SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

OUTGOING SR MPC | **JEE MAINS GT- 10** | **Date: 26-07-2020**

Time: 3 Hours | **Max Marks : 300**

JEE MAIN MODEL

MATHEMATICS

Section	Question type	s	s	No.of Qs	l s
Sec–I(Q.N: 01 –20)	ionswithSingleAnswerType	4	-1	20	80
Sec–II(Q.N: 21–25)	ionswithNumericalAnswerType cimalNumbers)	4	0	5	20
Total				25	100

PHYSICS

Section	Question type	s	s	No.of Qs	l s
Sec–I(Q.N: 26 –45)	ionswithSingleAnswerType	4	-1	20	80
Sec–II(Q.N: 46 –50)	ionswithNumericalAnswerType cimalNumbers)	4	0	5	20
Total				25	100

CHEMISTRY

Section	Question type	s	s	No.of Qs	l s
Sec–I(Q.N: 51 –70)	ionswithSingleAnswerType	4	-1	20	80
Sec–II(Q.N: 71 –75)	ionswithNumericalAnswerType cimalNumbers)	4	0	5	20
Total				25	100

SECTION–I

(SINGLECORRECTANSWER TYPE)

Thissectioncontains20multiplechoicequestions.Eachquestionhas4options(1),(2),(3)and(4)forits answer,outofwhich**ONLYONE**optioncan becorrect.
Markingscheme:+4forcorrectanswer,0ifnotattemptedand-1if notcorrect.

MATHS

1. Let S be the set of real numbers. For $a, b \in S$, relation R is defined by $a\,R\,b \Leftrightarrow |a-b|<1$ then R is

   1) only reflexive 2) only symmetric
   3) only transitive 4) Reflexive & symmetric

2. Given that matrix $A=\begin{bmatrix} x & 3 & 2 \\ 1 & y & 4 \\ 2 & 2 & z \end{bmatrix}$. If $xyz=2013$ and $8x+4y+3z=2012$ then $A(adj\,A)$ is equal to

   1) $\begin{bmatrix} 68 & 0 & 0 \\ 0 & 68 & 0 \\ 0 & 0 & 68 \end{bmatrix}$ 2) $\begin{bmatrix} 34 & 0 & 0 \\ 0 & 34 & 0 \\ 0 & 0 & 34 \end{bmatrix}$ 3) $\begin{bmatrix} 29 & 0 & 0 \\ 0 & 29 & 0 \\ 0 & 0 & 29 \end{bmatrix}$ 4) $\begin{bmatrix} 58 & 0 & 0 \\ 0 & 58 & 0 \\ 0 & 0 & 58 \end{bmatrix}$

3. In a ΔPQR, if $3\sin P+4\cos Q=6$ and $4\sin Q+3\cos P=1$ then angle 'R' is

   1) $\frac{\pi}{6}$ 2) $\frac{\pi}{4}$ 3) $\frac{3\pi}{4}$ 4) $\frac{5\pi}{6}$

4. $\theta \in [0,2\pi]$ and z_1, z_2, z_3 are three complex numbers such that they are collinear and $\left(1+|\sin\theta|\right)z_1+\left(|\cos\theta|-1\right)z_2-\sqrt{2}\,z_3=0$ .If at least one of the complex numbers z_1, z_2, z_3 is non- zero then number of possible values of θ is

   1) Infinite 2) 0 3) 2 4) 4

5. If $\left(1+x+x^2+x^3\right)^{10}=a_0+a_1x+a_2x^2+a_3x^3+.....+a_{30}x^{30}$ then which of the following is true?

   1) $a_2-a_4+a_6-.....-a_{28}+a_{30}=1$ 2) $a_1-a_3+a_5-a_7+.....-a_{27}+a_{29}=0$
   3) $a_0-a_1+a_2-a_3+.....+a_{30}=2^{19}$ 4) Both (1) and (2)

6. The equation of the plane containing the line $\frac{x-1}{2}=\frac{y+1}{-1}=\frac{z-3}{4}$ and perpendicular to the plane $x+2y+z=12$ is

   1) $9x+2y-5z+4=0$ 2) $9x-2y+5z-4=0$
   3) $9x-2y-5z-4=0$ 4) $9x-2y-5z+4=0$

7. The number of real common normals of $y^2 = 4x$ and $x^2 = 4y$ that can be drawn is equal to

1) 1 2) 3 3) 5 4) 6

8. The line $3x+2y=24$ meets x-axis at *A* and y-axis at *B*. The perpendicular bisector of $\overline{AB}$ meets the line passing through $(0,-1)$ and parallel to x-axis at 'C'. Then the area of ΔABC is (in square units)

1) 83 2) 87 3) 90 4) 91

9. The area bounded by the circles $x^2 + y^2 = 1$ & $x^2 + y^2 = 4$ and the pair of lines $2x^2 - 3xy - 2y^2 = 0$ $(y>0)$ is ___(in sq.units)

1) $\pi/4$ 2) $\pi/2$ 3) $3\pi/4$ 4) $\pi/3$

10. A random variable X has its range $\{0,1,2\}$ and $P(X=0)=3c^3$, $P(X=1)=4c-10c^2$, $P(X=2)=5c-1$ then $P(0<X<3)=$ ____

1) $\frac{1}{3}$ 2) $\frac{8}{9}$ 3) $\frac{7}{8}$ 4) $\frac{1}{9}$

11. A tower ABCD stands on a level ground with foot A. At a point P on the ground, the portion AB, AC and AD subtends angles α, β and γ respectively. If $AB=a, AC=b, AD=c$, $AP=x$ and $\alpha+\beta+\gamma=180^0$ then $(a+b+c)x^2 =$

1) abc 2) $\frac{1}{abc}$ 3) a + b – c 4) a – b – c

12. The equation of the curve passing through $(2,2)$ and satisfying the differential equation $\frac{dy}{dx}+2xy=x^2\left(3-\frac{dy}{dx}\right)$ is

1) $x^2(x-y)=x-2$ 2) $y^2(x-y)=y-2$ 3) $y^2(x-y)=x-2$ 4) $x^2(x-y)=y-2$

13. If α, β, γ are the roots of $x^3-3x^2+3x+7=0$ and ω is a complex cube root of unity, then the value of $\left(\frac{\alpha-1}{\beta-1}+\frac{\beta-1}{\gamma-1}+\frac{\gamma-1}{\alpha-1}\right)$ is equal to $p(\omega^q)$ for some $p,q\in Z$. Then the number of ordered pairs (p,q) such that $p+q=15$ is

1) 0 2) 1 3) 2 4) infinite

14. Let f be a real function satisfying $f(x)=f(x+3)-f(x+6)+f(x+9)$. Then the function $g(x)=\int_x^{x+12} f(t)\,dt$ is

1) a constant function 2) a linear function of x
3) an exponential function of x 4) a pure quadratic function of x

15. **Statement** (S_1)**:** Let $f(x)=\begin{cases} 5x-7 & \text{for } x\le 2 \\ \int_0^x (1+|1-t|)\,dt & \text{for } x>2 \end{cases}$

Then *f* is not differentiable at $x=2$

Statement (S_2)**:** A function $f(x)$ is not differentiable at $x=a$,if f is not continuous at $x=a$, where $f(x)$ is defined in the neighbourhood of $'a'$

1) S_1 is true, S_2 is true and S_2 is correct explanation for S_1

2) S_1 is true, S_2 is false

3) S_1 is true, S_2 is true but S_2 is not a correct explanation for S_1

4) S_1 is false, S_2 is true

16. If the points $A(z), B(-z), C(1-z)$ in argand plane are vertices of an equilateral triangle, then $z=$

1) $1\pm i\frac{\sqrt{3}}{2}$ 2) $\frac{1}{2}(1\pm i)$ 3) $\frac{1}{4}\left(1\pm\sqrt{3}i\right)$ 4) $\frac{1}{3}\left(1\pm\sqrt{3}i\right)$

17. **Statement** (S_1)**:** If the straight line given by $\bar{r}=\left(2\bar{i}-\bar{j}\right)+\lambda\left(x\bar{i}+2\bar{j}-3\bar{k}\right)$, $\lambda\in R$ and the points with position vectors $\bar{i}+2\bar{j}+3\bar{k}$, $\bar{i}+\bar{j}+\bar{k}$ are coplanar, then the value of x is $-\frac{7}{3}$

