MELUHA INTERNATIONAL SCHOOL

HYDERABAD

SR MPC | **JEE MAINS GT- 7** | **Date: 15-07-2020**

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

JEE MAIN MODEL
MATHEMATICS

Section	Question type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 01 – 20)	Questions with Single Answer Type	4	-1	20	80
Sec – II(Q.N : 21 – 25)	Questions with Numerical Answer Type (+/ - Decimal Numbers)	4	0	5	20
Total				25	100

PHYSICS

Section	Question type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 26 – 45)	Questions with Single Answer Type	4	-1	20	80
Sec – II(Q.N : 46 – 50)	Questions with Numerical Answer Type (+/ - Decimal Numbers)	4	0	5	20
Total				25	100

CHEMISTRY

Section	Question type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 51 – 70)	Questions with Single Answer Type	4	-1	20	80
Sec – II(Q.N : 71 – 75)	Questions with Numerical Answer Type (+/ - Decimal Numbers)	4	0	5	20
Total				25	100

MATHS
SECTION – I
(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and -1 if not correct.

01. If $A^{-1}=\begin{bmatrix}1 & 2017 & 2\\ 1 & 2017 & 4\\ 1 & 2018 & 8\end{bmatrix}$, *then* $|2A|-|2A^{-1}|$ is equal to

(A) 3 (B) -3 (C) 12 (D) -12

02. $\int_2^4 \frac{\log x^2}{\log x^2+\log\left(36-12x+x^2\right)}dx =$

(A) 2 (B) 4 (C) 1 (D) 6

03. If A = $\{x\in R: x\ is\ not\ a\ positive\ integer\}$, and $f: A\to R$ *wherere* $f(x)=\frac{2x}{x-1}$, then '*f*' is

(A) injective but not surjective (B) not injective

(C) surjective but not injective (D) neither injective nor surjective

04. Consider the following three statements:
P : 5 is a Prime number
Q : 7 is a factor of 192
R: LCM of 5 and 7 is 35.
Then, which of the following statement is true?

A) $(P\vee\sim Q)\wedge(\sim R)$ B) $P\vee(\sim Q\wedge R)$ C) $(\sim P)\vee(Q\wedge R)$ D) $(\sim P)\wedge(\sim Q\wedge R)$

05. If two tangents are drawn from any point on the circle $x^2+y^2=41$ to the ellipse $\frac{x^2}{25}+\frac{y^2}{16}=1$ then the angle between these two tangents is

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{2}$

06. Let [t] denote the greatest integer $\le$ t and $\lim_{x\to 0} x\left[\frac{4}{x}\right]=A$. Then the function, f (x) = $\left[x^2\right]\sin(\pi x)$ is discontinuous, when x is equal to:

(A) $\sqrt{A+5}$ (B) $\sqrt{A+1}$ (C) $\sqrt{A}$ (D) $\sqrt{A+21}$

07. If θ is the angle between $\frac{x+1}{1}=\frac{y-1}{2}=\frac{z-2}{2}$ and the plane $2x-y+\sqrt{\lambda}z+4=0$ such that sin θ = 1/3, the value of λ =

(A) -4/3 (B) 4/3 (C) -3/5 (D) 5/3

08. If PQ is the focal chord of parabola $y^2=-x$ and P is (-4,2), then the slope of tangent at Q is

(A) 2 (B) 3 (C) 4 (D) 5

09. The number of ways in which all the letters of the word "COCONUT" can be arranged such that at least one C comes at odd place, is

(A) 240 (B) 360 (C) 720 (D) 1080

10. If the lines $\bar{r} = 2\hat{i} + \hat{j} + \hat{k} + \lambda\left(\hat{i} - 2\hat{j}\right)$ and $\bar{r} = \hat{i} + \hat{j} - 3\hat{k} + \mu\left(\hat{j} + 2\hat{k}\right)$ intersect each other, then $(\lambda + \mu)$ is equal to-

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

11. General solution of $x\frac{dy}{dx} + y = y^2 x^3 \cos x$, is

(A) $\frac{1}{xy} + x\sin x - \cos x = c$ (B) $\frac{1}{xy} - x\sin x + \cos x = c$

(C) $\frac{1}{xy} + x\cos x - \sin x = c$ (D) $\frac{1}{xy} + x\sin x + \cos x = c$

12. Let A,B be two sets, $A = \{z / |z+6| + |z-2| = 10\}, B = \{z / |z-6| = 3\}$, then the number of elements common to both A and B is _____

(A) Zero elements (B) Only one element

(C) Infinite elements (D) Two elements

13. $\lim\limits_{x \to \frac{\pi}{4}} \frac{\sqrt{1 - \sqrt{\sin 2x}}}{\pi - 4x} =$

(A) 1/4 (B) -1/4 (C) 1 (D) Does not exist

14. The value of m for which one of the roots of x^2-3x+2m = 0 is double of one of the roots of x^2-x+m = 0 is

(A) 2 (B)1 (C) -2 (D) -1

15. $\left\{\cos^{-1}\left(\frac{-2}{7}\right) - \frac{\pi}{2}\right\} =$

(A) $\frac{2}{3\sqrt{5}}$ (B) $\frac{2}{3}$ (C) $\frac{1}{\sqrt{5}}$ (D) $\frac{4}{\sqrt{5}}$

16. $\int \left(1 + x - x^{-1}\right) e^{x + x^{-1}} dx =$

(A) $x.e^{x+x^{-1}} + c$ (B) $-x.e^{x+x^{-1}} + c$ (C) $(x+1).e^{x+x^{-1}} + c$ (D) $(x-1).e^{x+x^{-1}} + c$

