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Subject: **CHEMISTRY, MATHEMATICS & PHYSICS**

Paper Code: **JEE_Main_Sample Paper - I**

Duration: 3 hours

Maximum Marks: 360

General Instructions:

1. The test is of **3 hours duration.**
2. The Test consists of **90** questions. The maximum marks are **360.**
3. There are **three** parts in the question paper A, B, C consisting of **Chemistry, Mathematics** and **Physics** having 30 questions in each part of equal weightage. Each question is allotted **4 (four)** marks for correct response.
4. Candidates will be awarded marks as stated above in instruction No. 4 for correct response of each question. (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.
5. There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instruction 4 above.

Part – A – Chemistry

1) A sudden large jump between the values of second and third ionization energies of elements would be associated with which of the following electric configurations.

A $1s^2 2s^2 2p^6 3s^1$

B $1s^2 2s^2 2p^6 3s^2 3p^1$

C $1s^2 2s^2 2p^6 3s^1 3p^2$

D $1s^2 2s^2 2p^6 3s^2$

2) Which one of the following arrangements not truly represents the property indicated against it?

A $Br_2 < Cl_2 < F_2$: Electro negativity

B $Br_2 < F_2 < Cl_2$: Electron affinity

C $Br_2 < Cl_2 < F_2$: Bond energy

D $Br_2 < Cl_2 < F_2$: Oxidizing power

3) An element forms compounds of formula ACl_3, A_2O_5 and Mg_3A_2 but does not form ACl_5. Which of the following could A be?

A Boron

B Phosphorous

C Nitrogen

D Aluminium

4) The true statements from the following is/are:

1 PH_5 and $BiCl_5$ do not exist

2 p_π - d_π bond is present in SO_2

3 Electrons travel at the speed of light

4 SFe_4 and CH_4 have same shape

5 I_3^+ has bent geometry

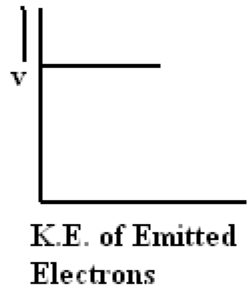
A 1, 3

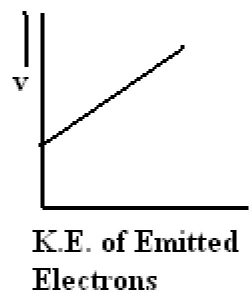
B 1, 2, 5

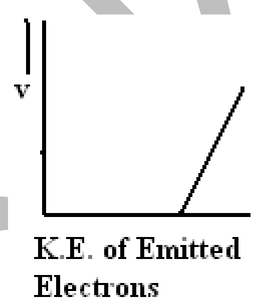
C 1, 3, 5

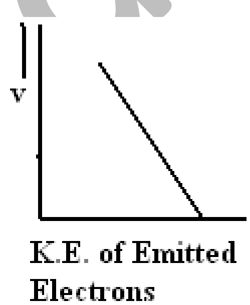
D 1, 2, 4

5) Which among the following graphs explains the photoelectric effect?

A 

B 

C 

D 

6) A catalyst

A increases the free energy change in the reaction

B decreases the free energy change in the reaction

C does not increase or decreases the free energy change in the reaction

D can either increase or decrease the free energy change depending on what catalyst we use.

7) During transformation of ${}^{a}_{c}X$ to ${}^{b}_{d}Y$, the numbers of β particles emitted are

A (a-b)/4

B d + (a-b)/2 +c

C d+[(a-b)/2] – c

D (2c)-d+a-b

8) The number of meso forms in the compound given below is

$HOOCCH(CH_3)CH(OH)CH(Cl)CH(OH)CH(CH_3)COOH$

A 4

B 3

C 16

D 8

9) $NaBH_4$ is used in organic chemistry to convert

A $> C = O$ to $> CH_2$

B $> C = O$ to $> CHOH$

C $> C = O$ to $-N{<}^{O}_{O}$

D $> C = O$ to $-$ NHOH

10) Which is not correctly matched?

1 basic strength of oxides $Cs_2O < Rb_2O < K_2O < Na_2O < Li_2O$

2 Stability of peroxides $Na_2O_2<K_2O_2<Rb_2O_2<Cs_2O_2$

3 Stability of bicarbonate

$LiHCO_3<NaHCO_3<KHCO_3<RbHCO_3<CsHCO_3$

4 Melting point NaF<NaCl<NaBr<NaI

A 1 and 4

B 1 and 3

C 1 and 2

D 2 and 3

11) It is an experimental fact that $Cs_2[CuCl_4]$ is orange coloured but $(NH_4)_2[CuCl_4]$ is yellow. It is further known that total paramagnetic moment of an unpaired electron is due to spin as well as due to nature or orbital, 'd' orbital contributing more that 's' or 'p'. Thus the total paramagnetic moment of orange compound is found to be more than that of yellow compound. Then which of the following is correct.

