JEE (Main)
Sample Question Paper

Subjects	Physics, Chemistry and Mathematics
Total Number of Questions	75
Maximum Marks	300
Time Allowed	3 Hours

Marking Scheme (As per JEE Main Pattern)

Each question carries **4 (four) marks**.
1 (one) mark will be deducted for each incorrect answer.
No marks will be deducted for unattempted questions.
Only one option is correct for each question.

Important Instructions

1. This Question Paper consists of **75 Multiple Choice Questions**.
2. The paper contains **25 questions each from Physics, Chemistry and Mathematics**.
3. All questions are compulsory.
4. Rough work should be done only in the space provided in the Question Paper.
5. Calculators, mobile phones, smart watches, or any electronic devices are strictly prohibited.

Name of the Candidate (Capital Letters)	
Roll Number	
Examination Centre Name	
Candidate's Signature	Date

Invigilator's Signature

PHYSICS

1. A nucleus at rest disintegrates into two smaller nuclei with their masses in the ratio of 2:1. After disintegration they will move

A) In opposite directions with speed in the ratio of 1:2 respectively

B) In opposite directions with speed in the ratio of 2:1 respectively

C) In the same direction with same speed.

D) In opposite directions with the same speed.

2. A body of mass $2\,\text{kg}$ begins to move under the action of a time-dependent force given by $\vec{F} = (6t\,\hat{i} + 6t^2\,\hat{j})\,\text{N}$. The power developed by the force at the time t is given by:

A) $(6t^4 + 9t^5)\,\text{W}$

B) $(3t^3 + 6t^5)\,\text{W}$

C) $(9t^5 + 6t^3)\,\text{W}$

D) $(9t^3 + 6t^5)\,\text{W}$

3. Given below are two statements: Statement I : In a vernier callipers, one vernier scale division is always smaller than one main scale division. Statement II : The vernier constant is given by one main scale division multiplied by the number of vernier scale divisions. In light of the above statements, choose the correct answer from the options given below.

A) Both Statement I and Statement II are false.

B) Statement I is true but Statement II is false.

C) Both Statement I and Statement II are true.

D) Statement I is false but Statement II is true.

4. What is the relative decrease in focal length of a lens for an increase in optical power by 0.1 D from 2.5 D? ('D' stands for dioptre).

A) 0.04

B) 0.40

C) 0.1

D) 0.01

5. A hydrogen atom in ground state is given an energy of 10.2 eV. How many spectral lines will be emitted due to transition of electrons ?

A) 6

B) 3

C) 10

D) 1

6. A gun fires a lead bullet of temperature 300 K into a wooden block. The bullet having melting temperature of 600 K penetrates into the block and melts down. If the total heat required for the process is 625 J, then the mass of the bullet is_____grams. Given Data: Latent heat of fusion of lead = 2.5×10^4 J kg^{-1} and specific heat capacity of lead = 125 J kg^{-1} K^{-1}.

A) 20

B) 15

C) 10

D) 5

7. A proton and a deuteron ($q = +e$, $m = 2.0u$) having the same kinetic energies enter a region of uniform magnetic field $\vec{B}$, moving perpendicular to $\vec{B}$. The ratio of the radius r_d of the deuteron path to the radius r_p of the proton path is:

A) 1 : 1

B) $1 : \sqrt{2}$

C) $\sqrt{2} : 1$

D) 1 : 2

8. If the percentage errors in measuring the length and the diameter of a wire are 0.1% each. The percentage error in measuring its resistance will be:

A) 0.002

B) 0.003

C) 0.001

D) 0.00144

9. A long straight wire of circular cross-section (radius a) is carrying a steady current I. The current I is uniformly distributed across this cross-section. The magnetic field is:

A) Zero in the region $r < a$ and inversely proportional to r in the region $r > a$

B) Inversely proportional to r in the region $r < a$ and uniform throughout in the region $r > a$

