FIITJEE INTERNAL TEST

SECOND YEAR 2019-21

JEE MAINS

(First Year Syllabus)

Time: 3 hours **Maximum Marks: 300**

INSTRUCTIONS: **23rd May 2020**

Instructions to the Candidates

A. General

1. This booklet is your Question Paper containing 75 questions.
2. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets in any form are not allowed to be carried inside the examination hall.
3. Fill in the boxes provided for Name and Enrolment No.
4. The answer sheet, a machine-readable Objective Response (ORS), is provided separately.
5. DO NOT TAMPER WITH / MULTILATE THE ORS OR THE BOOKLET.

B. Filling in the OMR:

6. The instructions for the OMR sheet are given on the OMR itself.

C. Question paper format:

7. The question paper consists of **3 parts (Mathematics, Physics and Chemistry)**. Each part consists of **two sections**.
8. **Section I** contains **20 Multiple Choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE** is correct.
9. **Section II** contains **5 questions**. Each question is numerical value. For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to second decimal place.

   (e.g. 6.25, 7.00, - 0.33, - .30, 30.27, - 127.30)
10. **Q.No. 21-25, 46-50, 71-75** are Numerical based questions with answer is of the type xxxx.xx. Suppose your answer is 25.3 (example-1) you need to write answer as 0025.30, if your answer is only 1 (example-2) then you have bubble like 0001.00 and bubble accordingly including zero's and dot.

D. Marking Scheme

11. For each question in **Section I**, you will be awarded **4 marks** if you darken ALL the bubble(s) corresponding to the correct answer(s) **ONLY**. In all other cases **zero (0) marks** will be awarded. **–1 negative marks** will be awarded for incorrect answers in this section.
12. For each question in **Section II**, you will be awarded **4 marks** if you darken the bubble corresponding to the correct answer **ONLY.** In all other cases **zero (0) marks** will be awarded. **No negative marks** will be awarded for incorrect answers in this section.

Don't write / mark your answers in this question booklet.

If you mark the answers in question booklet, you will not be allowed to continue the exam.

NAME: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

ENROLLMENT NO.: ☐☐☐☐☐☐☐☐☐☐☐☐

MATHEMATICS

Section-I :: Single Correct Answer Type

1. Let $f:[0,3)\to(1,4]$ be a function defined as $f(x)=\frac{[x]+2}{\{x\}+1}$, where $[x]$ and $\{x\}$ denotes 'Greatest Integer Function' and 'Fractional part of x', then $f(x)$ is

(A) one-one but not onto (B) onto but not one-one
(C) a bijection (D) neither one-one nor onto

2. Let $f(x)$ be a strictly decreasing function. Then, the set of all values of θ lying in the interval $\left(0,\frac{\pi}{2}\right)$ satisfying $f\left(2\tan^2\theta+\tan\theta+1\right)<f\left(3\tan^2\theta-4\tan\theta+1\right)$ is

(A) $\left(0,\text{Tan}^{-1}5\right)$ (B) $\left(\text{Tan}^{-1}5,\frac{\pi}{2}\right)$ (C) $\left(0,\frac{\pi}{4}\right)$ (D) $\left(\frac{\pi}{4},\text{Tan}^{-1}10\right)$

3. Let $f:\mathbb{R}\to\mathbb{R}$ be a function such that $f(0)=1$ and for $x,y\in\mathbb{R}$, $f(xy+1)=f(x)f(y)-f(y)-x+2$ holds, then $\lim\limits_{x\to0^-}\left(1+f(x)\right)^{3+[f(x)]}$ is equal to ($[\cdot]$ denotes greatest integer function)

(A) 2 (B) 25 (C) 8 (D) 4

4. Tangents are drawn from origin to the curve $y=\cos x$. Then, all the points of contacts lie on the curve

(A) $x^2-y^2-x^2y^2=0$ (B) $x^2-y^2+2xy=0$ (C) $x^2+y^2-x^2y^2=0$ (D) $x^2+y^2+2xy=0$

5. Let $f:[0,\infty)\to\mathbb{R}$ be a function defined as $f(x)=\begin{cases}x^x-x^{x^x} & \text{if } x>0\\ a & \text{if } x=0\end{cases}$. If $f(x)$ is continuous at $x=0$ then the value of 'a' is

(A) 1 (B) 2 (C) – 1 (D) none

6. The exhaustive set of values of 'a' for which the curve $y=x^4+ax^3+\frac{3}{2}x^2+1$ is concave upward in the entire real line is