A Anion of orange compound is tetrahedral and that of yellow is square planar

B Anion of orange compound is square planar and that of yellow is tetrahedral

C Both the anions are tetrahedral

D Both the anion are square planar

12) $[Fe(en)_2(H_2O)_2]^{2+}$ + en → complex (X). The correct statement about the complex (X) is

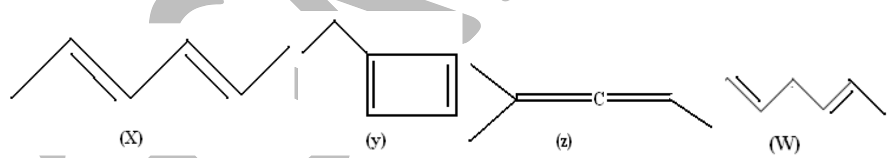
A it is a low spin complex

B it is diamagnetic

C it shows geometrical isomerism

D (A) and (B) both

13) The correct stability order of following species is:



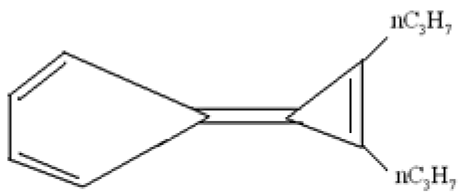
A x>y>w>z

B y>x>w>z

C x>w>z>y

D z>x>y>w

14) Ordinarily the barrier to rotation about a carbon-carbon double bond is quite high out in compound P double bond between two rings was observed by NMR to have a rotational energy barrier of only about 20cal./mol., showing that it has lot of single bond character.



(P)

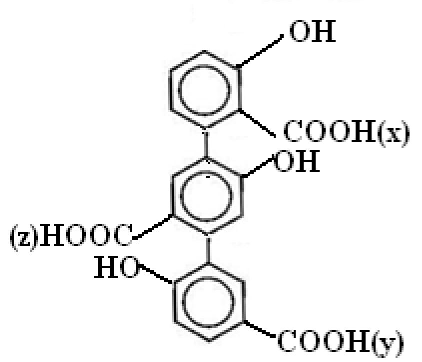
The reason for this is

A Double bond having particle triple bond character because of resonance

B Double bond undergo flipping

C Double bond having very high single bond character because of aromaticity gained in both three and five membered rings,

D +I effect of nC_3H_7 groups makes double bond having partial single bond character.

15) 

The correct acidic strength order of acidic hydrogen x, y and z is respectively.

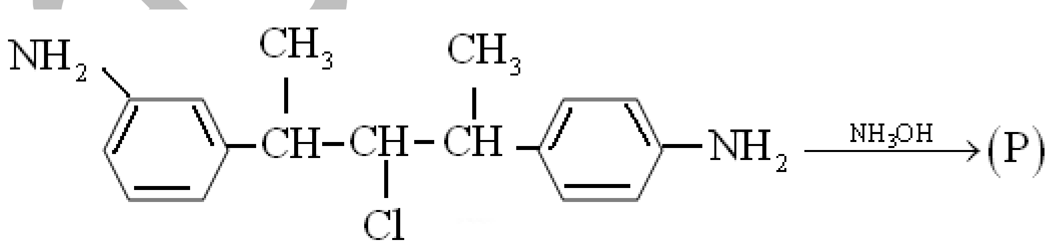
A x>z>y

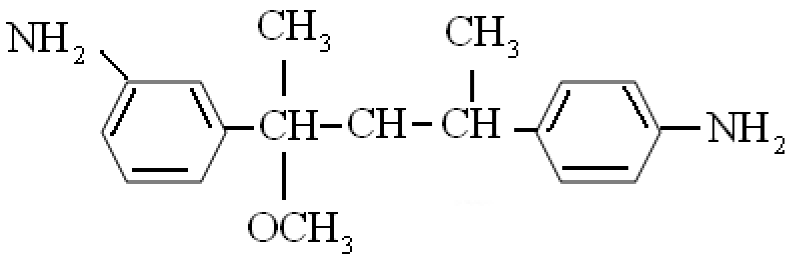
B x>y>z

C z>y>x

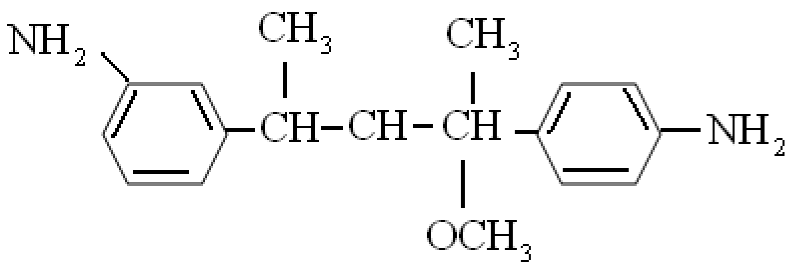
D y>z>x

16) The major product P of the following reaction is

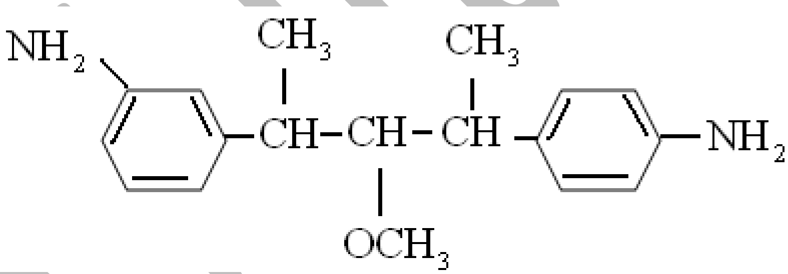




A



B



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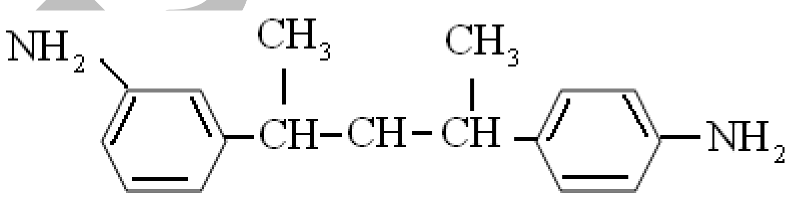


D

17) The heat of combustion of $CH_4(g)$, C(s) and $H_2(g)$ at 25^o are – 212.4kcal, -94.0 kcal and -68.4 kcal respectively, the heat of formation of CH_4 will be:

A +54.4kcal

B -18.4kcal

C -375.2kcal

D +212.8kcal

18) When pressure is applied to the equilibrium system

Ice $\rightleftharpoons$ Water

Which of the following phenomenon will happen?

