UNWAL PACIFIC
Foundation | IIT-JEE | Medical | Repeater

JEE Main – 2023

24th JAN 2023 (Morning Shift)

General Instructions

1. The test is of **3 hours** duration and the maximum marks is **300.**
2. The question paper consists of **3 Parts** (Part I: **Physics**, Part II: **Chemistry**, Part III: **Mathematics**). Each Part has **two** sections (Section 1 & Section 2).
3. **Section 1** contains **20 Multiple Choice Questions**. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE CHOICE** is correct.
4. **Section 2 contains 10 Numerical Value Type Questions Out of which ONLY 5 (any) questions have to be attempted. You will NOT be allowed to attempt the sixth question. If you wish to attempt any other question apart from the five already attempted, then you will have to delete any one response from the five previously answered and then proceed to answer the new one.**
   The answer to each question should be **rounded off to the nearest integer**.
5. No candidate is allowed to carry any textual material, printed or written, bits of papers, pager, mobile phone, any electronic device, etc. inside the examination room/hall.

Marking Scheme

1. **Section – 1:** +4 for correct answer, –1 (negative marking) for incorrect answer, 0 for all other cases.
2. **Section – 2:** +4 for correct answer, –1 (negative marking) for incorrect answer, 0 for all other cases.

SUBJECT I: PHYSICS	MARKS: 100

SECTION-1

This section contains 20 Multiple Choice Questions. Each question has 4 choices (1), (2), (3) and (4), out of which ONLY ONE CHOICE is correct.

1. If two charges are separated with distance 'd' and placed in a medium of dielectric constant K. What will be the equivalent distance between charges in air for the same electrostatic force?

(1) **(2)** **(3)** **(4)**

2. 1 g of a liquid is converted to vaour at Pa pressure. If 10% of the heat supplied is used for increasing the volume by during this phase change, then the increase in internal energy in the process will be :

(1) 432000 J **(2)** **(3)** 4800 J **(4)** 4320 J

3. Given below are two statements :

Statement I : An elevator can go up or down with uniform speed when its weight is balanced with the tension of its cable.

Statement II : Force exerted by the floor of an elevator on the foot of a person standing on it is more than his/her weight when the elevator goes does with increasing speed.

In the light of the above statement, choose the correct answer form the options given below:

(1) Statement I is false but Statement II is true

(2) Both Statement I and Statement II are false

(3) Statement I is true but Statement II is false

(4) Both Statement I and Statement II are true

4. Match Column I with Column II

Column I		Column II	
I.	Planck's constant (h)	**P.**	
II.	Stopping potential (Vs)	**Q.**	
III.	Work function	**R.**	
IV.	Momentum (p)	**S.**	

Choose the correct answer form the options given below :

(1) I – P ; II – R ; III – S ; IV – Q **(2)** I – R ; II – S ; III – P ; IV – Q

(3) I – R ; II – P ; III – Q ; IV – S **(4)** I – Q ; II – S ; III – R ; IV – P

5. A conducting circular loop of radius cm is placed perpendicular to a uniform magnetic field of 0.5 T. the magnetic field is decreased to zero in 0.5 s at a steady rate. The induced emf in the circular loop at 0.05 s is :

(1) emf = 1 mV **(2)** emf = 5 mV

(3) emf = 10 mV **(4)** emf = 100 mV

6. Consider the following radioactive decay process

The mass number and the atomic number of are given by :

(1) 210 and 82 **(2)** 210 and 84 **(3)** 210 and 80 **(4)** 211 and 80

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

Assertion (A) : Photodiodes are preferably operated in reverse bias condition for light intensity measurement.

Reason (R) : The current in the forward bias is more than the current in the reverse bias for a p – n junction diode.

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

(1) (A) is false but (R) is true

(2) (A) is true but (R) is false

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

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

8. The maximum vertical height to which a man can throw a ball is 136m. The maximum horizontal distance upto which he can throw the same ball is :

(1) 272 m **(2)** 136 m **(3)** 192 m **(4)** 68 m

9. Given below are two statements :

Statement I : The temperature of a gas is -73°C. When the gas is heated to 572°C, the root mean square speed of the molecules is doubled.