17. The area of the region bounded by the curves $|x+y| \le 2, |x-y| \le 2$ and $2x^2 + 6y^2 \ge 3$ is

(A) $\left(8 + \frac{\sqrt{3}}{2}\pi\right)$ sq. units (B) $\left(8 - \frac{\sqrt{3}}{2}\pi\right)$ sq. units

(C) $\left(4 - \frac{3\sqrt{3}}{2}\pi\right)$ sq. units (D) $\left(8 - \frac{3\sqrt{3}}{2}\pi\right)$ sq. units

18. If $\sum_{i=1}^{5}(x_i - 100) = 5$ and $\sum_{i=1}^{5}(x_i - 100)^2 = 25$, then the standard deviation of observations $2x_1 + 73, 2x_2 + 73, 2x_3 + 73, 2x_4 + 73, 2x_5 + 73$ is

(A) 8 (B) 16 (C) 4 (D) 2

19. The line 3x-4y+7 = 0 is rotated through an angle π/4 in the clock wise direction about the point (-1, 1). The equation of the line in its new position is

(A) $7y + x - 6 = 0$ (B) $7y - x - 6 = 0$ (C) $7y + x + 6 = 0$ (D) $7y - x + 6 = 0$

20. Let A and B be two independent events such that P (A) = $\frac{1}{3}$ and P(B)= $\frac{1}{6}$. Then , which of the following is TRUE?

(A) P (A/B)= $\frac{2}{3}$ (B) P (A/(A $\cup$ B))= $\frac{1}{4}$ (C) P(A/B^c)= $\frac{1}{3}$ (D) P(A^c/B^c)= $\frac{1}{3}$

SECTION-II
(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical value. If the numerical value has more than two decimal places, **round-off the value** of Two decimal places. Answer to each question will be evaluated according to the following marking scheme:
Marking scheme: +4 for correct answer, 0 in all other cases.

21. If the system of linear equations $x+ky+3z=0, 3x+ky-2z=0$ and $2x+4y-3z=0$ has a non-zero solution (x,y,z), then $\frac{xz}{y^2}$ is equal to

22. Three numbers, the third of which is 4 form a decreasing G.P. if the last term is replaced by 3, the three numbers form an A.P, then the first number of the G.P.is

23. If in the expansion of $\left(a^{\frac{1}{3}}+b^{\frac{1}{9}}\right)^{6561}$; where a, b are distinct prime numbers, the number of irrational terms is N, then the value of $\frac{N}{100}$ is

24. If image of point (1,2,3) in plane x+2y-z = 0 along line $\frac{x-2}{1}=\frac{y-1}{8}=\frac{z-4}{9}$ is (α,β,λ), then the absolute value of $\alpha+\beta+\lambda$ is _____

25. Let $f(x)$ be a polynomial of degree 3 such that $f(-1)=10, f(1)=-6, f(x)$ has a critical point at $x=-1$ and $f^1(x)$ has a critical point at x = 1. Then $f(x)$ has a local minima at x = _____

PHYSICS

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.
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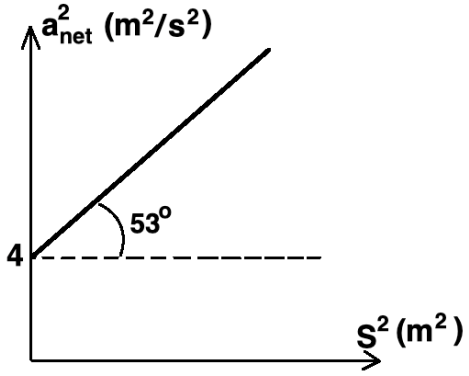
26. The energy of an electron in excited hydrogen atom is -3.4 eV. Then according to Bohr's Theory, the angular momentum of this electron in Js is $\left[\text{h} = 6.625\text{x}10^{-34}\text{Js}\right]$

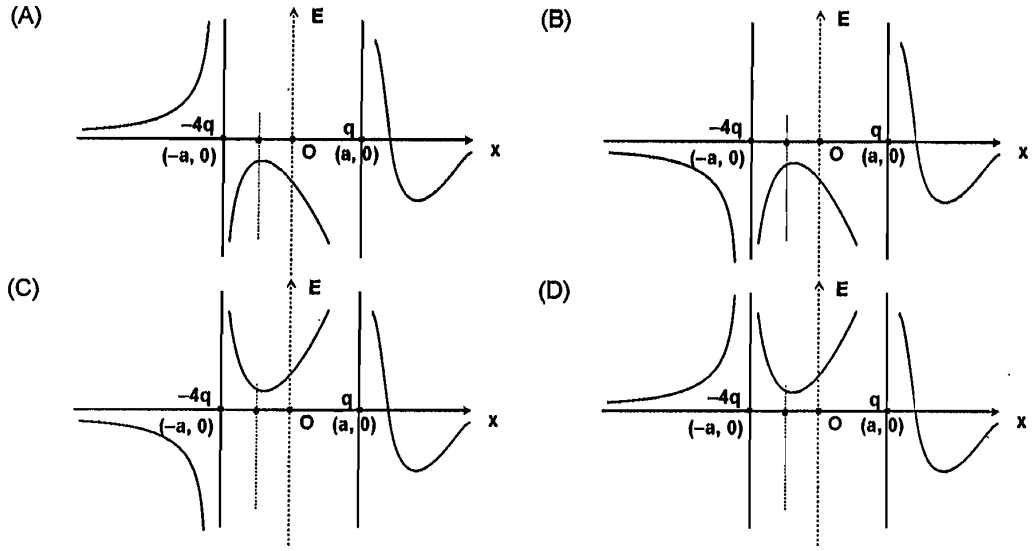
A) 2.11×10^{-34} B) 3.05×10^{-34} C) 2.54×10^{-34} D) 1.77×10^{-34}

