

CODE

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PART SYLLABUS TEST [PST- 03]

TARGET : JEE MAIN 2016

CLASS : XII & DROPPERS

Date : 27-12-2015

Duration : 3 Hours

Max. Marks : 360

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

INSTRUCTIONS

A. General :

1. This Question Paper contains 90 questions.
2. **The question paper CODE is printed on the left hand top corner on this sheet of the booklet as well as on each page of the paper. Please check that all the pages have same CODE written on it. If it is not so then change the paper.**
3. No additional sheets will be provided for rough work.
4. Blank paper, clipboard, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets in any form are **not** allowed.
5. The answer sheet, a machine-gradable **Objective Response Sheet (ORS)**, is provided separately.
6. Do not open the question-paper booklet before instructed to do so by the invigilators.
7. Write your **Name** and **Roll No.** in the space provided on the front page of this booklet.

B. Instructions regarding ORS :

8. Write your Roll No., Name and Class and sign with pen in appropriate places. **Do not write these anywhere else.**
9. Darken the appropriate bubbles below your roll number and paper code with **Black/Blue ball pen.**
10. Do not Tamper / mutilate the **ORS** or this booklet.
11. Erasing the filled bubbles are not allowed in any case.
12. Use of Pencil on **ORS** is strictly prohibited.
13. **You are required to strictly follow the instructions for the ORS Sheet, mentioned here.**
14. **Any instructions provided by the invigilator in the exam-hall will not be valid.**
15. **Any excuse or mistake in following these instructions for the ORS sheet, will not be considered later on.**

C. Question paper format and Marking scheme :

16. The question paper consists of 3 parts (Physics, Chemistry & Maths)
17. Candidates will be **awarded 4 (four) marks** for correct response of each question in **Part - I, II & III. 1/4 (one fourth) marks** will be deducted for indicating 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.

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JEE MAIN TEST SERIES

PART – I (PHYSICS)

1. A vessel contains oil (density = 0.8 gm/cm^3) over mercury (density = 13.6 gm/cm^3). A uniform sphere floats with half its volume immersed in mercury and the other half in oil. The density of the material of sphere in gm/cm^3 is:
 [1] 3.3 [2] 6.4 [3] 7.2 [4] 12.8
 2. A hollow conducting sphere of inner radius R and outer radius $2R$ has resistivity ' ρ ' a function of the distance ' r ' from the centre of the sphere: $\rho = kr^2/R$. The inner and outer surfaces are painted with a perfectly conducting 'paint' and a potential difference ΔV is applied between the two surfaces. Then, as ' r ' increases from R to $2R$, the electric field inside the sphere
 [1] increases [2] decreases
 [3] remains constant [4] passes through a maxima
 3. In the circuit shown the variable resistance is so adjusted that the ammeter reading is same in both the position 1 and 2 of the key. The reading of ammeter is $2A$. If $E = 10 \text{ V}$, then x is
 [1] 2Ω
 [2] 5Ω
 [3] 10Ω
 [4] 20Ω
-
4. Four wires A, B, C and D are made of different materials. They each carry the same current I . Wire B has twice the length of other wires. Wire C has twice the internal electric field of other wires. Wire D has twice the diameter of other wires. Other than these differences, all wires share identical characteristics. Rank the conductivities of these materials, from greatest to least.
 [1] $\sigma_A = \sigma_B > \sigma_C > \sigma_D$
 [2] $\sigma_A = \sigma_B = \sigma_C = \sigma_D$
 [3] $\sigma_A = \sigma_B < \sigma_C = \sigma_D$
 [4] $\sigma_A = \sigma_B > \sigma_C = \sigma_D$
-

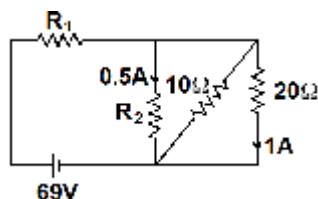
(SPACE FOR ROUGH WORK)

5. A uniform wire of resistance R is stretched uniformly n times and then cut to form five identical wires. These wires are arranged in the form of a wheat - stone's bridge. The effective resistance of the bridge is

[1] $\frac{nR}{5}$ [2] $\frac{R}{5n^2}$ [3] $\frac{n^2R}{5}$ [4] $\frac{n^2R}{2}$

