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**Memory Based Paper
Science (Group X)
16 Nov 2024 All Shifts**



70 Questions

Que. 1 Kirchoff's current law is based on conservation of _____ while Kirchoff's voltage law is based on conservation of _____

1. Mass, Charge
2. Energy, Charge
3. Charge, Energy
4. Charge, Mass

Correct Option - 3

Que. 2 The ratio of the radius of the Earth to that of the Moon is 10. The ratio of acceleration due to gravity on the Earth and on the Moon is 6. The ratio of the escape velocity from the Earth's surface to that from the Moon is

1. 7
2. 1.66
3. 8
4. 10

Correct Option - 3

Que. 3 The displacement of a car during its journey is given by $s = xt^2 - yt + z$ where x, y and z are constants and t is the time. The acceleration of the car at $t = 4$ s is

1. 4 m/s^2
2. $2x$
3. $\sqrt{2} \text{ kmph}$
4. None of the above

Correct Option - 2

Que. 4 In a cyclic process, the change in internal energy of the system is

1. Positive
2. Negative
3. Zero
4. Cannot be determined

Correct Option - 3

Que. 5 A Carnot heat engine takes heat from a reservoir at 127°C and rejects heat to a sink at 27°C . Its efficiency will be

1. 20%

2. 25%
3. 30%
4. 50%

Correct Option - 2

Que. 6 Dimensional formula of ω in equation $y = a \sin (\omega t + kx)$ is

1. $M^0 L^0 T^{-1}$
2. $M^0 L^{-1} T^0$
3. $M L^0 T^0$
4. $M^0 L T^{-1}$

Correct Option - 1

Que. 7 Magnetic field at the centre of a circular coil of radius R due to current I flowing through it is B . The magnetic field at a point along the axis at distance R from the centre is _____

1. B
2. $B/\sqrt{2}$
3. $B/\sqrt{4}$
4. $B/\sqrt{8}$

Correct Option - 4

Que. 8 Determine the magnitude of induced EMF (in V) in a coil, if the current changes from $+2$ to $-2A$ in 0.5 second and the coefficient of mutual induction is 0.5

1. 2
2. 4
3. 3
4. 6

Correct Option - 2

Que. 9 An AC current is expressed as $i = 50 \sin 100 t$ A. What is the half-cycle average value of that current?

1. $\frac{50}{\pi} A$
2. $50 A$
3. $100 A$
4. $\frac{100}{\pi} A$

Correct Option - 4

Que. 10 The turns ratio of a transformer used in half-wave rectifier is $n_1 : n_2 = 12 : 1$. The primary is connected to the power mains of $220 V$, $50 Hz$. Assuming the diode resistance in forward bias to be zero, calculate

the dc voltage across the load

1. 8.24 V
2. 4.12 V
3. 2.8 V
4. 16.48 V

Correct Option - 1

Que. 11 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 :

1. 1 : 9
2. 1 : 3
3. 1 : 81
4. 1 : 27

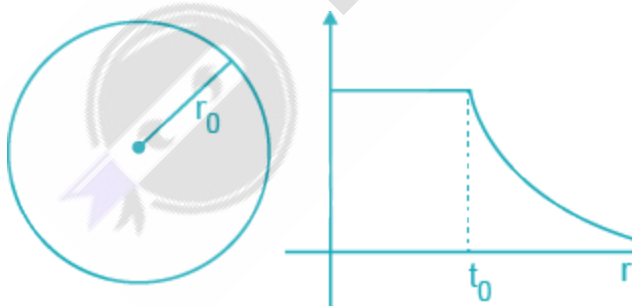
Correct Option - 4

Que. 12 A current-carrying straight conductor is placed in a magnetic field. The conductor experiences the maximum force when the angle between the direction of the current in it and the direction of the magnetic field is:

1. 45°
2. 30°
3. 90°
4. 60°

Correct Option - 3

Que. 13 The given graph shows variation (with distance r from centre) of



1. Electric field of a uniformly charged spherical shell
2. Potential of a uniformly charged spherical shell
3. Electric field of a uniformly charged sphere
4. Potential of a uniformly charged sphere

Correct Option - 2

Que. 14 A concave lens with unequal radii of curvature made of glass ($\mu_g = 1.5$) has a focal length of 40 cm. If it is immersed in a liquid of refractive index $\mu_l = 2$, then

1. it behaves like convex lens of 80 cm focal length
2. it behave like a convex lens of 20 cm focal length
3. its focal length becomes 60 cm
4. nothing can be said

Correct Option - 1

Que. 15 If the empirical formula for the observed wavelengths (λ) for hydrogen is $1/\lambda = R(1/4^2 - 1/n^2)$, where 'n' is integral values higher than 4, then it represents the _____ series.