Statement II : The product of pressure and volume of an ideal gas will be equal to translational kinetic energy of the molecules.

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

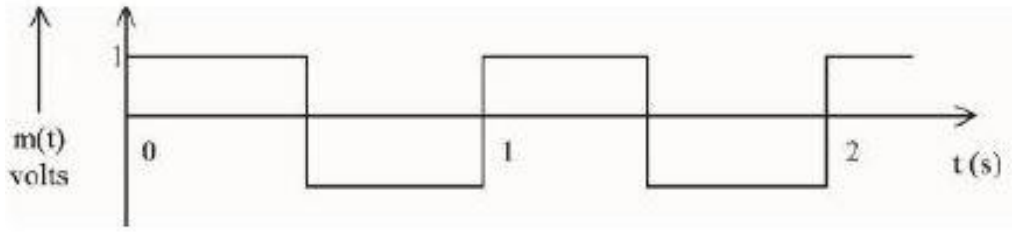
(1) Statement I is true but Statement II is false

(2) Statement I is false but Statement II is true

(3) Both Statement I and Statement II are false

(4) Both Statement I and Statement II are true

10. A modulating signal is a square wave, as shown in the figure.



If the carrier wave is given as volts, the modulation index is :

(1) **(2)** **(3)** 1 **(4)**

11. A circular loop of radius r is carrying current I A. The ratio of magnetic field at the centre of circular loop and at a distance r from the center of the loop on its axis is :

(1) **(2)** **(3)** **(4)**

12. From the photoelectric effect experiment, following observations are made. Identify which of these are correct.

I. The stopping potential depends only on the work function of the metal

II. The saturation current increase as the intensity of incident light increases

III. The maximum kinetic energy of a photo electron depends on the intensity of the incident light

IV. Photoelectric effect can be explained using wave theory of light

Choose the correct answer from the options given below:

(1) I, II, IV only **(2)** II, III only **(3)** II only **(4)** I, III, IV only

13. Two long straight wires *P* and *Q* carrying equal current 10A each were kept parallel to each other at 5 cm distance. Magnitude of magnetic force experienced by 10 cm length of wire *P* is If distance between wires is halved and currents on them are doubled, force on 10 cm length of wire *P* will be :

(1) **(2)** **(3)** **(4)**

14. Given below are two statements :

Statement I : If the Brewster's angle for the light propagating from air to glass is then the Bresster's angle for the light propagating from glass to air is

Statement II : The Brewster's angle for the light propagating from glass to air is where is the refractive index of glass.

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

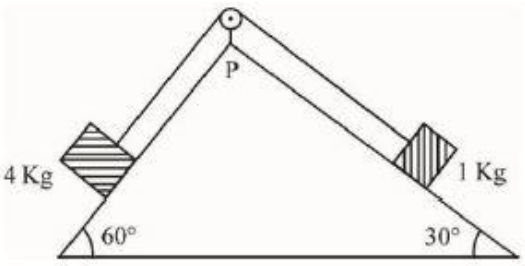
(1) Statement I is false but Statement II is true

(2) Statement I is true but Statement II is false

(3) Both Statement I and Statement II are true

(4) Both Statement I and Statement II are false

15. As per given figure, a weightless pulley P is attached on a double inclined frictionless surfaces. The tension in the string (massless) will be (if)



(1) **(2)** **(3)** **(4)**

16. A travelling wave is described by the equation

The velocity of the wave is : [all the quantities are in SI unit]

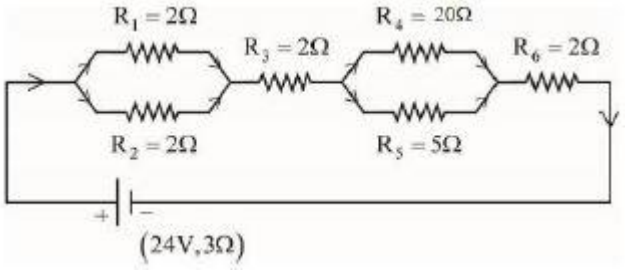
(1) **(2)** **(3)** **(4)**

17. In represent electric field and propagation vectors of the EM waves in vacuum, then magnetic field vector is given by:

(- angular frequency):