27. A particle starts from rest and move along a circular path with uniformly increasing speed. Variation of a^2 vs square of distance travelled by the particle is given. Centripetal acceleration (in m/s^2) of the particle at t = 2 s is given by



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

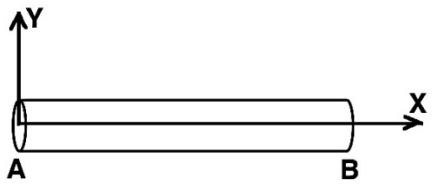
28. Two charge particles –4q and q lie on x-axis as shown in the figure. Which of the following graphs will show the variation of electric field on the x-axis (Take E as +ve along + X-axis).



29. Unit of CR^2 is not (C = capacitance and R = resistance)

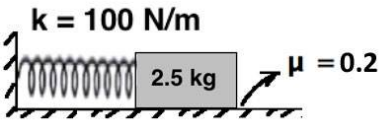
A) Henry B) $\frac{\text{volt-second}}{\text{ampere}}$ C) $\frac{\text{volt}}{\text{ampere}}$ D) $\frac{\text{joule}}{\text{ampere}^2}$

30. Ends A and B of the rod AB is maintained at temperature of 0^oC and 100^oC respectively. The conductivity of the rod varies with 'x' as $K = \frac{a}{x}$. The temperature of the middle of the rod is



A) $20\ ^oC$ B) $25\ ^oC$ C) $50\ ^oC$ D) $80\ ^oC$

31. A block of mass 2.5 kg is hooked to a horizontal spring of spring constant 100 N/m and the spring is compressed by a length of 40 cm and released. The coefficient between the rough surface and the block is 0.2. Find the maximum extension in the spring during the subsequent motion of the block.



A) 15 cm B) 25 cm C) 20 cm D) 30 cm

32. In tug of war contest, each teams keep applying gradually increasing pulling force on the other team via a rope until one of the team yields. Winner is that team who necessarily

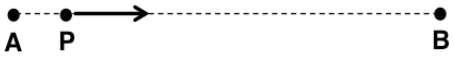
A) applies more force on the rope

B) has more coefficient of static friction between the ground and the shoes.

C) Has more combined mass of the people on their side

D) Has more total limiting friction (when all people on side are considered in the system).

33. A particle of mass 'm' is projected from point P with some velocity as shown in the figure. Mass of each of fixed particles A and B is '7m'. Distance between A and B is '8a' where as distance between A and P is 'a'. The minimum velocity of projection of 'm' such that it hits the particle B is



A) $3\sqrt{\frac{Gm}{a}}$ B) $2\sqrt{\frac{Gm}{a}}$ C) $\sqrt{\frac{7Gm}{2a}}$ D) $\sqrt{\frac{6Gm}{a}}$

34. If a dip needle is in a vertical plane making an angle 30^0 to the magnetic meridian, the dip needle makes angle of 45^0 with the horizontal. The real dip is

A) $\tan^{-1}(\sqrt{3}/2)$ B) $\tan^{-1}(\sqrt{3})$ C) $\tan^{-1}\frac{3}{\sqrt{2}}$ D) $\tan^{-1}\frac{2}{\sqrt{3}}$

35. A particle moves with simple harmonic motion in a straight line. In first τ s, after starting from rest, it travels a distance 'a' and in next τ s, it travels '2.5a' without changing direction. Then

A) Amplitude of motion is 4a B) Amplitude of motion is 3a

C) Time period of oscillations is 6τ D) Time period of oscillations is 8τ

36. In a communication system, noise is most likely to affect the signal

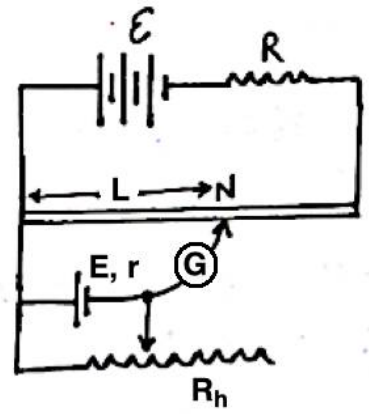
A) At the transmitter B) In the medium of transmission

C) Information source signal D) At the destination

37. A cubical block of mass 4 kg and side length 20 cm is sliding downwith constant speed on a fixed rough inclined plane of inclination $\tan^{-1}4/3$. Direction of motion of the block is perpendicular to two of the faces of the block. Torque of normal force on the block about a horizontal axis that is attached to center of mass of the block and is perpendicular to its direction of propagation is

A) 6.4 Nm B) 9.6 Nm C) 3.2 Nm D) data insufficient

38. A rheostat is connected in the secondary circuit of potentiometer as shown in the figure. When the resistance of the rheostat is increased, the length of the null point (L) will

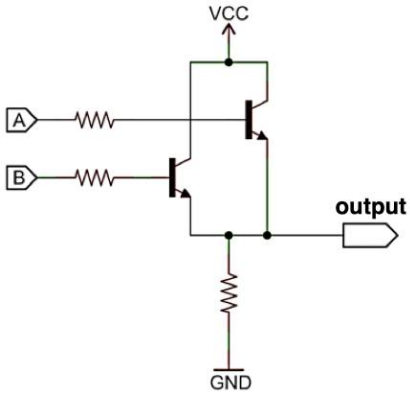


A) increase B) decrease C) will remain same D) data insufficient

39. A clock with a metallic pendulum is 8 s faster each day when temperature is 15°C and 12 s slower each day when temperate is 30°C. At what temperature does the clock show correct time?