1. Balmer
2. Brackett
3. Paschen
4. Lyman

Correct Option - 2

Que. 16 Zener diode is a _____ doped PN junction diode and connected in _____ bias in the circuit.

1. lightly, forward
2. heavily, forward
3. lightly, reversed
4. heavily, reversed

Correct Option - 4

Que. 17 The refractive index of glass is 1.5 for light whose wavelength in a vacuum is 6000 Å. The wavelength of this light when it passes through glass is

1. 4000 Å
2. 6000 Å
3. 9000 Å
4. 15000 Å

Correct Option - 1

Que. 18 A source of sound of frequency 600 Hz is placed inside water. The speed of sound in water is 1500 m/s and in air it is 300 m/s. The frequency of sound recorded by an observer in air is:

1. 3000 Hz
2. 1500 Hz
3. 600 Hz
4. 120 Hz

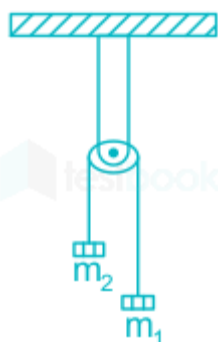
Correct Option - 3

Que. 19 The density of a material in SI units is 128 kg m^{-3} . In certain units in which the unit of length is 25 cm and the unit of mass is 50 g, the numerical value of density of the material is

1. 40
2. 16
3. 640
4. 410

Correct Option - 1

Que. 20 Two masses m_1 and m_2 are attached to a string which passes over a frictionless fixed pulley as is shown in the figure, If $m_1 = 7\text{Kg}$, $m_2 = 3\text{kg}$, and $g = 10 \text{ ms}^{-2}$, the acceleration of the masses is:



1. 2.1 ms^{-2}
2. 4 ms^{-2}
3. 42 ms^{-2}
4. 10 ms^{-2}

Correct Option - 2

Que. 21 A uniform chain of length L and mass m is lying on a smooth table and one-third of its length is hanging vertically down over the edge of the table. If g is the acceleration due to gravity, then work required to pull the hanging part on the table will be:

1. $\frac{MgL}{6}$
2. $\frac{MgL}{9}$
3. $\frac{MgL}{12}$
4. $\frac{MgL}{18}$

Correct Option - 4

Que. 22 A ball of mass M moving with a speed of 2 m/s hits another ball of mass 1 kg moving in the same direction with a speed of 1 m/s. If the kinetic energy of center of mass is $\frac{4}{3}$ Joule, then the magnitude of M is

1. 1 kg
2. 0.25 kg
3. 0.50 kg
4. 2 kg

Correct Option - 3

Que. 23 Consider a circular ring of mass 1 kg and diameter 0.2 m. It is making 10 rotations per second about an axis passing through its centre and normal to the surface. The value of angular momentum is:-

1. $0.628 \text{ kg m}^2/\text{sec}$
2. $0.4 \text{ kg m}^2/\text{sec}$
3. $1.256 \text{ kg m}^2/\text{sec}$
4. $0.2 \text{ kg m}^2/\text{sec}$

Correct Option - 1

Que. 24 Two plane mirrors are placed making angle of 30° with each other. Find the number of images formed if we place an object between the mirrors asymmetrically.

1. 15
2. 12
3. 10
4. 11

Correct Option - 4

Que. 25 The coefficient of areal expansion of a material is $1.6 \times 10^{-5} \text{ K}^{-1}$. Which one of the following gives the value of coefficient of volume expansion of this material?

1. $0.8 \times 10^{-5} \text{ K}^{-1}$
2. $2.4 \times 10^{-5} \text{ K}^{-1}$
3. $3.2 \times 10^{-5} \text{ K}^{-1}$
4. $4.8 \times 10^{-5} \text{ K}^{-1}$

Correct Option - 2

Que. 26 Calculate $\int (x^2 \cos x) dx$

1. $x^2 \sin x + 2x \cos x - \sin x + C$
2. $x^2 \sin x - 2x \cos x + \sin x + C$
3. $x^2 \sin x + 2x \cos x + 2\sin x + C$
4. $x^2 \sin x + 2x \cos x - 2 \sin x + C$