6. In the circuit shown in the given figure the resistances R_1 and R_2 are respectively

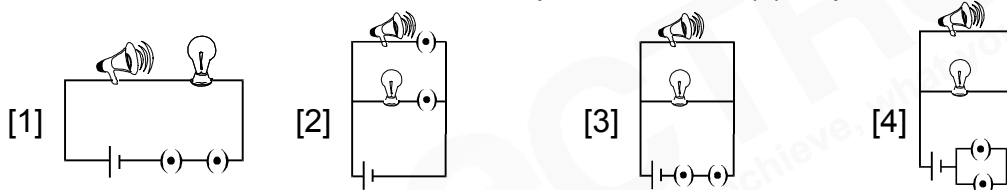
- [1] 14Ω and 40Ω
 [2] 40Ω and 14Ω
 [3] 40Ω and 30Ω
 [4] 14Ω and 30Ω



7. Two cells of the same emf E have different internal resistances r_1 and r_2 . They are connected in series with an external resistance R and the potential difference across the first cell is found to be zero. Therefore, the external resistance R must be

[1] $r_1 - r_2$ [2] $r_1 + r_2$ [3] $2r_1 - r_2$ [4] $r_1 - 2r_2$

8. In the house of a person who is weak of hearing, a light bulb is also lit when some body rings the door-bell. The ring can be operated both from the garden gate and from the door of the house. Select the correct possible circuit(s) required.



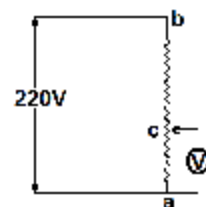
9. The wattage rating of a light bulb indicates the power dissipated by the bulb if it is connected across $110V$ DC potential difference. If a $50W$ and $100W$ bulb are connected in series to a $110V$ DC source, how much power will be dissipated in the $50W$ bulb.

[1] $50W$ [2] $100W$ [3] $22W$ [4] $11W$

10. A potential difference of $220V$ is maintained across a 12000Ω rheostat, as shown in the figure. The voltmeter has a resistance of 6000Ω and point c is at one-fourth of the distance from a to b .

Therefore the reading of the voltmeter will be

[1] $32V$ [2] $36V$ [3] $40V$ [4] $42V$

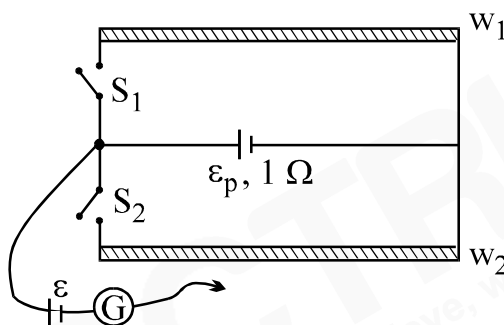


(SPACE FOR ROUGH WORK)

11. A galvanometer of resistance $100\ \Omega$ contains 100 division. It gives a deflection of one division on passing a current of 10^{-4} A . Find the resistance in ohms to be connected to it, so that it becomes a voltmeter of range 10 V .

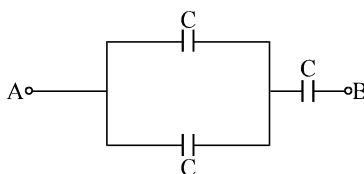
[1] $\frac{500}{9}\ \Omega$ [2] $500\ \Omega$ [3] $\frac{100}{9}\ \Omega$ [4] $900\ \Omega$

12. Two identical potentiometer wires w_1 and w_2 of equal length l , connected to a battery of emf ε_p and internal resistance $1\ \Omega$ through two switches s_1 and s_2 . A battery of emf ε is balanced on these potentiometer wires one by one. If potentiometer wire w_1 is of resistance $2\ \Omega$ and balancing length is $l/2$ on it, when only s_1 is closed and s_2 is open. On closing s_2 and opening s_1 the balancing length on w_2 is found to be $(2l/3)$, then find the resistance (in Ω) of potentiometer wire w_2 .



