end{array}$
- (3) $\begin{array}{c} \text{Ph} \quad \quad \text{H} \\ \quad \quad \quad \diagdown \quad \diagup \\ \quad \quad \quad \text{C} = \text{C} \\ \quad \quad \quad \diagup \quad \diagdown \\ \text{H} \quad \quad \quad \text{CH}_3 \end{array}$ (4) सभी

56. दिये गये समावयवी युग्म में कौनसा सही है-

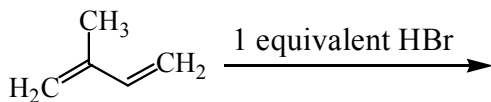


57. निम्न में से कौन Br_2 (ब्रोमीन) जल विलयन को रंगहीन करता है-

- (1)  (2) $\text{CH}_3-\text{CH}_2-\text{OH}$
- (3) $\text{HC}\equiv\text{CH}$ (4) $\text{CH}_3-\text{CH}_2-\text{Cl}$

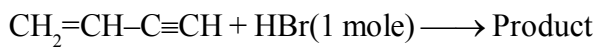
कच्चे कार्य के लिए स्थान

58. In the following reaction, the major product is



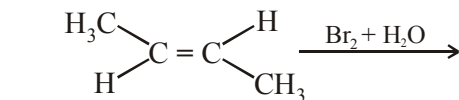
- (1) $\text{CH}_2=\overset{\text{CH}_3}{\text{C}}(\text{Br})-\text{CH}_3$ (2) $\text{H}_3\text{C}-\overset{\text{CH}_3}{\text{C}}(\text{Br})-\text{CH}=\text{CH}_2$
 (3) $\text{H}_2\text{C}=\overset{\text{CH}_3}{\text{C}}-\text{CH}_2-\text{CH}_2-\text{Br}$ (4) $\text{H}_3\text{C}-\overset{\text{CH}_3}{\text{C}}=\text{CH}-\text{CH}_2-\text{Br}$

59. Major product of reaction is :



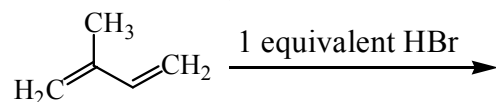
- (1) $\text{CH}_3-\underset{\text{Br}}{\text{CH}}-\text{C}\equiv\text{CH}$ (2) $\text{CH}_2=\underset{\text{Br}}{\text{C}}-\text{CH}=\text{CH}_2$
 (3) $\text{CH}_2=\underset{\text{Br}}{\text{C}}(\text{Br})-\text{CH}_3$ (4) $\underset{\text{Br}}{\text{CH}_2}-\text{CH}-\text{C}\equiv\text{CH}$

60. Major product of reaction is :



- (1) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{H}-\text{C}-\text{Br} \\ | \\ \text{CH}_3 \end{array}$ (2) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{Br}-\text{C}-\text{H} \\ | \\ \text{CH}_3 \end{array}$
 (3) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{Br}-\text{C}-\text{H} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{CH}_3 \end{array}$ (4) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{CH}_3 \end{array}$

58. निम्न अभिक्रिया में मुख्य उत्पाद है-



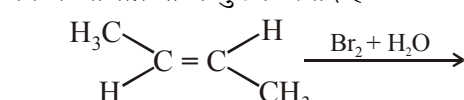
- (1) $\text{CH}_2=\overset{\text{CH}_3}{\text{C}}(\text{Br})-\text{CH}_3$ (2) $\text{H}_3\text{C}-\overset{\text{CH}_3}{\text{C}}(\text{Br})-\text{CH}=\text{CH}_2$
 (3) $\text{H}_2\text{C}=\overset{\text{CH}_3}{\text{C}}-\text{CH}_2-\text{CH}_2-\text{Br}$ (4) $\text{H}_3\text{C}-\overset{\text{CH}_3}{\text{C}}=\text{CH}-\text{CH}_2-\text{Br}$