Correct Option - 4

Que. 27 Find the value of $\det(3A)$ for the following matrix:

$$A = \begin{bmatrix} 4 & 7 & 1 \\ -1 & 3 & 2 \\ -2 & 0 & 5 \end{bmatrix}$$

1. 1458
2. 81
3. 27
4. 1971

Correct Option - 4

Que. 28 ${}^n P_5 = 42 \times {}^n P_3$ then $n =$

1. 3
2. 10
3. 8
4. 20

Correct Option - 2

Que. 29 Find the domain of $\sin^{-1} 3x$

1. $[-1, 1]$
2. $\left[\frac{-1}{2}, \frac{1}{2}\right]$
3. $\left[\frac{-1}{3}, \frac{1}{3}\right]$
4. $\left[0, \frac{1}{3}\right]$

Correct Option - 3

Que. 30 The area of the region bounded by the curves, $y^2 = 8x$ and $y = x$ is

1. $\frac{64}{3}$
2. $\frac{32}{3}$
3. $\frac{16}{3}$
4. $\frac{8}{3}$

Correct Option - 2

Que. 31

Solve: $\int_0^{\frac{\pi}{4}} x \cdot \sec^2 x dx$

1. $\frac{\pi}{4} + \log \sqrt{2}$
2. $\frac{\pi}{4} - \log \sqrt{2}$
3. $1 + \log \sqrt{2}$
4. $1 - \frac{1}{2} \log 2$

Correct Option - 1

Que. 32

If $f(x) = \begin{cases} \frac{2x - \sin^{-1} x}{2x + \tan^{-1} x}; & x \neq 0 \\ K; & x = 0 \end{cases}$ is a continuous function at $x = 0$, then the value of k is:

1. 2
2. $\frac{1}{2}$
3. 1
4. None of these

Correct Option - 4

Que. 33

$\lim_{x \rightarrow 0} \frac{\sin(2+x) - \sin(2-x)}{x} = ?$

1. $\frac{1}{2} \cos 2$
2. 1
3. $2 \cos 2$
4. More than one of the above

Correct Option - 3

Que. 34

The value of $\cot \left[\cos^{-1} \left(\frac{7}{25} \right) \right]$ is

1. $\frac{25}{24}$
2. $\frac{25}{7}$
3. $\frac{24}{25}$
4. $\frac{7}{24}$

Correct Option - 4

Que. 35

What will be the value of $y''(x)$ for the given parametric form

$x = at$, and $y = a/t$

1. $-\frac{2}{at^3}$
2. $\frac{2}{at^3}$
3. $\frac{2}{a+3}$
4. a

Correct Option - 2

Que. 36 The value of k for which the points $(2, 3)$, $(4, k)$ and $(5, 9)$ are collinear is:

1. 0
2. -7
3. 7
4. 6

Correct Option - 3

Que. 37 Find the distance between two points $(2, 6, 5)$ and $(2, 3, 9)$.

1. 7 units
2. 5 units
3. 0 units
4. 4 units

Correct Option - 2

Que. 38 If E_1 and E_2 are two events such that $P(E_1) = 0.3$, $P(E_1 \cup E_2) = 0.4$ and $P(E_2) = x$ then find the value of x such that E_1 and E_2 are two independent events ?

1. $2/7$
2. $1/5$
3. $1/7$
4. $3/5$

Correct Option - 3

Que. 39 The inverse of the matrix $\begin{bmatrix} 2 + 3i & -i \\ i & 2 - 3i \end{bmatrix}$ is

1. $\frac{1}{12} \begin{bmatrix} 2 - 3i & i \\ -i & -2 + 3i \end{bmatrix}$
2. $\frac{1}{12} \begin{bmatrix} 2 - 3i & i \\ -i & 2 + 3i \end{bmatrix}$
3. $\frac{1}{12} \begin{bmatrix} 2 + 3i & i \\ -i & 2 - 3i \end{bmatrix}$



4. $\frac{1}{12} \begin{bmatrix} 2 - 3i & -i \\ i & 2 + 3i \end{bmatrix}$

Correct Option - 2

Que. 40 If chord of contact of the tangents drawn from the point (α, β) to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, touches the circle $x^2 + y^2 = c^2$, then the locus of the point (α, β) is

1. $\frac{x^2}{a^2} + \frac{y^2}{b^2} = \frac{1}{c^2}$
2. $\frac{x^2}{a^2} + \frac{y^2}{b^2} = \frac{1}{c^4}$
3. $\frac{x^2}{a^4} + \frac{y^2}{b^4} = \frac{1}{c^2}$
4. None of these

Correct Option - 3

Que. 41 The distance of the point $(3, 4)$ from the line $2x + 5y + 32 = 0$, measured parallel to the line $x - y - 3 = 0$, is equal to

1. $\sqrt{2}$
2. $\sqrt{3}$
3. $\sqrt{5}$
4. $\sqrt{7}$

Correct Option - 1

Que. 42 The value (round off to one decimal place) of $\int_{-1}^1 x e^{|x|} dx$ _____

1. 1
2. 2
3. 0
4. -5

Correct Option - 3

Que. 43 The degree of the differential equation $\left(\frac{dy}{dx}\right)^4 + 3\frac{d^2y}{dx^2} = 0$ _____

1. Not defined
2. 2
3. 4
4. 1

Correct Option - 4

What will be the sum of $3 + 7 + 11 + 15 + 19 + \dots$ upto 80 terms ?