(A) $[-1,2]$ (B) $[-4,2]$ (C) $[0,4]$ (D) $[-2,2]$

7. The function $f(x)=\left\{x^2\right\}-\{x\}^2$, $\forall x\in\mathbb{R}$ is (where $\{x\}$ denotes 'Fractional part of x')

(A) differentiable at $x=0$ (B) continuous but not differentiable at $x=0$
(C) discontinuous at $x=0$ (D) $\lim\limits_{x\to0}f(x)=0$

8. If $\sin A=2\sin(A+\theta)$ then $\frac{\tan\left(A+\frac{\theta}{2}\right)}{\tan\left(\frac{\theta}{2}\right)}=$

(A) 2 (B) – 2 (C) 3 (D) – 3

9. In ΔABC, AD bisects $\angle BAC$, (D is a point in BC). The length of angle bisector AD if $\angle BAC = 2\theta$ is given by

(A) $\frac{2AB \times AC}{AB + AC}\sin\theta$ (B) $\frac{2AB \times AC}{AB + AC}\cos\theta$ (C) $\frac{2AB \times AC}{AB + AC}\tan\theta$ (D) none of these

10. If $\left[\sin^{-1}x\right] = \left[\cos^{-1}x\right]$, where $[\cdot]$ is greatest integer function then $x \in$

(A) $(0, \cos 1)$ (B) $(\cos 1, \sin 1)$ (C) $(\sin 1, 1)$ (D) $(-1, 1)$

11. In ΔABC, BD bisects $\angle ABC$, where D is a point in AC. If A and B has coordinates $(3, 5)$ and $(1, 1)$ respectively and equation of BD is $x = y$. Then equation of BC is

(A) $y = 2x - 1$ (B) $x + y = 2$ (C) $x - 2y + 1 = 0$ (D) $2x + 3y = 5$

12. The largest interval of θ for which the point $P\left(\sin^2\theta, \cos^2\theta\right)$ always lie inside the triangle formed by vertices $(-4, -1)$, $(2, 5)$, $(5, -3)$ is possible as

(A) $\left(\frac{\pi}{12}, \frac{\pi}{3}\right)$ (B) $\left(-\frac{\pi}{3}, \frac{\pi}{3}\right)$ (C) no such θ exists (D) R (set of real numbers)

13. A triangle ABC has sides AB given by $x - y = 2$ and AC as $2x + 3y = 5$. If mid point of BC is $(2, -1)$ then the equation of BC is

(A) $x + y = 1$ (B) $2x - 7y = 11$ (C) $3x - y = 7$ (D) none of these

14. Let f, g, h be differential function of x and Δ be such that $\Delta = \begin{vmatrix} f & g & h \\ (xf)' & (xg)' & (xh)' \\ \left(x^2 f\right)'' & \left(x^2 g\right)'' & \left(x^2 h\right)'' \end{vmatrix}$. There exist Δ_1 and Δ_2 which are $\Delta_1 = \begin{vmatrix} f & g & h \\ f' & g' & h' \\ f'' & g'' & h'' \end{vmatrix}$ and $\Delta_2 = \begin{vmatrix} f & g & h \\ f' & g' & h' \\ f''' & g''' & h''' \end{vmatrix}$ and the relation of Δ, Δ_1 and Δ_2 is given as $\Delta' = ax^2\Delta_1 + bx^3\Delta_2$ then $a + b$ value is?

(A) 3 (B) 4 (C) 5 (D) 6

15. The vertex A of the triangle ABC is on the line $\vec{r} = \hat{i} + \hat{j} + \hat{k} + \lambda\hat{k}$ and vertices B and C have respectively position vector. $\hat{i}$ and $\hat{j}$. Let Δ be the area of the triangle and $\Delta^2 \in [1, 2]$ then the range of values of λ corresponding to A is

(A) $\left[-1 - \frac{\sqrt{14}}{2}, -1 + \frac{\sqrt{14}}{2}\right]$ (B) $\left[-1 - \frac{\sqrt{6}}{2}, -1 + \frac{\sqrt{6}}{2}\right]$

(C) $\left[-1 - \frac{\sqrt{14}}{2}, -1 - \frac{\sqrt{6}}{2}\right] \cup \left[-1 + \frac{\sqrt{6}}{2}, -1 + \frac{\sqrt{14}}{2}\right]$ (D) $\left[-1 - \frac{\sqrt{14}}{2}, -1 + \frac{\sqrt{6}}{2}\right]$

16. Given three points on the xy plane as $O(0,0)$, $A(2,0)$, $B(-2,0)$ point 'P' is moving on the plane satisfying the condition. $\overrightarrow{PA} \cdot \overrightarrow{PB} + 2\left(\overrightarrow{OA} \cdot \overrightarrow{OB}\right) = 0$. If the maximum and minimum value of $\left|\overrightarrow{PA}\right| \left|\overrightarrow{PB}\right|$ are M and m respectively, then find $M^2 + m^2$.