Statement (S_2)**:** Three vectors $\bar{a},\bar{b},\bar{c}$ are coplanar iff $\left[\bar{a},\bar{b},\bar{c}\right]=0$

1) S_1 is true, S_2 is true and S_2 is a correct explanation for S_1

2) S_1 is true, S_2 is true and S_2 is not a correct explanation for S_1

3) S_1 is true, S_2 is false 4) S_1 is false, S_2 is true

18. If $(0,1),(1,1)\ and\ (1,0)$ are the mid-points of the sides of ΔABC, then the abscissa of in-centre of ΔABC, is equal to

1) $2\tan\frac{\pi}{8}$ 2) $2\tan\frac{3\pi}{8}$ 3) $\sqrt{2}\tan\frac{\pi}{8}$ 4) $\sqrt{2}\tan\frac{3\pi}{8}$

19. $\int\frac{x+x^{2/3}+x^{1/6}}{x\left(1+x^{1/3}\right)}dx=$

1) $\frac{3}{2}x^{2/3}+\tan^{-1}\left(x^{1/6}\right)+c$ 2) $\frac{2}{3}x^{2/3}+6\tan^{-1}\left(x^{1/6}\right)+c$

3) $\frac{3}{2}x^{2/3}-6\tan^{-1}\left(x^{1/6}\right)+c$ 4) $\frac{3}{2}x^{2/3}+6\tan^{-1}\left(x^{1/6}\right)+c$

20. If $\int_0^x f(t)dt=x+\int_x^1 tf(t)\,dt$, then the value of $f(1)$ is

1) $\frac{1}{2}$ 2) 0 3) 1 4) $-\frac{1}{2}$

SECTION-II

(Numerical ValueAnswerType)

Thissectioncontains5questions.Theanswertoeachquestionisa Numericalvaluescomprisingofpositive

ornegativedecimalnumbers. Eachquestionhas4options(1),(2),(3) and(4)foritsanswer,outof which**ONLY ONE**optioncanbecorrect.
Markingscheme:+4forcorrectanswer,0inallothercases.

21. Let $f(x)=2x^n+\lambda,\ \lambda\in R and\ n\in N\ \ f(4)=133$ and $f(5)=255$ then sum of all the positive integral divisors of $(f(3)-f(2))$ is

22. The area bounded by $y=xe^{|x|}$ and the lines $|x|=1$, y = 0 is (insq.units)

23. A point (a,b) is called a good point if both 'a' and 'b' are integers. The number of good points on the curve xy= 225 are

24. Let A be a non – singular matrix such that $A^{-1}=\begin{pmatrix}1 & 1 & 1\\ 4 & 6 & 8\\ 100 & 100 & 99\end{pmatrix}$. Then the value of $\det(adj(2A))+\det(2A)=$

25. The number of 4 – digit natural numbers, such that the sum of the digits of each number is equal to 9 is

SECTION–I

(SINGLECORRECTANSWER TYPE)

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Markingscheme:+4forcorrectanswer,0ifnotattemptedand-1if notcorrect.

PHYSICS

26. When a body is suspended from a fixed point by a spring, the angular frequency of its vertical oscillations is ω_1. When a different spring is used, the angular frequency is ω_2 . The angular frequency of vertical oscillations when both the springs are used together in series is given by

1) $\omega=\left[\omega_1^2+\omega_2^2\right]^{\frac{1}{2}}$ 2) $\omega=\left[\frac{\omega_1^2+\omega_2^2}{2}\right]^{\frac{1}{2}}$ 3) $\omega=\left[\frac{\omega_1^2\omega_2^2}{\omega_1^2+\omega_2^2}\right]^{\frac{1}{2}}$ 4) $\omega=\left[\frac{\omega_1^2\omega_2^2}{2\left(\omega_1^2+\omega_2^2\right)}\right]^{\frac{1}{2}}$

27. A racing car moves along circular track of radius b. The car starts from rest and its speed increases at a constant rate α. Let the angle between the velocity and the acceleration be θ at time t. Then $(\cos\theta)$ is

1) 0 2) $\alpha t^2/b$ 3) $\frac{b}{\left(b+\alpha t^2\right)}$ 4) $\frac{b}{\left(b^2+\alpha^2t^4\right)^{\frac{1}{2}}}$

28. In cases of real images formed by a thin convex lens, the linear magnification is (I) directly proportional to the image distance, (II) inversely proportional to the object

distance, (III) directly proportional to the distance of image from the nearest principal focus, (IV) inversely proportional to the distance of the object from the nearest principal focus. From these the correct statements are :

1) (I) and (II) only 2) (III) and (IV) only

3) (I) , (II), (III) and (IV) all 4) None of (I), (II), (III) and (IV)

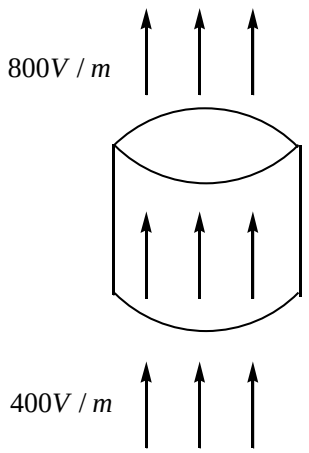
29. A quantity α is defined as $\alpha = \frac{e^2}{4\pi\varepsilon_0 ch}$. where e is electric charge, $h = \frac{h}{2\pi}$ is the reduced Planck'sconstant and c is the speed of light. The dimensions of α are

1) $\left[M^0L^0T^0I^0\right]$ 2) $\left[M^1L^{-1}T^2I^{-2}\right]$ 3) $\left[M^2L^1T^{-1}I^0\right]$ 4) $\left[M^0L^3T^{-1}I^{-2}\right]$

30. A slit of width a is illuminated by parallel monochromatic light of wavelength λ. The value of a at which the first minimum of the diffraction pattern will form at $\theta = 30^0$ is

1) $\lambda/2$ 2) λ 3) 2λ 4) 3λ

31. A cylinder on whose surfaces there is a vertical electric field of varying magnitude as shown. The electric field is uniform on the top surface as well as on the bottom surface therefore, this cylinder encloses



1) no net charge

2) net positive charge

3) net negative charge

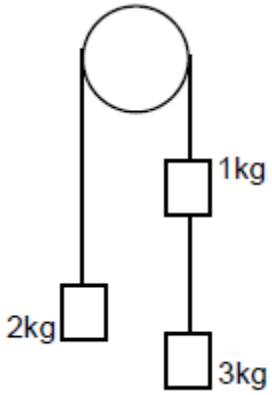
4) There is not enough information to determine whether or not there is net charge inside the cylinder.

32. A coaxial cable consists of two thin cylindrical conducting shells of radii a and b $(a < b)$. The inductance per unit length of the cable is

1) $\frac{\mu_0}{2\pi}\frac{(a-b)}{a}$ 2) $\frac{\mu_0}{4\pi}\ln\left(\frac{a}{b}\right)$ 3) $\frac{\mu_0}{4\pi}\ln\left(\frac{b}{a}\right)$ 4) $\frac{\mu_0}{2\pi}\ln\left(\frac{b}{a}\right)$

33. In the following arrangement the pulley is assumed to be light and the string inextensible. The acceleration of the system can be determined by considering

conservation of a certain physical quantity. The physical quantity conserved and the acceleration respectively, are



1) energy and 2g/3 2) linear momentum and g/3
3) angular momentum and g/3 4) none

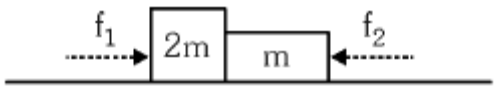
34. A wire in the shape of square frame carries a current I and produces a magnetic field B_S at its centre. Now the wire is bent in the shape of a circle and carries the same current. If B_C is the magnetic field produced at the centre of the circular coil, then B_S / B_C is

1) $8\pi^2$ 2) $\frac{8\pi^2}{\sqrt{2}}$ 3) $\frac{8\sqrt{2}}{\pi^2}$ 4) $8\pi\sqrt{2}$

35. Ultraviolet light of wavelength 300 nm and intensity 1 W/m^2 falls on the surface of a photosensitive material. If one percent of the incident photons produce photoelectrons then the number of photoelectrons emitted per second from and area of $1cm^2$ of the surface is nearly