(1) **(2)** **(3)** **(4)**

18. As shown in the figure, a network of resistors is connected to a battery of 24V with an internal resistance of The currents through the resistors are respectively. The values of are :



(1) **(2)**

(3) **(4)**

19. A 100 m long wire having cross-sectional area and Yough's modulus is is subjected to a load of 250N, then the elongation in the wire will be :

(1) **(2)**

(3) **(4)**

20. The weight of a body at the surface of earth is 18 N. The weight of the body at an altitude of 3200 km above the earth's surface is (given, radius of earth):

(1) 9.8 N **(2)** 4.9 N **(3)** 8 N **(4)** 19.6 N

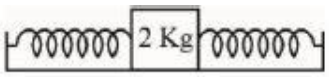
SECTION-2

Section 2 contains 10 Numerical Value Type Questions Out of which ONLY 5 (any) questions have to be attempted. The answer to each question should be **rounded off to the nearest integer**.

21. A spherical body of mass 2 kg starting from rest acquires a kinetic energy of 10000 J at the end of 5^{th} second. The force acted on the body is N.

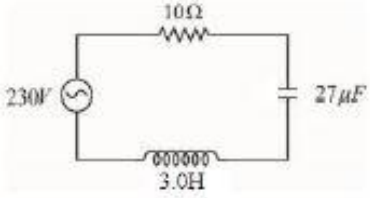
22. A block of a mass 2 kg is attached with two identical springs of spring constant 20 N/m each. The block is placed on a frictionless surface and the ends of the springs are attached to rigid supports (see in figure). When the mass is displaced from its equilibrium position, it executes a simple harmonic motion.

The time period of oscillation is in SI unit. The value of x is _____.



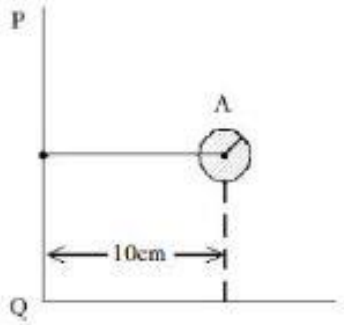
23. Assume that protons and neutrons have equal masses. Mass of a nucleon is and radius of nucleus is The approximate ratio of the nuclear density and water density is The value of n is _____.

24. In the circuit shown in the figure, the ratio of the quality factor and the band width is _____ s.



25. A stream of a positively charged particles having and velocity is deflected by an electric field The electric field exists in a region of 10 cm along x direction. Due to the electric field, the deflection of the charge particles in the y direction is _____.

26. Solid sphere A is rotating about an axis PQ. If the radius of the sphere is 5 cm then its radius of gyration about PQ will be The value of x is _____.



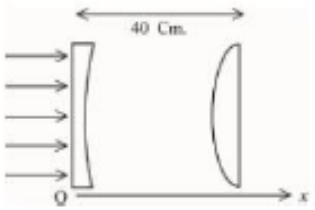
27. A hole is drilled in a metal sheet. At 27°C, the diameter of hole is 5 cm. When the sheet is heated to 177°C the change in the diameter of hole is The value of d will be _____ if coefficient of linear expansion of the metal is

28. Vector are perpendicular to each other when the ratio of a to b is . The value of x is _____.

29. A hollow cylindrical conductor has length of 3.14 m, while its inner and outer diameters are 4 mm and 8 mm respectively. The resistance of the conductor is If the resistivity of the material is

The value of n is _____.

30. As shown in the figure, a combination of thin plano concave lens and a thin plano convex lens is used to image an object at infinity. The radius of curvature of both the lenses is 30 cm and refraction index of the material for both the lenses is 1.75. Both the lenses are placed at distance of 40 cm from each other. Due to the combination, the image of the object is formed at distance x = _____ cm from concave lens.



SUBJECT II: CHEMISTRY	MARKS: 100

SECTION-1

This section contains 20 Multiple Choice Questions. Each question has 4 choices (1), (2), (3) and (4), out of which ONLY ONE CHOICE is correct.

1. Order of covalent bond ;

I.

II.

III.

IV.

V.

Choose the correct answer from the options given below:

(1) II, III, V only **(2)** III, V only

(3) II, III only **(4)** I, II only

2. Assertion (A) : Hydrolysis of an alkyl chloride is a slow reaction but in the presence of NaI, the rate of the hydrolysis increases.