Que. 44

1. 12880
2. 12400
3. 25760
4. 24800

Correct Option - 1

Que. 45

Solve: $5x - 3 < 3x + 1$

1. $x \leq 2$
2. $x = 2$
3. $x \geq 2$
4. $x < 2$

Correct Option - 4

Que. 46

Find the interval in which the function $f(x) = 2x^3 - 24x + 107$ is strictly decreasing.

1. $(-\infty, -2)$
2. $(2, \infty)$
3. $[-2, 2)$
4. $(-2, 2)$

Correct Option - 4

Que. 47

The plane $2x - 3y + 6z - 11 = 0$ makes an angle $\sin^{-1}(\alpha)$ with x-axis. The value of α is equal to

1. $\frac{\sqrt{3}}{2}$
2. $\frac{\sqrt{2}}{3}$
3. $\frac{2}{7}$
4. $\frac{3}{7}$

Correct Option - 3

Que. 48

If the plane $2x - y + z = 0$ is parallel to the line $\frac{2x-1}{2} = \frac{2-y}{2} = \frac{z+1}{a}$, then value of a is

1. 4
2. -4
3. 2
4. -2

Correct Option - 2

Que. 49 If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = 2\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{c} = \hat{i} - 2\hat{j} + \hat{k}$, and a unit vector parallel to the vector $2\vec{a} - \vec{b} + 3\vec{c}$?

1. $\frac{9}{\sqrt{22}}\hat{i} - \frac{3}{\sqrt{22}}\hat{j} + \frac{1}{\sqrt{22}}\hat{k}$
2. $\frac{2}{\sqrt{22}}\hat{i} - \frac{3}{\sqrt{22}}\hat{j} + \frac{2}{\sqrt{22}}\hat{k}$
3. $\frac{3}{\sqrt{22}}\hat{i} - \frac{3}{\sqrt{22}}\hat{j} + \frac{3}{\sqrt{22}}\hat{k}$
4. $\frac{3}{\sqrt{22}}\hat{i} - \frac{3}{\sqrt{22}}\hat{j} + \frac{2}{\sqrt{22}}\hat{k}$

Correct Option - 4

Que. 50 What is the square root of $z = 7 - 24i$?

1. $\pm (4 + 3i)$
2. $\pm (4i + 3)$
3. $\pm (4i - 3)$
4. $\pm (4 - 3i)$

Correct Option - 4

Que. 51 Choose the word which is similar in meaning to the italicized word in this sentence.
He could rise to this stature because of his *invincible* courage.

1. Susceptible
2. Unmanageable
3. Unbeatable
4. Immeasurable

Correct Option - 3

Que. 52 **Directions:** Each item in this section consists of a sentence with an underlined word followed by four words/groups of words. Select the option that is nearest in meaning to the underlined word and mark your response on the Answer Sheet accordingly.

Their discussion was "fruitful", leading to several actionable ideas by the end of the session.

1. unsuccessful
2. productive
3. useless
4. lengthy

Correct Option - 2

Que. 53 Choose the correct spelling:

1. ambiguous
2. ambiguos

3. ambiguous
4. ambeeguuous

Correct Option - 1

Que. 54 Which of the following words is correctly spelt?

1. Vaccum
2. Vaccuum
3. Vaacum
4. Vacuum

Correct Option - 4

Que. 55 Choose the most appropriate answer and fill in the blanks:

The plural of 'sheep' is _____.

1. Sheeps
2. Sheep
3. Sheepes
4. None of the above

Correct Option - 2

Que. 56 **Direction:** The following sentence has been divided into parts. One of them may contain an error. Select the part that contains the error from the given options. If you don't find any error, mark 'No error' as your answer.

No sooner he was / brought to the hospital / than he began panting heavily.

1. brought to the hospital
2. No sooner he was
3. No error
4. than he began panting heavily

Correct Option - 2

Que. 57 The following sentence has been split into four segments. Identify the segment that contains a grammatical error.

She will have participate / in the dance competition / by the time her father / returns from the tour.

1. in the dance competition
2. She will have participate
3. by the time her father
4. returns from the tour

Correct Option - 2

Que. 58 Isn't it strange that though we live in the same city, I get to see my sister once in a blue moon?