1) 1.51×10^{13} 2) 1.51×10^{12} 3) 4.12×10^{13} 4) 2.13×10^{11}

36. Two blocks of masses m and 2m are placed on a smooth horizontal surface as shown. In the first case only f_1 is applied from left. Later on only a force f_2 is applied from right. If the force acting at the interface of the two blocks in the two cases is the same, then $f_1 : f_2$ is



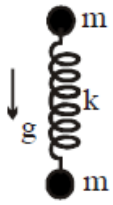
1) 1:1 2) 1:2 3) 2:1 4) 1:3

37. A ball A of mass 1 kg moving at a speed of 5 m/s strikes tangentially another ball B initially at rest. The ball A then moves at right angles to its initial direction at a speed of 4 m/s .If the collision is elastic , the mass (in kg) of ball B and its momentum after collision (in kg – m/s) respectively are approximately)

1) 1.2 and 1.8 2) 2.2 and 3.3 3) 4.6 and 6.4 4) 6.2 and 9.1

38. Two identical rooms in a house are connected by an open doorway. The temperatures in the two rooms are maintained at two different values. Therefore,
1) The room with higher temperature contains more amount of air.
2) The room with lower temperature contains more amount of air.
3) Both the rooms contain the same amount of air.
4) The room with higher pressure contains more amount of air.

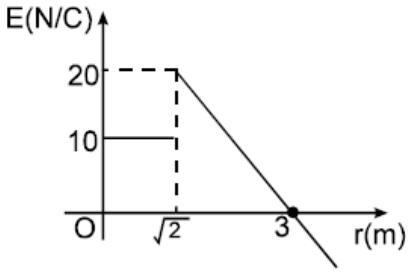
39. A mass m is hung on an ideal massless spring. Another equal mass is connected to the other end of the spring. The whole system is at rest. At t = 0, m is released and the system falls freely under gravity. Assume that natural length of the spring is L_0 its initial stretched length is L and the acceleration due to gravity is g. What is distance between masses as function of time ?



1) $L_0+(L-L_0)\cos\sqrt{\frac{2k}{m}}t$ 2) $L_0+(L-L_0)\cos\sqrt{\frac{k}{m}}t$

3) $L_0-2(L+2L_0)\cos\sqrt{\frac{2k}{m}}t$ 4) $L_0+(L-L_0)\sin\sqrt{\frac{2k}{m}}t$

40. An electric field 'E' whose direction is radially outward varies as distance from origin 'r' as shown in the graph. E is taken as positive if its direction is away from the origin. Then the work done by electric field on a 2 C charge if it is taken from $(1,\ 1,\ 0)$ to $(3,0,0)$ is :



1) $20(3-\sqrt{2})J$ 2) $-60J$ 3) $60J$ 4) $20(\sqrt{2}-3)J$

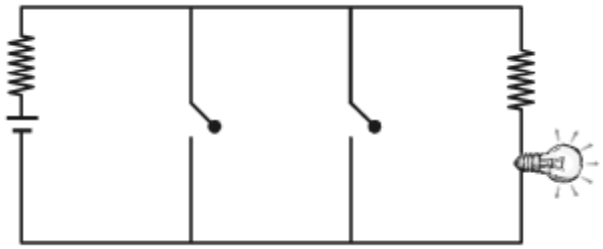
41. A particle of mass 10 g starts from rest at t=0 s from a point (0 m, 4 m) and gets accelerated at $0.5m/s^2$ along $x-\sqrt{3}y+4\sqrt{3}=0$ in XY plane. The angular momentum of the particle about the origin (in SI units) at t = 2 s is

1) $-0.01\sqrt{3}\hat{k}$ 2) $-0.02\sqrt{3}\hat{k}$ 3) zero 4) $-20\sqrt{3}\hat{k}$

42. A thin rod of length l in the shape of a semicircle is pivoted at one of its ends such that it is free to oscillate in its own place. The frequency f of small oscillations of the semicircular rod is

1) $\frac{1}{2\pi}\sqrt{\frac{g\pi}{2l}}$ 2) $\frac{1}{2\pi}\sqrt{\frac{g\sqrt{\pi^2+4}}{2l}}$ 3) $\frac{1}{2\pi}\sqrt{\frac{\sqrt{g(\pi+2)}}{l}}$ 4) $\frac{1}{2\pi}\sqrt{\frac{g(\pi^2+1)}{2\pi l}}$

43. The circuit shown below is equivalent to

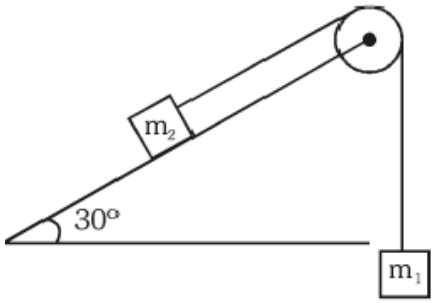


1) OR gate 2) NOR gate 3) AND gate 4) NAND gate

44. A charge (-2Q) is distributed uniformly on a spherical balloon of radius R. Another point charge (+Q) is situated at the centre of the balloon. The balloon is now inflated to twice the radius. Neglecting the elastic energy involved in the process , the change in total electric energy of the system is

1) $\frac{-Q^2}{2\pi\in_0 R}$ 2) $\frac{-Q^2}{4\pi\in_0 R}$ 3) $\frac{+Q^2}{4\pi\in_0 R}$ 4)Zero

45. Masses m_1 *and* m_2 are connected to a string passing a pulley as shown, Mass m_1 starts from rest and falls through a distance d in time t. Now, by inter charging the masses the time required for m_2 to fall through the same distance is 2t . Therefore, the ratio of masses $m_1 : m_2$ is



1) $\frac{2}{3}$ 2) $\frac{3}{2}$ 3) $\frac{5}{2}$ 4) $\frac{4}{3}$

SECTION-II

(Numerical ValueAnswerType)

Thissectioncontains5questions.Theanswertoeachquestionisa Numericalvaluescomprisingofpositive ornegativedecimalnumbers. Eachquestionhas4options(1),(2),(3) and(4)foritsanswer,outof which**ONLY ONE**optioncanbecorrect.
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46. A small pond of depth 0.5m deep is exposed to a cold winter with outside temperature of 263K. Thermal conductivity of ice is $K = 2.2 W m^{-1} K^{-1}$, latent heat $L = 3.4 \times 10^5\ Jkg^{-1}$ and density $\rho = 0.9 \times 10^3$. Take the temperature of the pond to be 273 K. The time taken for the whole pond to freeze is about (in days)

47. A body of mass 4 kg moves under the action of a force $\vec{F} = \left(4\hat{i} + 12t^2\,\hat{j}\right) N$. where t is the time in second. The initial velocity of the particle is $\left(2\hat{i} + \hat{j} + 2\hat{k}\right) ms^{-1}$. If the force is applied for 1 s, work done is (in J)

48. A small fish, 4cm below the surface of a lake, is viewed through a thin converging lens of focal length 30 cm held 2 cm above the water surface. Refractive index of water is 1.33. The image of the fish from the lens is at a distance of (in cm)

49. Two moles of hydrogen are mixed with n moles of helium. The root mean square speed of gas molecules in the mixture is $\sqrt{2}$ times the speed of sound in the mixture. Then n is.

50. A vibrator of frequency f is placed near one end of a long cylindrical tube. The tube is fitted with a movable piston at the other end. An observer listens to the sound through a side opening. As the piston is moved through 8.75 cm, the intensity of sound recorded by the observer changes from a maximum to a minimum. If the speed of sound in air is 350 m/s, the frequency f is(in Hz)

SECTION–I

(SINGLECORRECTANSWER TYPE)

Thissectioncontains20multiplechoicequestions.Eachquestionhas4options(1),(2),(3)and(4)forits answer,outofwhich**ONLYONE**optioncan becorrect.
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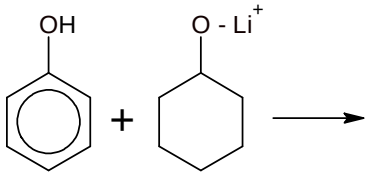
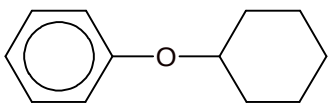
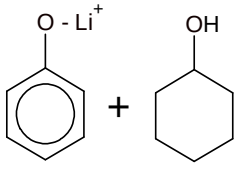
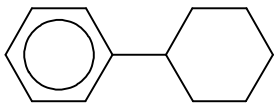
CHEMISTRY

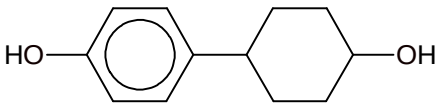
51. 