(A) 320 (B) 250 (C) 256 (D) 396

17. Solve the inequality

$\log_{|x|}\left(t-x-\operatorname{sgn}\left(e^x\right)\right)\geq 1$

where 't' is a function of 'x' and it represents the positive part (above x-axis) of circle having centre at origin and radius '3' units.

(A) $x\in\left[-2\sqrt{2},-1\right)\cup\left[\frac{2}{5}\left(\sqrt{11}-1\right),1\right)$ (B) $x\in\left[-2\sqrt{2},\frac{2}{5}\sqrt{11}-1\right)$

(C) $x\in(-1,1)$ (D) $x\in\left[-2\sqrt{2},1\right)$

18. If $\vec{p},\vec{q}$ and $\vec{r}$ are there non coplanar unit vectors equally inclined to each other at an angle α, such that $\vec{p}\times\vec{q}+\vec{q}\times\vec{r}=x\vec{p}+y\vec{q}+z\vec{r}$ where x,y and z are scalars, then find the number of solution of

$x^2+z^2=\frac{y^2}{\cos\alpha}$ in $\alpha\in[0,2\pi)$ & $\alpha\neq\frac{\pi}{2},\frac{3\pi}{2},\frac{2\pi}{3},\frac{4\pi}{3}$

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

19. The value of $\left(\vec{a}\times\vec{c}\right)\times\left(\vec{b}\times\vec{d}\right)$ is

(A) $\left[\bar{a}\ \bar{b}\ \bar{c}\right]\bar{d}-\left[\bar{b}\ \bar{c}\ \bar{d}\right]\bar{a}$ (B) $\left[\bar{a}\ \bar{c}\ \bar{d}\right]\bar{b}-\left[\bar{b}\ \bar{c}\ \bar{d}\right]\bar{a}$

(C) $\left[\bar{a}\ \bar{b}\ \bar{d}\right]\bar{c}-\left[\bar{a}\ \bar{c}\ \bar{d}\right]\bar{b}$ (D) $\left[\bar{a}\ \bar{b}\ \bar{d}\right]\bar{c}+\left[\bar{b}\ \bar{c}\ \bar{d}\right]\bar{a}$

20. Let $A=\begin{bmatrix}\cos\theta & \sin\theta\\ -\sin\theta & \cos\theta\end{bmatrix}$ and $B=\begin{bmatrix}1 & 1\\ 0 & 1\end{bmatrix}$ and define matrix C equal to $\left(ABA^T\right)^n$ where $n\in z^+$. Then find the maximum value of Trace (C). [where trace is defined as $\sum a_{ij}$ where $i\neq j$]

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

Section-II :: Numerical Based

21. If $\frac{d^3x}{dy^3}=\frac{p(y'')^2+qy'y'''}{(y')^r}$, where y', y'' and y''' are the first, second and third derivatives of y with respect to x, then $(p+q)r$ is equal to

22. Let $f(x)$ be a polynomial of degree 100 such that $f(x)=0$ has 100 distinct real roots $\alpha_1,\alpha_2,...,\alpha_{100}$ such that $\alpha_1<\alpha_2<....<\alpha_{100}$. Then, the number of real roots of $100f(x)+f'(x)=0$ in the interval (α_1,α_{100}) is

23. Number of solutions of the equation $e^{|x|}\cdot|\sin x|=1,\ x\in[-2\pi,2\pi]$ is/are _____

24. The number of straight lines which are at unit distance from each of the points $P(1,2)$ and $Q(8,5)$ are _____.

25. Find the maximum area of triangle where vertices are $(-1,2,3)$, $(t,t,1)$ and $(t,1,1)$: where $t\in[1,2]$?

PHYSICS

Section-I :: Single Correct Answer Type

26. The velocity of light $\left(3\times10^{8}\text{ms}^{-1}\right)$ acceleration due to gravity $\left(10\text{ms}^{-2}\right)$ and the normal atmospheric pressure $\left(10^{5}\text{Nm}^{-2}\right)$ are taken as fundamental units, the unit of mass in this system is

(A) 75×10^{34}kg (B) 78×10^{34}kg (C) 81×10^{34}kg (D) 84×10^{34}kg

27. A horizontal acceleration is given to a smooth inclined plane of angle $\sin^{-1}\left(\frac{1}{\ell}\right)$ to keep a block stationary on the inclined plane. The horizontal acceleration should be given to the plane is