C) Directly proportional to r in the region $r < a$ and inversely proportional to r in the region $r > a$

D) Uniform in the region $r < a$ and inversely proportional to distance r from the axis, in the region $r > a$

10. In a plane EM wave, the electric field oscillates sinusoidally at a frequency of $5 \times 10^{10}\,\text{Hz}$ and an amplitude of $50\,\text{Vm}^{-1}$. The total average energy density of the electromagnetic field of the wave is: [Use $\epsilon_0 = 8.85 \times 10^{-12}\,\text{C}^2/\text{Nm}^2$]

A) $1.106 \times 10^{-8}\,\text{Jm}^{-3}$

B) $4.425 \times 10^{-8}\,\text{Jm}^{-3}$

C) $2.212 \times 10^{-8}\,\text{Jm}^{-3}$

D) $2.212 \times 10^{-10}\,\text{Jm}^{-3}$

11. Two charges q and $3q$ are separated by a distance r in air. At a distance x from charge q, the resultant electric field is zero. The value of x is:

A) $\frac{1+\sqrt{3}}{r}$

B) $\frac{r}{3(1+\sqrt{3})}$

C) $\frac{r}{1+\sqrt{3}}$

D) $r(1+\sqrt{3})$

12. An air bubble of radius 0.1 cm lies at a depth of 20 cm below the free surface of a liquid of density 1000 kg/m^3. If the pressure inside the bubble is 2100 N/m^2 greater than the atmospheric pressure, then the surface tension of the liquid in SI units is (use $g = 10\,m/s^2$).

A) 0.02

B) 0.1

C) 0.25

D) 0.05

13. An AC voltage $V = 20\sin 200\pi t$ is applied to a series LCR circuit which drives a current $I = 10\sin\left(200\pi t + \frac{\pi}{3}\right)$. The average power dissipated is:

A) 21.6 W

B) 200 W

C) 173.2 W

D) 50 W

14. A uniform rod of mass 250 g having length 100 cm is balanced on a sharp edge at the 40 cm mark. A mass of 400 g is suspended at the 10 cm mark. To maintain the balance of the rod, the mass to be suspended at the 90 cm mark is:

A) 300 g

B) 200 g

C) 290 g

D) 190 g

15. A force $F = \alpha + \beta x^2$ acts on an object in the x-direction. The work done by the force is 5 J when the object is displaced by 1 m. If the constant $\alpha = 1\,N$, then β will be:

A) 15 N/m²

B) 10 N/m²

C) 12 N/m²

D) 8 N/m²

16. The excess pressure inside a soap bubble is thrice the excess pressure inside a second soap bubble. The ratio between the volume of the first and the second bubble is :

A) 1 : 9

B) 1 : 3

C) 1 : 81

D) 1 : 27

17. The measured value of the length of a simple pendulum is 20 cm with 2 mm accuracy. The time for 50 oscillations was measured to be 40 seconds with 1 second resolution. From these measurements, the accuracy in the measurement of acceleration due to gravity is N%. The value of N is:

A) 4 **B)** 8

C) 6 **D)** 5

18. A force $\mathbf{F} = 2\hat{i} + b\hat{j} + \hat{k}$ is applied on a particle and it undergoes a displacement $\mathbf{r} = \hat{i} - 2\hat{j} - \hat{k}$. What will be the value of b, if the work done on the particle is zero?

A) $\frac{2}{3}$ **B)** $\frac{1}{2}$

C) 0 **D)** $\frac{1}{3}$

19. A positive ion A and a negative ion B has charges 6.67×10^{-19} C and 9.6×10^{-10} C, and masses 19.2×10^{-27} kg and 9×10^{-27} kg respectively. At an instant, the ions are separated by a certain distance r. At that instant, the ratio of the magnitudes of electrostatic force to gravitational force is $P \times 10^{-13}$, where the value of P is:

A) 20 **B)** 15

C) 10 **D)** 5

20. Two spherical bodies of same materials having radii 0.2 m and 0.8 m are placed in same atmosphere. The temperature of the smaller body is 800 K and temperature of bigger body is 400 K. If the energy radiate from the smaller body is E, the energy radiated from the bigger body is (assume, effect of the surrounding to be negligible):

A) 256 E **B)** E

C) 64 E **D)** 16 E

21. A hydrogen atom in ground state is given an energy of 10.2 eV. How many spectral lines will be emitted due to transition of electrons ?