What is/are the product(s) of the above reaction?

1) 

2) 

3) 

4) 

52. Identify the correct statement of the following
A) Hypo forms super saturated solutions

B) on thermal decomposition hypo gives H_2S, SO_2 and S.

C) Dilute sodium thiosulphate, on reaction with $AgNO_3$ finally gives black ppt. of Ag_2S

D) AgBr can be used in making photo graphic films.

1) A, B, C 2) B, C, D 3) A, C, D 4) A, B, C, D

53. Specify the coordination geometry around and hybridisation of N and B atoms in a 1 : 1 complex of BF_3 and NH_3

1) N : tetrahedral, sp^3 ; B–tetrahedral, sp^3

2) N–Pyramidal, sp^3; B–pyramidal, sp^3

3) N–pyramidal, sp^3; B–planar, sp^2

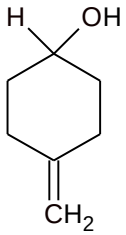
4) N–pyramidal, sp^3; B–tetrahedral – sp^3

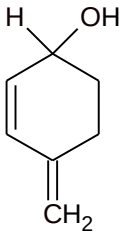
54. Two components A and B form an ideal solution. The mole fractions of A and B in ideal solution are X_A and X_B, while that of in vapour phase, these components have their mole fractions as Y_A and Y_B. Then, the slope and intercept of plot of $\frac{1}{Y_A} vs \frac{1}{X_A}$ will be :

1) $\frac{P_A^0}{P_B^0}, \frac{P_B^0 - P_A^0}{P_B^0}$ 2) $\frac{P_B^0}{P_A^0} . \frac{P_A^0 - P_B^0}{P_A^0}$.

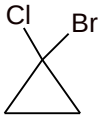
3) $\frac{P_B^0}{P_A^0}, \frac{P_B^0}{P_3^0 - P_A^0}$ 4) $P_A^0 - P_B^0, \frac{P_A^0}{P_B^0}$

55. Which of the following compounds posses a chiral centre?

1) 

2) 

3) 

4) 

56. Which of the following has the minimum heat of dissociation:

1) $[(CH_3)_3 N \rightarrow BF_3]$ 2) $[(CH_3)_3 N \rightarrow B(CH_3)F_2]$

3) $[(CH_3)_3 N \rightarrow B(CH_3)_2 F]$ 4) $[(CH_3)_3 N \rightarrow B(CH_3)_3]$

57. Which among the following is most soluble in water?

1) $CsClO_4$ 2) $NaClO_4$ 3) $LiClO_4$ 4) $KClO_4$

58. $C_6H_5 - CO - CH_2 - CH_2 - CH_2 - COOH \rightarrow C_6H_5 - CO - CH_2 - CH_2 - CH_2 - CD_2OH$.

This conversion is done by

1) $NaBH_4 / H_3O^+$ followed by $LiAlD_4 / H_2O$

2) $LiAlD_4 / H_2O$ followed by $NaBH_4 / H_3O^+$

3) $(CH_2OH)_2$ followed by $LiAlD_4 / H_3O^+$

4) $DMgBr / H_3O^+$

59. On heating potassium ferrocyanide with conc. H_2SO_4 produces a neutral gas 'A'. The gas 'A' on treatment with caustic soda under high pressure produced 'B', what are 'A' and 'B' respectively.

1) CO_2, Na_2CO_3 2) SO_2, Na_2SO_4

3) CO, HCOONa 4) NO_2, $NaNO_3$

60. Among the following statements, the incorrect one is :

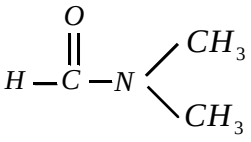
1) Calamine and siderite are carbonates

2) Argentite and cuprite are oxides

3) Zinc blende and pyrites are sulphides

4) Malachite and azurite are ores of copper

61. An organic compound upon hydrolysis produces two compounds one product gave silver mirror test, other product reacts with Hinsberg reagent to produce an alkali insoluble product. The organic compound is

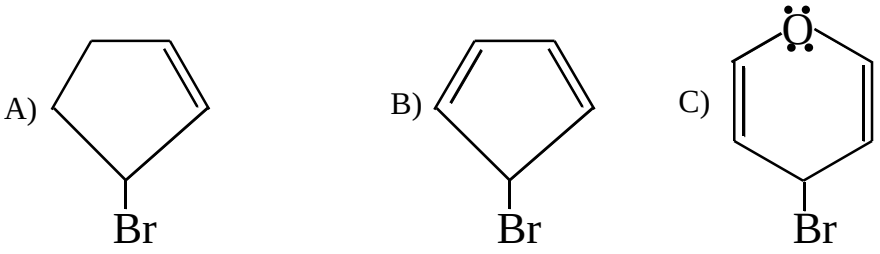
1) $CH_3-CH_2-\overset{O}{\overset{\|}{C}}-NHCH_3$ 2) 

3) $CH_3-CH_2-\overset{O}{\overset{\|}{C}}-NH_3$ 4) $H-\overset{O}{\overset{\|}{C}}-NH-CH_2-CH_3$

62. 100 ml of a sample of hard water after passing through cation exchange resin, required 20ml of 0.05M NaOH for neutralisation. One litre of same sample of water on treatment with sufficient lime gave 200mg of $CaCO_3$. Assuming that the hardness is only due to Ca^{+2} ions. Find the degree of permanent hardness of water.

1)300ppm 2)150ppm 3) 100ppm 4) 200ppm

63. Arrange the following bromides in the increasing order of reactivity towards $AgNO_3$



1) $C<A<B$ 2) $C>A>B$ 3) $B<A<C$ 4) $A<B<C$

64. Bond dissociation energy of XY, X_2 and Y_2 (all diatomic molecules) are in the ratio 1:1: 0.5 and ΔH_f of XY is –200 kJ mol^{-1}. The bond dissociation energy of X_2 will be:

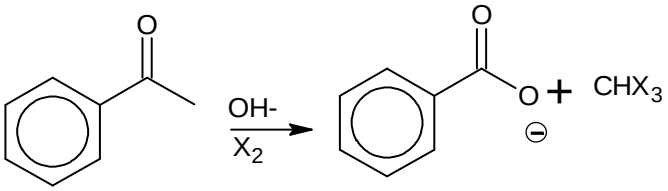
1) 800 kJ mol^{-1} 2) 200 kJ mol^{-1}

3) 300 kJ mol^{-1} 4) 400 kJ mol^{-1}

65. The compound insoluble in acetic acid is

1) Calcium oxide 2) Calcium carbonate

3) Calcium oxalate 4) Calcium hydroxide

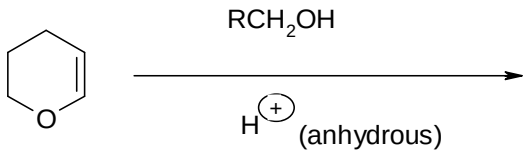
66. 

Which of the following is correct comparison of rate of haloform reaction with various halogens ?

1) $rCl_2 > rBr_2 > rI_2$ 2) $rI_2 > rBr_2 > rCl_2$

3) $rBr_2 > rCl_2 > rI_2$ 4) $rCl_2 \approx rBr_2 \approx rI_2$

67. The major product of the following reaction is



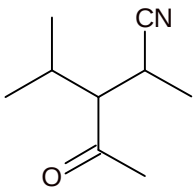
1) A hemiacetal 2) An acetal 3) An ether 4) An ester

68. The compressibility of a gas is less than unity at STP. Therefore,

1) $V_m > 22.4\,L$ 2) $V_m < 22.4\,L$ 3) $V_m = 22.4\,L$ 4) $V_m = 44.8\,L$

69. Nitrogen dioxide cannot be obtained by heating

1) KNO_3 2) $Pb(NO_3)_2$ 3) $Cu(NO_3)_2$ 4) $AgNO_3$

70. The IUPAC name of 

is

1) 2-methyl-3-(1-methylethyl)-4-oxopentanenitrile

2) 4-cyano–3-(1-methylethyl)–2–pentanone

3) 3-acetyl–2–cyano–4–methylpentane

4) 3–ethanoyl–2–methyl–3–(1–methylethyl) pentanenitrile

SECTION-II

(Numerical ValueAnswerType)

Thissectioncontains5questions.Theanswertoeachquestionisa Numericalvaluescomprisingofpositive ornegativedecimalnumbers. Eachquestionhas4options(1),(2),(3) and(4)foritsanswer,outof which**ONLY ONE**optioncanbecorrect.