59. निम्न अभिक्रिया में मुख्य उत्पाद है-



- (1) $\text{CH}_3-\underset{\text{Br}}{\text{CH}}-\text{C}\equiv\text{CH}$ (2) $\text{CH}_2=\underset{\text{Br}}{\text{C}}-\text{CH}=\text{CH}_2$
 (3) $\text{CH}_2=\underset{\text{Br}}{\text{C}}(\text{Br})-\text{CH}_3$ (4) $\underset{\text{Br}}{\text{CH}_2}-\text{CH}-\text{C}\equiv\text{CH}$

60. निम्न अभिक्रिया में मुख्य उत्पाद है-



- (1) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{H}-\text{C}-\text{Br} \\ | \\ \text{CH}_3 \end{array}$ (2) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{Br}-\text{C}-\text{H} \\ | \\ \text{CH}_3 \end{array}$
 (3) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{Br}-\text{C}-\text{H} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{CH}_3 \end{array}$ (4) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{CH}_3 \end{array}$

कच्चे कार्य के लिए स्थान

PART C - MATHEMATICS

- | | |
|---|--|
| <p>61. Let $f(x)$ is a polynomial function such that $f(x) + f\left(\frac{1}{x}\right) = f(x) \cdot f\left(\frac{1}{x}\right) \forall x \in \mathbb{R} - \{0\}$ and $f(5) = 126$, then value of $\int f(x) dx$ is-</p> <p>(1) $\frac{x^4}{4} + x + C$ (2) $\frac{x^4}{4} - x + C$</p> <p>(3) $-\frac{x^4}{4} + x - C$ (4) $-\frac{x^4}{4} - x - C$</p> <p>(where C is an integration constant)</p> <p>62. The letters of the word MUNNAR are permuted and all the permutations are arranged in an alphabetical order as in an English dictionary, then number of words that appear before the word MUNNAR</p> <p>(1) 359 (2) 719</p> <p>(3) 113 (4) 53</p> <p>63. If $x = a \left[\cos t + \log \left(\tan \frac{t}{2} \right) \right]$ & $y = a \sin t$, where t is a parameter and 'a' is constant, then $\frac{dy}{dx}$ is equal to-</p> <p>(1) $\sin t$ (2) $\cos t$</p> <p>(3) $\tan t$ (4) $\tan^2 t$</p> | <p>61. माना $f(x)$ एक बहुपद फलन इस प्रकार है कि $f(x) + f\left(\frac{1}{x}\right) = f(x) \cdot f\left(\frac{1}{x}\right) \forall x \in \mathbb{R} - \{0\}$ है तथा $f(5) = 126$ है, तो $\int f(x) dx$ का मान होगा-</p> <p>(1) $\frac{x^4}{4} + x + C$ (2) $\frac{x^4}{4} - x + C$</p> <p>(3) $-\frac{x^4}{4} + x - C$ (4) $-\frac{x^4}{4} - x - C$</p> <p>(जहाँ C समाकलन अचर है)</p> <p>62. शब्द MUNNAR के अक्षरों से सभी सम्भव क्रमचय बनाये जाते हैं तथा सभी क्रमचयों को अंग्रेजी शब्दकोष में वर्णमाला के क्रम के अनुसार व्यवस्थित किया जाता है, तब शब्द MUNNAR के पहले आने वाले शब्दों की संख्या होगी-</p> <p>(1) 359 (2) 719</p> <p>(3) 113 (4) 53</p> <p>63. यदि $x = a \left[\cos t + \log \left(\tan \frac{t}{2} \right) \right]$ तथा $y = a \sin t$ है, जहाँ t प्राचल तथा 'a' अचर है, तो $\frac{dy}{dx}$ बराबर होगा-</p> <p>(1) $\sin t$ (2) $\cos t$</p> <p>(3) $\tan t$ (4) $\tan^2 t$</p> |
|---|--|

