

Railway Recruitment Cell

Post Name : 05A-Physics and Mathematics

Exam Code : MASSYPPM

Exam Date : 19-06-2024

Exam Time : 11:15AM

Question No. 1

The process by which heat comes from the Sun to Earth is called-

- A) Conduction
B) Convection
C) Radiation
D) Condensation

Answer Key: C

Question No. 2

Which rule is used to determine the direction of the magnetic field around a current carrying conductor?

- A) Helix rule
B) End rule
C) Maxwell's right-hand thumb rule
D) Faraday rule

Answer Key: C

Question No. 3

The focal length of a convex mirror is:

- A) Positive
B) Negative
C) Zero
D) Infinite

Answer Key: A

Question No. 4

The magnetic Susceptibility of a paramagnetic material is-

- A) Positive
B) Negative
C) Zero
D) Unity

Answer Key: A

Question No. 5

What is the time taken by two consecutive compressions or rarefactions to cross a fixed point called?

- A) Time period of the wave
B) Frequency of the wave
C) Wavelength of the wave
D) Speed of the wave

Answer Key: A

Question No. 6

The main constituent of permalloy is-

- A) Nickel
B) Cobalt
C) Chromium
D) Tungsten

Answer Key: A

Question No. 7

The repeated reflection that results in persistence of sound is called-

- A) Echo
- B) Reverberation
- C) Reflection
- D) Rarefaction

Answer Key: B

Question No. 8

Find mass of an iron cube of side 2 cm. (Density of iron is 7.8 gm/cm^3)

- A) 0.975 gm
- B) 62.4 gm
- C) 3.9 gm
- D) 15.6 gm

Answer Key: B

Question No. 9

A source produces 30 crests and 30 troughs in 0.3 seconds. What is the frequency of the wave produced?

- A) 50 Hz
- B) 100 Hz
- C) 150 Hz
- D) 200 Hz

Answer Key: B

Question No. 10

In the Rutherford atomic model, alpha particles were struck on-

- A) Aluminium
- B) Gold
- C) Silver
- D) Titanium

Answer Key: B

Question No. 11

A convex lens has a focal length of 50 cm. Calculate its power.

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

Answer Key: A

Question No. 12

Greater the value of _____ of a material, the more rapidly it will conduct heat.

- A) Melting point
- B) Thermal conductivity
- C) Boiling point
- D) Regelation

Answer Key: B

Question No. 13

If an object is placed between two parallel mirrors, then the number of images formed will be _____.

- A) 2
- B) 4
- C) 8
- D) Infinite

Answer Key: D

Question No. 14

Which of the following are generally used to reduce reverberation in an auditorium as sound absorbents?

- A) Compressed fibreboard
- B) Rough plaster
- C) Draperies
- D) All of the options

Answer Key: D

Question No. 15

The atoms that have the same mass number but different atomic numbers are called-

- A) Isobars
- B) Isotopes
- C) Isotones
- D) Isomers

Answer Key: A

Question No. 16

The NOR gate is an OR gate followed by a/an-

- A) NOT gate
- B) NAND gate
- C) AND gate
- D) EX-OR gate

Answer Key: A

Question No. 17

Modulus of elasticity is also known as-

- A) Shear modulus
- B) Bulk modulus
- C) Young's modulus
- D) Rigidity modulus

Answer Key: C

Question No. 18

The factor that affects the surface tension of liquids is-

- A) Impurities
- B) Presence of dissolved substances
- C) Electrification
- D) All of the options

Answer Key: D

Question No. 19

The magnetic field inside a solenoid-

- A) Is uniform
- B) Increases from one end to another
- C) Is zero
- D) Varies from point to point

Answer Key: A

Question No. 20

During the dispersion of white light into its component colours, which light bends the least?

- A) Violet
- B) Green

C) Blue

D) Red

Answer Key: D

Question No. 21

Which of the following instruments is used to measure current?

A) Potentiometer

B) Ammeter

C) Galvanometer

D) Voltmeter

Answer Key: B

Question No. 22

What would be the angle of incidence for a light ray having zero reflection angle?

A) 180 degrees

B) 90 degrees

C) 0 degree

D) 45 degrees

Answer Key: C

Question No. 23

The ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant. It is given by-

A) Faraday's law

B) Snell's law

C) Newton's law

D) Murphy's law

Answer Key: B

Question No. 24

The movement of the axis of the spinning top around the vertical through its point of contact with the ground, sweeping out a cone is termed as-

A) Translation

B) Vertical spin

C) Rolling

D) Precession

Answer Key: D

Question No. 25

_____ is defined as the current per unit area perpendicular to the direction of flow.

A) Drift velocity

B) Surface density

C) Current density

D) Variable velocity

Answer Key: C

Question No. 26

Which of the following gates is known as the universal gate?