Markingscheme:+4forcorrectanswer,0inallothercases.

71. Calculate the pH at which $Mg(OH)_2$ begins to precipitate from solution containing 0.1 M Mg^{+2} ions. Ksp for $Mg(OH)_2$ is 1.0×10^{-11}

72. Consider a titration of potassium dichromate solution with acidified Mohr's salt solution using diphenylamine as indicator. The number of moles of Mohr's salt required per mole of dichromate is

73. The total number of lone pairs of electrons in N_2O_3 is

74. How many of the following substances are more acidic than Phenol?
O-Cresol, P-Cresol, ethyl alcohol, 2,4 di methyl phenol, m - methoxy phenol, P- ethyl phenol, m – Amino phenol

75. How many effective Na^+ ions are present in rock salt NaCl if ions along one axis joining opposite faces are removed?

SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

OUTGOING SR MPC | **JEE MAINS GT- 10** | **Date: 26-07-2020**

Time: 3 Hours | **Max Marks : 300**

KEY SHEET

MATHS

1	**4**	2	**3**	3	**1**	4	**4**	5	**4**
6	**4**	7	**1**	8	**4**	9	**3**	10	**2**
11	**1**	12	**4**	13	**1**	14	**1**	15	**3**
16	**3**	17	**1**	18	**3**	19	**4**	20	**1**
21	**60**	22	**2**	23	**18**	24	**12**	25	**165**

PHYSICS

26	**3**	27	**4**	28	**2**	29	**1**	30	**3**
31	**2**	32	**4**	33	**1**	34	**3**	35	**2**
36	**3**	37	**3**	38	**2**	39	**1**	40	**1**
41	**2**	42	**2**	43	**2**	44	**4**	45	**2**
46	**25**	47	**16**	48	**6**	49	**2**	50	**1000**

CHEMISTRY

51	**2**	52	**4**	53	**1**	54	**2**	55	**2**
56	**4**	57	**3**	58	**3**	59	**3**	60	**2**
61	**2**	62	**1**	63	**3**	64	**4**	65	**3**
66	**4**	67	**2**	68	**2**	69	**1**	70	**1**
71	**9**	72	**6**	73	**8**	74	**2**	75	**3**

SOLUTIONS

MATHS

1. Clearly $|a - a| < 1 \setminus$ Reflexive

   If $|a - b| < 1 \text{Þ} |b - a| < 1 \setminus$ Symmetric but it need not be transitive

2. $A(adjA) = |A| I; |A| = 29$

3. $3\sin P + 4\cos Q = 6$ .....(1)

   $4\sin Q + 3\cos P = 1$ .....(2)

   From the above, $\underline{|P}$ is obtuse

   Now squaring and adding gives $\sin(P+Q) = \frac{1}{2} \Rightarrow P+Q = \frac{5\pi}{6} \Rightarrow R = \frac{\pi}{6}$

4. If z_1, z_2, z_3 are collinear and $az_1 + bz_2 + cz_3 = 0$ then a+b+c =0 .Hence

   $1 + |\sin\theta| + |\cos\theta| - 1 - \sqrt{2} = 0 \Rightarrow |\sin\theta| + |\cos\theta| = \sqrt{2} \Rightarrow \theta = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

5. Put x = i

   Then $(a_0 - a_2 + a_4 - a_6 + ...) + i(a_1 - a_3 + a_5 - a_7 + ...) = 0$

   (1)(2)are true (by comparison of real parts and Im. Parts, both (1) (2) are true.

   $(\because a_0 = 1)$

   Put x = - 1, then $a_0 - a_1 + a_3 - a_3 + ... + a_{30} = 0$

   \ (3)is false

6. Reqd. plane is $\begin{vmatrix} x-1 & y+1 & z-3 \\ 2 & -1 & 4 \\ 1 & 2 & 1 \end{vmatrix} = 0;$ $9x - 2y - 5z + 4 = 0$

7. Normals to $y^2 = 4x$ and $x^2 = 4y$ interms of 'm' are $y = mx - 2m - m^3$ and

   $y = mx + 2 + \frac{1}{m^2}$ for common normal $2 + \frac{1}{m^2} + 2m + m^3 = 0$

   $\Rightarrow am^5 + 2am^3 + 2bm^2 + b = 0$ atmost 5 common normals.but only one real

8. A(8, 0), B(0, 12). Midpoint of $\overline{AB}$ is (4, 6)

Equation to the perpendicular bisector of $\overline{AB}$ to $2x-3y+10=0$ ---- (1)

The line through (0, -1) and parallel to x-axis is y = -1 ----(2)

Solving (1) and (2); C (-13/2, -1)

9. $\frac{1}{4}\pi\left(R^2-r^2\right)=\frac{3\pi}{4}$ [$\because a+b=0$ angle between pair of lines in $90°$]

10. $\sum_{\pi=0}^{2} p(x_i)=1\Rightarrow c=1/3 \quad P(0<x<3)=P(x=1)+P(x=2)$

11. $\tan\alpha=\frac{a}{x},\tan\beta=\frac{b}{x},\tan\gamma=\frac{c}{x} \quad \alpha+\beta+\gamma=180^0\Rightarrow\sum\tan\alpha=\pi\tan\alpha$

12. $\left(1+x^2\right)\frac{dy}{dx}+2xy=3x^2$ *or* $\frac{dy}{dx}+\left(\frac{2x}{1+x^2}\right)y=\frac{3x^2}{1+x^2}$

This is of the form $\frac{dy}{dx}+Py=Q$

I.F = $e^{\int P\,dx}=1+x^2$ and hence

$y\left(1+x^2\right)=\int\left(1+x^2\right)\left(\frac{3x^2}{1+x^2}\right)dx\Rightarrow y\left(1+x^2\right)=x^3+C$

put x = y = 2 then C = 2 and the curve is given by $y-2=x^3-x^2y$

13. α,β,γ are roots of $(x-1)^3=-8$

$\Rightarrow\alpha-1,\beta-1,\gamma-1$ are equal to $-2,-2\omega,-2\omega^2$ in any order

then $\frac{\alpha-1}{\beta-1}+\frac{\beta-1}{\gamma-1}+\frac{\gamma-1}{\alpha-1}=3\omega^2$ *or* $3\omega=3(\omega)^{3k+1}$ *or* $3(\omega)^{3k+2}$ *where* $k\in Z$

$\therefore p=3, q=3k+1$ *or* $3k+2$

$p+q=15$ Þ $k=\frac{11}{3}$ *or* $\frac{10}{3}$ which is not possible

14. $f(x)=f(x+3)-f(x+6)+f(x+9)$

Replacing x with x + 3

$f(x+3)=f(x+6)-f(x+9)+f(x+12)$

Adding we get $f(x)=f(x+12)$

Now $g(x)=\int_{x}^{x+12} f(t)\,dt$ Þ $g'(x)=f(x+12)-f(x)=0\ \forall x$

$\therefore g(x)$ is a constant function

15. $\int_0^x \left(1+|1-t|\right)dt = \int_0^1 (2-t)\,dt + \int_1^x t\,dt = \frac{x^2}{2}+1$

$\therefore f(x) = 5x-7$ for $x \le 2$ and $\frac{x^2}{2}+1$ for $x > 2$

At x = 2, L.H.L = R.H.L = 3. But L.H.D ¹ R. H. D

$\therefore$ f is continuous at x = 2, but not differentiable at x = 2 $\therefore$ S_1 is true.

S_2 is true (conceptual), but S_2 is not correct explanation of S_1

16. $z_1^2 + z_2^2 + z_3^2 = z_1z_2 + z_2z_3 + z_3z_1$ where $z_1 = z, z_2 = -z, z_3 = 1-z$

$\Rightarrow 4z^2 - 2z + 1 = 0 \Rightarrow z = \frac{1}{4}(1 \pm \sqrt{3}i)$

17. $\bar{r} = \bar{a} + \lambda\bar{b}$ is passing through $A(\bar{a}) = (2,-1,0)$ and is parallel to $\bar{b} = x\bar{i} + 2\bar{j} - 3\bar{k}$.