कच्चे कार्य के लिए स्थान

64. Let $f(x) = \begin{cases} A + B \cos x & ; x \leq \frac{\pi}{2} \\ x & ; x > \frac{\pi}{2} \end{cases}$

is differentiable function, then-

(1) $A = \frac{\pi}{2}, B = 1$ (2) $A = \frac{\pi}{2} - 1, B = -1$

(3) $A = \frac{\pi}{2} + 1; B = 1$ (4) $A = \frac{\pi}{2}; B = -1$

65. Let p be the coefficient of x^{15} in the expansion of $(1 - x^3)^{15}$ and q be the term independent of x

in the expansion of $\left(x^2 - \frac{2}{x}\right)^{15}$, then $\left|\frac{p}{q}\right|$ is-

(1) 1024 (2) 512

(3) $\frac{1}{512}$ (4) $\frac{1}{1024}$

66. If $f(x) = 1 - \sin x$, $g(x)$ be antiderivative of $f(x)$ such that $g(0) = 1$ and $h(x)$ be inverse of $g(x)$, then $h'(\pi - 1)$ is

(1) -1 (2) 0

(3) 1 (4) 4

64. माना $f(x) = \begin{cases} A + B \cos x & ; x \leq \frac{\pi}{2} \\ x & ; x > \frac{\pi}{2} \end{cases}$

अवकलनीय फलन है, तब-

(1) $A = \frac{\pi}{2}, B = 1$ (2) $A = \frac{\pi}{2} - 1, B = -1$

(3) $A = \frac{\pi}{2} + 1; B = 1$ (4) $A = \frac{\pi}{2}; B = -1$

65. माना $(1 - x^3)^{15}$ के प्रसार में x^{15} का गुणांक p तथा

$\left(x^2 - \frac{2}{x}\right)^{15}$ के प्रसार में x से स्वतंत्र पद q है, तो $\left|\frac{p}{q}\right|$

मान होगा -

(1) 1024 (2) 512

(3) $\frac{1}{512}$ (4) $\frac{1}{1024}$

66. यदि $f(x) = 1 - \sin x$ तथा $g(x)$, $f(x)$ का प्रतिअवकलज इस प्रकार है कि $g(0) = 1$ तथा $h(x)$, $g(x)$ का प्रतिलोम है, तो $h'(\pi - 1)$ होगा-

(1) -1 (2) 0

(3) 1 (4) 4

कच्चे कार्य के लिए स्थान

67. $\int \frac{(\sin x + \cos x) dx}{3 + \sin 2x}$ is equal to-

(1) $\frac{1}{2} \sin^{-1}(\sin x + \cos x) + C$

(2) $\frac{1}{2} \tan^{-1} \left(\frac{\sin x + \cos x}{\sin x - \cos x} \right) + C$

(3) $\frac{1}{4} \sin^{-1} \left(\frac{1}{\sin x + \cos x} \right) + C$

(4) $\frac{1}{4} \ln \left| \frac{2 + \sin x - \cos x}{2 - \sin x + \cos x} \right| + C$

(where C is constant of integration)

68. If $f(xy) = f(x)f(y) \forall x, y \in \mathbb{R}$ and $f(x)$ is differentiable function such that $f'(1) = 4$, $f(1) \neq 0$, then $f(5)$ is equal to

(1) 5^4 (2) $\left(\frac{5}{4}\right)^4$

(3) $\left(\frac{5}{2}\right)^4$ (4) $\left(\frac{4}{5}\right)^4$

67. $\int \frac{(\sin x + \cos x) dx}{3 + \sin 2x}$ बराबर होगा-

(1) $\frac{1}{2} \sin^{-1}(\sin x + \cos x) + C$

(2) $\frac{1}{2} \tan^{-1} \left(\frac{\sin x + \cos x}{\sin x - \cos x} \right) + C$

(3) $\frac{1}{4} \sin^{-1} \left(\frac{1}{\sin x + \cos x} \right) + C$

(4) $\frac{1}{4} \ln \left| \frac{2 + \sin x - \cos x}{2 - \sin x + \cos x} \right| + C$

(जहाँ C समाकलन अचर है)

68. यदि $f(xy) = f(x)f(y) \forall x, y \in \mathbb{R}$ तथा $f(x)$ अवकलनीय फलन इस प्रकार है कि $f'(1) = 4$, $f(1) \neq 0$ है, तो $f(5)$ बराबर होगा-