A More ice will be formed

B Water will evaporate

C More water will be formed

D Equilibrium will not be formed.

19) The ionic product of water will increase if

A pressure is decreased

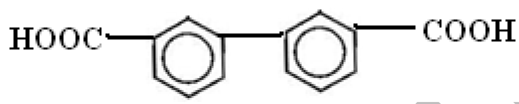
B H^+ are added

C OH^- are added

D temperature is increased

20) **Statement – 1:** The molar mass obtained for benzoic acid in benzene is found to be nearly 244.

Statement – 2: The Benzoic acid has the formula



A Statement – 1 is True, Statement – 2 is True; Statement -2 is a correct explanation for Statement – 1

B Statement – 1 is True, Statement – 2 is True; Statement – 2 is NOT a correct explanation for Statement – 1

C Statement – 1 is True, Statement – 2 is False

D Statement – 1 is False, Statement – 2 is True

21) Which of the following could be added to water to make 0.10 M solution of NH^+_4?

A NH_3

B NH_4Cl

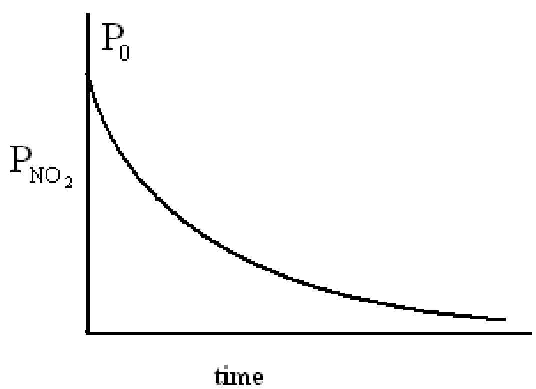
C KNH$_2$

D None of these

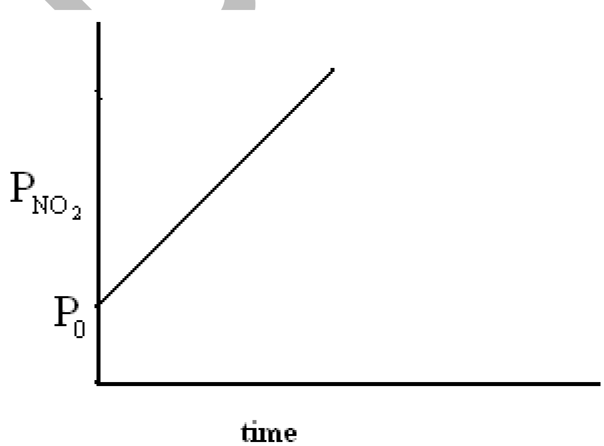
22) $N_2O_5 \rightarrow 2NO_2 + \frac{1}{2} O_2$

When N_2O_5 decompose, its $t_{1/2}$ does not change with its changing pressure during the reaction, so which one is the correct representation for "pressure of NO_2" vs "time" during the reaction when initial $P_{N_2O_5}$ is equal to P_0.

$N_2O_5 \rightarrow 2NO_2 + \frac{1}{2} O_2$



A



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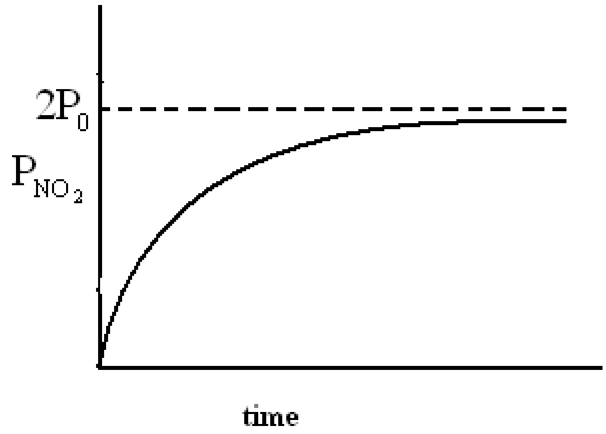
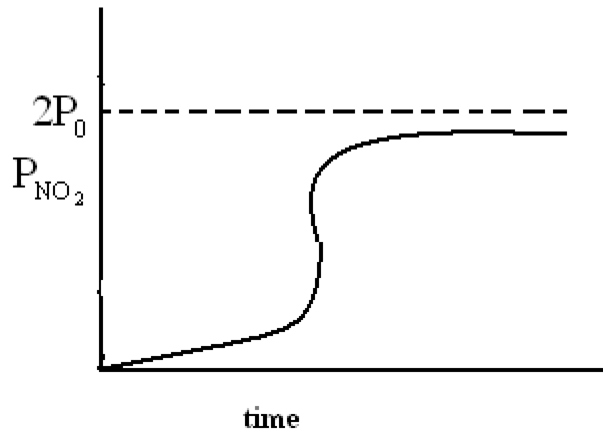


C



D

23) A hypothetical reaction:

$A_2 + B_2 \rightarrow 2AB$ Follows mechanism as given below:

$A_2 \underset{}{\overset{K_c}{\rightleftharpoons}} A + A$ ....(fast) (K_c – is equilibrium constant)

$A + B_2 \xrightarrow{K_1} AB + B$ ....(slow) (k_1 – rate constant)

$A + \underset{k_1}{\overset{K2}{\rightleftharpoons}} AB$ ....(fast) (k_2, k_3 – are rate constant)

The order of overall reaction is:

A 2.5

B 1

C 3/2

D 0

24) A crystal is made of particle X, Y and Z X forms FCC packing, Y occupies all octahedral voids of X and Z occupies all tetrahedral voids of X, if all the particles along one body diagonal are removed then the formula of the crystal would be –

A XYZ_2

B X_2YZ_2

C $X_6Y_4Z_5$

D $X_5Y_4Z_8$

25) Which of the following has been arranged in decreasing order of oxidation number of sulphur

A $H_2S_2O_7 > Na_2S_4O_6 > Na_2S_2O_3 > S_8$

B $FeS_2 > SO_4^{2-} > SO^{2-}{}_3 > H_2S$

C $H_2SO_5 > H_2SO_3 > HSCl_2$

D $H_2SO_4 > SO_2 > H_2S > H_2S_2O_8$

26) Alkaline earth metals form hydrated crystalline solids such as $MgCl_2.6H_2O$, $CaCl_2.6H_2O$. This is due to –

A Smaller ionic size, increased charge

B Increased charge on ions

C Higher hydration enthalpies

D high oxidation potential

27) The oxidizing property of H_2O is best explained by assuming that two oxygen atoms in its molecule are.

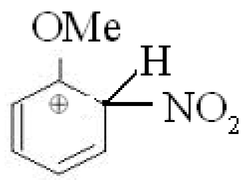
A Bonded differently

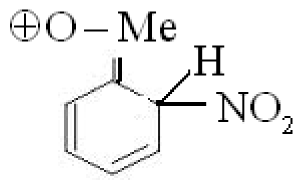
B Bonded similarly

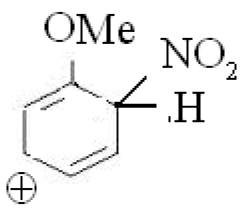
C Bonded covalently

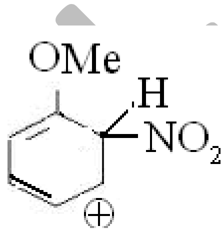
D Bonded by hydrogen bonds

28) Which of the following canonical forms is the most stable?

A 

B 

C 

D 

29) Consider the following energies:

1 Covalent single bond energy

2 Average translational kinetic energy of gases at room temperature

3 Rotational barrier energy in ethane between eclipsed and staggered forms.

4 Ionization energy of hydrogen atom.

The order of magnitude of these energies is

A 1>2>4>3

B 4>3>2>1

C 4>1>3>2

D 4>2>1>3

30) The square planar molecule in which the central atom is sp^3d^2hybridized

A SF_6

B XeF_6

C XeF_4

D I_3^-

Part – B - Physics

31) Two spherical vessels of equal volume are connected by 'a narrow tube. The apparatus contains an ideal gas at 1 atm and 300 K. Now, if one vessel is

immersed in a bath of constant temperature 600K and other in a bath of constant temperature 300K, then common pressure will be

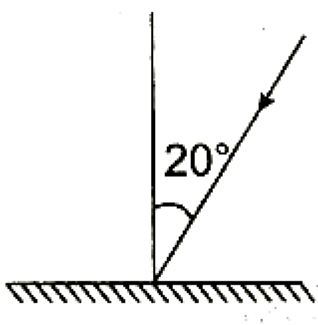
A 1 atm

B 4/5 atm

C 4/3 atm

D 3/2 atm

32) A ray is incident at an angle of 20° to a plane mirror as shown in figure. If mirror is rotated by 10° in anticlockwise direction and incident ray is rotated by 10° in clockwise direction then through what angle the .reflected ray will turn?



A 30°, clockwise

B 10°, anticlockwise

C 30°, anticlockwise

D 10°, clockwise

33) The minimum kinetic energy needed to project a body of mass m from the earth's surface to infinity is [g is acceleration due to gravity at earth's surface]

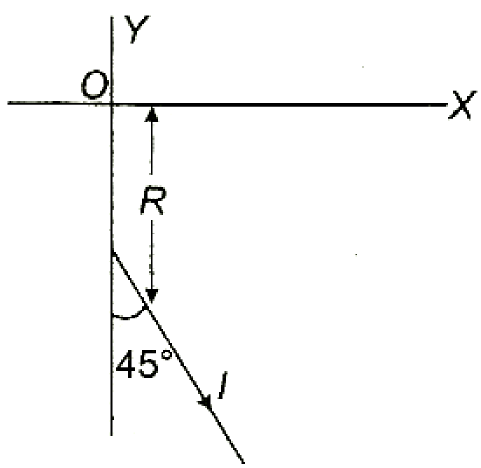
A 1/4 mgR

B 1/2mgR

C mgR

D 2 mgR

34) Find the magnetic field at point 0 due to semi-infinite wire shown in figure.



A $\frac{\sqrt{2}\mu I}{4\pi R}$ out of plane of paper

B $\frac{\sqrt{2}\mu I}{2\pi R}$ into the plane of paper

C $\frac{(\sqrt{2}-1)\mu I}{4\pi R}$ out of plane of paper

D $\frac{\mu I}{4\pi R}$ into the plane of paper

35) Two bodies *A* and *B* having equal surface areas are maintained at temperatures 10°C and 20°C. The thermal radiation emitted in a given time by A and *B* are in the ratio

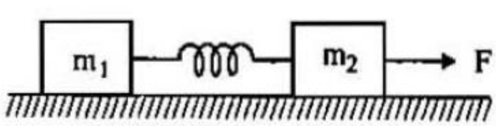
A 1 : 1.15

B 1 : 2

C 1:4

D 1 : 16.

36) Two blocks of masses m_1 and m_2 connected by an undeformed massless spring rest on a horizontal plane. Find the minimum constant force F_{min}, that has to be applied on m_2 so that block gets shifted, if μ be the coefficient of friction between blocks and surface.