A) 20°C B) 25°C C) 18°C D) 21°C

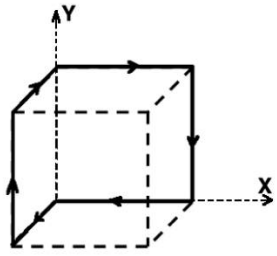
40.



The following circuit is a representation of

A) AND gate B) OR gate C) NAND gate D) NOR gate

41. Figure shows a loop through which current 'i' is flowing. The cubes is of side length 'a'. X-axis is towards right and Y axis is upwards.Net force on the loop due to magnetic field $\vec{B} = \frac{B_0 x}{a}\hat{j}$.



A) Zero B) $\frac{Bia}{2}$ C) Bia D) 2Bia

42. A nonviscous fluid of density $\rho g / cm^3$ is flowing through conical section of a pipe. If area of its end are $A_1 \& A_2\ cm^2$ respectively and pressure drop across its length is $100\ N/m^2$, then volume flow rate (in cm^3) of the fluid through the pipe is

A) $A_1A_2\sqrt{\frac{20}{\rho\left(A_1^2-A_2^2\right)}}$ B) $A_1A_2\sqrt{\frac{200}{\rho\left(A_1^2-A_2^2\right)}}$

C) $A_1A_2\sqrt{\frac{2000}{\rho\left(A_1^2-A_2^2\right)}}$ D) None of these

43. In an AC circuit, maximum voltage across resistor in R-C series circuit (with AC sinusoidal input source) is 100 V whereas circuit current is given by $i = 2\sin\left(50t + \pi/3\right)$. If resistance in the circuit is doubled, source voltage leads the capacitor voltage by 45^o. Find X_C.

A) 50Ω B) 75Ω C) $100\ \Omega$ D) $150\ \Omega$

44. A surface Irradiated with light of wavelength 480 nm gives out electrons with maximum velocity v m/s, the cut off wavelength being 600 nm. The same surface would release electrons with maximum velocity 2v m/s if it Irradiated by light of wavelength

(A) 300 nm (B) 360 nm (C) 240 nm (D) 400 nm

45. The electric field component of a monochromatic radiation is given by

$\vec{E} = 2E_0\hat{i}\sin kz\cos\omega t$

The magnetic field is then given by

A) $\frac{2E_0}{c}\hat{j}\cos kz\sin\omega t$ B) $-\frac{2E_0}{c}\hat{j}\sin kz\cos\omega t$

C) $-\frac{2E_0}{c}\hat{j}\cos kz\sin\omega t$ D) $\frac{2E_0}{c}\hat{j}\sin kz\cos\omega t$

SECTION-II
(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical value. If the numerical value has more than two decimal places, **round-off the value** of Two decimal places. Answer to each question will be evaluated according to the following marking scheme:
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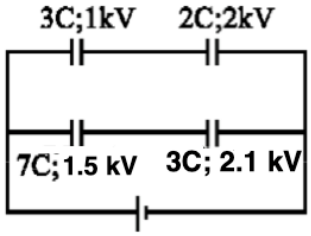
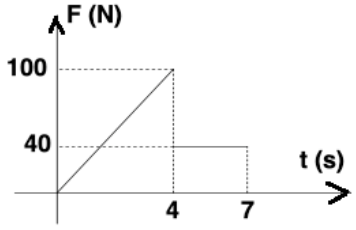
46. The diagram shows four capacitors with capacitances and break down voltages as mentioned. What is the maximum value of the external emf source (in Volt) such that no capacitor breaks down?



47. A disk of mass '2m' and radius '4r' is free to rotate in a horizontal frictionless surface about a fixed vertical axis passing through its center. The disk is spinning with angular velocity

$\omega = 10\,\text{rad/s}$ anticlockwise as seen from top. Now another (rough) disk of mass '4m' and radius '2r' initially spinning with angular velocity $\omega = 8\,\text{rad/s}$ in clockwise direction as seen from top is gently placed on top of the former disk so that center of both the disks coincide. After sometime, both the disks start spinning about the same fixed vertical axis with common angular velocity. Their common angular velocity (in radian per second) is

48. A 10 kg block is resting on the horizontal surface when a horizontal force F is applied to it for 7 seconds. The variation of 'F' with the time is as shown in the graph. Take $\mu_s = \mu_k = 1/2$. The time (in seconds) at which velocity of the block is maximum is



49. A particle starts moving along a parabolic path $y = (x-4)(x-12)$. Here x, y are in meter. Initially (at t = 0), its x-coordinate is zero. Throughout the motion x-component of velocity is constant and is equal to +0.5 m/s. The time at which instantaneous velocity of the particle is inclined with x-axis by angle 53^o is

50. A point object is kept on the principal axis of a thin lens of focal length 30 cm. The distance between lens and object is 45 cm and the image is obtained on the screen. Now the lens is slightly shifted away from the object by a distance of 1 mm. For obtaining the image again on the screen, the screen should be shifted by 'X' millimetre. Then, the integer closest to X is

CHEMISTRY

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and -1 if not correct.