(1) 5^4 (2) $\left(\frac{5}{4}\right)^4$

(3) $\left(\frac{5}{2}\right)^4$ (4) $\left(\frac{4}{5}\right)^4$

कच्चे कार्य के लिए स्थान

69. If $f(x) = \begin{cases} \frac{a|x^2 - 15x + 56|}{x-8} & x > 9 \\ b & x = 9 \\ \frac{x - [x]}{x-8} & x < 9 \end{cases}$

(where $[.]$ denotes greatest integer function) and function is continuous at $x = 9$, then-

(1) $a = -\frac{1}{2}, b = 1$ (2) $a = \frac{1}{2}, b = 1$

(3) $a = 0, b = 1$ (4) $a = -\frac{1}{2}, b = -1$

70. The number of points where the function

$f(x) = \frac{\sin|x|}{1-|x|^2}, x \in (-\pi, \pi)$ is not differentiable

is -

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

71. $\int \frac{dx}{16+x^2} = f(x)$ where $f(4) = \frac{\pi}{16}$, then value

of $f(2) + f\left(\frac{4}{3}\right)$ is -

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{8}$

(3) $\frac{\pi}{16}$ (4) $\frac{\pi}{2}$

69. यदि $f(x) = \begin{cases} \frac{a|x^2 - 15x + 56|}{x-8} & x > 9 \\ b & x = 9 \\ \frac{x - [x]}{x-8} & x < 9 \end{cases}$

(जहाँ $[.]$ महत्तम पूर्णांक फलन दर्शाता है) तथा $x = 9$ पर फलन संतत है, तब

(1) $a = -\frac{1}{2}, b = 1$ (2) $a = \frac{1}{2}, b = 1$

(3) $a = 0, b = 1$ (4) $a = -\frac{1}{2}, b = -1$

70. बिन्दुओं की संख्या,

जहाँ फलन $f(x) = \frac{\sin|x|}{1-|x|^2}, x \in (-\pi, \pi)$ अवकलनीय

नहीं है, होगी -

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

71. $\int \frac{dx}{16+x^2} = f(x)$ जहाँ $f(4) = \frac{\pi}{16}$ है,

तो $f(2) + f\left(\frac{4}{3}\right)$ का मान होगा -

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{8}$

(3) $\frac{\pi}{16}$ (4) $\frac{\pi}{2}$

कच्चे कार्य के लिए स्थान

72. $\lim_{x \rightarrow \infty} \sqrt[3]{x} [(x+1)^{2/3} - (x-1)^{2/3}]$ is equal to-

- (1) $\frac{2}{3}$ (2) $\frac{4}{3}$
 (3) $\frac{1}{3}$ (4) Does not exist

73. If $f(x) = \begin{cases} px^2 - q & 0 \leq x < 2 \\ x + 2 & 2 \leq x \end{cases}$ be a continuous function at $x = 2$, then (p, q) **CAN NOT** be-

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

74. If $(1 + 2x + 3x^2)^{15} = a_0 + a_1x + a_2x^2 + \dots + a_{30}x^{30}$, then $\sum_{k=1}^{30} k.a_k$ is-

- (1) 20.6^{15} (2) 6^{15}
 (3) 20.3^{15} (4) 3^{15}

75. Let F is anti-derivative of f defined by $f(x) = 5(x^4-1)$ where $F(1) = 20$, then value of $F(2)$ is

- (1) 160 (2) 46
 (3) 120 (4) 72

72. $\lim_{x \rightarrow \infty} \sqrt[3]{x} [(x+1)^{2/3} - (x-1)^{2/3}]$ बराबर होगा-

- (1) $\frac{2}{3}$ (2) $\frac{4}{3}$
 (3) $\frac{1}{3}$ (4) विद्यमान नहीं होगा।

73. यदि $f(x) = \begin{cases} px^2 - q & 0 \leq x < 2 \\ x + 2 & 2 \leq x \end{cases}$, $x = 2$ पर संतत फलन है, तो (p, q) नहीं हो सकता है-