(A) $g\sqrt{\ell^2-1}$ (B) $\frac{\sqrt{\ell^2-1}}{g}$ (C) $\frac{g}{\sqrt{\ell^2-1}}$ (D) $\frac{\sqrt{\ell^2+1}}{g}$

28. A circular disc of radius r and thickness $\frac{r}{6}$ has moment of inertia I about an axis passing through its centre and perpendicular to its plane. It is melted and recasted to a solid sphere. The moment of inertia of the sphere about its diameter as axis of rotation is

(A) $\frac{I}{2}$ (B) $\frac{2I}{11}$ (C) $\frac{I}{10}$ (D) $\frac{I}{5}$

29. A wheel of radius 1 m completes one revolution in 4 seconds. Its centripetal acceleration is

(A) $4\pi^2\,m/s^2$ (B) $2\pi^2\,m/s^2$ (C) $\frac{\pi^2}{4}m/s^2$ (D) $\frac{\pi^2}{16}m/s^2$

30. A force of 5 N acts on a body at rest for an interval of 4 sec. The impulse on the body is

(A) 18 N-s (B) 20 N-s (C) 22 N-s (D) 24 N-s

31. The horizontal and vertical distances travelled by a body projected from the surface of a planet at a certain angle are $x=10\sqrt{3}t$, $y=10t-t^2$. The maximum height attained by the body is

(A) 22 m (B) 25 m (C) 28 m (D) 31 m

32. A projectile can have the same range R for two angles of projection. If t_1 and t_2 be the times of flight in the two cases, then the product of the two times of flight t_1, t_2 is proportional to

(A) R^2 (B) R (C) $\frac{1}{R}$ (D) $\frac{1}{R^2}$

33. A satellite S is moving in an elliptical path around the earth. The mass of the satellite is very small as compared to the mass of the earth. Then

(A) the total mechanical energy of S varies periodically with time

(B) the linear momentum of S remains constant in magnitude

(C) the angular momentum of S about the centre of the earth changes in direction but the magnitude remains constant

(D) the acceleration of the satellite S is always directed towards the centre of the earth

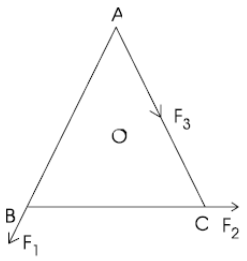
34. The orbital velocity of a satellite at a height h above the surface of the earth is 36% of that just above the surface of the earth (11.2 km/s), then its value at height h will be

(A) 11.2 km/s (B) $\frac{9}{25}\times11.2$ km/s (C) $\sqrt{\frac{h}{R}}\times11.2$ km/s (D) $\sqrt{\frac{R}{h}}\times11.2$ km/s

35. Two forces 9 N and 15 N act at 120°. The third force required to keep the body in equilibrium is

(A) $2\sqrt{17}$ N (B) $3\sqrt{19}$ N (C) $2\sqrt{19}$ N (D) $3\sqrt{17}$ N

36. O is the centre of an equilateral triangle ABC. Three forces F_1, F_2 and F_3 ac along the sides AB, BC and AC respectively. What should be the value of F_3 so that the total torque about O zero?



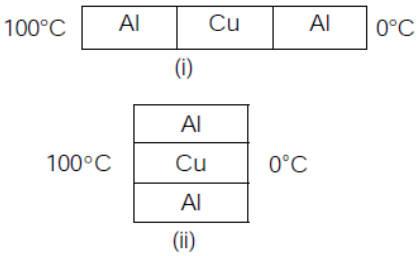
(A) F_1+F_2 (B) F_1-F_2

(C) $\frac{F_1+F_2}{2}$ (D) $2(F_1-F_2)$

37. The planet Jupiter has an atmosphere mainly of methane at a temperature of $-130^\circ C$. Assuming γ for the atmospheric mixture to be 1.3 and gas constant $R = 8.3$ J/mol. Find the velocity of sound on this planet. $\left(v=\sqrt{\frac{\gamma P}{\rho}}\right)$

(A) $321\,ms^{-1}$ (B) $316\ ms^{-1}$ (C) $311\,ms^{-1}$ (D) $306\ ms^{-1}$

38. Two rods of aluminium and one rod of copper of same dimensions are arranged as shown figure (i). Heat flowing from the hot end to cold end is 40 W. The thermal conductivity of copper and aluminium are $400\,W/m^2$ and $200\,W/m^2$ respectively. The rate of heat flow when the rods are arranged as figure (ii) is