[1] 1 [2] 2 [3] 0.5 [4] 1.5

13. In the network shown we have three identical capacitors. Each of them can withstand a maximum 100 V p.d. What maximum voltage can be applied across A and B so that no capacitor gets spoiled ?

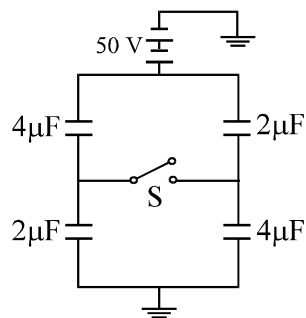


[1] 150 V [2] 120 V [3] 180 V [4] 200 V

(SPACE FOR ROUGH WORK)

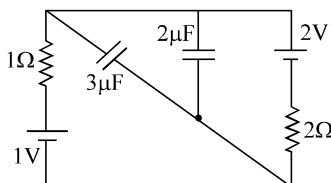
14. The circuit was in the shown state from a long time. Now the switch S is closed. The charge that flows through the switch is

- [1] $\frac{400}{3} \mu\text{C}$
 [2] $100 \mu\text{C}$
 [3] $50 \mu\text{C}$
 [4] $\frac{100}{3} \mu\text{C}$



15. In the circuit shown, the charge on the $3\mu\text{F}$ capacitor at steady state will be

- [1] $6 \mu\text{C}$
 [2] $4 \mu\text{C}$
 [3] $\frac{2}{3} \mu\text{C}$
 [4] $3 \mu\text{C}$

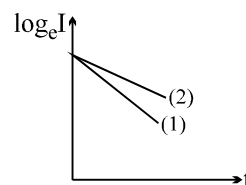


16. The potential across a $3 \mu\text{F}$ capacitor is 12 V when it is not connected to anything. It is then connected in parallel with an uncharged $6 \mu\text{F}$ capacitor. At equilibrium, the charge q on the $3 \mu\text{F}$ capacitor and the potential difference V across it are

- [1] $q = 12\mu\text{C}, V = 4\text{V}$ [2] $q = 24\mu\text{C}, V = 8\text{V}$
 [3] $q = 36\mu\text{C}, V = 12\text{V}$ [4] $q = 12\mu\text{C}, V = 6\text{V}$

17. A graph between current & time during charging of a capacitor by a battery in series with a resistor is shown. The graphs are drawn for two circuits. R_1, C_1 and V_1 are the values of resistance, capacitance and EMF of the cell in one circuit and R_2, C_2 and V_2 for another circuit respectively. If only two parameters (out of resistance, capacitance, EMF) are different in the two circuits. What is the correct option ?

- [1] $V_1 = V_2, R_1 > R_2, C_1 > C_2$
 [2] $V_1 > V_2, R_1 > R_2, C_1 = C_2$
 [3] $V_1 < V_2, R_1 < R_2, C_1 = C_2$
 [4] $V_1 < V_2, C_1 < C_2, R_1 = R_2$

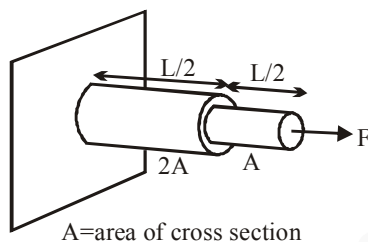


(SPACE FOR ROUGH WORK)

18. A wire of cross-section A is stretched horizontally between two clamps located $2l$ meters apart. A weight W kg is suspended from the mid point of the wire. If the mid point sags vertically through a distance $x \ll l$ the strain produced is

[1] $\frac{2x^2}{l^2}$ [2] $\frac{x^2}{l^2}$ [3] $\frac{x^2}{2l^2}$ [4] none of these

19. The bar shown in the figure is made of a single piece of material. It is fixed at one end. It consists of two segments of equal length $\frac{L_0}{2}$ but different cross-sectional area A and $2A$. What is the change in length of the entire system under the action of an axial force F . Consider the shape of joint to remain circular. (Given : y is young's modulus).



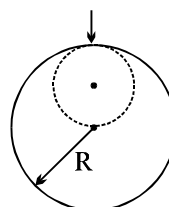
[1] $\frac{3FL}{4Ay}$ [2] $\frac{3FL}{8Ay}$ [3] $\frac{3FL}{2Ay}$ [4] None of these

20. Water freezes inside a pipe and normally it expands by about 9% due to freezing. What would be the pressure increase inside the pipe? The bulk modulus of ice is $2.00 \times 10^9 \text{ N/m}^2$.