A $(m_1+m_2)\mu g$

B $\left(m_1+\frac{m_2}{2}\right)\mu g$

C $\left(\frac{m_1}{2}+m_2\right)\mu g$

D $\left(2m_1+m_2\right)\mu g$

37) A body starts from rest with uniform acceleration. Its velocity after 2n second is v_0. The displacement of the body in last n seconds of this 2n second interval is

A $\frac{v_0(2n-3)}{6}$

B $\frac{v_0}{4n}(2n-1)$

C $\frac{2v_0n}{3}$

D $\frac{3v_0n}{4}$

38) The headlight of a train of length 200m is switched on when it starts from rest with an acceleration of $0.5 m/s^2$. After 20s, its tail-light is switched on. An observer in a frame moving with a constant velocity parallel to the railway track observes that the two events occur at the same place. The velocity of this frame is

A 5m/s in a direction opposite to the train's motion

B 10m/s in a direction to the train's motion

C 5m/s in the same direction as the train's motion

D 10m/s in the same direction as the train's motion

39) A point moves in x-y plane according to the law x = 4 sin6t and y = 4 (1 – cos 6t). Find out the distance traversed by the particle in ¼ seconds in meter. (x and y are in meters)

A 2

B 6

C 8

D Zero

40) A car starts from rest and again comes to rest travelling 200m in a straight line. If its acceleration and deceleration are limited to $10 m/s^2$ and $20 m/s^2$ respectively then minimum time the car will take to travel the distance is $x\sqrt{15}$. Find the value of x.

A 1

B 2

C 3

D 4

41) If COM of a system of particle lies at the origin of the coordinate system then

A x-coordinate of all of the particles may be positive

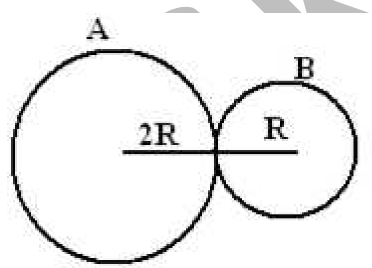
B x-coordinate of all the particles may be negative

C x-coordinate of all the particles may be zero

D y-coordinate of all the particles may be positive

42) Two spheres A and B of masses m and 2m and radii 2R and R respectively are placed in contact as

shown. The COM of the system lies



A Inside A

B Inside B

C At the point of contact

D None of these

43) The electric field at the origin is along the positive X-axis. A small circle is drawn with the centre at the origin cutting the axes at points *A, B, C* and *D* having coordinates *(a,* 0), (0, *a), (- a,* 0), (0, - *a)* respectively. Out of the points on the periphery of the circle, the potential is minimum at

A A

B B

C C

D D

44) A lift is coming from 8th floor and is just about to reach 4th floor. Taking ground floor as origin and positive direction upwards for all quantities, which of the following is correct?

A $X < 0, v < 0, a > 0$

B $X > 0, v < 0, a < 0$

C $X > 0, v < 0, a > 0$

D $X > 0, v < 0, a < 0$

45) A 30kg block rests on a rough horizontal surface. A force of 200N is applied on the body. The block acquires a speed of 4m/sec, starting from rest, in 2sec. What is the value of coefficient of friction?

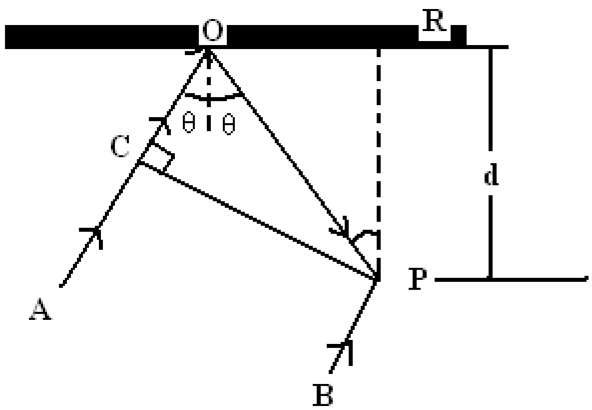
A 10/ 3

B 3 /10

C 0.47

D 0.185

46) In the adjacent diagram, CP represents a wave front and AO and BP, the corresponding two rays. Find the condition of θ for constructive interface at P between the ray BP and reflected ray OP



A $\cos\theta = 3\lambda/2d$

B $\cos\theta = \lambda/4d$

C $\sec\theta - \cos\theta = \lambda/d$

D $\sec\theta - \cos\theta = 4\lambda/d$

47) 2kg of ice at -20°C is mixed with 5kg of water at 20°C in an insulating vessel having a negligible heat capacity. Calculate the final mass of water remaining in

the container. It is given that the specific heats of water and ice are 1kcal/kg/ ^{o}C and 0.5kcal/kg/ ^{o}C while the latent heat of fusion of ice is 80kcal/kg

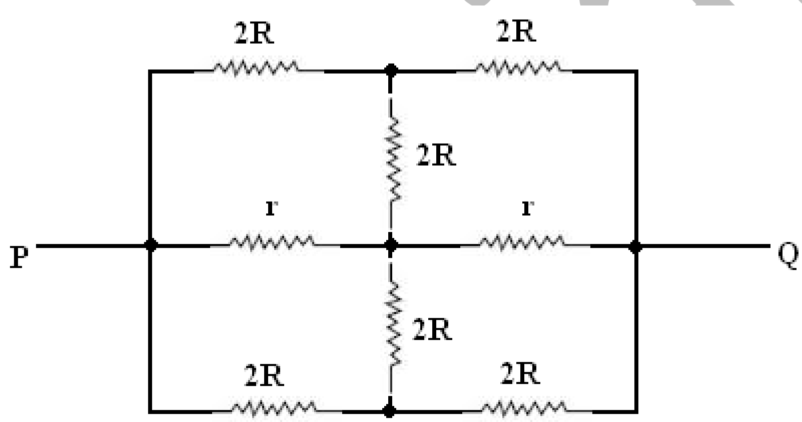
A 7kg

B 6kg

C 4kg

D 2kg

48) The effective resistance between points P and Q of the electrical circuit shown in the figure is