(A) 440 W (B) 400 W

(C) 360 W (D) 320 W

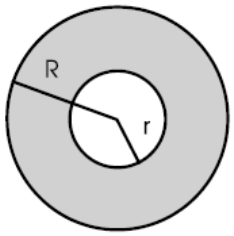
39. A ball impinges directly on a similar ball at rest. The first ball comes to rest due to impact. Half of the kinetic energy is lost by impact. The value of the coefficient of restitution is

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

40. A mass is attached to one end of a spring of spring constant k. The spring is stretched and then released such that its amplitude of oscillation is A. For a displacement y from the mean position, if the kinetic energy is 44% of its potential energy, then y in terms of A is

(A) $\frac{5}{6}A$ (B) $\frac{7}{8}A$ (C) $\frac{13}{16}A$ (D) $\frac{11}{25}A$

41. A sphere of solid material of spherical cavity and just sinks in water. Then the ratio of the radius of the cavity to that of the outer radius of the sphere must be



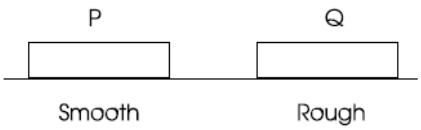
(A) $\frac{(9)^{\frac{1}{3}}}{2}$ (B) $\frac{(7)^{\frac{1}{3}}}{2}$

(C) $\frac{(5)^{\frac{1}{3}}}{2}$ (D) $\frac{(3)^{\frac{1}{3}}}{2}$

42. A metal wire has a length of 1 m when the tension in the wire is T_1 and ℓ_2 m when the tension in it is T_2. The original length of the wire ℓ when there is no tension is

(A) $\sqrt{\ell_1\ell_2}$ (B) $\frac{\ell_1+\ell_2}{2}$ (C) $\frac{T_2\ell_1-T_1\ell_2}{T_2-T_1}$ (D) $\frac{T_2\ell_2+T_1\ell_1}{T_1+T_2}$

43. Two similar rods of copper P and Q are of equal lengths and at the same temperature. The rod P is on a smooth frictionless surface and Q is placed on a rough surface. If the temperature of both the rods are raised by same temperature, then



(A) final length of both the rods are the same (B) final length of P is greater than Q
(C) final length of P is lesser than Q (D) none of the above

44. Water in a lake is converted into ice at 0 °C whereas atmospheric temperature is –10 °C. If 7 hours are taken in freezing 1cm thick ice layer, then the time taken in freezing two cm thick ice layer from 1cm thick ice layer will be :

(A) 7 hours (B) 14 hours (C) less than 7 hours (D) 21 hours

45. A force $\vec{F}$ = K(yi + xj) (where K is a positive constant) acts on a particle moving in the xy- plane. Starting from the origin, the particle is taken along the positive x-axis to the point (a, 0), and then parallel to the y-axis to the point (a, a). The total work done by the force $\vec{F}$ on the particle is:

(A) - $2ka^2$ (B) $2ka^2$ (C) - ka^2 (D) ka^2

Section-II :: Numerical Based

46. The solution of $\frac{0.9996\times3.54}{1.638}$ with regard to significant figures is

47. A body of mass 1 kg suspended from a certain big spring hanging vertically. Its length is found to be stretched by 5 cm. By suspending a 2.0 kg mass to the spring and the mass is pulled by 10 cm and released, the maximum velocity of the mass will be (in ms^{-1})

48. A car is moving along a straight horizontal road at a speed of 90 km/hr. If the coefficient of static friction between the road and the tyres is 0.5 the shortest distance in which the car can be stopped is $\left(g=10ms^{-2}\right)$ (in meters)

49. A stationary bomb of mass 17 kg explodes into three pieces of masses 4 kg, 5 kg and 8 kg. Of these 4 kg and 5 kg masses are ejected with speeds of $15ms^{-1}$ and $16ms^{-1}$ respectively in mutually perpendicular directions. The speed with which the piece of mass 8 kg ejected is (in ms^{-1})

50. An engine having an efficiency of 0.6 has an exhaust which is used to drive another engine with an efficiency of 0.4. The efficiency of the system of two engines as a whole is

CHEMISTRY

Section-I :: Single Correct Answer Type

51. In which of the following process more amount of energy is released?

(A) $F_{(g)} + e^- \longrightarrow F^-_{(g)}$ (B) $Cl_{(g)} + e^- \longrightarrow Cl^-_{(g)}$

(C) $O^-_{(g)} + e^- \longrightarrow O^{2-}_{(g)}$ (D) $Na^+_{(g)} + e^- \longrightarrow Na_{(g)}$