[1] $1.80 \times 10^8 \text{ N/m}^2$ [2] $3.60 \times 10^8 \text{ N/m}^2$
[3] $9 \times 10^7 \text{ N/m}^2$ [4] $7.2 \times 10^8 \text{ N/m}^2$

21. A spherical hole of radius $R/2$ is excavated from the asteroid of mass M as shown in the figure. The gravitational acceleration at a point on the surface of the asteroid just above the excavation is

[1] $\frac{GM}{R^2}$ [2] $\frac{GM}{2R^2}$
[3] $\frac{GM}{8R^2}$ [4] $\frac{7GM}{8R^2}$



(SPACE FOR ROUGH WORK)

22. A particle is projected vertically upwards from the surface of the earth (radius R_e) with a speed equal to one fourth of escape velocity. The maximum height attained by it from the surface of the earth is

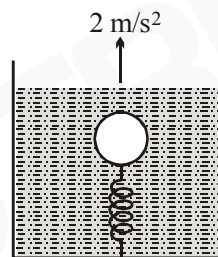
[1] $\frac{R_e}{5}$ [2] $\frac{R_e}{10}$ [3] $\frac{R_e}{15}$ [4] $\frac{R_e}{20}$

23. Two satellites S_1 and S_2 revolve around a planet in coplanar circular orbits in the same sense. Their periods of revolution are 1 hour and 8 hours respectively. The radius of the orbit of S_1 is 10^4 km. When S_1 is closest to S_2 , the angular speed of S_2 as observed by an astronaut in S_1 is :

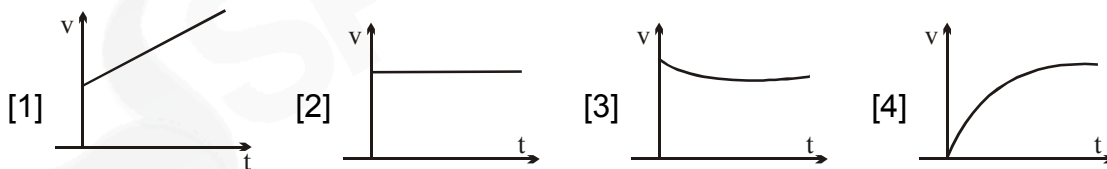
[1] π rad/hr [2] $\pi/3$ rad/hr [3] 2π rad/hr [4] $\pi/2$ rad/hr

24. A ball of mass 10 kg and density 1 gm/cm^3 is attached to the base of a container having a liquid of density 1.1 gm/cm^3 , with the help of a spring as shown in the figure. The container is going up with an acceleration 0.2 m/s^2 . If the spring constant of the spring is 200 N/m , the elongation in the spring is

- [1] 2 cm
[2] 4 cm
[3] 6 cm
[4] 8 cm



25. Which one of the following curves shows correctly the variation of velocity v with time t for a small spherical body falling vertically in a long column of viscous liquid ?



26. Two drops of same radius are falling through air with steady velocity of $v \text{ cm/s}$. If the two drops coalesce, what would be the terminal velocity ?

[1] $4v$ [2] $(4)^{1/3}v$ [3] $2v$ [4] $64v$

(SPACE FOR ROUGH WORK)

27. A mosquito with 8 legs stands on water surface and each leg makes depression of radius a . If the surface tension and angle of contact are T and zero respectively then the weight of mosquito is :

[1] $8T \cdot a$ [2] $16 \pi Ta$ [3] $Ta/8$ [4] $Ta/16 \pi$

28. A sample of a metal weights 210 g in air, 180 g in water and 120 g in an unknown liquid. Then

[1] the density of the metal is four times the density of the unknown liquid

[2] the density of the metal is 3 g/cm^3

[3] the density of the metal is 7 g/cm^3

[4] the metal will float on water

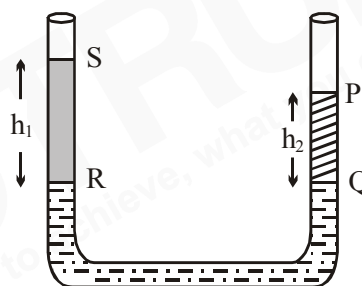
29. In a U-tube experiment, a column PQ of water is balanced by a column RS of some liquid (see figure). Points R and Q are at same horizontal level. The relative density of the liquid is