A) 6 **B)** 3

C) 10 **D)** 1

22. The fundamental frequency of a closed organ pipe is equal to the first overtone frequency of an open organ pipe. If length of the open pipe is 60 cm, the length of the closed pipe will be :

A) 60 cm **B)** 45 cm

C) 30 cm **D)** 15 cm

23. A car of mass m moves on a banked road having radius r and banking angle θ. To avoid slipping from the banked road, the maximum permissible speed of the car is v_0. The coefficient of friction μ between the wheels of the car and the banked road is:

A) $\mu = \frac{v_0^2 + rg\tan\theta}{rg - v_0^2\tan\theta}$ **B)** $\mu = \frac{v_0^2 + rg\tan\theta}{rg + v_0^2\tan\theta}$

C) $\mu = \frac{v_0^2 - rg\tan\theta}{rg + v_0^2\tan\theta}$ **D)** $\mu = \frac{v_0^2 - rg\tan\theta}{rg - v_0^2\tan\theta}$

24. Consider the following statements:

A. The junction area of a solar cell is made very narrow compared to a photodiode.

B. Solar cells are not connected with any external bias.

C. LED is made of lightly doped p-n junction.

D. Increase of forward current results in a continuous increase in LED light intensity.

E. LEDs have to be connected in forward bias for emission of light.

A) B, D, E Only **B)** A, C Only

C) A, C, E Only **D)** B, E Only

25. The relation between time t and distance x is $t = \alpha x^2 + \beta x$, where α and β are constants. The relation between acceleration a and velocity v is:

A) $a = -2\alpha v^3$

B) $a = -5\alpha v^5$

C) $a = -3\alpha v^2$

D) $a = -4\alpha v^4$

JEE MAIN PHYSICS ANSWER KEY

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

CHEMISTRY

1. Which of the following cannot be explained by crystal field theory?

A) Magnetic properties of transition metal complexes

B) The order of spectrochemical series

C) Colour of metal complexes

D) Stability of metal complexes

2. A. Ammonium salts produce haze in atmosphere
B. Ozone gets produced when atmospheric oxygen reacts with chlorine radicals
C. Polychlorinated biphenyls act as cleansing solvents
D. 'Blue baby' syndrome occurs due to the presence of excess of sulphate ions in water
Choose the correct answer from the options given below:

A) B and C only

B) A and C only

C) A and D only

D) A, B and C only

3. Given below are two statements, one is labelled as Assertion A and the other is labeled as Reason R
Assertion A : The alkali metals and their salts impart characteristic colour to reducing flame
Reason R : Alkali metals can be detected using flame tests
In the light of the above statements, choose the most appropriate answer from the options given below

A) A is not correct but R is correct

B) Both A and R are correct but R is NOT the correct explanation of A

C) Both A and R are correct and R is the correct explanation of A

D) A is correct but R is not correct

4. Match List I with List II:

LIST I (Type)	LIST II (Name)
(P) Antifertility drugs	(A) Norethindrone
(Q) Antihistamines	(B) Seldane
(R) Tranquilizers	(C) Meprobamate
(S) Antibiotics	(D) Penicillin

Choose the correct answer from the options given below:

A) P → (A), Q → (B), R → (C), S → (D)

B) P → (A), Q → (C), R → (B), S → (D)

C) P → (D), Q → (C), R → (B), S → (A)

D) P → (A), Q → (D), R → (B), S → (C)

5. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R:
Assertion A: Acetal / Ketal is stable in basic medium
Reason R: The high leaving tendency of alkoxide ion gives the stability to acetal ketal in basic medium
In the light of the above statements, choose the correct answer from the options given below :

A) Both A and R are true but R is NOT the correct explanation of A

B) A is false but R is true

C) A is true but R is false

D) Both A and R are true and R is the correct explanation of A

6. Which one of the following reactions does not occur during extraction of copper?

A) $CaO + SiO_2 \rightarrow CaSiO_3$

B) $2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$

C) $FeO + SiO_2 \rightarrow FeSiO_3$

D) $2FeS + 3O_2 \rightarrow 2FeO + 2SO_2$

7. Match List I with List II

List I	List II
A Tranquilizers	i Anti blood clotting
B Aspirin	ii Salvarsan
C Antibiotic	iii Antidepressant drugs
D Antiseptic	iv Soframicine

Choose the correct answer from the options given below:

A) (A) - II, (B) - IV, (C) - I, (D) - III

B) (A) - IV, (B) - II, (C) - I, (D) - III

C) (A) - III, (B) - I, (C) - II, (D) - IV

D) (A) - II, (B) - I, (C) - III, (D) - IV

8. Which one among the following metals is the weakest reducing agent?

A) Rb

B) Na

C) Li

D) K

9. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R)
Assertion (A): α-halocarboxylic acid on reaction with dil NH_3 gives good yield of α-aminocarboxylic acid whereas the yield of amines is very low when prepared from alkyl halides
Reason (R): Amino acids exist in zwitter ion form in aqueous medium
In the light of the above statements, choose the correct answer from the options given below :

A) Both (A) and (R) are correct and (R) is the correct explanation of (A)

B) (A) is not correct but (R) is correct

C) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

D) (A) is correct but (R) is not correct

10. When the hydrogen ion concentration $[H^+]$changes by a factor of 1000 , the value of pH of the solution_____

A) decreases by 3 units

B) decreases by 2 units

C) increases by 2 units

D) increases by 1000 units

11.
Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R :

Assertion (A) : Acetal / Ketal is stable in basic medium.

Reason (R) : The high leaving tendency of alkoxide ion gives the stability to acetal ketal in basic medium

In the light of the above statements, choose the correct answer from the options given below

A) Both A and R are true but R is NOT the correct explanation of A

B) A is false but R is true

C) A is true but R is false

D) Both A and R are true and R is the correct explanation of A

12. ' 25 volume' hydrogen peroxide means

A) $100\,mL$ marketed solution contains $25\,g$ of H_2O_2.

B) $1L$ marketed solution contains $75\,g$ of H_2O_2.

C) $1L$ marketed solution contains $250\,g$ of H_2O_2.

D) $1L$ marketed solution contains $25\,g$ of H_2O_2.

13. The correct order in aqueous medium of basic strength in case of methyl substituted amines is :

A) $NH_3 > Me_3N > MeNH_2 > Me_2NH$

B) $Me_2NH > Me_3N > MeNH_2 > NH_3$

C) $Me_2NH > MeNH_2 > Me_3N > NH_3$

D) $Me_3N > Me_2NH > MeNH_2 > NH_3$

14. What is the mass ratio of ethylene glycol ($C_2H_6O_2$, molar mass 62 g/mol) required for making 500 g of 0.25 molal aqueous solution and 250 ml of 0.25 molal aqueous solution?

A) 1 : 2 **B)** 1 : 1

C) 3 : 1 **D)** 2 : 1

15. S_1: Be^{+2} has higher SRP than other alkaline earth metals.

S_2: Be^{+2} has higher hydration energy and greater $\triangle$aH (atomisation enthalpy) than other alkaline earth metals.

