KVPY – CLASS-XII
PART TEST – 1
(OLTS-1819-T1-PT-1-KVPY-XII)

PART – I

MATHEMATICS

1. Let $A_r\left(r \in N\right)$ be the area of the bounded region whose boundary is defined by $\left(6y^2r - x\right) = 0$ and $\left(6\pi^2 y - x\right) = 0$ then the value of $\lim\limits_{n\to\infty}(\sqrt{A_1A_2A_3} + \sqrt{A_2A_3A_4} + \sqrt{A_3A_4A_5}$.....upto n terms), is

(A) π^9 (B) $\frac{1}{2}\pi^9$

(C) $\frac{1}{3}\pi^9$ (D) $\frac{1}{4}\pi^9$

2. The domain of the function $f\left(x\right) = \log\left(-a - \left|\left[x\right] + 1\right|\right)$, where a is a fixed negative real number, $a \notin I$ and $\left[.\right]$ denotes the greatest integer function, is

(A) $\left[a\right] \le x < \left[-a\right]$ (B) $\left[a\right] \le x \le \left[-a\right]$

(C) $\left[a\right] + 1 \le x \le \left[-a\right]$ (D) $\left[a\right] + 1 \le x < \left[-a\right] + 1$

3. Two lines $5x + 3^{\alpha}y = 1$ and $\alpha x - y = 0$ are perpendicular to each other for some value of α lying in the interval

(A) $\left(-1, 0\right)$ (B) $\left(1, 2\right)$

(C) $\left(2, 3\right)$ (D) $\left(3, 4\right)$

4. Let $a_1, a_2, ...a_n$ be all +ve real numbers whose product is 3^{2n} $\left(n \in N\right)$. Let the function $f\left(x\right) = \sum\limits_{r=1}^{n}\left(x - a_r\right)^2$ has a point of local minima at x = 9 then the value of $\lim\limits_{n\to\infty}\sum\limits_{r=1}^{n}\left(\left(a_r\right)^{-r}\right)$, is

(A) $\frac{1}{6}$ (B) $\frac{1}{7}$

(C) $\frac{1}{8}$ (D) $\frac{1}{9}$

5. The function $f\left(x\right) = a\left(x^2 - 1\right)\left(ax + b\right), \left(a \neq 0\right)$, has

(A) a point of local maxima at certain $x \in R^+$
(B) a point of local minima at certain $x \in R^-$
(C) a point of local maxima at certain $x \in R^-$
(D) no point of local maxima/minima

6. Let f be a biquadratic function of x such that $\lim\limits_{x\to 0}\left(\frac{f\left(-x\right)}{2x^3}\right)^{1/x} = \frac{1}{e^3}$ then the value of $\left|f\left(1\right)\right|$, is

(A) 8 (B) 6
(C) 4 (D) 2

7. $\int \frac{\ln x}{(1+\ln x)^2} dx$ is equal to

(A) $\frac{1}{(1+\ln x)^3} + c$ (B) $\frac{1}{(1+\ln x)^2} + c$

(C) $\frac{x}{1+\ln x} + c$ (D) $\frac{x}{(1+\ln x)^2} + c$

8. The value of $\int_0^{\frac{\pi}{4}} \ell n(\cot x - \tan x) dx$ is

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{4}\ln(2)$

(C) $\pi \ln(2)$ (D) none of these

9. Let $f(x)$ be a differential function in $[-1, \infty)$ and $f(0) = 1$ such that $\lim_{t \to x+1} \frac{t^2 f(x+1) - (x+1)^2 f(t)}{f(t) - f(x+1)} = 1$. Find the value of $\lim_{x \to 1} \frac{\ln(f(x)) - \ln 2}{x - 1}$

(A) 0 (B) 1

(C) 2 (D) -1

10. If the circles $x^2 + y^2 + 10\alpha x + \beta y + \alpha = 0$ and $x^2 + y^2 - 5\alpha x + \gamma y - 1 = 0$ intersect in two distinct points A and B, then the line $15x + \delta y - \alpha = 0$ passes through A and B for

(A) infinitely many values of α (B) exactly two values of α

(C) exactly one value of α (D) no value of α

11. A variable circle passes through the fixed point P (h, k) and touches x – axis. The locus of the other end of the diameter through P is

(A) $(y-h)^2 = 4kx$ (B) $(x-k)^2 = 4hy$

(C) $(x-h)^2 = 4ky$ (D) $(y-k)^2 = 4hx$

12. A variable line $ax + by + c = 0$, where a, b, c are in A.P. is normal to a circle $(x-\alpha)^2 + (y-\beta)^2 = \gamma$, which is orthogonal to circle $x^2 + y^2 - 4x - 4y - 1 = 0$. The value of $\alpha + \beta + \gamma$ is equal to

(A) 3 (B) 5

(C) 10 (D) 7

13. The value of $\int_0^{2\pi} \ln|2\sin x + 1| dx$, is

(A) is equal to $-2\pi \ln 2$ (B) is equal to $-\frac{\pi}{2}\ln 2$

(C) is equal to 0 (D) does not exist

14. $\int \frac{\cos x + \sqrt{3}}{1 + 4\sin\left(x + \frac{\pi}{3}\right) + 4\sin^2\left(x + \frac{\pi}{3}\right)} dx$, is

