

Post Name : 05A-Physics and Mathematics

Exam Code : MASSZPM

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Exam Time : 11:15AM

Question No. 1

The refractive indices of four substances A, B, C and D are 1.33, 1.47, 1.71 and 1.65 respectively. In which substance is the speed of light maximum?

- A) A
B) D
C) B
D) C

Answer Key: A

Question No. 2

Which mirror is used in car parking garage for wide view?

- A) Concave mirror
B) Convex mirror
C) Plane mirror
D) None of the options

Answer Key: B

Question No. 3

To get a diminished, virtual and erect image of a tall building, which mirror is used?

- A) Concave mirror
B) Convex mirror
C) Plane mirror
D) Both concave and plane mirror

Answer Key: B

Question No. 4

Which of the following is highly compressible?

- A) Solids
B) Liquids
C) Gases
D) Plasma

Answer Key: C

Question No. 5

Division of a nucleus in two almost equal parts is called nuclear-

- A) Fission
B) Fusion
C) Scattering
D) Both fission and fusion

Answer Key: A

Question No. 6

The property of a coil by which it generates induced EMF due to the changing flux linked with it, is called-

- A) Resistance
B) Self inductance
C) Capacitance
D) Reactance

Answer Key: B

Question No. 7

Which of the following is a ferromagnetic material?

- A) Tungsten
- B) Aluminium
- C) Copper
- D) Nickel

Answer Key: D

Question No. 8

Which of the following is an example of paramagnetic material?

- A) Zinc
- B) Silver
- C) Gold
- D) Tantalum

Answer Key: D

Question No. 9

The ratio of active power to apparent power is known as _____ factor.

- A) Demand
- B) Load
- C) Power
- D) Form

Answer Key: C

Question No. 10

Temporary magnets are commonly employed in-

- A) Electric instruments
- B) Motors
- C) Moving coils
- D) Loud speakers

Answer Key: B

Question No. 11

Choose the transition element from the following elements –

- A) S
- B) Sc
- C) Mg
- D) Sr

Answer Key: B

Question No. 12

Which of these measures surface curvature?

- A) Spherometer
- B) Sphygmomanometer
- C) Sphygmoscope
- D) Spectrometer

Answer Key: A

Question No. 13

_____ states that the electric current flowing through a metallic wire is directly proportional to the potential difference "V" across its ends provided its temperature remains the same.

- A) Ampere's law
- C) Joule's law

- B) Coulomb's law
- D) Ohm's law

Answer Key: D

Question No. 14

Identify the one that is NOT a Class 1 lever.

- A) Pliers
- C) Nut crackers

- B) Scissors
- D) See-saw

Answer Key: C

Question No. 15

What is the wavelength of a sound wave whose frequency is 840 Hz and speed is 420 m/s in a given medium?

- A) 1.52 m
- C) 2.52 m

- B) 0.5 m
- D) 3.52 m

Answer Key: B

Question No. 16

Siemens is the unit of-

- A) Permittivity
- C) Electric conductance

- B) Permeability
- D) Work

Answer Key: C

Question No. 17

The effort applied to move a load is 15 units and the mechanical advantage is observed to be 3. Find the load.

- A) 45 units
- C) 15 units

- B) 5 units
- D) 3 units

Answer Key: A

Question No. 18

The incident ray, the normal at the _____ and the reflected ray all lie in the same plane.

- A) Point of reflection
- C) Point of refraction

- B) Point of diffraction
- D) Point of incidence

Answer Key: D

Question No. 19

Which of the following terminals does NOT belong to the Bipolar Junction Transistor (BJT)?

- A) Emitter
- C) Collector

- B) Base
- D) Drain

Answer Key: D

Question No. 20

If there is a decrease in length, then the stress is called-

- A) Tensile stress
- B) Normal stress
- C) Compression stress
- D) Tangential stress

Answer Key: C

Question No. 21

Which law states this?

"Two systems in thermal equilibrium with a third system separately are in thermal equilibrium with each other".

- A) First law of thermodynamics
- B) Second law of thermodynamics
- C) Third law of thermodynamics
- D) Zeroth law of thermodynamics

Answer Key: D

Question No. 22

How was Thomson's first proposed atomic model called pictorially?

- A) Planetary model
- B) Concentric circle model
- C) Plum pudding model
- D) Strawberry jelly model

Answer Key: C

Question No. 23

What is the full form of IC?

- A) Integrated Circuit
- B) Information Chip
- C) Induced Current
- D) Implied Chip

Answer Key: A

Question No. 24

Who discovered electrons?

- A) Eugen Goldstein
- B) J.J. Thomson
- C) Ernst Rutherford
- D) James Chadwick

Answer Key: B

Question No. 25

Which of the following regions of a transistor is heavily doped?

- A) Emitter
- B) Base
- C) Collector
- D) Gate

Answer Key: A

Question No. 26

One Newton is equal to-

- A) 10^2 dyne
- B) 10^3 dyne

C) 10^4 dyne

D) 10^5 dyne

Answer Key: D

Question No. 27

What is the SI unit of work?