A) Both S_1 & S_2 are true **B)** S_1 is true ; S_2 is false

C) S_1 is false ; S_2 is true **D)** Both S_1 & S_2 are false

16. The correct order in aqueous medium of basic strength in case of methyl substituted amines is :

A) $NH_3 > Me_3N > MeNH_2 > Me_2NH$ **B)** $Me_2NH > Me_3N > MeNH_2 > NH_3$

C) $Me_2NH > MeNH_2 > Me_3N > NH_3$ **D)** $Me_3N > Me_2NH > MeNH_2 > NH_3$

17. Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R
Assertion A: Carbon forms two important oxides - CO and CO_2. CO is neutral whereas CO_2 is acidic in nature
Reason R : CO_2 can combine with water in a limited way to form carbonic acid, while CO is sparingly soluble in water
In the light of the above statements, choose the most appropriate answer from the options given below

A) A is not correct but R is correct **B)** Both A and R are correct but R is NOT the correct explanation of A

C) Both A and R are correct and R is the correct explanation of A **D)** A is correct but R is not correct

18. Given below are two statements:
Statement I : In froth floatation method a rotating paddle agitates the mixture to drive air out of it.
Statement II : Iron pyrites are generally avoided for extraction of iron due to environmental reasons.
In the light of the above statements, choose the correct answer from the options given below:

A) Both Statement I and Statement II are false **B)** Both Statement I and Statement II are true

C) Statement I is false but Statement II is true **D)** Statement I is true but Statement II is false

19. Which one of the following statements is correct for electrolysis of brine solution?

A) OH^- is formed at cathode **B)** Cl_2 is formed at cathode

C) O_2 is formed at cathode **D)** H_2 is formed at anode

20. Increasing order of stability of the resonance structures is: Choose the correct answer from the options given below:

A) D, C, A, B **B)** C, D, A, B

C) D, C, B, A **D)** D, A, B

21. An α-particle, a proton, and an electron have the same kinetic energy. Which one of the following is correct in case of their De-Broglie wavelength:

A) $\lambda_\alpha < \lambda_p < \lambda_e$ **B)** $\lambda_\alpha > \lambda_p > \lambda_e$

C) $\lambda_\alpha = \lambda_p = \lambda_e$ **D)** $\lambda_\alpha > \lambda_p < \lambda_e$

22. Given below are two statements:
Statement-I: Pure Aniline and other arylamines are usually colourless.
Statement-II: Arylamines get coloured on storage due to atmospheric reduction
In the light of the above statements, choose the most appropriate answer from the options given below:

A) Both Statement-I and Statement-II are correct.
B) Both Statement-I and Statement-II are incorrect.
C) Statement-I is correct but Statement-II is incorrect.
D) Statement-I is incorrect but Statement-II is correct.

23. A cubic solid is made up of two elements X and Y Atoms of X are present on every alternate corner and one at the enter of cube Y is at $\frac{1}{3}td$ of the total faces The empirical formula of the compound is

A) $X_2Y_{1.5}$
B) $X_{2.5}Y$
C) $XY_2, 5$
D) $X_{1.5}Y_2$

24. A cubic solid is made up of two elements X and Y Atoms of X are present on every alternate corner and one at the center of cube Y is at $\frac{1}{3}rd$ of the total faces. The empirical formula of the compound is

A) $X_2Y_{1.5}$
B) X_3Y_2
C) $XY_{2,5}$
D) $X_{1.5}Y_2$

25. Decreasing order of dehydration of the following alcohols is

A) $a > d > b > c$
B) $d > b > c > a$
C) $b > a > d > c$
D) $b > d > c > a$

JEE MAIN CHEMISTRY ANSWER KEY

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

MATHEMATICS

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1. The number of functions $f:\{1,2,3,4\}\to\{a\in:Z|a|\le 8\}$ satisfying $f(n)+\frac{1}{n}f(n+1)=1,\forall n\in\{1,2,3\}$ is