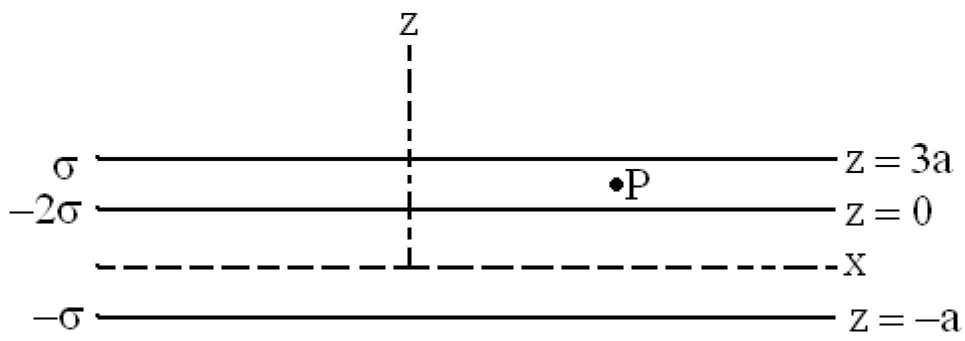
A 2Rr/R+r

B 8R(R+r)/3R+r

C 2r+4R

D 5R/2 + 2r

49) Three infinity long change sheets are placed an shown in figure. The electric field at point P is



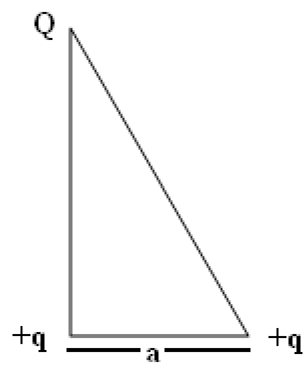
A $\sigma/\varepsilon_0 \hat{k}$

B $-2\sigma/\varepsilon_0 \hat{k}$

C $4\sigma/\varepsilon_0 \hat{k}$

D $-4\sigma/\varepsilon_0 \hat{k}$

50) Three charges Q, + q and +q are placed at the vertices of a right angle triangle (isosceles triangle) as shown. The net electrostatic energy of the configuration is zero, if Q is equal to



A -q/1+√2

B -2q/2+√2

C -2q

D +q

51) A radioactive substance with decay constant of $0.5s^{-1}$ is being produced at a constant rate of 50 nuclei per second. If there are no nuclei present initially, the time (in second) after which 25 nuclei will be present is

A 1

B ln2

C ln(4/3)

D 2ln(4/3)

52) In the ideal double-slit experiment, when a glass-plate (refractive index = 1.5) of thickness t is introduced in the path of one of the interfering beams (wave-length λ), the intensity at the position where the central maximum occurred previously remains unchanged. The minimum thickness of the glass-plate is

A 2 λ

B 2 λ/3

C λ/3

D λ

53) The Boolean expression: B. (A' + B) + A. (B'+ A) can be realized using minimum number of

A 1 AND gate

B 2 AND gates

C 1 OR gate

D 2 OR gates

54) In a photoelectric effect measurement, the stopping potential for a given metal is found to be V_0 volt when radiation of wavelength λ_0 is used. If radiation of wavelength $2\lambda_0$ is used with the same metal then the stopping potential (in volt) will be

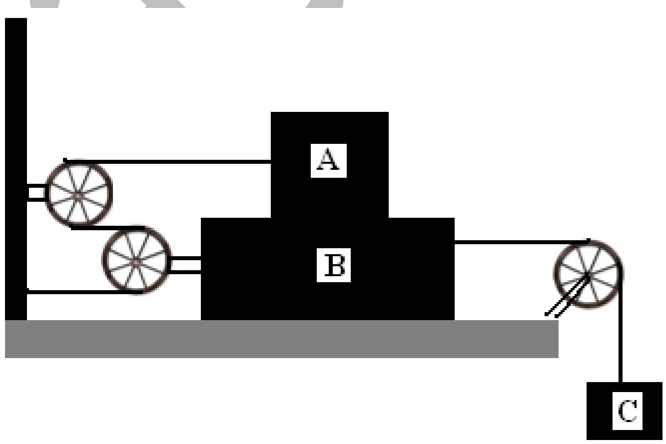
A $V_0/2$

B $2V_0$

C $V_0 + hc/2e\lambda_0$

D $V_0 - hc/2e\lambda_0$

55) The maximum value of mass of block C so that neither A nor B moves is (Given that mass of A is 100kg and that of B is 140kg. Pulleys are smooth and friction coefficient between A and B and between B and horizontal surface is μ = 0.3 and g = 10 m/s²



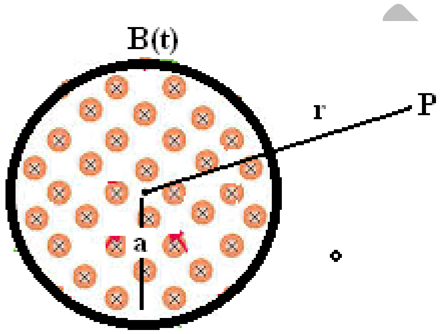
A 210kg

B 190kg

C 185kg

D 162kg

56) A uniform but time-varying magnetic field B(t) exists in a circular region of radius a and is directed into the plane of the paper as shown. The magnitude of the induced electric field at point P at a distance r from the centre of the circular region