52. Which of the following is incorrect?

(A) $NO_2^{\oplus} > NO_3^- > NH_4^+ > NH_3 > NH_2^-$ (Bond angle)

(B) Both AlF_3 and $AlCl_3$ violate octet rule (anhydrous state)

(C) Vapour pressure of O-nitrophenol is more than P-nitrophenol

(D) $LiF > NaF > KF > RbF > CsF$ (Strength of ionic bond)

53. Which of the following is incorrect?

(A) KHF_2 exist while $KHCl_2$ does not exist

(B) When CO converted to $CO^{\oplus}$ its bond order decreases

(C) The no of nodes for $\overset{*}{\pi}P_x$ orbital is equal to 2

(D) The bond order of N – O bond in NO_3^- is 1.33

54. Which of the following ions are cause for hardness of water?

(A) Cl^- (or) SO_4^{-2} (B) HCO_3^- (C) Mg^{+2} (or) Ca^{+2} (D) All the above

55. Which of the following is incorrect?

(A) K_2CO_3 cannot be prepared by Solvay's (soda-ammonia) process

(B) $BeSO_4 > MgSO_4 > CaSO_4 > SrSO_4 > BaSO_4$ (Solubility in water)

(C) The hybridisation of 'Be' in dimer of $BeCl_2$ is SP^2 where as in polymer from SP^3

(D) $Be(OH)_2$ is fairly soluble in water where as $Ba(OH)_2$ is almost insoluble in water

56. Which of the following is incorrect?

(A) The acidic strength of boric acid increases in the presence of ethylene glycol

(B) Borazine is isoelectronic as well as isosteric with benzene

(C) The bond dissociation energy of B – F in BF_3 is more than C – F in CF_4

(D) $BCl_3 < AlCl_3 < GaCl_3 < InCl_3$ (Lewis acid character)

57. Which of the following is incorrect?

(A) $(CH_3)_3N$ is stronger base than $(SiH_3)_3N$

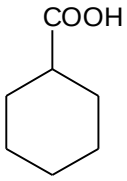
(B) The shape of $(CH_3)_3N$ is pyramidal where as the shape of $(SiH_3)_3N$ is trigonal planar

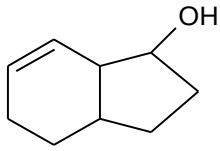
(C) Cross linked silicones are formed by hydrolysis followed by condensation of R_2SiCl_2

(D) Fullerenes are paramagnetic in nature

58. Which of the following is the correct IUPAC name?

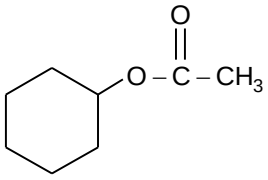
(A) $(CH_3)_3C-COOH$ Trimethylenthanoicacid

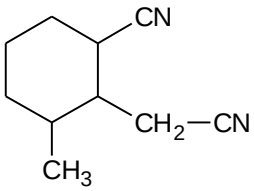
(B)  Cyclohexanoic acid

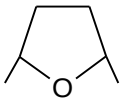
(C)  $[4.3.0]$ bicyclonon-8-en-2-ol

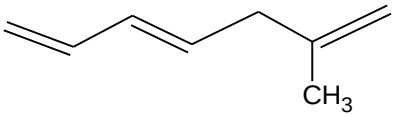
(D) $(CH_3)_2CH-CH_2-\underset{\displaystyle CH_3}{\underset{|}{CH}}-NH-CH_3$ N,4-dimethylpentan-2-amine

59. Which of the following is the incorrect IUPAC name?

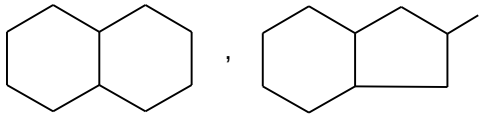
(A)  Cyclohexylethanoate

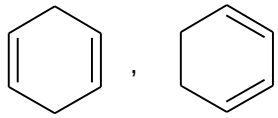
(B)  2-(Cyanomethyl)cyclohexane – 1,3 – dicarbonitrite

(C)  1,4-dimethyl-1,4-epoxybutane

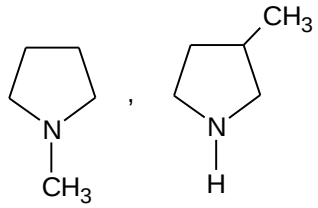
(D)  6-methylhepta-1,3,6-triene

60. Which of the following is incorrect?

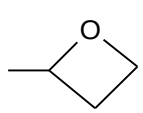
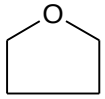
(A)  are chain isomers