(A) $\frac{\cos x}{1 + 2\sin\left(x + \frac{\pi}{3}\right)} + c$

(B) $\frac{\sec x}{1 + 2\sin\left(x + \frac{\pi}{3}\right)} + c$

(C) $\frac{\sin x}{1 + 2\sin\left(x + \frac{\pi}{3}\right)} + c$

(D) $\frac{1}{2}\tan^{-1}\left(1 + 2\sin\left(x + \frac{\pi}{3}\right)\right) + c$

15. The value of $\int_0^2 \frac{x^4 + 1}{\left(x^4 + 2\right)^{3/4}} dx$, is

(A) $\sqrt{2\sqrt{2}}$

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

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

(D) $\sqrt{3\sqrt{3}}$

16. $px + qy = 40$ is a chord of minimum length of the circle $(x-10)^2 + (y-20)^2 = 729$. If the chord passes through (5, 15). Then $\left(p^{2013} + q^{2013}\right)$ is equal to

(A) 0

(B) 2

(C) 2^{2013}

(D) 2^{2014}

17. The area enclosed by the curve $\max\left\{|x-1|, |y|\right\} = k$ is 100, then k is equal to

(A) 5

(B) 8

(C) 10

(D) none of these

18. The maximum value of $\left|\sqrt{x^4 - 3x^2 - 6x + 13} - \sqrt{x^4 + 5x^2 + 4}\right|$ is

(A) 2

(B) 3

(C) 4

(D) 5

19. A circle in the first quadrant with center on the curve $y = 2x^2 - 27$ is tangent to the y – axis and the line $4x = 3y$. The radius of the circle is

(A) $\frac{7}{2}$

(B) $\frac{3}{2}$

(C) $\frac{5}{2}$

(D) $\frac{9}{2}$

20. $\int \frac{dx}{x(x+1)\left(\ln(x+1) - \ln(x)\right)^{11}}$ equals (where C is constant of integration)

(A) $\frac{1}{10\left(\ln(x+1) - \ln x\right)^{10}}$

(B) $\frac{\left(\ln(x+1) - \ln x\right)^{10}}{10} + C$

(C) $\frac{1}{11\left(\ln(x+1) - \ln x\right)^{11}} + C$

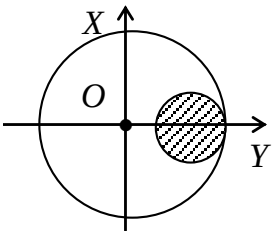
(D) $\frac{\left(\ln(x-1) - \ln x\right)^{11}}{11} + C$

PHYSICS

21. An aeroplane is flying with 360 km/hr. at an altitude of 2 km in a horizontal line. A box of mass 10 kg is dropped from it. When the box hits the ground then the plane will be
(A) just above the box (B) behind the box
(C) at some distance in forward direction (D) can not be find

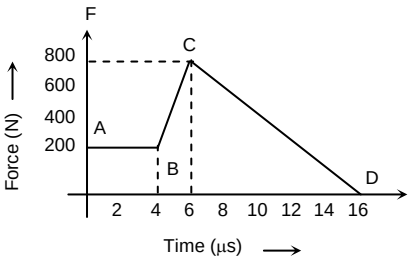
22. A boat which has a speed of 6 km/h in still water crosses a river of width 1 km along the shortest possible path in 20 min. The velocity of the river water in km/h is
(A) 1 (B) 3
(C) 4 (D) $3\sqrt{3}$

23. From a uniform circular plate of radius R, a small circular plate of radius R/4 is cut off as shown. If O is the center of the complete plate, then the x-coordinate of the new center of mass of the remaining plate will be:



(A) – R/20 (B) – R/16
(C) – R/15 (D) $-\frac{3}{4}$ R

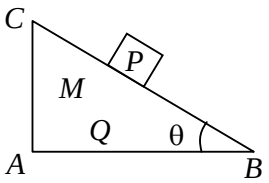
24. The magnitude of the force (in N) acting on a body varies with time t (in μs) as shown. AB, BC and CD are straight line segments. The magnitude of the total impulse of the force on the body from t = 4 μs to t = 16 μs is:



(A) 5×10^{-3} Ns (B) 5.8×10^{-3} Ns
(C) 5.8×10^{3} Ns (D) 5×10^{3} Ns

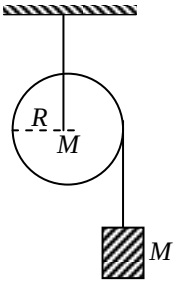
25. One body is dropped while a second body is thrown downwards with an initial velocity of 1 m/sec simultaneously from same point. The separation between these is 18 meters after a time,
(A) 18 sec (B) 9 sec
(C) 4.5 sec (D) 36 sec

26. A block Q of mass M is placed on a horizontal frictionless surface AB and a body P of mass m is released on its frictionless slope. As P slides by a length L on this slope of inclination θ, the block Q would move by a distance:



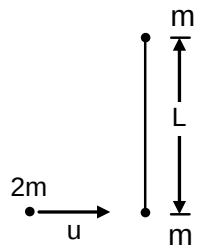
(A) $\frac{m}{M}L\cos\theta$ (B) $\frac{m}{M+m}L$
(C) $\frac{M+m}{mL\cos\theta}$ (D) $\frac{mL\cos\theta}{m+M}$

27. A mass M is supported by a massless string wound round a uniform solid cylinder of mass M and radius R. On releasing the mass from rest, it will fall with acceleration :