A is zero

B decreases as 1/r for all values of r

C increases as r for r>a and decreases as 1/r for r<=a

D decreases as 1/r for r>a and increases as r for r<=a

57) Two particles, each of the mass m and charge q, are attached to the two ends of a light rigid rod of length 2R. The rod is rotated at constant angular speed

about a perpendicular axis passing through its centre. The ratio of the magnitudes of the magnetic moment of the system and its angular momentum about the centre of the rod is

A q/2m

B q/m

C 2q/m

D q/πm

58) The electric potential between a proton and an electron is given by $V = V_0 \ln r/r_0$, where r_0 is a constant. Assuming that the electrostatic force between the charges does not follow Coulomb's law,the relation between the radius of the nth orbit and n in an atom is (n being the principle quantum number):

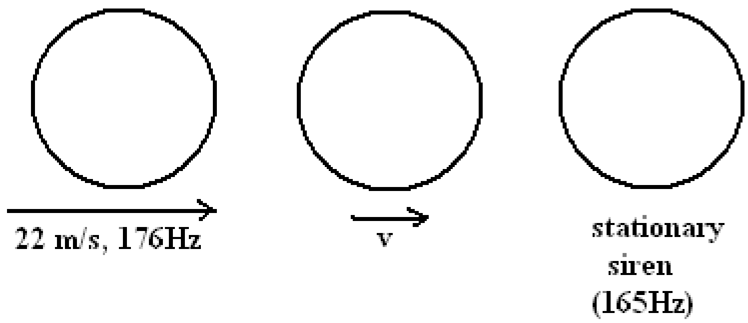
A $r_n \propto n$

B $r_n \propto 1/n$

C $r_n \propto n^2$

D $r_n \propto 1/n^2$

59) A police car moving at 22m/s chases a motorcyclist. The police man sounds his horn at 176Hz, while both of them move towards a stationary siren of frequency 165Hz. Calculate the speed of the motorcycle. If it is given that the motorcyclist does not observe any beats (speed of sound = 330m/s)



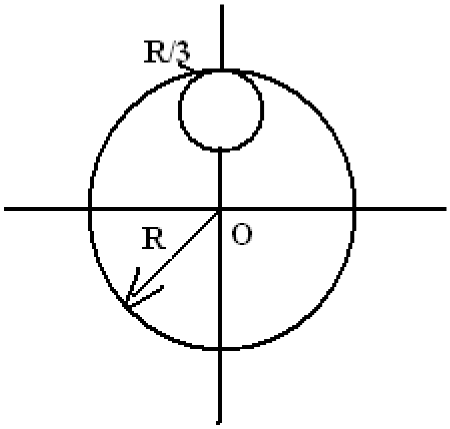
A 33m/s

B 22m/s

C zero

D 11m/s

60) From a circular disc of radius R and mass 9M, a small dice of radius R/3 is removed from the disc. The moment of inertia of the remaining disc about an axis perpendicular to the plane of the disc and passing through O is



A $4MR^2$

B $40/9\ MR^2$

C $10MR^2$

D $37/9\ MR^2$

PART A– MATH

61) The largest interval in which $X^{12} - x^9 + x^4 - x + 1 > 0$ is

A $[0, \infty)$

B $(-\infty, 0]$

C $(-\infty, \infty)$

D None of these

62) The number of ways in which 7persons can be seated at a round table, if two particular persons are not to sit together, is

A 120

B 480

C 600

D 720

63) The equation 2x+y = 5, x+3y = 5, x – 2y= 0 have

A no solution

B one solution

C two solutions

D infinitely many solutions

64) One of the value of i^i is(I = √(-1))

A $e^{-\pi/2}$

B $e^{\pi/2}$

C e^{π}

D $e^{-\pi}$

65) For all complex numbers z_1, z_2 satisfying $|z_1| = 12$ and $|z_2 - 3 - 4i| = 5$, the minimum value of $|z_1 - z_2|$ is

A 0

B 2

C 7

D 17

66) A monkey while trying to reach the top of a pole of height 12m takes every time a jump of 2m but slips 1 m while holding the pole. The number of jumps required to reach the top of the pole, is

A 6

B 10

C 11

D 12

67) If 7 divide $32^{32^{32}}$, the remainder is

A 1

B 0

C 4

D 6

68) A die is thrown 2n+1 times, n ∈N. The probability that even numbers show odd number of times is

A 2n+1/2n+3

B less than ½

C greater than ½

D none of these

69) If 5 parallel straight lines are intersected by 4 parallel straight lines, then the number of parallelograms, thus formed, is

A 20

B 60

C 101

D 126

70) The matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ -1 & -2 & -3 \end{bmatrix}$ is

A idempotent

B nilpotent

C involuntary

D orthogonal

71) Two distinct numbers are selected at random from the first twelve natural numbers. The probability that the sum will be divisible by 3 is

A 1/3

B 23/66

C ½

D none of these

72) The set of angles between 0 & 2π satisfying the equation $4\cos^2\theta - 2\sqrt{2}\cos\theta - 1 = 0$ is

A {π/12, 5π/12, 19π/12, 23π/12}

B {π/12, 7π/12, 17π/12, 23π/12}

C { 5π/12, 13π/12, 19π/12}

D {π/12, 7π/12, 19π/12, 23π/12}

73) If $i = \sqrt{-1}$, then $4+5\left(-\frac{1}{2} + i\frac{\sqrt{3}}{2}\right)^{334} + 3\left(-\frac{1}{2} + i\frac{\sqrt{3}}{2}\right)^{365}$ is equal to