It is coplanar with points B = (1,2,3), C = (1,1.1)

$\Leftrightarrow \bar{b}, \overline{CA}, \overline{AB}$ are coplanar

$\Rightarrow \left[\bar{b}\ \overline{CA}\ \overline{CB}\right] = \begin{vmatrix} x & 2 & -3 \\ 1 & -2 & -1 \\ 0 & 1 & 2 \end{vmatrix} = 0$

Solving $x = -\frac{7}{3}$

18. $D(0,1), E(1,1); F(1,0)$ are mid-points of BC, CA, AB of ΔABC

$\Rightarrow A(2,0);\ B(0,0);\ C(0,2)$

Abscissa of $I = \frac{ax_1 + bx_2 + cx_3}{a+b+c}$

$= \frac{2(2)+0+0}{2+2+2\sqrt{2}} = \frac{4}{2\left(2+\sqrt{2}\right)} = 2-\sqrt{2} = \sqrt{2}\left(\sqrt{2}-1\right) = \sqrt{2}\tan\frac{\pi}{8}$

19. $x = t^6$

$\int \frac{\left(t^6+t^4+t\right)6t^5}{t^6\left(t^2+1\right)}dt = 6\int \frac{t^5+t^3+1}{t^2+1}dt$

$$6\int\left(t^3+\frac{1}{t^2+1}\right)dt=\frac{3t^4}{2}+6\tan^{-1}t$$

20. Using Leibnitz rule

21. $f(x)=2x^n+\lambda,\ f(4)=133\ ,\ f(5)=255$

$\therefore\ f(4)=2.4^n+\lambda=133$ ……..(i)

$f(5)=2.5^n+\lambda=255$ ……..(ii)

$\therefore\ f(5)-f(4)=2\left(5^n-4^n\right)=122$

$\Rightarrow 5^n-4^n=5^3-4^3\Rightarrow n=3$

$\therefore\ f(4)=133=2\times4^3+\lambda\ \therefore\lambda=5$

$\therefore\ f(x)=2x^3+5$

$\therefore\ f(3)=59$ and $f(2)=21$

$\therefore\ f(3)-f(2)=38=2\times19=2^a19^b,\ (a=1,b=1)$

Sum of factors $f(3)-f(2)=\dfrac{2^{a+1}-1}{2-1}.\dfrac{19^{b+1}-1}{19-1}=\dfrac{3\times360}{18}=60$

22. $y=xe^{|x|}=\begin{cases}xe^{-x}, & -1<x<0\\ xe^{x}, & 0<x<1\end{cases}$, $R.A=\left|\int_{-1}^{0}xe^{-x}dx\right|+\left|\int_{0}^{1}xe^{-x}dx\right|$

$=\left|-xe^{-x}-e^{-x}\right]_{-1}^{0}\Big|+\left|xe^{x}-e^{x}\right]_{0}^{1}\Big|\qquad=\left|-1-e+e\right|+\left|e-e-0+1\right|=2$

Area of $\Delta ABC=\dfrac{1}{2}\begin{vmatrix}8-0 & 0-12\\ 8+13/2 & 0+1\end{vmatrix}=\dfrac{1}{2}\begin{vmatrix}8 & -12\\ 29/2 & 1\end{vmatrix}=\dfrac{1}{2}\left|8\times1+12\times\dfrac{29}{2}\right|=\dfrac{1}{2}\times182=91$

23. The order pair (x,y) satisfying $xy=225$ are $(1,225),(3,75),(5,45),(9,25)$ *and* $(15,15)$ and order can be changed for first four pairs and both x and y can be negative also. The required pairs = 5+ 5 + 4 + 4 =18

24. By $R_3\to R_3-100R_1$, $\det\left(A^{-1}\right)=\begin{vmatrix}1 & 1 & 1\\ 4 & 6 & 8\\ 0 & 0 & -1\end{vmatrix}=-2$

$$\det\left(A^{-1}\right)=\frac{1}{\det(A)}\Rightarrow\det(A)=\frac{-1}{2}$$

$$\left|Adj\,(2A)\right|=\left|2A\right|^2=\left(2^3\left|A\right|\right)^2=16$$

$$\text{and}\left|2A\right|=2^3\left|A\right|=-4$$

$$\therefore\left|Adj\,(2A)\right|+\left|2A\right|=12$$

25. If $abcd$ is 4 – digit natural number

Then $a+b+c+d=9,$ and $a,b,c,d\in\{0,1,2,....,9\}$ $and\ a\neq0$

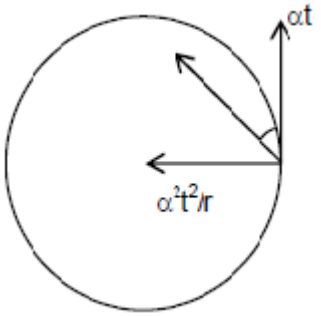
Number of solutions of $(a-1)+b+c+d=8\,is\left({}^{11}C_3\right)=165$

PHYSICS

26. $\omega_1=\sqrt{\frac{k_1}{m}}\qquad\omega_2=\sqrt{\frac{k_2}{m}}$

$$\omega_2=\sqrt{\frac{k_1k_2}{(k_1+k_2)m}}=\sqrt{\frac{1}{m\left(\frac{1}{k_2}+\frac{1}{k_1}\right)}}=\sqrt{\frac{1}{\frac{1}{\omega_2^2}+\frac{1}{\omega_1^2}}}=\frac{\omega_1\omega_2}{\sqrt{\omega_2^1+\omega_2^2}}$$

27.



$$\cos\theta=\frac{\alpha}{\sqrt{\alpha^2+\frac{2\alpha^4t^4}{b^2}}}=\frac{b}{\sqrt{b^2+\alpha^2t^4}}$$

28. $m=\frac{v}{u}\Rightarrow\frac{1}{v}-\frac{1}{u}=\frac{1}{f}\Rightarrow t-\frac{v}{u}=\frac{v}{f}\Rightarrow1-m=\frac{v}{f}$

$$m=1-\frac{v}{f}=\frac{f-v}{f}\ \text{and}\ \frac{u}{v}-1=\frac{u}{f}\Rightarrow\frac{u}{v}=\frac{1+u}{f}=\frac{f+u}{f}$$

$$m=\frac{u}{v}=\frac{f}{f+u}$$

$$u=-(f+x)\Rightarrow m=\frac{f}{f-f-x}=\frac{f}{x}$$

$v = f + y \Rightarrow m = \dfrac{f - f - y}{f} = -\dfrac{y}{f}$

$m \propto \dfrac{1}{x}, m \propto \dfrac{1}{y}$

29. $[\alpha] = \left[\dfrac{e^2}{\varepsilon_0}\right]\left[\dfrac{1}{hc}\right]$

$= \left[Fr^2\right]\dfrac{1}{[E\lambda]}$

$= \left[M^1T^{-2}L^2\right]\dfrac{1}{\left[M^1L^{-2}T^1\right]} = \left[M^1L^{-3}T^2\right] = \left[M^0L^0T^0\right]$

30. $a\sin 30^0 = \lambda \Rightarrow a = 2\lambda$

31. consider a Gaussian surface

$\phi = (800 - 400)A = \dfrac{\phi_n}{\varepsilon_0}$

32. $\dfrac{\rho A}{\rho l} = \dfrac{1}{2} \Rightarrow \dfrac{\rho A}{\rho B} = \dfrac{1}{3}$.