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

28. Two small balls A and B, each of mass m, are joined rigidly at the ends of a light rod of length L. They are placed on a frictionless horizontal surface. Another ball of mass 2 m moving with speed u towards one of the ball and perpendicular to the length of the rod on the horizontal frictionless surface as shown in the figure. If the coefficient of restitution is 1/2 then the angular speed of the rod after the collision will be



(A) $\frac{4}{3}\frac{u}{\ell}$ (B) $\frac{u}{\ell}$

(C) $\frac{2}{3}\frac{u}{\ell}$ (D) None of these

29. A thin circular ring of mass M and radius R is rotating about its axis with a constant angular velocity ω. Two objects, each of mass m, are attached gently to the opposite ends of a diameter of the ring. The ring rotates now with an angular velocity:

(A) $\frac{\omega M}{M+m}$ (B) $\frac{\omega(M-2m)}{M+2m}$

(C) $\frac{\omega M}{M+2m}$ (D) $\frac{\omega(M+m)}{M}$

30. A cricket player catches a ball of mass 10^{-1} kg, moving with a velocity of 25 ms^{-1}. If the ball is caught in 0.1 s, the force of the blow exerted on the hand of the player is

(A) 4 N (B) 25 N

(C) 40 N (D) 250 N

31. When a sphere rolls without slipping, the ratio of its kinetic energy of translation to its total kinetic energy is:

(A) 1 : 7 (B) 1 : 2

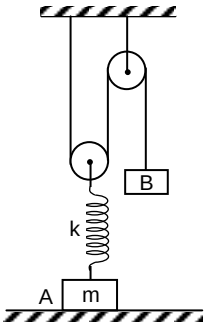
(C) 1 : 1 (D) 5 : 7

32. A very broad elevator is going up vertically with a constant acceleration of 2 m/sec^2. At the instant, when its velocity is 4 m/sec, a ball is projected from the floor of the lift with a speed of 10 m/sec relative to the floor at an angle of elevation of 30º. The time taken by the ball to return the floor is

(A) 5/6 sec (B) 3/2 sec

(C) 5/4 sec (D) 4/5 sec

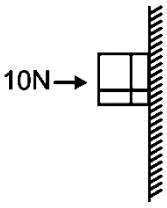
33. Find the minimum mass of block B so that A leaves the surface when B is released from rest when spring at natural length



(A) $\frac{m}{2}$ (B) $\frac{m}{4}$

(C) 2 m (D) 4 m

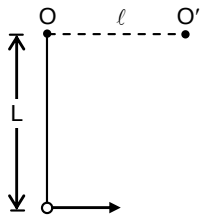
34. A horizontal force of 10 N is necessary to just hold a block stationary against a wall. The coefficient of friction between the block and the wall is 0.2, The weight of the block is



(A) 20 N (B) 50 N

(C) 100 N (D) 2 N

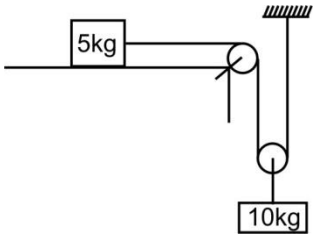
35. A particle is hanging from a fixed point O by means of a string of length L. There is a small nail O′ in the same horizontal line with O at a distance ℓ(<L) from O. The minimum velocity with which particle should be projected from its lowest position in order that it may make a complete revolution round the nail.



(A) $\sqrt{3gL}$ (B) $\sqrt{5gL}$

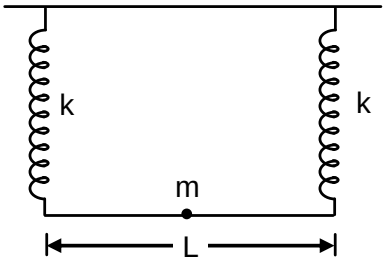
(C) $\sqrt{g(5L-3\ell)}$ (D) $\sqrt{g(5\ell-3L)}$

36. In the arrangement shown in figure, if the horizontal surface is smooth, the acceleration of the block 10 kg will be (g = 10 m/s^2)



(A) 10/3 m/sec^2
(B) 20/9 m/sec^2
(C) 40/9 m/sec^2
(D) 5/3 m/sec^2

37. A uniform thin rod of mass 'm', length 'ℓ' is hanged with the help of two identical massless springs of spring constant 'k' as shown in figure. Just after one of the spring is cut, the acceleration of the other end of the rod will be



(A) zero
(B) g upward
(C) g downward
(D) $\frac{3g}{2}$ upward

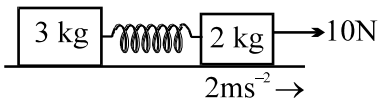
38. A body is moved along a straight line by a machine delivering constant power. The distance moved by the body in time t is proportion to

(A) $t^{1/2}$ (B) $t^{3/4}$
(C) $t^{3/2}$ (D) t^2

39. A force $\vec{F}=3\hat{i}+4\hat{j}+\hat{k}$ acts on a particle of mass 2 kg placed at point P(2, 1, -3). If this particle move to the point Q (2, 2, 2). Find the work done by the force

(A) 10 J (B) 9 J
(C) 16 J (D) 18 J

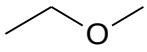
40. Find the acceleration of 3 kg mass when acceleration of 2 kg mass is 2 ms^{-2} as shown in figure.