Reason (R) : is a good nuclephile as well as a good leaving group.

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

(1) (A) is false but (R) is true

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

(3) (A) is true but (R) is false

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

3. Match Column I with Column II

Column I		Column II	
I.	Chlorophyll	**P.**	
II.	Soda ash	**Q.**	
III.	Dentistry, Ornamental work	**R.**	
IV.	Used in white washing	**S.**	

Choose the correct answer from the options given below :

(1) I – R ; II – S ; III – P ; IV – Q **(2)** I – Q ; II – P ; III – R ; IV – S

(3) I – Q ; II – R ; III – S ; IV – P **(4)** I – R ; II – P ; III – Q ; IV – S

4. Decreasing order of the hydrogen bonding in following forms of water is correctly represented by

I. Liquid water

II. Ice

III. Impure water

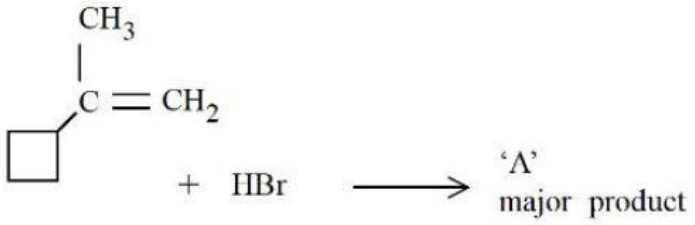
Choose the correct answer from the options given below :

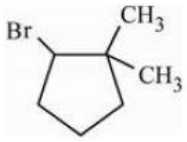
(1) III > II > I **(2)** I > II > III **(3)** II > I > III **(4)** I = II > III

5. The primary and secondary valencies of cobalt respectively in are :

(1) 2 and 6 **(2)** 3 and 5 **(3)** 2 and 8 **(4)** 3 and 6

6. In the following given reaction 'A' is



(1) 

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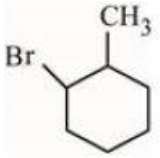
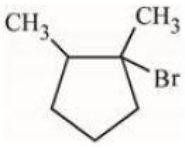
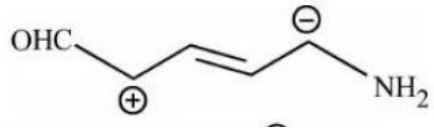
(3) 

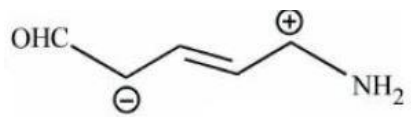
(4) 

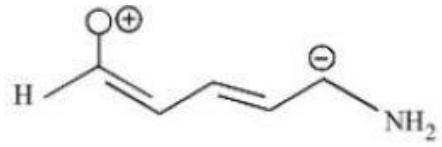
7. The magnetic moment of a transition metal compound has been calculated to be 2.87 B.M. The metal ion is

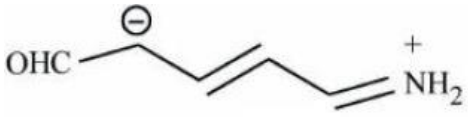
(1) **(2)** **(3)** **(4)**

8. Increasing order of stability of the resonance structures is :

I. 

II. 

III. 

IV. 

Choose the correct answer from the options given below:

(1) IV, III, II, I **(2)** IV, III, I, II **(3)** III, IV, II, I **(4)** III, IV, I, II

9. Given below are two statements:

Statement I : Noradrenaline is a neurotransmitter

Statement II : Low level of noradrenaline is not the cause of depression in human

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

(1) Statement I is true but Statement II is false

(2) Both Statement I and Statement II are false

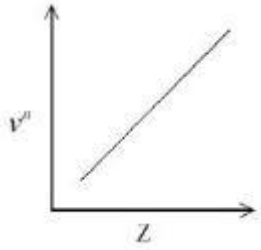
(3) Statement I is false but Statement II is true

(4) Both Statement I and Statement II are true

10. Statement I : For colloidal particles, the values of colligative properties are of small order as compared to values shown by true solutions at same concentration.
Statement II : For colloidal particles, the potential difference between the fixed layer and the diffused layer of same charges is called the electrokinetic potential or zeta potential.
In the light of the above statements, choose the correct answer from the options given below