$\rho_A Vg + \rho_B Vg = \rho l_2 Vg$

$\rho_A + \rho_B = 2\rho_e$

$\rho_B = 3\rho_A$

$\rho_t = 2\rho_A$

$\rho_t = \rho_A : \rho_B == 2:1:3$

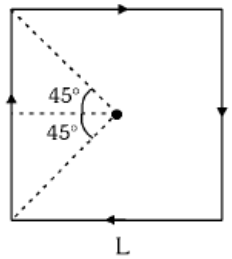
33. No dissipative forces so total mech energy is conserved

$(3+1)gx - 2gx = \dfrac{1}{2}(3+1+2)v^2$

$\Rightarrow 2gx = 3v^2$

$\Rightarrow 2gv = 6v\dfrac{dv}{2dt}$

$\Rightarrow \dfrac{dv}{dt} = \dfrac{g}{3}$



34.

$$B_S = 4\left[\frac{\mu_0 I}{4\pi\frac{L}{2}}\left(\sqrt{2}\right)\right]$$

$$= \frac{2\mu_0 I\sqrt{2}}{\pi L}$$

$$B_c = \frac{\mu_0 I}{2R} \text{ and } 2\pi R = L4; R = \frac{4L}{2\pi}$$

$$\frac{\mu_0 I}{2(L)4}2\pi = \frac{\mu_0 I\pi}{4L}$$

$$\frac{B_S}{B_C} = \frac{2\sqrt{2}/\pi}{\pi} = \frac{2\sqrt{2}}{\pi^2}.4\frac{8\sqrt{2}}{\pi^2}$$

35. No of photo $e^- - \frac{IA}{(hc/\lambda)}\left(\frac{\eta}{100}\right)$

$$\frac{1\left(10^{-4}\right)\left(300\times10^{-9}\right)}{\left(6.626\times10^{-34}\right)\left(3\times10^{8}\right)}\left(\frac{1}{100}\right)$$

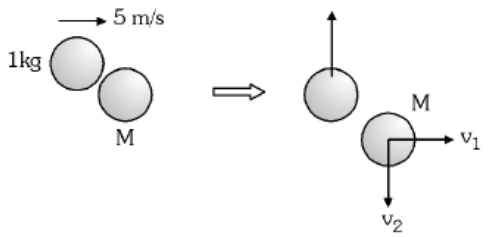
$$= (0.151)\times10^{18}$$

$$= 1.51\times10^{12}$$

36. $\frac{f_1(m)}{3m} = \frac{f_2(2m)}{3m}$

$$\frac{f_1}{f_2} = 2$$

37.



$(1)(4) = Mv_2$

$1(5) = M(V_1)$

$\Rightarrow \frac{v_1}{v_2}\frac{5}{4}$

Now $\frac{1}{2}(1)(5)^2 = \frac{1}{2}(1)(4)^2 + \frac{1}{2}M\left(v_1^2 + v_2^2\right)$

$\frac{9}{2} = \frac{1}{2}M\left[\frac{25}{M^2} + \frac{16}{M^2}\right]$

$M = \frac{41}{9} = 4.55$ and $P = \sqrt{4^4 + 5^2} = \sqrt{41} = 6.4$

38. nT is constant

39. In CM frame both the masses execute SHM with

$\omega = \sqrt{\frac{k}{\mu}} = \sqrt{\frac{2k}{m}}$ *SHM*

Initially particles are at extreme

Distance $= L_0 + (L - L_0)\cos\sqrt{\frac{2k}{m}}t$

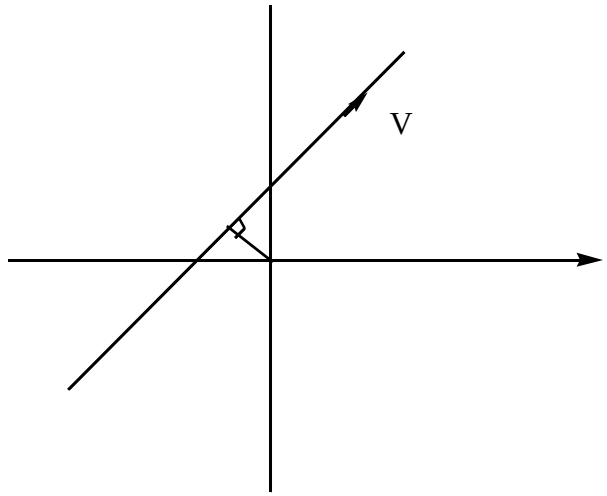
40. Work done on 2 C charge $= \int q\vec{E}.d\vec{r} = q\int_1^3 Edr$

$\left[\because r \text{ for } (1,1,0) = \sqrt{2} \quad r \text{ for } (3,0,0) = 3\right]$

$= 2\times$ area of E – r graph from $r = \sqrt{2}$ *m to* $r = 3$

$= 2\times\left[\frac{1}{2}\left(3-\sqrt{2}\right)20\right] = 20\left(3-\sqrt{2}\right)J.$

41.



$d = 2\sqrt{3}$

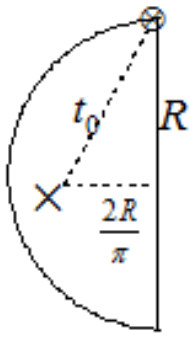
Velocity at t = 2 s is v = 1 m/s

$\vec{L} = mvd\left(-\hat{k}\right)$

$= 0.01 \times 1 \times 2\sqrt{3}\ \hat{k}$

$= -0.02\sqrt{3}\ \hat{k}$

42. Length of rod $l = \pi R$

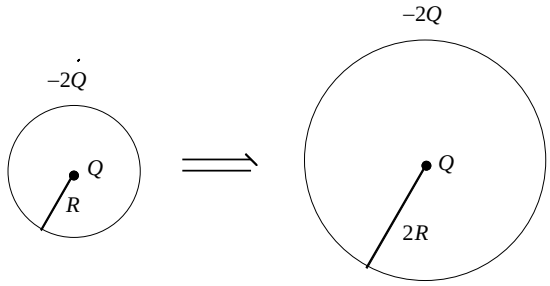


$\because f = \frac{1}{2\pi}\sqrt{\frac{mg\ell_0}{1}}$

$= \frac{1}{2\pi}\sqrt{\frac{mg \times \left(\frac{2R}{\pi}\right)^2}{2mR^2}} = \frac{1}{2\pi}\sqrt{\frac{g\sqrt{1+\frac{4}{\pi^2}}}{2R}} = \frac{1}{2\pi}\sqrt{\frac{g\sqrt{\pi^2+4}}{2\pi R}} = \frac{1}{2\pi}\sqrt{\frac{g\sqrt{\pi^2+4}}{2\ell}}$

43. NOR gate. When either of the switch is closed output is high (Bulb turns on)

44. $U_1 = \frac{k(-2Q)^2}{2R} - \frac{KQ(2Q)}{R} = 0$



$$U_1 = \frac{K(-2Q)^2}{4R} - \frac{KQ(2Q)}{2R} = 0$$

So no change

45. $\frac{1}{2}a_1t^2 = \frac{1}{2}a_2(2t)^2$

$a_1 = 4a_2$

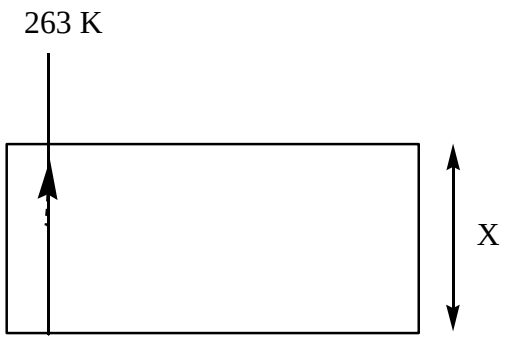
$$\frac{m_1g - \frac{m_2g}{2}}{m_1 + m_2} = \frac{4\left(m_2g - \frac{m_1g}{2}\right)}{m_1 + m_2}$$

$$m_1 - \frac{m_2}{2} = \left(m_2 - \frac{m_1}{2}\right)4$$

$$3m_1 = \frac{9}{2}m_2$$

$$\frac{m_1}{m_2} = \frac{3}{2}$$

46.