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

74. यदि $(1 + 2x + 3x^2)^{15} = a_0 + a_1x + a_2x^2 + \dots + a_{30}x^{30}$, है, तब $\sum_{k=1}^{30} k.a_k$ होगा-

- (1) 20.6^{15} (2) 6^{15}
 (3) 20.3^{15} (4) 3^{15}

75. माना F , f का प्रतिअवकलज है जो $f(x) = 5(x^4-1)$ द्वारा परिभाषित है, जहाँ $F(1) = 20$ है, तो $F(2)$ का मान होगा-

- (1) 160 (2) 46
 (3) 120 (4) 72

कच्चे कार्य के लिए स्थान

76. Let $5 < n_1 < n_2 < n_3 < n_4$ be integers such that $n_1 + n_2 + n_3 + n_4 = 35$. The number of such distinct arrangements (n_1, n_2, n_3, n_4) is-

- (1) ${}^{38}C_3$ (2) 8C_3 (3) 5 (4) 6

77. The differentiation of $\cos\left(2 \tan^{-1} \sqrt{\frac{1-x}{1+x}}\right)$

with respect to $\cos^{-1}\left(\sqrt{\frac{1-x}{2}}\right)$ is-

(1) $\frac{1}{2\sqrt{1-x^2}}$ (2) $-2\sqrt{1-x^2}$

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

78. $\int e^{\sin x} (\sin 2x + 2 \cos x) dx$ is equal to -

(1) $e^{\sin x} \left(\frac{\sin x + \cos x}{\sin x - \cos x}\right) + C$

(2) $e^{\sin x} (\sin x + \cos x) + C$

(3) $e^{\sin x} \cos x + C$

(4) $2 \sin x \cdot e^{\sin x} + C$

where C is constant of integration

76. माना $5 < n_1 < n_2 < n_3 < n_4$ पूर्णांक इस प्रकार है कि $n_1 + n_2 + n_3 + n_4 = 35$ है, तो ऐसे भिन्न क्रमचयों (n_1, n_2, n_3, n_4) की संख्या होगी-

- (1) ${}^{38}C_3$ (2) 8C_3 (3) 5 (4) 6

77. $\cos\left(2 \tan^{-1} \sqrt{\frac{1-x}{1+x}}\right)$ का $\cos^{-1}\left(\sqrt{\frac{1-x}{2}}\right)$ के

सापेक्ष अवकलज होगा-

(1) $\frac{1}{2\sqrt{1-x^2}}$ (2) $-2\sqrt{1-x^2}$

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

78. $\int e^{\sin x} (\sin 2x + 2 \cos x) dx$ बराबर होगा-

(1) $e^{\sin x} \left(\frac{\sin x + \cos x}{\sin x - \cos x}\right) + C$

(2) $e^{\sin x} (\sin x + \cos x) + C$

(3) $e^{\sin x} \cos x + C$

(4) $2 \sin x \cdot e^{\sin x} + C$

जहाँ C समाकलन अचर है

कच्चे कार्य के लिए स्थान

79. Let $f(x)$ be a function defined by

$$f(x) = \lim_{n \rightarrow \infty} \frac{x}{1 + (2 \sin x)^{2n}}, \text{ then which of the}$$

following is **INCORRECT**-

(1) $f(x) = x \forall x \in \left(n\pi - \frac{\pi}{6}, n\pi + \frac{\pi}{6} \right), n \in I$

(2) $f(x) = \frac{x}{2} \forall x = n\pi \pm \frac{\pi}{6}, n \in I$

(3) $f(x) = 0 \forall x \in \mathbb{R} - \left[n\pi - \frac{\pi}{6}, n\pi + \frac{\pi}{6} \right], n \in I$

(4) $f(x)$ is continuous function at $x = n\pi \pm \frac{\pi}{6}, n \in I$

80. If $f(x)$ is a non constant polynomial function such that $f'(2x) = f''(3x) \cdot f'''(x)$, then leading coefficient of $f(x)$ is-