51. $HC \equiv CH \xrightarrow{Cu_2Cl_2 + NH_4Cl}$ A (Four carbons compound) $\xrightarrow{+HCl} B.$

Incorrect statement among the following is

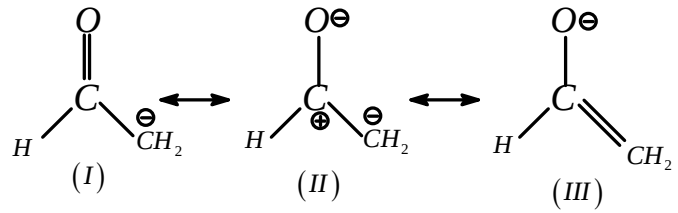
A) 'A' is vinyl acetylene

B) B is chloroprene

C) Polymerisation of 'B' gives a vulcanisable rubber like polymer

D) Polymer of 'B' is used in making buckets

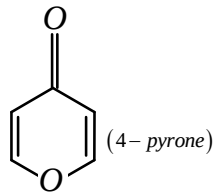
52.

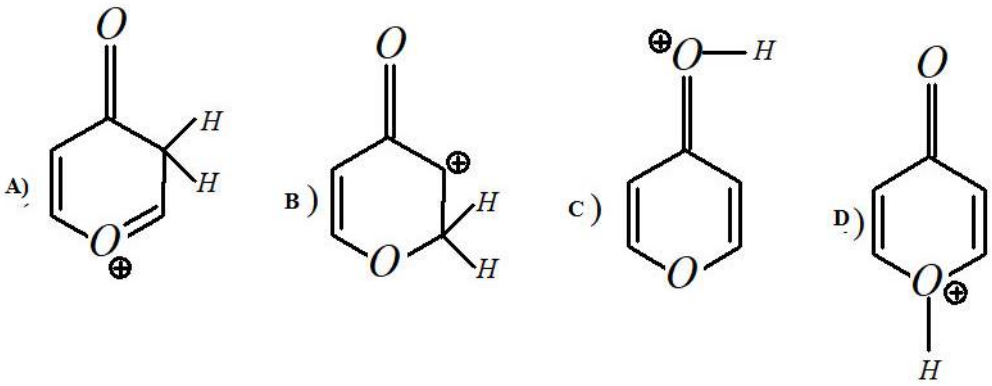


The correct stability order of the given canonical forms is

A) $I > III > II$ B) $III > I > II$ C) $II > III > I$ D) $II > I > III$

53. On reaction with acid, 4 – pyrone gives a very stable cationic product. Which of the following structures shows the protonation site in that product?





54. Which one of the following essential amino acid gives blood red colour in Lassaigne test for nitrogen?

A) Cysteine B) Methionine C) Tyrosine D) Tryptophan

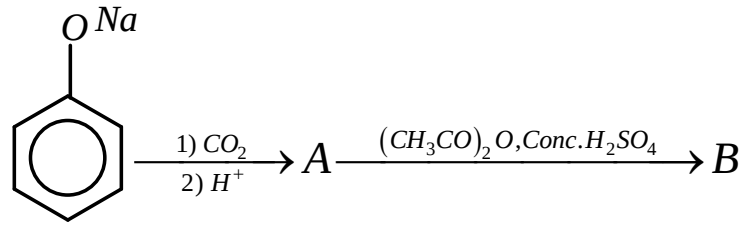
55. The correct acidic strength order of the following carboxylic acids is

a) $CHCl_2COOH$ b) $CH_2ClCOOH$ c) CH_2ClCH_2COOH d) $HCOOH$ e) $CH_2(NO_2)COOH$

A) $e > a > b > c > d$ B) $e > a > b > d > c$

C) $a > e > b > d > c$ D) $a > e > b > c > d$

56.



Incorrect statement among the following is

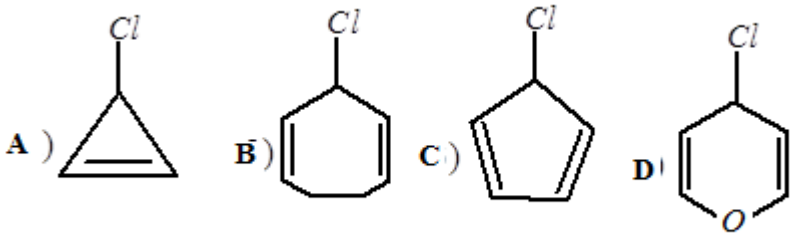
A) First step is not favourable with phenol because CO_2 is weak electrophile

B) 'A' is salicylic acid

C) 'B' has carboxylic acid and ester functional groups

D) 'B' is narcotic analgesic

57. Among the following, which one is least reactive in S_N^1 reactions



58. In λ_m vs $\sqrt{\text{concentration}}$ graph, among the following electrolytes for which one slope is different from others

A) $NaCl$ B) $MgSO_4$ C) KCl D) $RbCl$

59. Among the following which one is ferrimagnetic substance

A) Gadolinium B) CrO_2

C) MnO D) Magnetite $\left(Fe_3O_4\right)$

60. If N_2 gas is bubbled through water at 293K, how many milli moles of N_2 gas would dissolve in one litre of water. Assume that N_2 gas exerts a partial pressure of 1 bar. Given that Henry law constant for N_2 at 293 K is 75 K bar

A) 0.25 B) 0.5 C) 0.74 D) 1.01

61. Among the following incorrect statement is

A) Evaporation is surface phenomenon but boiling is bulk phenomenon

B) For a liquid normal boiling point is less than its standard boiling point

C) When a liquid is heated in a closed vessel, it will not boil but it will convert into super critical fluid at its critical temperature

D) At critical point ,liquid passes into gaseous state imperceptibly and continuously, the surface between two phases disappears