A) 2 **B)** 1

C) 4 **D)** 3

2. If (a,b) be the orthocenter of the triangle whose vertices are $(1,2)$, $(2,3)$, and $(3,1)$, and $I_1=\int_a^b x\sin(4x-x^2)dx$, $I_2=\int_a^b \sin(4x-x^2)dx$, then $36\frac{I_1}{I_2}$ is equal to:

A) 80 **B)** 88

C) 66 **D)** 72

3. If the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ meets the line $\frac{x}{7}+\frac{y}{2\sqrt{6}}=1$ on the x-axis and the line $\frac{x}{7}-\frac{y}{2\sqrt{6}}=1$ on the y-axis, then the eccentricity of the ellipse is

A) $\frac{5}{7}$ **B)** $\frac{2\sqrt{6}}{7}$

C) $\frac{3}{7}$ **D)** $\frac{2\sqrt{5}}{7}$

4. The statement $(p\wedge(\sim q))\Rightarrow(p\Rightarrow(\sim q))$ is

A) equivalent to$p\vee q$ **B)** equivalent to$(-p)\vee(-q)$

C) a contradiction **D)** a tautology

5. If the probability that the random variable X takes values x is given by $P(X=x)=k(x+1)3^{-x}, x=0,1,2,\ldots$, where k is a constant, then $P(X\ge 2)$ is equal to:

A) $\frac{5}{18}$ **B)** $\frac{10}{18}$

C) $\frac{20}{27}$ **D)** $\frac{7}{27}$

6. Find the number of integral values of x which satisfy the inequality x_2–10x+19<6.

A) 5 **B)** 11

C) 7 **D)** 8

7. If $f(x)-f(y)=ln\left(\frac{x}{y}\right)+x-y$, then find $\sum_{k=1}^{20} f'\left(\frac{1}{k^2}\right)$

A) 2890 **B)** 2390

C) 1245 **D)** None of this

8. Let the function $f(x)=2x^3+(2p-7)x^2+3(2p-9)x-6$ have a maxima for some value of $x<0$ and a minima for some value of $x>0$ Then, the set of all values of p is

A) $\left(\frac{9}{2},\infty\right)$ **B)** $\left(0,\frac{9}{2}\right)$

C) $\left(-\frac{9}{2},\frac{9}{2}\right)$ **D)** $\left(-\infty,\frac{9}{2}\right)$

9. A straight line cuts off the intercepts $OA = a$ and $OB = b$ on the positive directions of x-axis and y axis respectively If the perpendicular from origin O to this line makes an angle of $\frac{\pi}{6}$ with positive direction of y-axis and the area of $\triangle OAB$ is $\frac{98}{3}\sqrt{3}$, then $a^2 - b^2$ is equal to :

A) $\frac{392}{3}$ **B)** $\frac{196}{3}$

C) 196 **D)** 98

10. Let awards in event A is 48 and awards in event B is 25 and awards in event C is 18 and also n(A ∪ B ∪ C) = 60, n(A ∩ B ∩ C) = 5, then how many got exactly two awards is?

A) 21 **B)** 25

C) 24 **D)** 23

11. The sum of the absolute maximum and minimum values of the function $f(x) = \left|x^2 - 5x + 6\right| - 3x + 2$in the interval $[-1, 3]$ is equal to :

A) 12 **B)** 10

C) 24 **D)** 13

12. The complex number $z = \frac{i-1}{\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}}$ is equal to :

A) $\sqrt{2}i\left(\cos\frac{5\pi}{12} - i\sin\frac{5\pi}{12}\right)$ **B)** $\cos\frac{\pi}{12} - i\sin\frac{\pi}{12}$

C) $\sqrt{2}\left(\cos\frac{\pi}{12} + i\sin\frac{\pi}{12}\right)$ **D)** $\sqrt{2}\left(\cos\frac{5\pi}{12} + i\sin\frac{5\pi}{12}\right)$