[1] h_2/h_1

[2] $(h_1 - h_2)/h_1$

[3] $2 h_1/h_2$

[4] $2h_2/(h_1 + h_2)$



30. Water is filled in a container upto height 3 m. A small hole of area 'a' is punched in the wall of the container at a height 52.5 cm from the bottom. The cross sectional area of the container is A. If $a/A = 0.1$ then v^2 is (where v is the velocity of water coming out of the hole) [Take $g = 10 \text{ m/s}^2$]

[1] 48

[2] 51

[3] 50

[4] 51.5

(SPACE FOR ROUGH WORK)

PART- II (CHEMISTRY)

31. What is the molar solubility of $\text{Fe}(\text{OH})_2$ ($K_{sp} = 8.0 \times 10^{-16}$) at pH 13.0 ?
 [1] 8.0×10^{-18} [2] 2×10^{-14} [3] 8.0×10^{-17} [4] 8.0×10^{-14}

32. The solubility of different sparingly soluble salts are given as under :

S.NO.	Formula Type	Solubility product
1.	AB	4.0×10^{-20}
2.	A_2B	3.2×10^{-11}
3.	AB_3	2.7×10^{-31}

The correct increasing order of solubility is

- [1] 1,3,2 [2] 2,1,3 [3] 1,2,3 [4] 3,1,2
33. K_{sp} value of $\text{Al}(\text{OH})_3$ and $\text{Zn}(\text{OH})_2$ are 8.5×10^{-23} and 1.8×10^{-14} respectively. If NH_4OH is added in a solution of Al^{3+} and Zn^{2+} , which will precipitate earlier
 [1] $\text{Al}(\text{OH})_3$ [2] $\text{Zn}(\text{OH})_2$ [3] Both together [4] None

34. Why pure NaCl is precipitated when HCl gas is passed in a saturated solution of NaCl
 [1] Impurities dissolves in HCl
 [2] The value of $[\text{Na}^+]$ and $[\text{Cl}^-]$ becomes smaller than K_{sp} of NaCl
 [3] The value of $[\text{Na}^+]$ and $[\text{Cl}^-]$ becomes greater than K_{sp} of NaCl
 [4] HCl dissolves in the water

35. In thermodynamics which one of the following is not an intensive property [Kerala (Med.) 2002]
 [1] Pressure [2] Density [3] Volume [4] Temperature

36. At constant T and P , which one of the following statements is correct for the reaction,
 $\text{CO}(\text{g}) + \frac{1}{2} \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$
 [1] ΔH is independent of the physical state of the reactants of that compound
 [2] $\Delta H > \Delta E$
 [3] $\Delta H < \Delta E$ [4] $\Delta H = \Delta E$

37. One mole of an ideal gas is allowed to expand freely and isothermally into vacuum until its volume has doubled. A statement which is not true concerning this expression is
 [1] $\Delta H = 0$ [2] $\Delta S = 0$ [3] $\Delta E = 0$ [4] $W = 0$