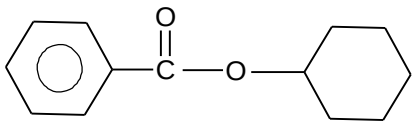
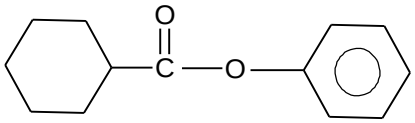
(B)  are position isomers

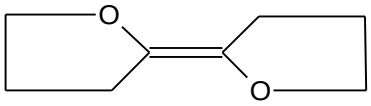
(C) The no of possible Monochloroderivatives possible for $C_5H_8 = 8$ (Structural isomers only)

(D)  are position isomers

61. Which of the following is incorrect?

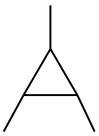
(A)  &  are position isomers

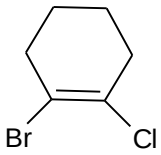
(B)  &  are metamers

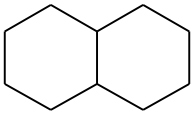
(C)  do not exhibit geometrical isomerism

(D) According to CIP rules $-CH_2-OH$ has higher priority than $-C\equiv N$

62. Which of the following is incorrect?

(A) The number of possible geometrical isomers for  is 2

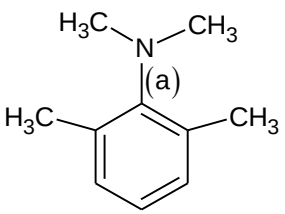
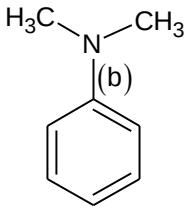
(B)  do not exhibit geometrical isomerism

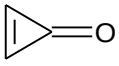
(C)  exhibit geometrical isomerism

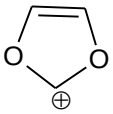
(D) Anti-conformation of n-butane has more energy

63. Which of the following is incorrect?

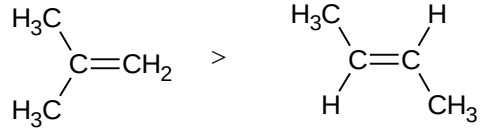
(A) The hybridisation of oxygen in phenol is SP^2

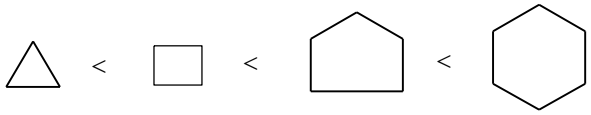
(B)   $a > b(\text{bond length})$

(C)  is Aromatic compound

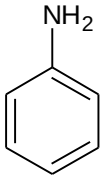
(D)  is not Aromatic compound

64. Which of the following is incorrect?

(A)  (stability)

(B)  (Heat of Combustion)

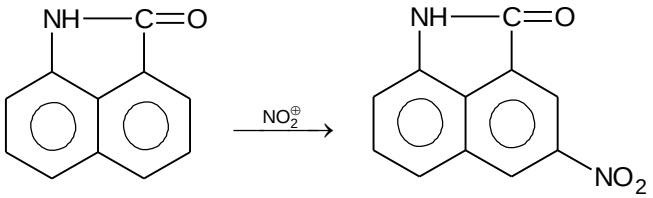
(C) $\underset{(a)}{CH_2-CH=CH_2}$, $CH_2=CH-CH_2-\underset{(b)}{CH_2}$ $a < b$ (Bond energy)

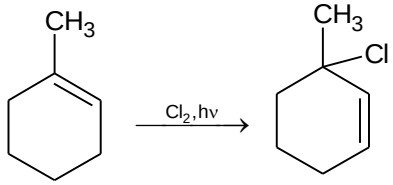
(D) The no. of possible resonance structures for  is 4

65. Which of the following is incorrect?

(A) For Nitration $C_6H_6 \simeq C_6D_6 \simeq C_6T_6$ [Reactivity order]

(B) For sulphonation $C_6H_6 > C_6D_6 > C_6T_6$ [Reactivity order]

(C) 

(D) 