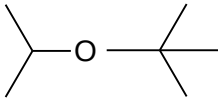


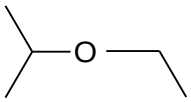
(A) 3 ms^{-2} (B) 2 ms^{-2}
(C) 0.5 ms^{-2} (D) zero

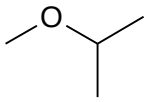
CHEMISTRY

41. Which of the following ether on hydrolysis gives two alcohol, both of them gives (+ve) iodoform test?

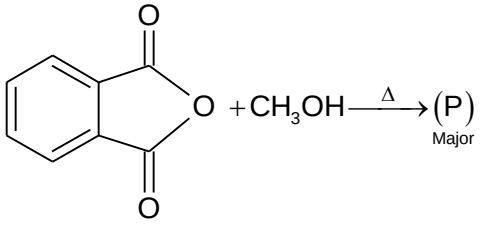
(A) 

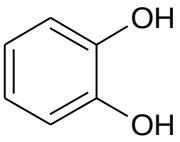
(B) 

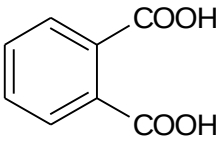
(C) 

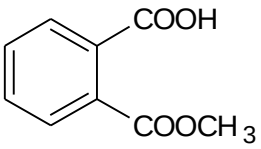
(D) 

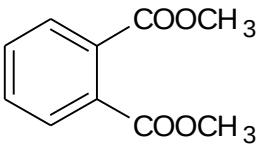
42. What is the major product(P) in following reaction:



(A) 

(B) 

(C) 

(D) 

43. Which is the correct order of size?
S^-, S^{2-}, Cl^-, Cl
(A) $S^{2-} > S^- > Cl^- > Cl$
(B) $S^- > S^{2-} > Cl^- > Cl$
(C) $S^{2-} > Cl^- > S^- > Cl$
(D) $S^{2-} > S^- > Cl > Cl^-$

44. Which has highest second ionization energy?
(A) N
(B) C
(C) O
(D) F

45. The dipole moment of HBr is 2.6×10^{-30} Cm and interatomic distance is 1.41 $\mathring{A}$. The% of ionic character is
(A) 10.5
(B) 11.5
(C) 12.5
(D) 13.5

46. The ratio of sigma and pi bonds in tetracyano ethylene is
(A) 2 :1
(B) 1 :2
(C) 1 :3
(D) 1 : 1

47. If the kinetic energy of an element is increased 4 times, the wavelength of the de Broglie wave associated with it would become
(A) 4 times
(B) 2 times
(C) $\frac{1}{2}$ times
(D) $\frac{1}{4}$ times

48. The speed of the electron in the 1st orbit of the hydrogen atom in the ground state is(C is the velocity of light)

(A) $\frac{C}{1.37}$ (B) $\frac{C}{1370}$

(C) $\frac{C}{13.7}$ (D) $\frac{C}{137}$

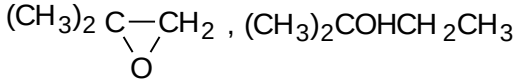
49. When 2 g of gas A is introduced into an evacuated flask kept at 25°, the pressure was found to be 1 atmosphere. If 3 g of another gas B is then added to the same flask, the pressure becomes 1.5 atm. Assuming ideal behaviour the ratio of molecular weight(M_A : M_B) is

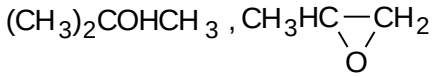
(A) 1 : 3 (B) 3 : 1

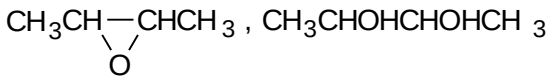
(C) 2 : 3 (D) 3 : 2

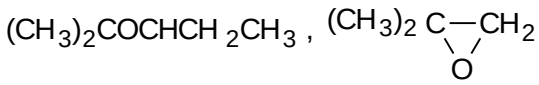
50. $(CH_3)_2C=CH_2 \xrightarrow{CH_3CO_3H} (A) \xrightarrow[2.H_3O^+]{1.CH_3MgI} (B)$

In above reaction the product (A) and (B) are respectively

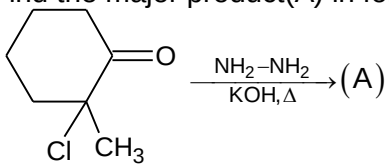
(A) 

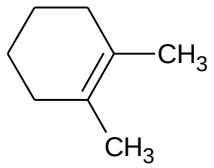
(B) 

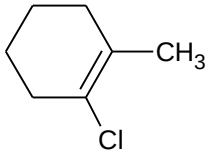
(C) 

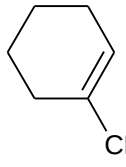
(D) 

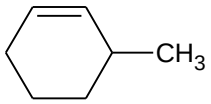
51. Find the major product(A) in following reaction



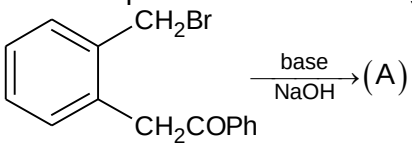
(A) 

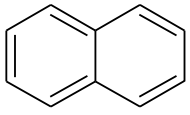
(B) 

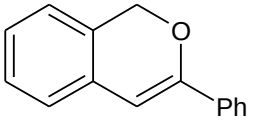
(C) 

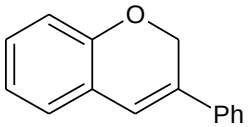
(D) 

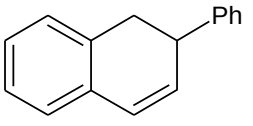
52. Predict the product in the following reaction:



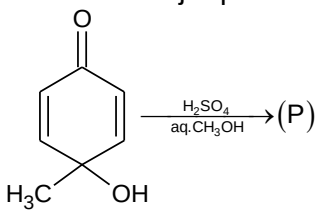
(A) 

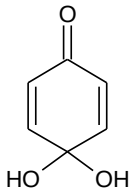
(B) 

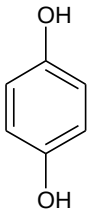
(C) 

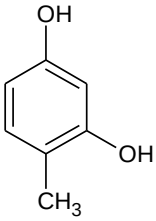
(D) 

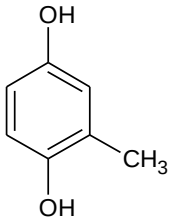
53. Predict the major product(P) in the following reactions:



(A) 

(B) 

(C) 

(D) 

54. $3KClO_3 + 3H_2SO_4 \longrightarrow 3KHSO_4 + HClO_4 + 2ClO_2 + H_2O$

The equivalent weight of $KClO_3$ is:

(A) $\frac{M}{4}$ (B) $\frac{M}{2}$

(C) $\left(M + \frac{M}{2}\right)$ (D) $\left(\frac{M}{4} + \frac{M}{2}\right)$

55. Which of the following is NOT an intramolecular redox reactions?

(A) $NH_4NO_2 \longrightarrow N_2 + 2H_2O$ (B) $2Mn_2O_7 \longrightarrow 4MnO_2 + 3O_2$

(C) $2KClO_3 \longrightarrow 2KCl + 3O_2$ (D) $2H_2O_2 \longrightarrow 2H_2O + O_2$

56. In the following equation

$CrO_4^{2-} + S_2O_3^{2-} + \bar{O}H \longrightarrow \left[Cr(OH)_4\right]^- + SO_4^{2-}$

What volume of 0.2 M Na_2CrO_4 solution is required just to react with 30 mL of 0.2 M $Na_2S_2O_3$ solution:

(A) 40 mL (B) 80 mL

(C) 20 mL (D) 60 mL

57. A certain transition in H spectrum from an excited state to the ground state in one or more steps gives rise to a total of 10 lines. How many of these belong to the UV spectrum.

(A) 3 (B) 4

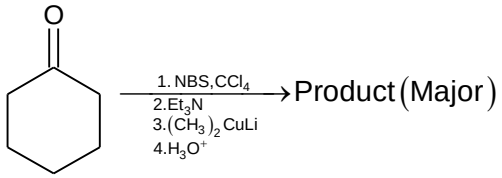
(C) 6 (D) 5

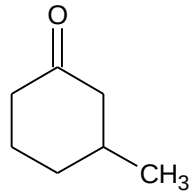
58. The ONO bond angle is maximum in

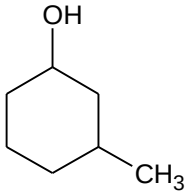
(A) NO_3^- (B) NO_2^+

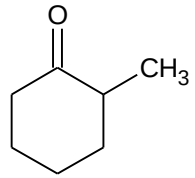
(C) NO_2^- (D) NO_2

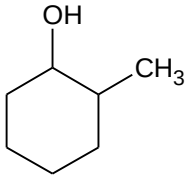
59. Identify major product in following sequence of reactions:



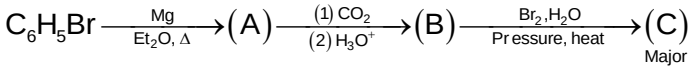
(A) 

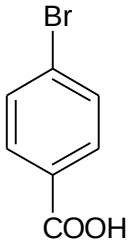
(B) 

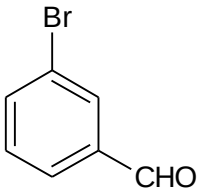
(C) 

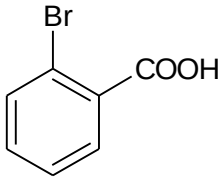
(D) 

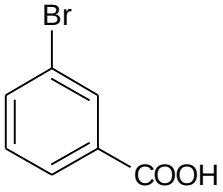
60. Give the major product(C) of the following sequence of reaction:



(A) 

(B) 

(C) 

(D) 

PART – II

MATHEMATICS

61. The minimum value of the function $f(x)=\frac{1}{2\{-x\}}-\{x\}$ occurs at x equals to (where {.} represents fractional part function)

(A) $n+\frac{1}{\sqrt{2}}, n\in I$ (B) $n-\frac{1}{\sqrt{2}}, n\in I$

(C) $n+\frac{1}{2\sqrt{2}}, n\in I$ (D) $n+\frac{1}{2}, n\in I$

62. The value of $\int_1^e\left(\left(\frac{1}{x}-x+x\ln x\right)\sin x\right)dx$, is

(A) $\sin e-\cos 1$ (B) $\cos e-\sin 1$

(C) $\sin e+\cos 1$ (D) $\cos e+\sin 1$

63. $\int\frac{x^3-x^2+x-1}{x^5+1}dx$ is

(A) $\frac{1}{5}\ln\left(\frac{1+x^5}{(1+x^3)^5}\right)+c$ (B) $\frac{1}{2}\ln\left(\frac{1+x^5}{1+x^3}\right)+c$

(C) $\frac{1}{5}\ln\left(\frac{1+x^5}{(1+x)^5}\right)+c$ (D) $\frac{1}{5}\ln\left(\frac{1+x^5}{1+x}\right)+c$