A $1 - i\sqrt{3}$

B $-1+i\sqrt{3}$

C $i\sqrt{3}$

D $-i\sqrt{3}$

74) The equations of the straight lines passing through the point of intersection of $x + 3y + 4 = 0$ & $3x + y + 4 = 0$ and equally inclined to the axes are

A $x - y + 1 = 0$ and $x + y + 2 = 0$

B $x - y = 0$ and $x + y + 2 = 0$

C $x + y = 0$ and $x - y + 2 = 0$

D none of these

75) The angle between the lines $(x^2 + y^2)\sin^2\alpha = (x\cos(b) - y\sin(b))^2$

A α

B 2α

C $\alpha+\beta$

D $2(\alpha-\beta)$

76) The circle passing through the distinct points $(1, t)$, $(t, 1)$ & (t, t) for all values of 't', passes through the point:

A $(-1, -1)$

B $(-1, 1)$

C $(1, -1)$

D $(1, 1)$

77) $\int \sec^2\theta(\sec\theta + \tan\theta)^2\, d\theta$

A $(\sec\theta + \tan\theta)/2\ [2+\tan\theta(\sec\theta+\tan\theta)]+C$

B $(\sec\theta + \tan\theta)/3\ [2+4\tan\theta(\sec\theta+\tan\theta)]+C$

C $(\sec\theta+\tan\theta)/6\ [3+(\sec\theta+\tan\theta)^2]+C$

D $3(\sec\theta+\tan\theta)/2\ [2+\tan\theta(\sec\theta+\tan\theta)]+C$

78) The radius of a right circular cylinder increases at the rate of 0.1cm/min, and the height decreases at the rate of 0.2cm/min. The rate of change of the volume of the cylinder, in cm^3/min, when the radius is 2cm and the height is 3cm is

A -2π

B $-8\pi/5$

C $-3\pi/5$

D $2\pi/5$

79) The positive values of the parameter 'a' for which the area of the figure bounded by the curve $y = \cos ax$, $y = 0$, $x = \pi/6a$, $x = 5\pi/6a$ is greater than 3 are

A ϕ

B $(0, 1/3)$

C $(3, \infty)$

D None of these

80) Find the area of the region bounded by

$y = \log_e x$ and $y = \sin^4 \pi x$.

A 1/8

B 11/8

C 3/8

D 2/7

81) The differential equation of the system of circles touching the x-axis at origin is

A $(x^2 - y^2)\, dy/dx + 2xy = 0$

B $(x^2 - y^2)\, dy/dx - 2xy = 0$

C $(x^2 + y^2)\, dy/dx + 2xy = 0$

D a second order differential equation

82) The general solution of the differential equation $(1+y^2)dx+(1+x^2)dy = 0$ is

A $mx - y = C(1-xy)$

B $x - y = C(1+xy)$

C $(x + y) = C(1-xy)$

D $x+y=C(1+xy)$

83) The first two terms of a geometric progression add up to 12. The sum of the third and the fourth terms is 48. If the terms of the geometric progression are alternately positive and negative, then the first term is

A -4

B -12

C 12

D 4

84) Suppose the cube $x^3 - px + q$ has three distinct real roots where $p>0$ and $q>0$. Then which one of the following holds?

A The cubic has minima at $\sqrt{(p/3)}$ and maxima at $-\sqrt{(p/3)}$

B The cubic has minima at $-\sqrt{(p/3)}$ and maxim at $\sqrt{(p/3)}$

C The cubic has minima at both $\sqrt{(p/3)}$ and $-\sqrt{(p/3)}$

D The cubic has maxima at both $\sqrt{(p/3)}$ and $-\sqrt{(p/3)}$

85) AB is a veritcal pole with B at the ground level A at the top. A man finds that the angle of elevetion of the point A from a certain point C on the ground is 60°. He moves away from the pole along the line BC to a point D such that CD = 7m. From

D the angle of elevation of the point A is 45°. Then the height of the pole is

A 7/√3. 1/√3-1 m

B 7√3/2.{ √3+1)m

C 7 √3/2. (√3-1)m

D 7√3/2.1/√3+1

86) A die is thrown. Let A be the event that the number obtained is greater than 3. Let B be the event that the number obtained is less than 5. Then P(A∪B) is

A 3/5

B 0

C 1

D 2/5

87) The locus of the midpoints of a chord of the circle $x^2 + y^2 = 4$ which subtends a right angle at the origin is

A $x + y = 2$

B $x^2 + y^2 = 1$

C $x^2 + y^2 = 2$

D $x + y = 1$

88) The mean of the numbers a, b, 8, 5, 10 is 6 and the variance is 6.80. Then which one of the following gives possible values of a andb?

A a = 0, b = 7

B a = 5, b = 2

C a = 1, b = 6

D a = 3, b = 4

89) The differential equation of the family of circles with fixed radius 5 units and centre on the line y = 2 is

A $(x-2)y'^2 = 25 - (y-2)^2$

B $(y-2)y'^2 = 25 - (y-2)^2$

C $(y-2)^2 y' = 25 - (y-2)^2$

D $(x-2)^2 y'^2 = 25 - (y-2)^2$

90) The equation of the hyperbola whose foci are (6,5), (-4,5) and eccentricity 5/4 is

A $\frac{(x-1)^2}{16} - \frac{(y-5)^2}{9} = 1$

B $\frac{x^2}{16} - \frac{y^2}{9} = 1$

C $\frac{(x-1)^2}{16}-\frac{(y-5)^2}{9}=-1$

D None of these