$$\frac{KA(10)}{x} = L\frac{d}{dt}(\rho Ax)$$

$$\frac{2.2\times(10)}{x} = 3.4\times10^5\times0.9\times10^3\frac{dx}{dt}$$

$$\frac{22}{3.4\times0.9\times10^{8}}\int_{0}^{t}dt=\int_{0}^{0.5}xdx$$

$$\frac{22}{306\times10^{6}}t=\frac{1}{2}(0.5)^{2}$$

$$t=\frac{(0.5)^{2}\times306\times10^{6}}{44}\sec=\frac{306}{44\times4}\times10^{6}\sec$$

$$=\frac{306000\times10^{3}}{44\times4\times24\times3600}\approx20\,days$$

47. $\int\vec{f}dt=\Delta\vec{\rho}$

$$\int_{0}^{1}\left(4\hat{i}+12\hat{t}\right)dt=m\left(\vec{v_t}-\vec{v_i}\right)$$

$$\Rightarrow4\hat{i}+\frac{12}{3}t^{3}\Big|_{0}^{1}\hat{j}=4\left(\vec{v_t}-\vec{v_1}\right)$$

$$\Rightarrow i+j=\vec{v}_1-\left(2\hat{i}+\hat{j}+2\hat{k}\right)$$

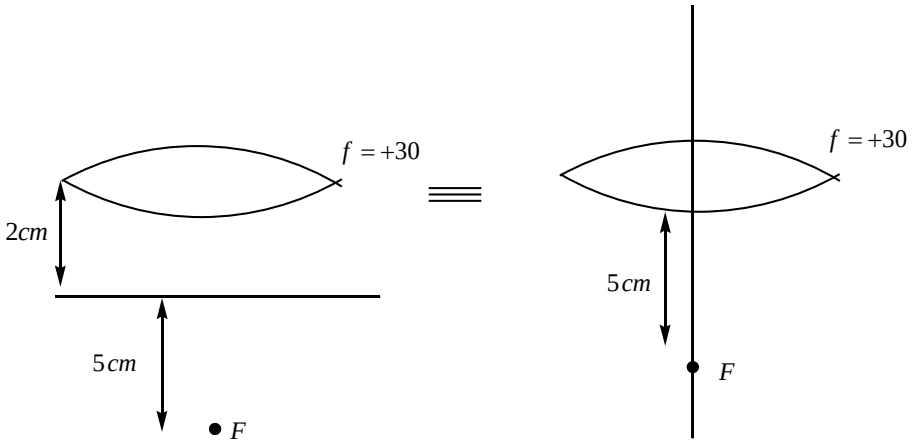
$$\Rightarrow\vec{v}_1=3\hat{i}+2\hat{j}+2\hat{k}$$

$$\Rightarrow\left|\vec{v}_1\right|=\sqrt{9+4+4}=\sqrt{17}$$

$$\Rightarrow\left|\vec{v}_1\right|=\sqrt{4+1+4}=3$$

$$\Delta K.E=\frac{1}{2}4(17-9)=2\times8=16J$$

48.



water $m=\frac{4}{3}$

$$\frac{1}{v}-\frac{1}{-5}=\frac{1}{30}\Rightarrow\frac{1}{v}=\frac{1}{30}-\frac{6}{30}$$

$\frac{1}{v} = -\frac{5}{30}$

$v = -6cm$

49. $V_{rms} = \sqrt{\frac{3Rt}{M_{mix}}}$

$V_{sound} = \sqrt{\frac{\gamma Rt}{M_{mix}}}$

$V_{rms} = \sqrt{2}V_{sound}$

$\sqrt{\frac{3RT}{M_{Mix}}} = \sqrt{2}\sqrt{\frac{\gamma RT}{M_{mix}}}$

$r = \frac{3}{2}$

$r_{mix} = \frac{n_1 C_{P_1} + n_2 C_{P_2}}{n_1 C_{v_1} + n_2 C_{v_2}}$

$\frac{3}{2} = \frac{2\times\frac{7R}{2} + n\times\frac{5R}{2}}{2\times\frac{5R}{2} + n\times\frac{3R}{2}} \Rightarrow \frac{3}{2} = \frac{14-5n}{10+3n} \Rightarrow 30+9n = 28+10n \Rightarrow n = 2$

50. $\frac{\lambda}{4} = 8.75$

$\lambda = 35cm = 0.35m$

$f = \frac{v}{\lambda} = 1000\ Hz$

CHEMISTRY

51. $R-OH < Ph-OH$ (Acidic Strength)

52. Conceptual

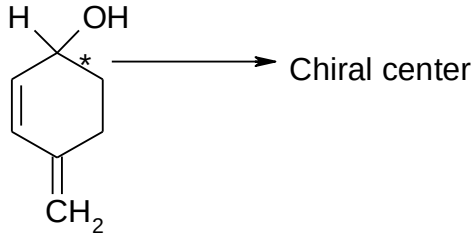
53. Conceptual

54. Conceptual

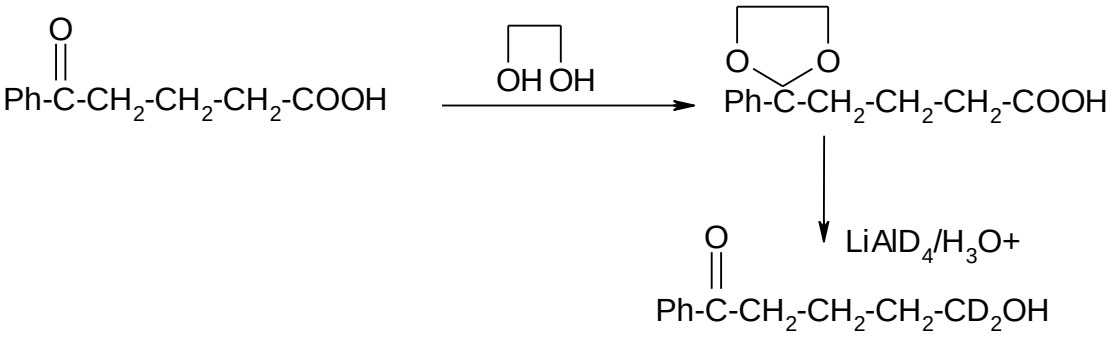
55. 1, 3, 4 $\rightarrow$ contains plane of symmetry

56. Conceptual

57. Conceptual



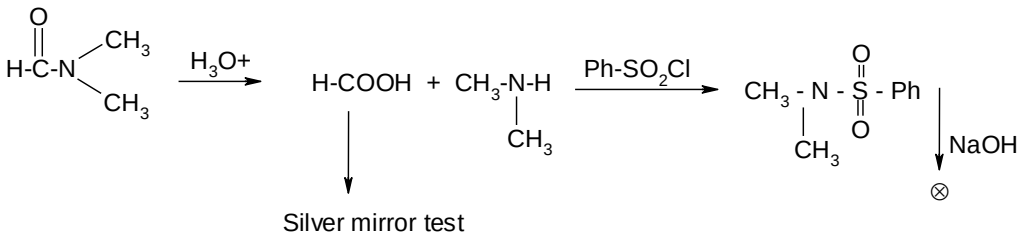
58.



59. Conceptual

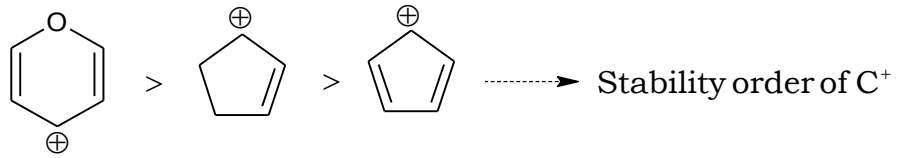
60. Conceptual

61.



62. Conceptual

63.



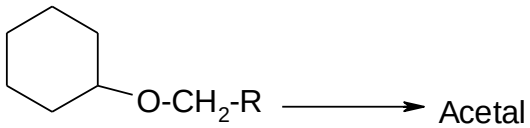
64. $X_2 + Y_2 \square \quad 2xy$

$$\frac{1}{2}x_2 + \frac{1}{2}y_2 \rightarrow xy \qquad \Delta H = -200$$

$$\frac{1}{2}BEX_2 + \frac{1}{2}BEY_2 - B.EXY = -200$$

65. Conceptual

66. formation of enol is rate determining step.

67. 

68. $z = \frac{VR}{Vi}$

69. Conceptual

70. Conceptual

71. $\left[Mg^{+2}\right]\left[OH^{-}\right]^{2} = 10^{-11}$

$\left[OH^{-}\right]^{2} = \frac{10^{-11}}{0.1} = 10^{-10} \Rightarrow P^{OH} = 5$

$P^{H} = 9$

72. $Cr_2O_7^{-2} + Fe^{+2} \rightarrow Cr^{+3} + Fe^{+3}$ ($6e^{-}$ gained by $Cr_2O_7^{-2}$; $1e^{-}$ lost by Fe^{+2})

73. Conceptual

74. Conceptual

75. Conceptual