SPACE FOR ROUGH WORK

38. One mole of an ideal gas is allowed to expand reversibly and adiabatically from a temperature of 27°C . If the work done during the process is 3 kJ , then final temperature of the gas is ($C_V = 20\text{ J/K}$)
 [1] 100 K [2] 150 K [3] 195 K [4] 255 K
39. The work done during the expansion of a gas from a volume of 4 dm^3 to 6 dm^3 against a constant external pressure of 3 atm is ($1\text{ L atm} = 101.32\text{ J}$)
 [1] $+304\text{ J}$ [2] -304 J [3] -6 J [4] -608 J
40. The correct name of 'sucrose' is
 [1] $\alpha\text{-D-glucopyranosyl}-\beta\text{-D-fructofuranoside}$
 [2] $\beta\text{-D-glucopyranosyl}-\beta\text{-D-fructofuranoside}$
 [3] $\alpha\text{-D-glucopyranosyl}-\alpha\text{-D-fructofuranoside}$
 [4] $\beta\text{-D-glucopyranosyl}-\alpha\text{-L-fructofuranoside}$
41. The substance that forms the plant cell walls is or Which carbohydrates is an essential constituents of plant cells
 [1] Cellulose [2] Sucrose [3] Vitamins [4] Starch
42. An example of a disaccharide made up of two units of the same monosaccharides is
 [1] Sucrose [2] Maltose [3] Lactose [4] None of these
43. The number of atoms in the cyclic structure of D-fructose is
 [1] 5 [2] 6 [3] 4 [4] 7
44. Proteins are hydrolysed by enzymes into
 [1] Dicarboxylic acids [2] Hydroxy acids
 [3] Amino acids [4] Aromatic acids
45. Biuret test is used for the detection of
 [1] Saturated oils [2] Sugars [3] Proteins [4] Fats
46. The order of intermolecular force in following polymer is
 [1] elastomers < fibres < thermoplastic < thermosetting plastic
 [2] Thermoplastic < fibres < Thermosetting plastic < elastomers
 [3] elastomers < thermoplastic < fibres < thermosetting plastic
 [4] fibres < Thermosetting plastic < elastomers < Thermoplastic

SPACE FOR ROUGH WORK

47. The base adenine occurs in
[1] DNA only [2] RNA only [3] DNA and RNA both [4] Protein
48. The deficiency of vitamin B_1 causes
[1] Beri-beri [2] Scurvy [3] Rickets [4] Anaemia
49. In DNA, the complementary bases are
[1] Uracil and adenine; cytosine and guanine
[2] Adenine and thymine; guanine and cytosine
[3] Adenine and thymine; guanine and uracil
[4] Adenine and guanine; thymine and cytosine
50. Vitamin B_6 is known as
[1] Pyridoxin [2] Thiamine [3] Tocopherol [4] Riboflavin
51. Number of chiral carbons in $\beta-D-(+)\text{-glucose}$ is
[1] Three [2] Four [3] Five [4] Six
52. The compound required for the formation of a thermosetting polymer with methanol is
[1] Benzene [2] Phenyl amine [3] Benzaldehyde [4] Phenol
53. Which of the following is a chain growth polymer
[1] Polystyrene [2] Protein [3] Starch [4] Nucleic acid
54. Which of the following is not true
[1] Hardness of water depends on its behaviour towards soap
[2] The temporary hardness is due to the presence of Ca and Mg bicarbonates
[3] Permanent hardness is due to the presence of soluble Ca and Mg sulphates, chlorides and nitrates
[4] Permanent hardness can be removed by boiling the water
55. 1 ml of H_2O_2 solution gives 10 ml of O_2 at NTP. It is
[1] 10 vol. H_2O_2 [2] 20 vol. H_2O_2 [3] 30 vol. H_2O_2 [4] 40 vol. H_2O_2

SPACE FOR ROUGH WORK

56. H_2O_2 is manufactured these days
[1] By the action of H_2O_2 on BaO_2 [2] By the action of H_2SO_4 on Na_2O_2
[3] By electrolysis of 50% H_2SO_4 [4] By burning hydrogen in excess of oxygen
57. Potassium permanganate acts as an oxidant in neutral, alkaline as well as acidic media. The final products obtained from it in the three conditions are, respectively
[1] MnO_2, MnO_2, Mn^{2+} [2] $MnO_4^{2-}, Mn^{3+}, Mn^{2+}$
[3] $MnO_2, MnO_4^{2-}, Mn^{2+}$ [4] MnO, MnO_4, Mn^{2+}
58. The atomic number of vanadium (V), chromium (Cr), manganese (Mn) and iron (Fe) are respectively 23, 24, 25 and 26 which one of these may be expected to have the highest second ionization enthalpy
[1] V [2] Cr [3] Mn [4] Fe
59. Four successive members of the first row transition elements are listed ahead with atomic numbers. Which one of them is expected to have the highest $E^\circ_{M^{3+}/M^{2+}}$ value
[1] Co (Z = 27) [2] Cr (Z = 24) [3] Mn (Z = 25) [4] Fe (Z = 26)
60. In neutral or alkaline medium, thiosulphate is quantitatively oxidized by $KMnO_4$ to
[1] SO_3^{2-} [2] SO_4^{2-} [3] SO_2 [4] SO_5^{2-}