62. pH of $1.0\times10^{-8}M$ solution of HCl is

A) 8 B) 6 C) 6.98 D) 6.7

63. The correct wavelength order of absorbed light of the following complexes is

i) $\left[CoCl\left(NH_3\right)_5\right]^{2+}$ ii) $\left[Co\left(NH_3\right)_5\left(H_2O\right)\right]^{3+}$

iii) $\left[Co\left(NH_3\right)_6\right]^{3+}$ iv) $\left[Co\left(CN_6\right)\right]^{3-}$

A) i > ii > iii > iv B) iv > iii > ii > i C) ii > i > iv > iii D) i > ii > iv > iii

64. Incorrect statement regarding a good quality cement is

A) The ratio of silica to alumina should be between 2.5 and 4

B) The ratio of line (CaO) to the total of the oxides of silicon (SiO_2), aluminium (Al_2O_3) and iron (Fe_2O_3) should be as close as possible to 2

C) Major ingredient is tricalcium aluminate

D) Purpose of gypsum is only to slow down the process of setting of the cement so that it gets sufficiently hardened

65. Large difference in boiling points of oxygen and sulphur may be due to

A) Large difference in $O-O$ and $S-S$ bond energy

B) Large difference in electron gain enthalpy of oxygen and sulphur

C) Large difference in atomicity of oxygen and sulphur

D) Large difference electronegativity of oxygen and sulphur

66. Wrought iron is the purest form of commercial iron and is prepared from cast iron by oxidising the impurities in a reverberatory furnace lined with

A) Haematite B) Silica C) Lime D) Gas carbon

67. $Xe_{(g)}(excess)+F_{2(g)} \xrightarrow{673K,1bar} A$, hydrolyses products of 'A' are

A) $XeOF_4+HF$ B) XeO_3+HF

C) $Xe+XeO_3+O_2+HF$ D) $Xe+HF+O_2$

68. Among the following incorrect statement regarding C_{60} is

A) Dangling bonds absent B) Aromatic

C) It has six member rings fused with six member ring

D) If has five member rings fused with five member ring

69. Among the following for which one dipolemoment is highest

A) BF_3 B) NH_3 C) NCl_3 D) NF_3

70. Among the following antidepressant drug is

A) Iproniazid B) Dimetape C) Cimetidine D) Nadril

SECTION-II
(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical value. If the numerical value has more than two decimal places, **round-off the value** of Two decimal places. Answer to each question will be evaluated according to the following marking scheme:
Marking scheme: +4 for correct answer, 0 in all other cases.

71. Number of stereo isomers possible for the square planar complex $\left[Pt(NH_3)_2(Br)Cl\right]$ is/are

72. Heat of hydrogenation of cyclohexene to cyclohexane is $-120 KJ/mole$ and benzene to cyclohexane is $-208 KJ/mole$. Resonance stabilization energy of benzene is (in KJ/mole)

73. When electromagnetic radiation of wavelength 300nm falls on the surface of a metal, electrons are ejected with the kinetic energy $3.3125\times10^{-19}\,J$ / per electron. What is the maximum wavelength (in nm) of electromagnetic radiation that will cause a photoelectron to be emitted

74. Consider an iron piece in cube shape with 1cm side. Finely divided iron is the good catalyst in Haber's process. Hence, this iron cube divided equally into 10^{15} small cubes. Now what is the total surface area $\left(in\,m^2\right)$ of this finely divided iron?

75. For decomposition of azoisopropane to hexane and nitrogen at 543K, the following data are obtained $\left(CH_3\right)_2 CHN = N\,CH\left(CH_3\right)_{2(g)} \rightarrow C_6H_{14(g)} + N_{2(g)}$

t (sec)	P (mm of Hg)
0	50
300	75
600	87.5

If it follow first order kinetics, what is the rate constant $\left(in\,h^{-1}\right)\left(\ln 2 = 0.693\right)$

MELUHA INTERNATIONAL SCHOOL

HYDERABAD

SR MPC | **JEE MAINS GT-7** | **Date: 15-07-2020**

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

KEY SHEET

MATHS

1) **C**	2) **C**	3) **A**	4) **B**	5) **D**	6) **B**	7) **D**	8) **C**	9) **D**	10) **D**
11) **D**	12) **B**	13) **D**	14) **C**	15) **A**	16) **A**	17) **B**	18) **C**	19) **A**	20) **C**
21) **10**	22) **9**	23) **58.32**	24) **3**	25) **3**					

PHYSICS

26) **A**	27) **A**	28) **A**	29) **C**	30) **B**	31) **D**	32) **D**	33) **A**	34) **A**	35) **A**
36) **B**	37) **C**	38) **A**	39) **D**	40) **B**	41) **A**	42) **C**	43) **C**	44) **A**	45) **A**
46) **2500**	47) **4**	48) **4**	49) **17.33**	50) **3**					

CHEMISTRY

51) **D**	52) **B**	53) **C**	54) **B**	55) **C**	56) **D**	57) **C**	58) **B**	59) **D**	60) **C**
61) **B**	62) **C**	63) **A**	64) **C**	65) **C**	66) **A**	67) **D**	68) **D**	69) **B**	70) **A**
71) **2**	72) **-152**	73) **600**	74) **60**	75) **8.32**					

HINTS & SOLUTIONS

MATHEMATICS

01. Given that $A^{-1} = \begin{bmatrix} 1 & 2017 & 2 \\ 1 & 2017 & 4 \\ 1 & 2018 & 8 \end{bmatrix}$

$$\left|A^{-1}\right| = \begin{bmatrix} 0 & 0 & -2 \\ 1 & 2017 & 4 \\ 1 & 2018 & 8 \end{bmatrix} \; R_1 \to R_1 - R_2 \; = -2(1) = -2$$