What does 'once in a blue moon' mean?

1. Everyday
2. All the time
3. Frequently
4. Occasionally

Correct Option - 4

Que. 59 Select the option that can be used as a one-word substitute for the given group of words.

An apparatus used by submerged submarines to see above water

1. Kaleidoscope
2. Telescope
3. Periscope
4. Bioscope

Correct Option - 3

Que. 60 Which term refers to risking a sum of money or valued item(s) on the outcome of a future event?

1. Whorl
2. Writhe
3. Wager
4. Warden

Correct Option - 3

Que. 61 **Direction: Use the right preposition.**

He deals _____ cosmetic goods.

1. of
2. with
3. in
4. on

Correct Option - 3

Que. 62 **Directions: Each of the following sentences in this section has a blank space with four options. Select whichever preposition or determiner you consider the most appropriate for the blank space and indicate your response on the Answer Sheet accordingly.**

We had a discussion ____ the project.

1. beneath

2. with
3. about
4. in

Correct Option - 3

Que. 63 Select the most appropriate option to fill in the blank.

As the school year was about to end, the students _____ their teacher a special present _____ their affection.

1. presented; to show
2. is presenting; showing
3. were presented; to show
4. present; showed

Correct Option - 1

Que. 64 Select the correct indirect form of the given sentence.

Nakul asked her, "How do you know that Rahul has told this to him?"

1. Nakul asked her how she knew that Rahul had told that to him.
2. Nakul asked her that how she has known that Rahul has told that to him.
3. Nakul asked her how she knew that Rahul has told that to him.
4. Nakul asked her that how she knows that Rahul had told that to him.

Correct Option - 1

Que. 65 Select the most appropriate indirect form of the given sentence.

"I finished my assignment two hours ago," she said.

1. She said that she finished my assignment two hours ago.
2. She said that she had finished her assignment two hours before.
3. She said that I finished my assignment two hours before.
4. She said that she has finished her assignment two hours ago.

Correct Option - 2

Que. 66 Select the correct passive form of the given sentence.

Humayun built a city named Dinpanah in 1533 in Delhi.

1. A city named Dinpanah was built by Humayun in 1533 in Delhi.
2. A city named Dinpanah had been built by Humayun in 1533 in Delhi.
3. A city named Humayun was built by Dinpanah in 1533 in Delhi.
4. A city named Dinpanah was being built by Humayun in 1533 in Delhi.

Correct Option - 1

Que. 67 Select the correct active voice of the given sentence

Why was such a letter written by Rupesh?

1. Why did Rupesh wrote such a letter?
2. Why has Rupesh writes such a letter?
3. Why is Rupesh write such a letter?
4. Why did Rupesh write such a letter?

Correct Option - 4

Que. 68 Read the following information carefully and answer the given questions.

As humans we really don't think that psychologically, birds are capable of the same mental tasks that other mammals are, and much more specifically, some of them are in the rarest of company with us, they are near-sapient, just like our close relatives.

Birds have been shown in previous studies to possess a range of skills such as complex social reasoning, an ability to problem solve and some have even demonstrated the capability to craft and use tools. Both birds and mammals are warm-blooded, which means they can maintain a constant body temperature and do not need to rely on an external heat source to stay warm. This similarity lends itself to several other commonalities, such as similar caloric requirements by weight and the ability to remain active in colder temperatures. Cold-blooded animals do not have to eat as much, but they also cannot survive colder temperatures.

Birds require a lot of energy in order to fly. This also necessitates a circulatory system that is both efficient and effective, so they have evolved a four-chambered heart with two atria and two ventricles, just like mammals.

The blood of birds and mammals contains both red and white blood cells, called erythrocytes and leukocytes respectively. The red blood cells in both classes of animals contain haemoglobin. Another similarity between birds and mammals is that both classes care for their young after they're hatched or born. Female mammals feed their young by lactating, while birds feed their young beak to beak.

What is the main purpose of the passage?

1. To encourage scientists to research more on birds.
2. To understand how birds and mammals are alike.
3. To explain the differences between birds and humans.
4. To motivate people to interact more with birds.

Correct Option - 2

Que. 69 The author has discussed which of the following skills of birds in the passage?

I. Complex social reasoning

II. Problem solving skill

III. Capability to craft tools

1. Only III
2. I and II
3. II and III
4. I, II and III

Correct Option - 4

Que. 70 Which characteristic of birds show that they are caring?

1. They fly together in a particular area.
2. They don't leave the side of their kind.
3. They feed their young beak to beak.
4. They have the capability to use tools.

Correct Option - 3