A) Joule

B) Watt

C) Ohm

D) Farad

Answer Key: A

Question No. 28

Which of the following instruments is used to measure the potential difference?

A) Ammeter

B) Voltmeter

C) Potentiometer

D) All of the options

Answer Key: B

Question No. 29

The maximum value of static friction when the body is on the verge of starting motion is known as the-

A) Angle of repose

B) Impending motion

C) Limiting friction

D) None of the options

Answer Key: C

Question No. 30

Angular momentum is conserved when net external torque is-

A) One

B) Zero

C) Greater than one

D) Infinity

Answer Key: B

Question No. 31

A car is moving along a zigzag path on a level road. This is an example of which of the following motions?

A) Two-dimensional

B) Zero-dimensional

C) One-dimensional

D) Three-dimensional

Answer Key: A

Question No. 32

_____ is an echo sounding device which can be used on a ship to determine the depth of the sea.

A) Radar

B) Sonar

C) Laser

D) Lidar

Answer Key: B

Question No. 33

Which scale is the base unit of thermodynamic temperature measurement in the International System (SI) of

measurement?

- A) Candela
- C) Ampere

- B) Kelvin temperature
- D) Voltage

Answer Key: B

Question No. 34

The CGS unit of entropy is-

- A) cal/Kmol
- C) erg/second

- B) cm/second
- D) dyne

Answer Key: A

Question No. 35

Which of the following is a good conductor of electricity?

- A) Silver
- C) Ebonite

- B) Glass
- D) Rubber

Answer Key: A

Question No. 36

A large field of 700 hectares is divided into two parts. The difference between the areas of the two parts is one-fifth of the average of the two areas. What is the area of the smaller part in hectare?

- A) 225
- C) 300

- B) 280
- D) 315

Answer Key: D

Question No. 37

Simplify: $\sin(A + B) \sin(A - B)$

- A) $\cos^2 A - \cos^2 B$
- C) $\sin^2 A + \sin^2 B$

- B) $\cos 2A$
- D) $\sin^2 A - \sin^2 B$

Answer Key: D

Question No. 38

What is the odds ratio in favour of drawing 3 red balls without replacement from a bag containing 4 white and 5 red balls?

- A) 37 : 5
- C) 5 : 42

- B) 5 : 39
- D) None of the options

Answer Key: C

Question No. 39

Find the median of the discrete values.

$(a + 4), (a - 3.5), (a - 2.5), (a - 3), (a - 2), (a + 0.5), (a + 5)$ and $(a - 0.5)$.

- A) $a - 2.5$

- B) $a - 1.25$

C) $a - 1.5$

D) $a - 0.75$

Answer Key: B

Question No. 40

If $\tan A = 4/5$, then find the value of $(\sec^2 A - \operatorname{cosec}^2 A)/(\sec^2 A + \operatorname{cosec}^2 A)$.

A) $-9/14$

B) $9/25$

C) $-9/41$

D) $19/41$

Answer Key: C

Question No. 41

For the set of values 13, 16, 12, 11, 8, 14, 12 and 18, which of the following is TRUE?

A) Median > Mean > Mode

B) Mean > Median > Mode

C) Mean > Mode > Median

D) Median > Mode > Mean

Answer Key: B

Question No. 42

In a single throw of two dice, what is the probability of getting a sum of 9?

A) $2/9$

B) $1/9$

C) $1/3$

D) $5/36$

Answer Key: B

Question No. 43

The mean of the 5 smallest numbers from a group is 15 while the mean of all the 13 numbers of the group taken together is 17. What is the mean of the 8 largest numbers?

A) 17.75

B) 18.25

C) 18.50

D) 18.75

Answer Key: B

Question No. 44

There are 20 students with an average height of 105 cm in a class. Then 10 students with an average height of 120 cm join the class. What will be the average height of the class now?

A) 120 cm

B) 110 cm

C) 115 cm

D) 100 cm

Answer Key: B

Question No. 45

Find the value of $(x - y)$, if the point (x, y) is equidistant from the points $(7, 1)$ and $(3, 5)$.

A) 2

B) 3

C) 4

D) 6

Answer Key: A

Question No. 46

Find the point on the x-axis which is equidistant from (2, -5) and (-2, 9).

- A) (7, 5)
- B) (-7, 0)
- C) (7, -9)
- D) (-7, 5)

Answer Key: B

Question No. 47

Which of the following is an odd function?