We have, $|A| = \dfrac{1}{\left|A^{-1}\right|} = -\dfrac{1}{2}$

Now, $|2A| - \left|2A^{-1}\right| = 8\left(-\dfrac{1}{2}\right) - 8(-2) = -4 + 16 = 12$

02. Let $\displaystyle\int_2^4 \frac{\log x^2}{\log x^2 + \log\left(36 - 12x + x^2\right)} dx$

$$= \int_2^4 \frac{2\log x}{2\log x+\log(6-x)^2}dx$$

$$\Rightarrow I = \int_2^4 \frac{\log x}{\left[\log x+\log(6-x)\right]}dx \rightarrow(1) \Rightarrow I = \int_2^4 \frac{\log x(6-x)}{\log(6-x)+\log x}dx \rightarrow(2)$$

$$2I = \int_2^4 \frac{\log x+\log(6-x)}{\log(6-x)+\log x}dx \Rightarrow 2I = 2 \Rightarrow I=1$$

03. Given that $f(x)=\frac{2x}{x-1}$

$\Rightarrow f(x)=2+\frac{2}{x-1}$

Differentiate with respect to 'x'

$f'(x)=-\frac{2}{(x-1)^2}<0$

f is strictly decreasing, so f is one,-one

We have $y=\frac{2x}{x-1} \Rightarrow yx-y=2x$

$\Rightarrow$yx-2x=y

$x=\frac{y}{y-2}$

$\therefore$ range $\neq$codomain.

$\therefore$ f is injective but not surjective.

04. Given that

P : 5 is a Prime number

Q : 7 is a factor of 192

R: LCM of 5 and 7 is 35.

$\therefore$ P is true, Q is false and R is true

Option (1)	**Option (2)**	**Option (3)**	**Option (4)**
$(Pv\sim Q)\wedge(\sim R)$	$P\vee(\sim Q\wedge R)$	$(\sim P)\vee(Q\wedge R)$	$(\sim P)\wedge(\sim Q\wedge R)$
$=(T\vee T)\wedge(F)$	$=T\vee(T\wedge T)$	$=F\vee(F\wedge T)$	$=F\vee(T\wedge T)$
$=T\vee F$	$=T\vee T$	$=F\vee F$	$=F\wedge T$
$=F$	$=T$	$=F$	$=F$

$\therefore$ Option (2) is true

05. Director circle

06. $A=\lim_{x\to0} x\left[\frac{4}{x}\right]=\lim_{x\to0} x\left(\frac{4}{x}\right)-x\left\{\frac{4}{x}\right\}=4$

$f(x)=\left[x^2\right]\sin(\pi x)$ will be discontinuous at nonintegers

$\therefore x=\sqrt{A+1}$

07. $\sin\theta = \left|\dfrac{2-2+2\sqrt{\lambda}}{3\sqrt{5+\lambda}}\right| = \dfrac{1}{3} \qquad \lambda = \dfrac{5}{3}$

08. Tangent at the end [point of focal chord are perpendicular

$y^2 = -x$

$\therefore$ slope of tangent at $P, \left(\dfrac{dy}{dx}\right)_{(-4,2)} = \dfrac{-1}{4}$

$\Rightarrow$ Slope of tangent at Q = 4

09. We have letters C,C,O,O,N,U,T

No of ways in which COCONUT word is arranged is

Required number of ways

=Total no of ways – Number of ways when no C comes at odd place (when C's come at even places)

$= \dfrac{7!}{2!2!} - {}^3C_2 x \dfrac{5!}{2!} = 1080$

10. If lines $\bar{r} = (2+\lambda)\hat{i} + (1-2\lambda)\hat{j} + \hat{k}$ & $\bar{r} = \hat{i} + (1+\mu)\hat{j} + (-3+2\mu)\hat{k}$

Intersects each other, then

$2+\lambda = 1, 1-2\lambda = 1+\mu \,\&\, 1 = -3+2\mu$

$\Rightarrow \lambda = -1, \mu = 2$

11. Given $x\dfrac{dy}{dx} + y = y^2 x^3 \cos x \Rightarrow \dfrac{(xdy + ydx)}{x^2 y^2} = x.\cos x dx$

$\Rightarrow \dfrac{d(xy)}{x^2 y^2} = x.\cos x dx \Rightarrow -\dfrac{1}{xy} = x\sin x + \cos x + c$

12. Both the curves touch each other

13. $\underset{x\to\frac{\pi}{4}}{Lt} \dfrac{\sqrt{1-\sqrt{\sin 2x}}}{\pi - 4x} = \underset{x\to\frac{\pi}{4}}{Lt} \dfrac{\sqrt{1-\sqrt{\sin 2x}}}{\pi - 4x} x \dfrac{\sqrt{1+\sqrt{\sin 2x}}}{\sqrt{1+\sqrt{\sin 2x}}}$

$= \underset{x\to\frac{\pi}{4}}{Lt} \dfrac{\sqrt{1-\cos\left(\frac{\pi}{2} - 2x\right)}}{\pi - 4x} x \dfrac{1}{\sqrt{2}} = \underset{x\to\frac{\pi}{4}}{Lt} \dfrac{\sqrt{2}\left|\sin\left(\frac{\pi}{4} - x\right)\right|}{4\left(\frac{\pi}{4} - x\right)}$

Which does not exists.