A) OR

B) NAND

C) AND

D) NOT

Answer Key: B

Question No. 27

Volt is NOT a unit of-

- A) Electric field
- B) Electric potential
- C) Potential difference
- D) Electromotive force

Answer Key: A

Question No. 28

A light emitting diode converts electrical energy into-

- A) Mechanical energy
- B) Light energy
- C) Chemical energy
- D) Solar energy

Answer Key: B

Question No. 29

The filament resistance of an electric bulb is 560 ohm. Potential difference of two points 220 V. Find the current flowing through the filament.

- A) 0.39 A
- B) 1.2 A
- C) 1.6 A
- D) 2.2 A

Answer Key: A

Question No. 30

The direction of induced EMF during electromagnetic induction is given by-

- A) Ampere's law
- B) Lenz's law
- C) Hooke's Law
- D) Pascal's law

Answer Key: B

Question No. 31

The emissivity of a black body is-

- A) Zero
- B) One
- C) Less than one
- D) Infinity

Answer Key: B

Question No. 32

One nibble is equal to how many bits?

- A) 4
- B) 16
- C) 8
- D) 32

Answer Key: A

Question No. 33

The basic building blocks of the arithmetic unit in digital computers are-

- A) Attenuators
- B) Adders
- C) Subtractors
- D) Demultiplexers

Answer Key: B

Question No. 34

Find the work done when moving 2 coulombs of charge across two points where the potential difference between them is 12 V.

- A) 7 joules
B) 24 joules
C) 13 joules
D) 17 joules

Answer Key: B

Question No. 35

Two consecutive compressions or two consecutive rarefactions are separated by a distance called-

- A) Wave velocity
B) Wavelength
C) Amplitude
D) Frequency

Answer Key: B

Question No. 36

From a cube of side 6 cm, a hemisphere of maximum volume is scooped out. What is the remaining volume?

- A) $[27 - (2\pi/3) \times 6]$
B) $216 - 18\pi$
C) $216 - 12\pi$
D) $36 - \pi$

Answer Key: B

Question No. 37

Surface areas of 3 co-terminous faces of a cuboid are 42 cm^2 , 28 cm^2 and 24 cm^2 . What is its volume?

- A) 218 cm^3
B) 168 cm^3
C) 108 cm^3
D) 216 cm^3

Answer Key: B

Question No. 38

Which of the following is an INCORRECT statement?

- A) Equally likely events have equal chance of occurring
B) Mutually exclusive events can happen simultaneously
C) The set of all possible outcomes of a random experiment is called sample space
D) An event is a subset of a sample space

Answer Key: B

Question No. 39

When three coins are tossed, the sample space consists of _____ events.

- A) 8
B) 4
C) 12
D) 6

Answer Key: A

Question No. 40

The variance of 5 values is 36. If each value is doubled, then find the standard deviation.

A) 6

B) 10

C) 12

D) 18

Answer Key: C

Question No. 41

The average marks of 30 boys in a class is 62. It was found that the marks of one student was wrongly entered as 17 instead of 70. What is the corrected average?

A) 61.4

B) 63.8

C) 65

D) 62.7

Answer Key: B

Question No. 42

If $\sec A = 5/3$, then find the value of $(2\sin A - 2\cos A)/(3\sin A - 2\cos A)$.

A) 3

B) 6

C) 2/3

D) 1/3

Answer Key: D

Question No. 43

If $\tan \theta = 6/5$, then find the value of $[(1 + \cos \theta)(1 - \cos \theta)] / [(1 + \sin \theta)(1 - \sin \theta)]$.

A) 6/5

B) 36/25

C) 5/6

D) 25/36

Answer Key: B

Question No. 44

The quadrilateral formed by joining the mid-points of the sides of a quadrilateral-

A) Is a hexagon

B) Is a pentagon

C) Is a parallelogram

D) Is cyclic

Answer Key: C

Question No. 45

Which of these statements is FALSE?

1) All similar triangles are congruent.

2) All right-angled triangles are similar.

3) Any two equilateral triangles are similar.

4) Areas of similar triangles are proportional to the squares of their altitudes.

A) Statement 1 and 2

B) Statement 2 only

C) Statement 3 only

D) Statement 3 and 4

Answer Key: A

Question No. 46

A) 8.5

B) 9

C) 9.5

D) 10

Answer Key: D

Question No. 53

The perimeters of two similar triangles are 30 cm and 20 cm. If one side of the bigger triangle is 15 cm, then find the corresponding side of the other triangle.

A) 12 cm

B) 12.5 cm

C) 8 cm

D) 10 cm

Answer Key: D

Question No. 54

If a metallic spherical ball of diameter 6 cm is melted and drawn into a wire of diameter 0.2 cm. What is the length of the wire?

A) 24 m

B) 32 m

C) 36 m

D) 28 m

Answer Key: C

Question No. 55

Find $\lim_{x \rightarrow 0} \frac{\sin 2x}{x}$.