(1) Both Statement I and Statement II are true
(2) Both Statement I and Statement II are false
(3) Statement I is false but Statement II is true
(4) Statement I is true but Statement II is false

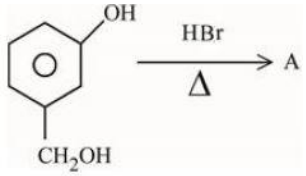
11. It is observed that characteristic X-ray spectra of elements show regularity. When frequency to the power "n" i.e., of X-rays emitted is plotted against atomic number "Z", following graph is

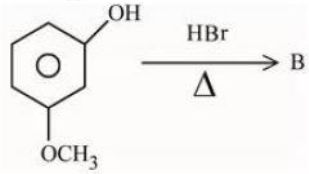


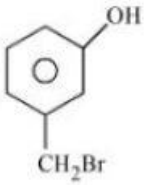
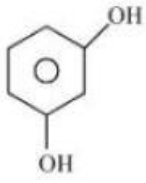
The value of "n" is

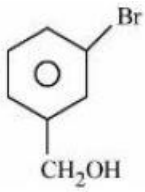
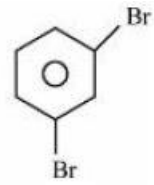
(1) 3 **(2)** 2 **(3)** 1 **(4)**

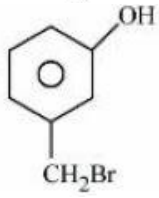
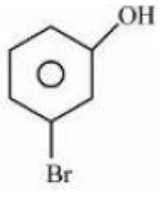
12. 'A' and 'B' formed in the following set of reactions are :

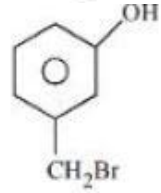
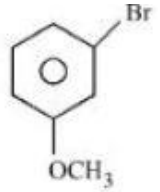




(1) A =  , B = 

(2) A =  , B = 

(3) A =  , B = 

(4) A =  , B = 

13. Match Column I with Column II

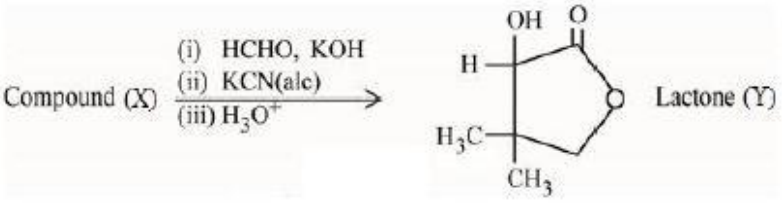
Column I		Column II	
I.	Reverberatory furnace	**P.**	Pig Iron
II.	Electrolytic cell	**Q.**	Aluminum
III.	Blast furnace	**R.**	Silicon
IV.	Zone refining furnace	**S.**	Copper

Choose the correct answer from the options given below :

(1) I – P ; II – R ; III – Q ; IV – S **(2)** I – S ; II – Q ; III – P ; IV – R

(3) I – R ; II – S ; III – P ; IV – Q **(4)** I – P ; II – S ; III – Q ; IV – R

14. Compound (X) undergoes following sequence of reactions to given the Lactone (Y)



Compound (X) is

(1) **(2)**

(3) **(4)**

15. In the depression of freezing point experiment

I. Vapour pressure of the solutions is less than that of pure solvent

II. Vapour pressure of the solution is more than that of pure solvent

III. Only solute molecules solidify at the freezing point

IV. Only solvent molecules solidify at the freezing point

Choose the most appropriate answer from the options given below :

(1) I and IV only **(2)** I only **(3)** II and III only **(4)** I and III only

16. Reaction of BeO with ammonia and hydrogen fluoride gives A which on thermal decomposition gives and What is 'A'?

(1) **(2)** **(3)** **(4)**

17. Which of the following is true about freons?

(1) All radicals are called freons

(2) These are chlorofluorocarbon compounds

(3) These are radicals of chlorine and chlorine monoxide

(4) These are chemicals causing skin cancer

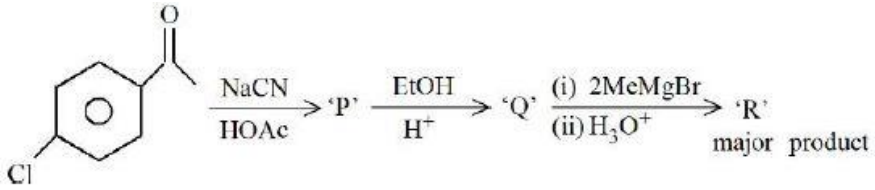
18. Which of the Phosphorus oxoacid can create silver mirror from solution?