14. Let α be the root of x^2-x+m = 0 and 2α be the root of x^2-3x+2m = 0

Then, α^2-α+m = 0 and $4\alpha^2$-6α+2m = 0

Eliminating α, $m^2 = -2m \Rightarrow m = 0, m = -2$

15. $\tan\left\{\cos^{-1}\left(-\dfrac{2}{7}\right) - \dfrac{\pi}{2}\right\} = \tan\left\{\pi - \cos^{-1}\left(\dfrac{2}{7}\right) - \dfrac{\pi}{2}\right\}$

$= \tan\left\{\sin^{-1}\left(\dfrac{2}{7}\right)\right\} = \tan\left\{\tan^{-1}\left(\dfrac{2}{3\sqrt{5}}\right)\right\} = \dfrac{2}{3\sqrt{5}}$

16. $\int \left(f(x) + x f^1(x)\right) dx = xf(x) + c$

17. $2x^2 + 6y^3 \geq 3$ ……..(1)

Area of ellipse = = $\pi x\frac{\sqrt{3}}{\sqrt{2}}x\frac{1}{\sqrt{2}}=\frac{\pi\sqrt{3}}{2}$

$|x+y|\le 2\Rightarrow -2\le(x+y)\le 2$ ……..(2)

$|x-y|\le 2\Rightarrow -2\le(x-y)\le 2$ ……..(3)

Required area = $\left(8-\frac{\pi\sqrt{3}}{2}\right)$ sq. units

18. Given that $\sum_{i=1}^{5}(x_i-1000)=5$ and $\sum_{i=1}^{5}(x_i-1000)^2=25$

Standard deviation of observations $2x_1+73, 2x_2+73, 2x_3+73, 2x_4+73, 2x_5+73$ is

$\sigma(2x_1+73)=2\sigma(x_1)$

$=2\sqrt{\frac{\sum_{i=1}^{5}x_i^2}{n}-\left(\frac{\sum_{i=1}^{5}x_i}{n}\right)^2}=2\sqrt{\frac{\sum_{i=1}^{5}(x_1-100)^2}{5}-\left(\frac{\sum_{i=1}^{5}x_i}{n}\right)^2}==2\sqrt{\frac{25}{5}-\left(\frac{5}{5}\right)^2}=2\sqrt{5-1}$

19. The correct option (a) 7y + x – 6 = 0

Explanation:

Line 3x – 4y + 7 = 0 is rotated through angle (π/4) and slope of given line is (3/4). Slope of line in new position be m1. Hence 45° is angle between them

∴ tan(π/4) = tan45 = 1 = [{(3/4) – m1}/{1 + (3/4)m_1}].

⇒ 1 + (3/4)m_1 = (3/4) – m_1

⇒ m_1 = [(– 1)/7].

∴ Line through (– 1, 1) with m= [(– 1)/7] is given by

(y – 1) = [(– 1)/7](x + 1)

∴ 7y – 7 + x + 1 = 0

∴ 7y + x – 6 = 0

20. (1) P(A/B) = P(A) = $\frac{1}{3}$

(2) P (A/(A$\cup$B))= $\frac{P(A\cap(A\cup B))}{P(A\cup B)}=\frac{P(A)}{P(A\cup B)}=\frac{3}{4}$

(3) P(A/B')= P(A) = $\frac{1}{3}$

(4) P(A'/B')= P(A') = $\frac{2}{3}$

21. Since given system of linear equations $x+ky+3z=0, 3x+ky-2z=0$ and $2x+4y-3z=0$ has a non-zero solution then

$\begin{vmatrix}1 & k & 3\\ 3 & k & -2\\ 2 & 4 & -3\end{vmatrix}=0\Rightarrow(-3k+8)-k(-9+4)+3(12-2k)=0$

⇒-3k +8+5k+36-6k=0

⇒+4k=44⇒k=11

Let z = λ

x+11y+3λ=0 …..(1)

$2x+4y-3\lambda=0$ …..(2)

(1)+(2)

$\Rightarrow 3x=-15y$

$\Rightarrow x=-5y$

Form (1), $-5y+11y=-3\lambda$

$\Rightarrow 6y=-3\lambda$

$\therefore y=-\lambda/2$

$\therefore x=-5\lambda/2$

Hence, $\frac{xz}{y^2}=\frac{\frac{5}{2}\lambda^2}{\frac{\lambda^2}{4}}=10$

22. A, ar, ar^2

$2ar = a+3 \Rightarrow a= 3/2r-1$

$ar^2=4$

Solve, r = 2/3, a=9

23. No of rational terms = $\frac{6561}{9}+1=730$

So, number of irrational terms = 6562-730= 5832

$\Rightarrow \frac{N}{100}=\frac{5832}{100}=58.32$

24. P = (t+1, 8t+2, 9t+3)

$t+1+2(8t+2)-9t-3=0$

t= -1/4, P = $\left(\frac{3}{4},0,\frac{3}{4}\right)$

$\left(\frac{\alpha+1}{2},\frac{\beta+2}{2},\frac{\gamma+3}{2}\right)=\left(\frac{3}{4},0,\frac{3}{4}\right)$

$\alpha\frac{1}{2} \quad \beta=-2 \quad \gamma=\frac{-3}{2}$

25. $f''(x)=\lambda(x-1)$

$f(x)=\frac{\lambda x^2}{2}-\lambda x+C \Rightarrow f'(-1)=0 \Rightarrow c=\frac{-3\lambda}{2}$

$f(x)=\frac{\lambda x^3}{6}-\frac{\lambda x^2}{2}-\frac{3\lambda}{2}x+d$

$f(1)=-6 \Rightarrow -11\lambda+6d0-36$ …(i)

$f(-1)=10 \Rightarrow 5\lambda+6d-60$ …(ii)

From (i) & (ii) $\lambda=6$ & d = 5

$f(x)=x^3-3x^2-9x+5$

Which has minimum at x = 3