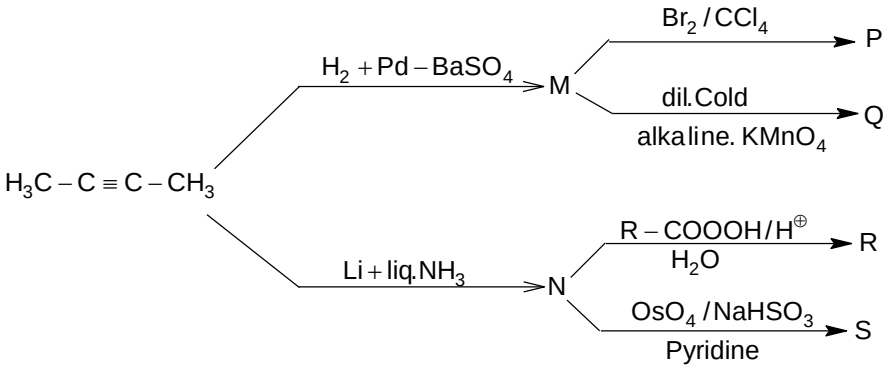
66. Identify the incorrect statement

(A) Sublimation technique is used to separate sublimable compounds from non-sublimable impurities

(B) Crystallisation technique is based on difference in the solubilities of the compound and the impurities in a suitable solvent

(C) Distillation technique is used to separate volatile liquid from non-volatile impurities

(D) Chromatography is based on difference in degree of absorption of components

67. 

Identify the incorrect option

(A) M – is cis-alkene

(B) Q – is a meso compound

(C) P – is a racemic mixture

(D) R – is a racemic mixture

68. The radius of n^{th} orbit of an H – like species is $0.529\ xA^\circ$ and the velocity of an electron revolving in that n^{th} orbit of the same species is $2.188\times10^8\ y\ cm.\sec^{-1}$. Then orbit number (n) of that species is _____

(A) $\frac{x}{y}$ (B) xy (C) $x+y$ (D) $x-y$

69. Compound – H is prepared from compound – A by the following 3 – reactions.

$3A\longrightarrow 2B+1C;\ (50\%\ of\ yield)$

$B+2D\longrightarrow 2E+3F;\ (75\%\ of\ yield)$

$\frac{1}{2}E+G\longrightarrow 3H;\ (25\%\ of\ yield)$

The number of moles of A must be used to get x-moles of H is _____

(A) $\frac{x}{4}$ (B) $\frac{3x}{2}$ (C) $\frac{x}{8}$ (D) $\frac{4x}{3}$

70. Gases A, B are effusing from 2-separate gaseous mixtures, mixture-I (at $27^\circ C$, through circular orifice of 1mm radius) and mixture-II (at $127^\circ C$, through circular orifice of 2mm radius). Partial pressure of gas A in mixture-I is twice to the partial pressure of gas-B in mixture-II. If molar mass of gas B is 9-times to the molar mass of gas-A, then the ratio of rate of effusion of gas-A to gas-B is _____

(A) $\sqrt{3}$ (B) $\sqrt{2}$ (C) 3 (D) 2

Section-II :: Numerical Based

71. The amount of O_2 gas is diffused when 2 g of H_2 gas is diffused under identical conditions

72. A 20 cm^3 solution of H_2O_2 liberates 2.032 g of iodine from an acidified KI solution. Then the strength of H_2O_2 solution interms of volume strength at STP

73. $n-propyl\ chloride \xrightarrow{Na/dry\ ether} \underset{(Major\ product)}{A} \xrightarrow[\Delta]{Cr_2O_3/Al_2O_3} \underset{Major\ product}{B} \xrightarrow{CH_3-Cl/AlCl_3} C \xrightarrow{HNO_3-H_2SO_4} \underset{Major}{D}$

The number of correct statements among the following is _____

(i) Propene on addition with HBr in presence of H_2O_2 forms n-propylchloride

(ii) Maximum number of monochloroproducts in case of product A is 3 (excluding stereoisomers)

(iii) Product-B is an aromatic compound with 6-conjugated electrons

(iv) n-heptane on heating with Cr_2O_3 (or) Al_2O_3 forms product – C

(v) Product-C is more reactive than product-B towards EAS

(vi) Product-D is p-nitrotoluene

74. The number of correct statements among the following is _____

(i) d_{z^2} orbital has zero nodal planes

(ii) Maximum kinetic energy of photoelectrons is directly proportional to the frequency of incident radiation

(iii) When electron dcexcites from 4^{th} orbit to ground state in the H_2 gas the maximum number of spectral lines produced is 6

(iv) Magnetic moment of V^{3+} is 1.73 BM

(v) The ratio of most probable, average and rms speed is 1 : 1.128 : 1.224

(vi) Excluded volume is actually 4-times the actual volume of the gas molecule

75. One mole of A and one mole of B are heated in 1L container then the equilibrium exist as shown below, where the $K_C=16$.

$A+B\rightleftharpoons C+D$

When 0.2 moles of each C and D are added to the equilibrium mixture, the new equilibrium exist. At this new equilibrium state the concentration of A is _____