64. Let f be a differentiable function such that $|f(x)|\le 1\ \forall x\in[-1,1]$ and $g(x)=|f'(x)|, g(0)=4,$ then Choose the correct statement

(A) there is no point x in the interval (–1, 0) at which $g(x)\le 2$

(B) $g(x)>2\forall x\in(0,1)$

(C) there is a point of local maxima of $g(x)$ in (–1, 1)

(D) $x=0$ is a point of local maxima of $g(x)$

65. Suppose that $|x+y|+|x-y|=2$. What is the maximum possible value of x^2-6x+y^2?

(A) 5 (B) 6

(C) 7 (D) 8

66. Let $f_1(x)=\frac{2}{3}-\frac{3}{3x+1}$ and $n\ge 2$, define $f_n(x)=f_1(f_{n-1}(x))$. The value of x that satisfies $f_{1001}(x)=x-3$ is

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

(C) $\frac{5}{3}$ (D) none of these

67. Let $f(x)$ and $g(x)$ be two differentiable functions on R (the set of all real numbers) satisfying $f(x)=\frac{x^3}{2}+1-\int_0^x g(t)dt$ and $g(x)=x-\int_0^1 f(t)dt$. Number of points where $f(|x|)$ is non – derivable, is

(A) 0 (B) 1
(C) 2 (D) 3

68. Consider $P(x)=ax^2+bx+c$, where $a,b,c\in R$ and $P(2)=-9$. Let α and β be the roots of the equation $P(x)=0$. If α and β both tends to infinity then $\lim_{x\to 3}\frac{\sqrt{|P(x)|}-3}{\sin(x-3)}$ is equal to

(A) 0 (B) 1
(C) 9 (D) non – existent

69. For $x\in\left(0,\frac{\pi}{2}\right)$, let $f_n(x)=\int n\sin 2x\left(\sin^{2n-2}x-\cos^{2n-2}x\right)dx, n\in N$ and $f_n\left(\frac{\pi}{4}\right)=\frac{1}{2^{n-1}}$.

If $n=\lim_{t\to-\infty}\left[\cot^{-1}t\right]$ then $\int\frac{f_3(x)}{\sin^2 x\cos^2 x}dx$ equals (where [k] denotes greatest integer less than or equal to k)

(A) $\tan x-\cot x+3x+c$ (B) $\tan x+\cot x-3x+C$
(C) $\tan x+\cot x+3x+C$ (D) $\tan x-\cot x-3x+C$

70. The maximum value of $y=\left(\cot^{-1}x\right)^p\left(\cot^{-1}(-x)\right)^q$, $(p,q\in I^+)$, is

(A) $p^pq^q\left(\frac{\pi}{p+q}\right)^{p+q}$ (B) $p^qq^p\left(\frac{\pi}{p+q}\right)^{p+q}$
(C) $p^pq^q\left(\frac{\pi}{2}\right)^{p+q}$ (D) $p^qq^p\left(\frac{\pi}{2}\right)^{p+q}$

PHYSICS

71. A particle of small mass m is joined to a very heavy body by a light string passing over a light pulley. Both bodies are free to move. The total downward force on the pulley exerted by string is

(A) mg (B) 2 mg
(C) 4 mg (D) >> mg

72. Two particles A and B move in the Earth's gravitational field. Initially, the particle located at a point O moved with velocity v_1 and v_2 horizontally in opposite directions. After what time from this instant, they will move in mutually perpendicular directions.

(A) $\frac{\sqrt{v_1v_2}}{g}$ (B) $\frac{v_1+v_2}{g}$
(C) $\frac{v_1+v_2}{2g}$ (D) $\frac{2\sqrt{v_1v_2}}{g}$

73. A particle is moving along x-axis. The position of the particle at time t is given as $x = t^3 - 9t^2 + 24t + 1$. Find the distance travelled in first 5 sec

(A) 20 m (B) 10 m

(C) 18 m (D) 28 m

74. A thin uniform rod of mass 'm' and length 'ℓ' is standing on a smooth horizontal surface. A slight disturbance causes the lower end to slip on the smooth surface. The velocity of centre of mass of the rod at the instant when it makes an angle 60° with vertical will be

(A) $\sqrt{\frac{9g\ell}{26}}$ downward (B) $\sqrt{\frac{g\ell}{13}}$, 30° with downward vertical

(C) $\sqrt{\frac{3g\ell}{26}}$ horizontal (D) $\sqrt{\frac{3g\ell}{13}}$, 60° with downward vertical

75. Velocity time equation of a particle moving in a straight line is $V = t^2 - 5t + 6$. The distance travelled by the particle in the time interval from t = 0 to t = 4 sec

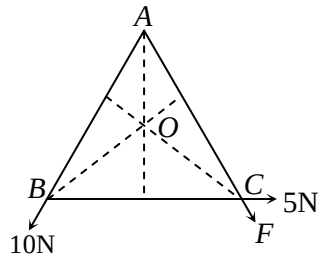
(A) 0 (B) $\frac{17}{3}$

(C) 6 (D) $\frac{16}{3}$

76. An equilateral triangle ABC has its centre at O as shown in figure. Three forces 10 N, 5N and F are acting along the sides AB, BC and AC. Magnitude of force F so that the net torque about 'O' is zero, will be:

(A) 15 N (B) 5 N

(C) 50 N (D) 2 N

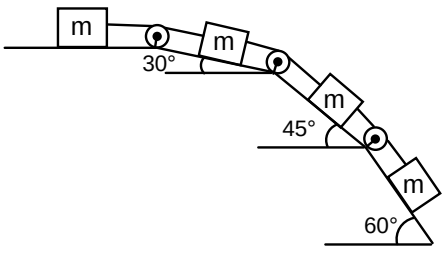


77. Two balls of masses $m_1 = 3$ kg and $m_2 = 2$ kg are moving towards each other with speeds u_1 and u_2. The ball m_1 stops after collision and m_2 starts moving with speed u_1. The co-efficient of restitution for the balls is:

(A) zero (B) 1

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

78. The magnitude of acceleration of each block as shown in figure will be (Assume pulleys and strings are ideal)



(A) $\frac{g}{2}\left(\frac{1}{2}+\frac{1}{\sqrt{2}}+\frac{\sqrt{3}}{2}\right)$

(B) $\frac{g}{4}\left(\frac{1}{2}+\frac{1}{\sqrt{2}}+\frac{\sqrt{3}}{2}\right)$

(C) $\frac{g}{2}\left(\frac{1}{2}-\frac{1}{\sqrt{2}}+\frac{\sqrt{3}}{2}\right)$

(D) $\frac{g}{4}\left(\frac{1}{2}-\frac{1}{\sqrt{2}}+\frac{\sqrt{3}}{2}\right)$

79. A uniform solid hemisphere of radius r is joined to uniform solid right circular cone of base of radius r. Both have same density. The centre of mass of the composite solid lies on the common face. The height (h) of the cone is

(A) 2r (B) $\sqrt{3}\,r$

(C) 3r (D) $r\sqrt{6}$

80. A car accelerates from rest at a constant rate α from some time after which it decelerates at a constant rate β to come to rest. If the total time elapsed is t, the distance travelled by the car is

(A) $\frac{1}{2}\left(\frac{\alpha\beta}{\alpha+\beta}\right)t^2$ (B) $\frac{1}{2}\left(\frac{\alpha^2+\beta^2}{\alpha+\beta}\right)t^2$

(C) $\frac{1}{2}\left(\frac{\alpha^2+\beta^2}{\alpha\beta}\right)t^2$ (D) $\frac{1}{2}\left(\frac{\alpha^2-\beta^2}{\alpha\beta}\right)t^2$

CHEMISTRY

81. M^{3+} has the electronic configuration as $[Ar]3d^{10}4s^2$, hence the element M lies in

(A) s-block (B) p-block

(C) d-block (D) f-block

82. The correct order of electronegativity of hybrid orbitals of carbon is

(A) $sp < sp^2 < sp^3$ (B) $sp < sp^2 > sp^3$

(C) $sp > sp^2 > sp^3$ (D) $sp > sp^2 < sp^3$

83. 20 mL of a solution containing 0.2 g of an impure sample of H_2O_2 reacts with 0.316 g of $KMnO_4$ in the presence of H_2SO_4. Find out the purity of H_2O_2.

(A) 94% (B) 100%

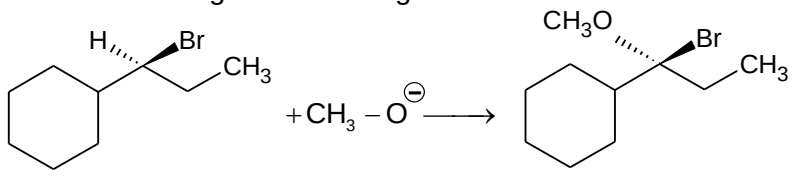
(C) 78% (D) 85%

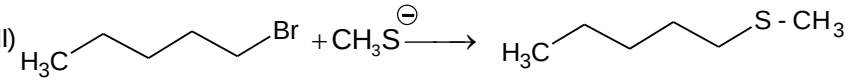
84. Let ν_1 be the frequency of the series limit of the Lyman series, ν_2 be the frequency of the first line of the Lyman series and ν_3 be the frequency of the series limit of the Balmer series. Then the correct relation between the frequencies ν_1, ν_2 and ν_3 will be.

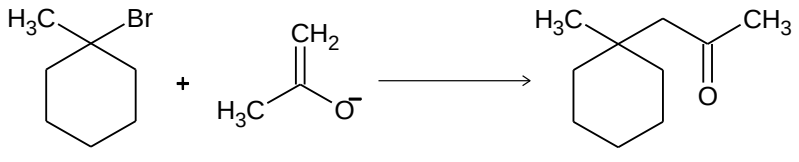
(A) $\nu_1 - \nu_2 = \nu_3$ (B) $\nu_2 - \nu_1 = \nu_3$

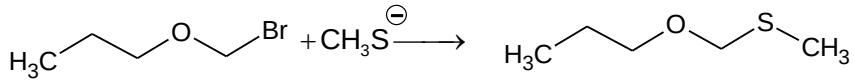
(C) $\nu_2 = \frac{1}{2}(\nu_1 - \nu_3)$ (D) $\nu_1 + \nu_2 = \nu_3$

85. Which of the following reaction will go faster if the concentration of the nucleophile is raised?

(I) 

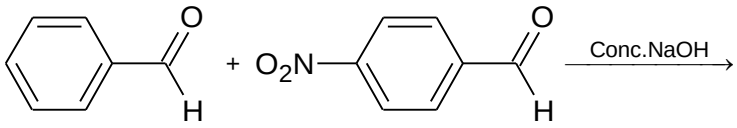
(II) 