(1) $\frac{1}{216}$

(2) $\frac{1}{36}$

(3) $\frac{1}{27}$

(4) $\frac{1}{81}$

81. If $\int \sqrt{\frac{1-\sqrt{x}}{1+\sqrt{x}}} \cdot \frac{1}{x} dx = A \ln \left| \frac{1+\sqrt{1-x}}{\sqrt{x}} \right| + B \cos^{-1} \sqrt{x} + C$,

then value of $A + B$ is-

(where C is an integration constant)

(1) 2

(2) -2

(3) 4

(4) 0

79. माना $f(x)$ एक फलन है,

$$\text{जो } f(x) = \lim_{n \rightarrow \infty} \frac{x}{1 + (2 \sin x)^{2n}} \text{ द्वारा परिभाषित है,}$$

तो निम्न में से कौनसा सही नहीं होगा-

(1) $f(x) = x \forall x \in \left(n\pi - \frac{\pi}{6}, n\pi + \frac{\pi}{6} \right), n \in I$

(2) $f(x) = \frac{x}{2} \forall x = n\pi \pm \frac{\pi}{6}, n \in I$

(3) $f(x) = 0 \forall x \in \mathbb{R} - \left[n\pi - \frac{\pi}{6}, n\pi + \frac{\pi}{6} \right], n \in I$

(4) $x = n\pi \pm \frac{\pi}{6}, n \in I$ पर $f(x)$ संतत फलन होगा।

80. यदि $f(x)$ बहुपद फलन जो कि अचर नहीं है इस प्रकार है कि $f'(2x) = f''(3x) \cdot f'''(x)$ है, तो $f(x)$ का मुख्य गुणांक होगा-

(1) $\frac{1}{216}$

(2) $\frac{1}{36}$

(3) $\frac{1}{27}$

(4) $\frac{1}{81}$

81. यदि $\int \sqrt{\frac{1-\sqrt{x}}{1+\sqrt{x}}} \cdot \frac{1}{x} dx = A \ln \left| \frac{1+\sqrt{1-x}}{\sqrt{x}} \right| + B \cos^{-1} \sqrt{x} + C$ है,

तो $A + B$ का मान होगा

(जहाँ C समाकलन अचर है।)

(1) 2

(2) -2

(3) 4

(4) 0

कच्चे कार्य के लिए स्थान

82. If nZ_m denote the number of m sided polygon which can be formed using the vertices of a regular polygon of n sides, then ${}^{12}Z_4 - {}^{11}Z_3$ is-

- (1) 0 (2) $2 \cdot {}^{11}Z_3$
 (3) 297 (4) ${}^{13}Z_5$

83. If $f(x) = \begin{cases} \frac{4}{1+x^2} & x \in \mathbb{R} - \mathbb{Q} \\ b & x \in \mathbb{Q} \end{cases}$ has exactly two

distinct points of continuity then range of b is-

- (1) (0,4) (2) [0,4]
 (3) (0,4] (4) [2,2]

84. If $R(m, n) = \begin{cases} R(m-n, n) & m \geq n \\ m & m < n \end{cases}$,

then $R(7^{2016}, 4)$ is

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

82. यदि nZ_m , m भुजा वाले बहुभुज की संख्या को व्यक्त करता है जिसे n भुजाओं के सम बहुभुज के शीर्षों का उपयोग करके बनाया जाता है, तो ${}^{12}Z_4 - {}^{11}Z_3$ होगा-

- (1) 0 (2) $2 \cdot {}^{11}Z_3$
 (3) 297 (4) ${}^{13}Z_5$

83. यदि $f(x) = \begin{cases} \frac{4}{1+x^2} & x \in \mathbb{R} - \mathbb{Q} \\ b & x \in \mathbb{Q} \end{cases}$ ठीक दो भिन्न

बिन्दुओं पर संतत फलन है, तो b परिसर होगा -

- (1) (0,4) (2) [0,4]
 (3) (0,4] (4) [2,2]

84. यदि $R(m, n) = \begin{cases} R(m-n, n) & m \geq n \\ m & m < n \end{cases}$ है,