13. The sum $\sum_{n=1}^{21} \frac{3}{(4n-1)(4n+3)}$ is equal to

A) $\frac{7}{87}$ **B)** $\frac{7}{29}$

C) $\frac{14}{87}$ **D)** $\frac{21}{29}$

14. $Height of tower AB is 30m where B is foot of tower. Angle of elevation from a point C on level ground to top of to$

A) 300($\sqrt{3}$-1) **B)** 600($\sqrt{3}$-1)

C) 150($\sqrt{3}$-1) **D)** 100($\sqrt{3}$-1)

15. Let $P(x_0, y_0)$ be the point on the hyperbola $3x^2 - 4y^2 = 36$, which is nearest to the line $3x + 2y = 1$. Then $\sqrt{2}(y_0 - x_0)$ is equal to:

A) -9 **B)** 3

C) 9 **D)** -3

16. The number of integral values of k, for which one root of the equation

$$2x^2 - 8x + k = 0$$

lies in the interval $(1, 2)$ and its other root lies in the interval $(2, 3)$, is:

A) 2 **B)** 0

C) 1 **D)** 2

17. If the number of words, with or without meaning, which can be made using all the letters of the word *MATHEMATICS* in which C and S do not come together, is (6!)k , is equal to

A) 5670 **B)** 1890

C) 595 **D)** 657

18. Let the point $P(\alpha, \beta)$ be at a unit distance from each of the two lines $L_1 : 3x - 4y + 12 = 0$, and $L_2 : 8x + 6y + 11 = 0$ If P lies below L_1 and above L_2, then $100(\alpha + \beta)$ is equal to

A) -14 **B)** 42

C) -22 **D)** 14

19. If the sum and product of four positive consecutive terms of a GP, are 126 and 1296, respectively, then the sum of common ratios of all such GPs is

A) $\frac{9}{2}$ **B)** 3

C) 7 **D)** 14

20. The set of all values of a for which $\lim\limits_{x \to a}([x - 5] - [2x + 2]) = 0$,where $[\propto]$ denotes the greatest integer less than or equal to $\propto$ is equal to

A) $[-7.5, -6.5)$ **B)** $(-7.5, -6.5)$

C) $(-7.5, -6.5]$ **D)** $[-7.5, -6.5]$

21. The mean and standard deviation of 10 observations are 20 and 8 respectively. Later on, it was observed that one observation was recorded as 50 instead of 40. Then the correct variance is:

A) $\frac{247}{3}$ **B)** $\frac{167}{2}$

C) 118 **D)** 96

22. Let $y = f(x) = \sin^3\left(\frac{\pi}{3}\left(\cos\left(\frac{\pi}{3\sqrt{2}}\left(-4x^3 + 5x^2 + 1\right)^{\frac{3}{2}}\right)\right)\right)$ Then, at $x = 1$

A) $2y' + \sqrt{3}\pi^2 y = 0$ **B)** $\sqrt{2}y' - 3\pi^2 y = 0$

C) $2y' + 3\pi^2 y = 0$ **D)** $y' + 3\pi^2 y = 0$

23. The number of common terms in the progressions 4, 9, 14, 19, ...,up to 25th term and 3, 6, 9, 12, ..., up to 37th term is:

A) 9 **B)** 5

C) 7 **D)** 8

24. Let $\alpha > 0$ If $\int\limits_0^{\alpha} \frac{x}{\sqrt{x+\alpha}-\sqrt{x}}dx = \frac{16+20\sqrt{2}}{15}$, then α is equal to :

A) 2 **B)** $2\sqrt{2}$

C) 4 **D)** $\sqrt{2}$

25. If the foot of the perpendicular drawn from $(1, 9, 7)$ to the line passing through the point $(3, 2, 1)$ and parallel to the planes $x + 2y + z = 0$ and $3y - z = 3$ is (α, β, γ), then $\alpha + \beta + \gamma$ is equal to

A) -1 **B)** 1

C) 3 **D)** 5

JEE MAIN MATHEMATICS ANSWER KEY

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