(III) 

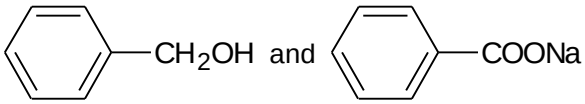
(IV) 

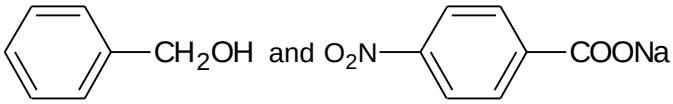
(A) I and III (B) II and IV

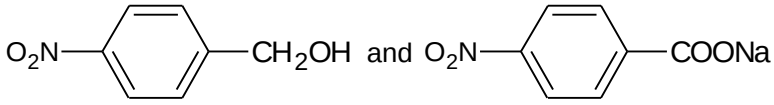
(C) I and II (D) I, II and IV

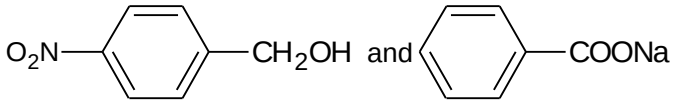
86. 

The products likely to be obtained are

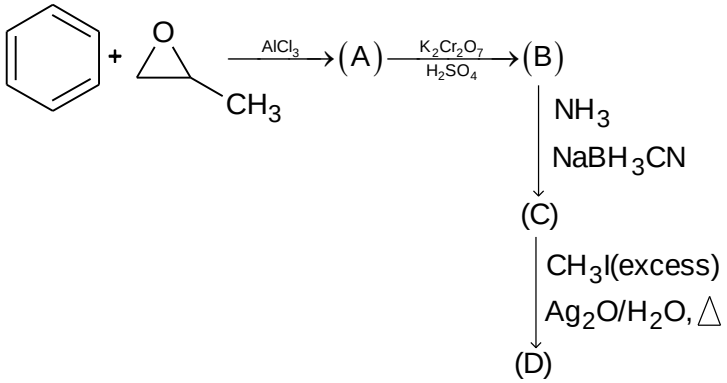
(A) 

(B) 

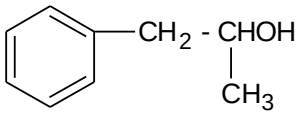
(C) 

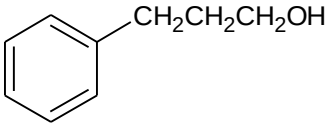
(D) 

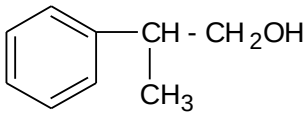
87. In the following sequence of reactions A, B, C and D are different products:-

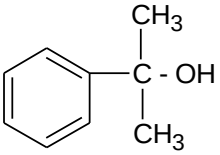


The product A in this reaction is:

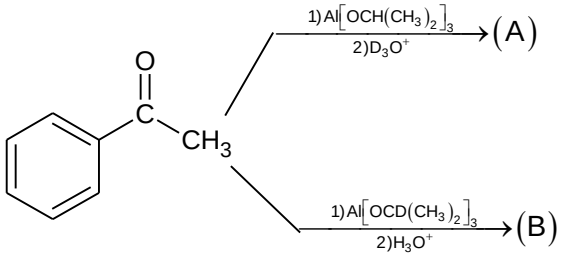
(A) 

(B) 

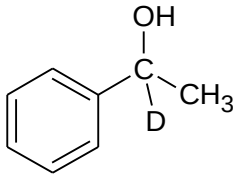
(C) 

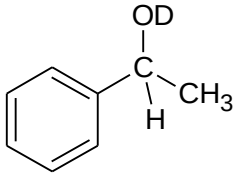
(D) 

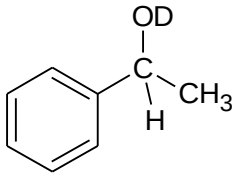
88.

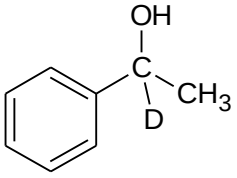


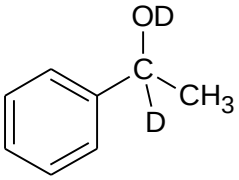
Identify A and B in above reaction:-

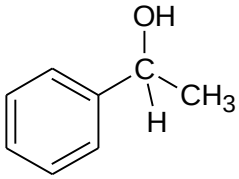
(A) A = 

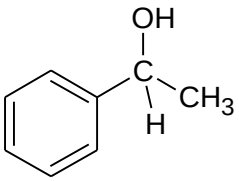
B = 

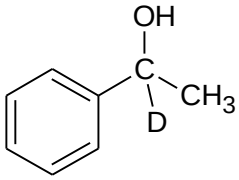
(B) A = 

B = 

(C) A = 

B = 

(D) A = 

B = 

89. How many resonating forms can be written for nitrate and chlorate ions?
(A) 3, 3 (B) 3, 4
(C) 3, 2 (D) 2, 3

90. Molecular shapes of SF_4, CF_4 and XeF_4 are
(A) the same with 2, 0 and 1 lone pair of electrons
(B) the same with 1, 1 and 1 lone pair of electrons
(C) different with 0, 1 and 2 lone pair of electrons
(D) different with 1, 0 and 2 lone pair of electrons