(1) **(2)** **(3)** **(4)**

19. An ammoniacal metal salt solution gives a brilliant red precipitate on addition of dimethylglyoxime. The metal ion is :

(1) **(2)** **(3)** **(4)**

20. 'R' formed in the following sequence of reactions is :



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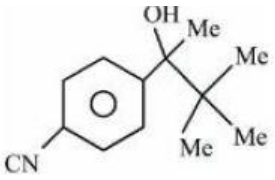

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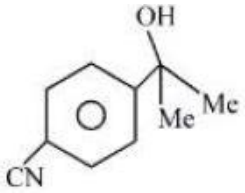
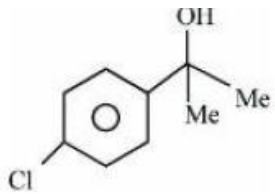


(3)



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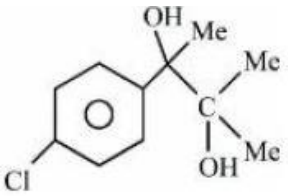


SECTION-2

Section 2 contains 10 Numerical Value Type Questions Out of which ONLY 5 (any) questions have to be attempted. The answer to each question should be **rounded off to the nearest integer**.

21. If wavelength of the first line of the Paschen series of hydrogen atom is 270 nm, then the wavelength of the second line of this series is _____nm. (Nearest integer).

22. At 298 K, a 1 litre solution containing 10 mmol of and 100 mmol of shows a pH of 3.0.

Given : and

The potential for the half cell reaction is The value of x is _____.

23. For independent processes at 300 K

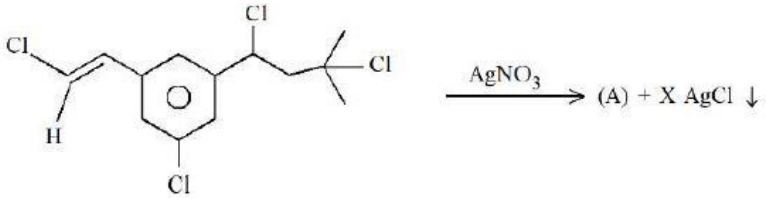
Process		
A	-25	-80
B	-22	40
C	25	-50
D	22	20

The number of non-spontaneous processes from the following is _____.

24. 5 g of NaOH was dissolved in deionized water to prepare at 450 mL stock solution. What volume (in mL) of this solution would be required to prepare 500 mL of 0.1 M solution? _____

Given : Molar Mass of Na, O and h is 23, 16 and respectively

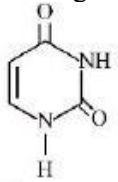
25. Number of moles of AgCl formed in the following reaction is _____.



26. The dissociation costant of acetic acid is When 25 mL of 0.2 M solution is mixed with 25 mL of solution, the pH of the resultant solution is found to be equal to 5. The value of x is _____.

27. The d-electronic configuration of in tetrahedral crystal field is Sum of "m" and

28. Uracil is a base present in RNA with the following structure. % of N in uracil is _____



Given :

Molar mass

29. The number of correct statement/s from the following is _____

I. Larger the activation energy, smaller is the value of the rate constant

II. The higher is the activation energy, higher is the value of the temperature coefficient

III. At lower temperatures, increase in temperature causes more change in the value of k than at higher temperature

IV. A plot of ln k vs is a straight line with slope equal to

30. When is heated in presence of oxygen, it converts to The number of correct statement/s from the following is _____.

I. The equivalent weight of is

II. The number of moles of in 1 mole of is 0.79 and 0.14 respectively

III. is metal deficient with lattice comprising of cubic closed packed arrangement of ions

IV. The % composition of and in is 85% and 15% respectively

SUBJECT III: MATHEMATICS	MARKS: 100

SECTION-1

This section contains 20 Multiple Choice Questions. Each question has 4 choices (1), (2), (3) and (4), out of which ONLY ONE CHOICE is correct.