SPACE FOR ROUGH WORK

61. The area bounded by $y = \cos^{-1}(\cos x)$, x -axis, $0 \leq x \leq 2\pi$, is
 [1] π [2] 2π
 [3] π^2 [4] $2\pi^2$
62. The number of positive integral solutions of the equation $x_1 x_2 x_3 = 60$ is
 [1] 54 [2] 27
 [3] 81 [4] None of these.
63. The solution of differential equation $\frac{dy}{dx} = \frac{y}{x} + \frac{\phi(y/x)}{\phi'(y/x)}$ is
 [1] $x \phi(y/x) = k$ [2] $\phi(y/x) = kx$
 [3] $y \phi(y/x) = k$ [4] $\phi(y/x) = ky$
64. A die is thrown n times (n being odd). The probability that even face turns odd number of times, is
 [1] $\frac{n}{2n+1}$ [2] less than $\frac{1}{2}$
 [3] $\frac{1}{2}$ [4] greater than $\frac{1}{2}$
65. In the expansion of $\left(\frac{x+1}{x^{2/3} - x^{1/3} + 1} - \frac{x-1}{x - x^{1/2}} \right)^{10}$, the term which does not contain x , is equal to
 [1] ${}^{10}C_0$ [2] ${}^{10}C_7$
 [3] ${}^{10}C_4$ [4] none of these.
66. The area bounded by the curves $|x| + |y| \geq 1$ and $x^2 + y^2 \leq 1$ is
 [1] 2 sq. units [2] π sq. units
 [3] $\pi - 2$ sq. units [4] $\pi + 2$ sq. units
67. Nine hundred distinct N -digit numbers are to be formed by using 6, 8 and 9 only. The smallest value of N for which this is possible, is
 [1] 6 [2] 7
 [3] 8 [4] 9

SPACE FOR ROUGH WORK

68. Solution of differential equation of $(x + 2y^3) dy = ydx$ is
 [1] $x = y^3 + cy$ [2] $y = x^3 + cx$
 [3] $x^2 + y^2 = cxy$ [4] none of these
69. The distinct numbers are chosen from the set $\{1, 2, \dots, 6\}$. The probability that the product of two numbers is the third one is
 [1] $1/4$ [2] $1/3$
 [3] $1/2$ [4] none of these
70. The coefficient of x^{65} in the expansion of $(1+x)^{131}(x^2 - x + 1)^{130}$ is
 [1] $^{130}C_{65} + ^{129}C_{66}$ [2] $^{130}C_{65} + ^{129}C_{55}$
 [3] $^{130}C_{66} + ^{129}C_{65}$ [4] none of these.
71. If A_n is the area bounded by $y = (1-x^2)^n$ and coordinate axes, $n \in \mathbb{N}$, then
 [1] $A_n = A_{n-1}$ [2] $A_n < A_{n-1}$
 [2] $A_n > A_{n-1}$ [4] $A_n = 2 A_{n-1}$
72. A polygon has 44 diagonals. The number of its sides is
 [1] 10 [2] 11
 [3] 12 [4] 13
73. The order of the differential equation of the family of parabolas with directrix $x + y = 2$ is
 [1] 1 [2] 2
 [3] 3 [4] 4
74. A and B are two events such that $P[1] = 0.2$ and $P(A \cup B) = 0.7$. If A and B are independent events then $P(B')$ equals
 [1] $2/7$ [2] $7/9$
 [3] $3/8$ [4] none of these
75. If coefficient of $x^2 y^3 z^4$ in $(x + y + z)^n$ is A, then coefficient of $x^4 y^4 z$ is
 [1] $2A$ [2] $\frac{nA}{2}$
 [3] $\frac{A}{2}$ [4] none of these