- A) $ax^2 + bx + c$
- B) $x(x-4)(x+4)$
- C) $a\cos x + b\sin x$
- D) $x^2\cos x$

Answer Key: B

Question No. 48

If a function $f(x)$ is increasing at a point, its derivative at that point is-

- A) Greater than 1
- B) Less than 0
- C) Greater than 0
- D) Equal to 0

Answer Key: C

Question No. 49

The function $x^3 - 9x^2 + 24x + 2$ is an increasing function for all x-

- A) Less than 4
- B) Between 2 and 4
- C) Less than 2 and greater than 4
- D) Less than 2 only

Answer Key: C

Question No. 50

If $xy + ax + c = 0$, then $dy/dx = ?$

- A) Constant
- B) c/x^2
- C) $-c/y$
- D) $-y/x$

Answer Key: B

Question No. 51

Derivative of $\left(\frac{x+1}{x-1}\right)$ with respect to x is-

- A) $1/(x-1)^2$
- B) $-2/(x-1)^2$

C)

$$2/(x-1)$$

D)

$$1$$

Answer Key: B

Question No. 52

A rectangle of a given perimeter has maximum area when-

A) Length = 2 x breadth

B) Length = breadth

C) Diagonal = 2 x length

D) None of the options

Answer Key: B

Question No. 53If $x > 0$ and $xy = 1$, then what is the maximum value of $(x + y)$?

A) 2

B) 0

C) -1

D) 1/2

Answer Key: A

Question No. 54

$$\int_1^e \left(\frac{1}{x}\right) dx = ?$$

A)

$$-1$$

B)

$$1$$

C)

$$0$$

D)

$$e$$

Answer Key: B

Question No. 55Given $x = a\cos^3\theta$ and $y = b\sin^3\theta$, find the value of dy/dx .A) b/a B) $-(b/a)\cot\theta$ C) $(b/a)\cot^2\theta$ D) $-(b/a)\tan\theta$

Answer Key: D

Question No. 56

$$\int \log(1 + x^2) dx = ?$$

A) $x \log(1 + x^2) + c$

B) $(\log(1 + x^2)/x) + c$

C) $x \log(1 + x^2) - 2 \tan^{-1}x$

D) $x \log(1 + x^2) - 2x + 2 \tan^{-1}x + c$

Answer Key: D

Question No. 57

The area bounded by the parabola $y^2 = 4ax$ and its latus rectum is-

A) $4a^3/3$

B) $16a^2/5$

C) $8a^2/3$

D) $16a/3$

Answer Key: C

Question No. 58

A box whose every side is a rectangle has a length of 12 cm, width of 8 cm and height of 10 cm. What is the total surface area of the box?

A) 376 cm^2

B) 482 cm^2

C) 524 cm^2

D) 592 cm^2

Answer Key: D

Question No. 59

Find the area of a rhombus, one of its sides being 25 cm and one of the diagonals being 30 cm.

A) 720 cm^2

B) 542 cm^2

C) 600 cm^2

D) 480 cm^2

Answer Key: C

Question No. 60

Which of these will have the least area?

(1) A regular hexagon of side 1 unit.

(2) A circle of radius 1 unit.

(3) A square of side $24\sqrt{12}$ units.

A)

A regular hexagon of side 1 unit.

B)

A circle of radius 1 unit.

C)

A square of side $24\sqrt{12}$ units.

D)

Cannot be determined

The mean of a set of 12 numbers is 24. If one item is excluded, the mean gets reduced by 3. What is the excluded number?

- A) 45
B) 57
C) 62
D) 55

Answer Key: B

Question No. 68

Simplify: $\sin\theta/(1 + \cos\theta)$

- A) $\operatorname{cosec}\theta - \cot\theta$
B) $\sec\theta - \tan\theta$
C) $\sec\theta + \tan\theta$
D) $\operatorname{cosec}\theta + \cot\theta$

Answer Key: A

Question No. 69

The area of a rectangle is 24000 m². The sides are in the ratio 5 : 3. What is the greater side?

- A) 150 m
B) 250 m
C) 200 m
D) 225 m

Answer Key: C

Question No. 70

A rectangular plot has dimensions 36 m × 25 m. If its breadth is increased by 5 m, how should the length be changed, if the area has to be the same?

- A) Increased by 6 m
B) Decreased by 6 m
C) Decreased by 5 m
D) Decreased by 10 m

Answer Key: B

Question No. 71

The base of a parallelogram is 36 cm. The area of the triangle with the same base and vertex on the side opposite to the base is 450 cm². Find the height of the parallelogram corresponding to the base.

- A) 50 cm
B) 20 cm
C) 25 cm
D) 40 cm

Answer Key: C

Question No. 72

Simplify: $\sin(\pi - \theta) \sin(\pi + \theta) - \cos(\pi - \theta) \cos(\pi + \theta)$

- A) 1
B) -1
C) $2\cos\theta\sin\theta$
D) $\cos 2\theta$

Answer Key: B

Question No. 73

If the sides of a square are increased by 30% , find the percentage increase in its area.

- A) 67%
B) 69%

C) 65%

D) 79%

Answer Key: B

Question No. 74

D, E, and F are the mid-points of the sides BC, CA and AB, respectively, of the triangle ABC such that the line drawn from the points forms a triangle within the triangle ABC. Determine the ratio of the area of triangles DEF to ABC.

A) 1 : 4

B) 1 : 2

C) 2 : 3

D) 4 : 5

Answer Key: A

Question No. 75

If the diameter of a sphere increases by 50%, what is the percentage increase in its volume?

A) 237.5%

B) 250%

C) 50%

D) 125%

Answer Key: A