1. Let be a root of the equation where are distinct real numbers such that the matrix is singular. Then, the value of is

(1) 3 **(2)** 12 **(3)** 9 **(4)** 6

2. Let and The is equal to

(1) **(2)** 2 **(3)** 1 **(4)**

3. is equal to

(1) **(2)** n **(3)** **(4)**

4. The relation is :

(1) Symmetric but not transitive **(2)** Reflexive but not symmetric

(3) Neither symmetric nor transitive **(4)** Transitive but not reflexive

5. Let be the solution of the differential equation

Then is equal to

(1) **(2)** 1 **(3)** 3 **(4)** e

6. The equation where denotes the greatest integer function, has :

(1) A unique solution in **(2)** Exactly two solution in

(3) No solution **(4)** A unique solution in

7. Let and Then and are roots of the equation.

(1) **(2)**

(3) **(4)**

8. Let PQR be a triangle. The points A, B and C are on the sides QR, RP and PQ respectively such that

Then is equal to :

(1) 3 **(2)** 4 **(3)** **(4)** 2

9. Let

Then at

(1) f is continuous but is not continuous

(2) is continuous but not differentiable

(3) f is continuous but not differentiable

(4) f and both are continuous

10. The distance of the point from the plane measured parallel to the line

is

(1) 26 **(2)** **(3)** **(4)** 31

11. The value of is

(1) **(2)** **(3)** **(4)**

12. If A and B are two non-zero matrics such that then

(1) **(2)**

(3) **(4)**

13. Let be the sample space and be an event.

Given below are two statements:

Statement I : If P(1) = 0, then

Statement II : P(1) = 1, then

Then

(1) Both Statement I and Statement II are false

(2) Only Statement II is true

(3) Only Statement I is true

(4) Both Statement I and Statement II are true

14. Let N denote the number that turns up when a fair die is rolled. If the probability that the system of equations

Has unique solution is then the sum of value of k and all possible values of N is

(1) 20 **(2)** 18 **(3)** 21 **(4)** 19

15. For three positive integers and such that 3, 3

are in A.P. with common difference Then is equal to

(1) 12 **(2)** 2 **(3)** -6 **(4)** 6

16. The distance of the point from the plane passing through the points and is :

(1) **(2)** **(3)** 4 **(4)** 5

17. Let a tangent to the curve meet the curve at the points A and B. Then the mid-points of such line segment *AB* lie on a parabola with the

(1) Directrix **(2)** Directrix

(3) Length of latus rectum 1 **(4)** Length of latus rectum

18. The area enclosed by the curves and is :

(1) 9 **(2)** **(3)** **(4)**

19. The compound statement is equivalent to

(1) **(2)**

(3) **(4)**

20. is equal to :

(1) **(2)** **(3)** **(4)**

SECTION-2

Section 2 contains 10 Numerical Value Type Questions Out of which ONLY 5 (any) questions have to be attempted. The answer to each question should be **rounded off to the nearest integer**.

21. Suppose Then the value of is _____.

22. A boy needs to select five courses from 12 available courses , out of which 5 courses are language courses. If he can choose at most two language courses, then the number of ways he can choose five courses is _____.

23. The value of is _____.

24. Let a tangent to the curve intersect the coordinate axes at the point A and B. Then, the minimum length of the lien segment AB is _____.

25. The 4^{th} term of GP is 500 and its common ratio is Let denote the sum of the fist n terms of this GP. If and then the number of possible values of m is _____,

26. The number of 9 digit numbers, that can be formed using all the digits of the number 123412341 so that the even digit occupy only even places, is _____.

27. Let and let the equation E to Then the largest element in the set is an integer solution of E} is _____.

28. The value of is _____.

29. The shortest distance between the lines and is equal to _____.

30. Let C be the largest circle centred at (2,0) and inscribed in the ellipse If lies on C, then is equal to _____.