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76. Area bounded by the curves $y = [x^2/64 + 2]$, $y = x - 1$, and $x = 0$ above x - axis is:
(where $[.]$ denotes greatest integer function)
(A) 2 [2] 3 [3] 4 [4] none of these
77. Six identical coins are arranged in a row. The number of ways in which the number of tails is equal to number of heads is
[1] 20 [2] 120
[3] 9 [4] 40
78. The degree of the differential equation $y = 1 + \frac{dy}{dx} + \frac{1}{2!} \left(\frac{dy}{dx} \right)^2 + \frac{1}{3!} \left(\frac{dy}{dx} \right)^3 + \dots$ is
[1] 1 [2] ∞
[3] Not defined [4] None of these
79. Entries of a 2×2 determinant are chosen from the set $\{-1, 1\}$. The probability that determinant has zero value is
[1] $1/4$ [2] $1/3$
[3] $1/2$ [4] none of these
80. Let n be an odd natural number and $A = \sum_{r=1}^{n-1} \frac{1}{{}^nC_r}$. Then value of $\sum_{r=1}^n \frac{r}{{}^nC_r}$ is equal to
[1] $n(A-1)$ [2] $n(A+1)$ [3] $\frac{nA}{2}$ [4] nA
81. If the area bounded by the curve $y = f(x)$, ($f(x) > 0, \forall x \in \mathbb{R}^+$) the x axis, the y axis and the line $x = a$ is $\frac{6a - \sin 2a}{4} \forall a > 0$, then $f(x)$ is
[1] $1 + \sin^2 x, x > 0$ [2] $1 - \cos^2 x, x > 0$
[3] $\frac{1 + \cos^2 x}{4}, x > 0$ [4] $\frac{1 - \cos^2 x}{4}, x > 0$
82. A five digit number divisible by 3 is to be formed using the numerals 0,1,2,3 and 5 without repetition. The total number of ways in which this can be done is
[1] 216 [2] 600
[3] 240 [4] 3125

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83. The solution of the differential equation $x \frac{dy}{dx} = -\frac{y}{2} - \frac{\sin 2x}{2y}$ is given by
 [1] $xy^2 = \cos^2 x + c$ [2] $xy^2 = \sin^2 x + c$
 [3] $yx^2 = \cos^2 x + c$ [4] None of these
84. If 'head' means one and 'tail' means two, then coefficient of quadratic equation $ax^2 + bx + c = 0$ are chosen by tossing three fair coins. The probability that roots of the equations are imaginary is
 [1] $\frac{5}{8}$ [2] $\frac{3}{8}$ [3] $\frac{7}{8}$ [4] $\frac{1}{8}$
85. Area bounded by $f(x) = \max(\sin x, \cos x)$; $0 \leq x \leq \pi/2$ and the coordinate axes is equal to
 [1] $\sqrt{2}$ sq. units [2] 2 sq. units [3] $\frac{1}{\sqrt{2}}$ sq. units [4] None of these
86. If x-intercept of any tangent is 3 times the x-coordinate of the point of tangency, then the equation of the curve, given that it passes through (1,1), is
 [1] $y = \frac{1}{x}$ [2] $y = \frac{1}{x^2}$ [3] $y = \frac{1}{\sqrt{x}}$ [4] none of these
87. In a bag there are 15 red and 5 white balls. Two balls are chosen at random and one is found to be red. The probability that the second one is also red is
 [1] $\frac{12}{19}$ [2] $\frac{13}{19}$ [3] $\frac{14}{19}$ [4] $\frac{15}{19}$
88. Differential equation whose general solution is $y = c_1x + c_2/x$ for all values of c_1 and c_2 is
 [1] $\frac{d^2y}{dx^2} + \frac{x^2}{y} + \frac{dy}{dx} = 0$ [2] $\frac{d^2y}{dx^2} + \frac{y}{x^2} - \frac{dy}{dx} = 0$
 [3] $\frac{d^2y}{dx^2} + \frac{1}{2x} \frac{dy}{dx} = 0$ [4] $\frac{d^2y}{dx^2} + \frac{1}{x} \frac{dy}{dx} - \frac{y}{x^2} = 0$
89. The number of solutions of the inequation ${}^{10}C_{x-1} > 3 \cdot {}^{10}C_x$ is
 [1] 0 [2] 1
 [3] 2 [4] 9
90. If $1 + 99^n$, n being an odd positive integer greater than 1, is divisible by 10^m , then largest m is equal to
 [1] 2 [2] 3 [3] 4 [4] 5

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