A)

B)

0

1

C)

D)

1/2

2

Answer Key: D

Question No. 56

If $y = f(x) = \frac{x+2}{x-1}$ then-

A)

$$x = f(y)$$

B)

$$f(x) = 3$$

C)

$$x = f(1/y)$$

D)

None of the options

Answer Key: A

Question No. 57

While of these statements is/are true?

(I) All polynomial functions are continuous.

(II) The derivative of an odd function is an even function.

(III) The inverse of the function $\log_e x$ is 10^x .

(IV) The limit of the sum of two functions is NOT equal to the sum of their limits.

A) Statement (I) only

B) Statement (III) only

C) Statement (IV) only

D) Statements (I) and (II)

Answer Key: D

Question No. 58

Evaluate the derivative of $\frac{\sin x}{x}$.

A)

$$\cos x$$

B)

$$x \cos x$$

C)

$$\frac{x \cos x - 1}{x^2}$$

D)

$$\frac{x \cos x - \sin x}{x^2}$$

Answer Key: D

Question No. 59

Find the value of $\lim_{x \rightarrow 2} \frac{x^2 - 6x + 8}{x^2 - 5x + 6}$.

- A) -2
- B) 0
- C) 2
- D) $\frac{4}{3}$

Answer Key: C

Question No. 60

If $y = a + bx + cx^2$ has its maximum at $x = 0$, then-

- A) $b > 0; c > 0$
- B) $b = 0; c = 0$
- C) $b = 0; c < 0$
- D) $b < 0; c < 0$

Answer Key: C

Question No. 61

If $y = \log\left(\frac{1+e^x}{1-e^x}\right)$ then, $\frac{dy}{dx} =$

- A) $\left(\frac{1-e^x}{1+e^x}\right)$
- B) $\left(\frac{1-e^{2x}}{1+e^x}\right)$
- C) $\left(\frac{2e^x}{1-e^{2x}}\right)$
- D) $\left(\frac{2e^x}{1-e^x}\right)$

Answer Key: C

Question No. 62

The distance 's' travelled by a particle in time 't' is given by $s = ae^t + be^{-t}$. The acceleration is-

- A) $e^t(a - b)$
- B) s
- C) $(a + b)/(a - b)$
- D) $(a + b)e^t$

C) $x = a$ is a point of inflection

D) $f(x)$ is maximum at $x = a$

Answer Key: A

Question No. 67

Evaluate $\lim_{x \rightarrow 0} \frac{\cos ax - \cos bx}{x^2}$.

A)

$$2(a^2 - b^2)$$

B)

$$(a^2 - b^2) / 4$$

C)

$$(b^2 + a^2) / 4$$

D)

$$(b^2 - a^2) / 2$$

Answer Key: D

Question No. 68

If $f(x) = \log xe^{2x}$, then $f'(x) = ?$

A) $2 + (1/x)$

B) $2/x$

C) $2 - (1/x)$

D) $2x$

Answer Key: A

Question No. 69

Evaluate $\int \tan x \sec^2 x \, dx$.

A) $(\tan^2 x) / 2$

B) $\tan^2(x/2)$

C) $\tan(x/2)$

D) $\tan(x^2/2)$

Answer Key: A

Question No. 70

If $y = \sin x + \cos x$, then $d^2y/dx^2 = ?$

A) $(1/2) \cos 2x$

B) $4 \sin 2x$

C) $-(\sin x + \cos x)$

D) $(\sin 2x) / 2$

Answer Key: C

Question No. 71

The tangent line to the curve $y = f(x)$ at $x = 2$ has its x , y intercepts equal to $10/3$ and -10 respectively. Find the values of $f(2)$ and $f'(2)$.

A) $-4, 3$

B) $4, 3$

C) -2, 2

D) -4, -3

Answer Key: A

Question No. 72

If the radius of a sphere is increased by 2 cm, then the surface area increases by 352 cm^2 . The radius of the sphere before its increase is:

A) 3 cm

B) 4 cm

C) 5.5 cm

D) 6 cm

Answer Key: D

Question No. 73

A circle touches all the four sides of a quadrilateral ABCD where $AB = 18 \text{ cm}$; $BC = 21 \text{ cm}$; and $CD = 12 \text{ cm}$. Find the side 'AD'.

A) 18 cm

B) 12 cm

C) 10 cm

D) 9 cm

Answer Key: D

Question No. 74

If a parallelogram is cyclic, then it is a-

A) Rectangle

B) Square

C) Rhombus

D) Both a rectangle and a square

Answer Key: A

Question No. 75

A black, a red and a green dice are thrown at the same time. What is the probability that the sum of the three numbers is ≥ 17 ?

A) $1/54$

B) $5/216$

C) $1/36$

D) $7/216$

Answer Key: A