तो $R(7^{2016}, 4)$ का मान होगा-

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

कच्चे कार्य के लिए स्थान

85. Let $f(x) = 7\tan^8x + 7\tan^6x - 4\tan^5x - 4\tan^3x$
 and $\int f(x)dx = g(x)$ where $g(0)=0$, then value

of $g\left(\frac{\pi}{4}\right)$ is-

- (1) 1 (2) π
 (3) 0 (4) None of these

86. $\lim_{x \rightarrow 0} \left(\sin^2 \left(\frac{\pi}{2-3x} \right) \right)^{\sec^2 \left(\frac{\pi}{2-3x} \right)}$ is -

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

87. $\int \frac{2x^2 + 5}{x^4 + 5x^2 + 4} dx$ is

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

(where C is an integration constant)

85. माना $f(x) = 7\tan^8x + 7\tan^6x - 4\tan^5x - 4\tan^3x$
 तथा $\int f(x)dx = g(x)$ है, जहाँ $g(0) = 0$ है,

तो $g\left(\frac{\pi}{4}\right)$ का मान होगा-

- (1) 1 (2) π
 (3) 0 (4) इनमें से कोई नहीं

86. $\lim_{x \rightarrow 0} \left(\sin^2 \left(\frac{\pi}{2-3x} \right) \right)^{\sec^2 \left(\frac{\pi}{2-3x} \right)}$ होगा-

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

87. $\int \frac{2x^2 + 5}{x^4 + 5x^2 + 4} dx$ होगा-

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

(जहाँ C समाकलन अचर है।)

कच्चे कार्य के लिए स्थान

88. $\int \frac{6}{x^2(x^3+3x)^{\frac{1}{3}}} dx$ is

(1) $\frac{3}{2} \left(1 + \frac{3}{x^2}\right)^{2/3} + C$

(2) $\frac{1}{2} \left(1 + \frac{3}{x^2}\right)^{3/2} + C$

(3) $\frac{5}{2} \left(1 + \frac{3}{x^2}\right)^{3/2} + C$

(4) $-\frac{3}{2} \left(1 + \frac{3}{x^2}\right)^{2/3} + C$

(where C is an integration constant)

89. If $\sin x + \sin y = 1$ where $x, y \in \left(0, \frac{\pi}{2}\right)$ and

$\lim_{x \rightarrow 0^+} x^\alpha \frac{dy}{dx}$ exists and non-zero then value of α is-

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

90. If $\int \frac{x}{x^8+1} dx = \frac{1}{k_1} \tan^{-1} \left(\frac{x^4-1}{k_2 x^2} \right) - \frac{1}{2} \int \frac{x^5-x}{x^8+1} + C$,

then value of $k_1 \cdot k_2$ is-

(where C is an integration constant)

(1) 8 (2) 2

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

88. $\int \frac{6}{x^2(x^3+3x)^{\frac{1}{3}}} dx$ होगा

(1) $\frac{3}{2} \left(1 + \frac{3}{x^2}\right)^{2/3} + C$

(2) $\frac{1}{2} \left(1 + \frac{3}{x^2}\right)^{3/2} + C$

(3) $\frac{5}{2} \left(1 + \frac{3}{x^2}\right)^{3/2} + C$

(4) $-\frac{3}{2} \left(1 + \frac{3}{x^2}\right)^{2/3} + C$

(जहाँ C समाकलन अचर है।)

89. यदि $\sin x + \sin y = 1$ जहाँ $x, y \in \left(0, \frac{\pi}{2}\right)$ तथा

$\lim_{x \rightarrow 0^+} x^\alpha \frac{dy}{dx}$ विद्यमान तथा अशून्य है, तो α का मान होगा-

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

90. यदि $\int \frac{x}{x^8+1} dx = \frac{1}{k_1} \tan^{-1} \left(\frac{x^4-1}{k_2 x^2} \right) - \frac{1}{2} \int \frac{x^5-x}{x^8+1} + C$

है, तो $k_1 \cdot k_2$ का मान होगा

(जहाँ C समाकलन अचर है।)

(1) 8 (2) 2

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

कच्चे कार्य के लिए स्थान

कच्चे कार्य के लिए स्थान