Test Booklet Series

A

Test Booklet

PHYSICS

Test Booklet No.

Name of Applicant ..... Answer Sheet No. .....

Applicant Roll No. : ..... Signature of Applicant : .....

Date of Examination: .....

Time of Examination : .....

Signature of the Invigilator(s)

1. .....

2. .....

Duration : 1½ Hours] **[Maximum Marks : 70**

IMPORTANT INSTRUCTIONS

(i) The question paper is in the form of Test-Booklet containing **70 (Seventy)** questions. All questions are compulsory. Each question carries four answers marked (A), (B), (C) and (D), out of which only one is correct. Choose the correct option or the most appropriate option.

(ii) On receipt of the Test-Booklet (Question Paper), the candidate should immediately check it and ensure that it contains all the pages, i.e., **70** questions. Discrepancy, if any, should be reported by the candidate to the invigilator immediately after receiving the Test-Booklet.

(iii) A separate Answer-Sheet is provided with the Test-Booklet/Question Paper. On this sheet there are **70** rows containing four circles each. One row pertains to one question.

(iv) The candidate should write his/her Application ID/Roll number at the places provided on the cover page of the Test-Booklet/Question Paper and on the Answer-Sheet and NOWHERE ELSE.

(v) No second Test-Booklet/Question Paper and Answer-Sheet will be given to a candidate. The candidates are advised to be careful in handling it and writing the answer on the Answer-Sheet.

(vi) For every correct answer of the question **One (1) mark will be awarded.**

(vii) Marking shall be done only on the basis of answers responded on the Answer-Sheet.

(viii) To mark the answer on the Answer-Sheet, candidate should **darken** the appropriate circle in the row of each question with Blue or Black pen.

(ix) For each question only **one** circle should be **darkened** as a mark of the answer adopted by the candidate. If more than one circle for the question are found darkened or with one black circle any other circle carries any mark, the answer will be treated as incorrect.

(x) The candidates should not remove any paper from the Test-Booklet/Question Paper. Attempting to remove any paper shall be liable to be punished for use of unfair means.

(xi) Rough work may be done on the blank space provided in the Test-Booklet/Question Paper only.

(xii) *Mobile phones (even in Switch-off mode) and such other communication/programmable devices are not allowed inside the examination hall.*

(xiii) No candidate shall be permitted to leave the examination hall before the expiry of the time.

DO NOT OPEN THIS QUESTION BOOKLET UNTIL ASKED TO DO SO.

PART–A

1. Select the option that is **nearest in meaning** to the underlined word.
   It is sheer lunacy to drive a car in this frosty weather.
   (A) prudence (B) normalcy
   (C) insanity (D) sanity

2. Select the option that is **opposite in meaning** to the underlined word.
   He was known for his sagacity.
   (A) prudence (B) wisdom
   (C) ignorance (D) sapience

Directions (Q. 3 & 4) : Each of the items consists of a sentence, the parts of which have been jumbled. These parts have been labelled P, Q, R and S.

3. Given below each sentence are four sequences namely (A), (B), (C) and (D). You are required to re-arrange the jumbled parts of the sentence correctly.
   please mark the same (P) be made in response to this notice (Q) if you have any complaint to (R)
   to the concerned authority (S)
   The correct sequence should be :
   (A) PQRS (B) RPQS
   (C) SQPR (D) RQPS

4. In the following question, a sentence has been given in Direct/Indirect speech. Out of the four alternatives suggested, select the one which best expresses the same sentence in Indirect/Direct speech.
   The candidate said, "I had passed the entrance test but could not present myself for the interview round held last month."
   (A) The candidate said that he had passed the entrance test but could not be presenting himself for the interview round held the month before.
   (B) The candidate said that he has passed the entrance test but could not present himself for the interview round that was held the month before.
   (C) The candidate said that he had passed the entrance test but could not present himself for the interview round that was held the month before.
   (D) The candidate said that he has passed the entrance test but could not be presenting himself for the interview round held the month before.

5. Improve the bracketed part of the sentence. Select the most appropriate option.

On a holiday, Priya **(prefers reading than going)** for shopping.

(A) prefers reading rather going
(B) prefers reading to going
(C) preferred reading to go
(D) No improvement

6. Fill in the blank with appropriate phrasal verb form the alternatives given below.

Sorry, I am not _____ local places.

(A) Conversant to
(B) Conversant in
(C) Conversant with
(D) Conversant into

7. Improve the bracketed part of the sentence. Select the most appropriate option.

She dithered every time she **(make)** a decision.

(A) makes
(B) had to make
(C) will make
(D) No improvement

8. M ranked sixteenth from the top and twenty-ninth from the bottom among those who passed an examination. Six students did not participate in the examination and five failed. The number of students in the class was :

(A) 40
(B) 44
(C) 50
(D) 55

9. Arrange the following words as per order in the dictionary :

1. Assassination
2. Association
3. Assimilate
4. Assimuthual

(A) 1, 2, 3, 4
(B) 1, 3, 2, 4
(C) 1, 3, 4, 2
(D) 2, 3, 1, 4

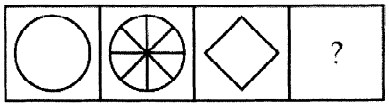
10. Some equations are solved on the basis of certain system. Find out the correct answer for unsolved equation on that basis :

$4 \times 5 \times 8 = 584$, $7 \times 3 \times 9 = 397$, $9 \times 7 \times 3 = ?$

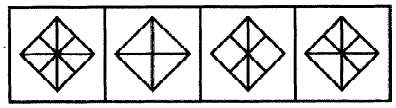
(A) 397 (B) 793

(C) 973 (D) 739

11. Select a suitable figure from the answer figures that would replace the question mark (?)



(A) (B) (C) (D)



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

(A) 1 (B) 2

(C) 3 (D) 4

Directions (Q. 12-14) : P, Q, R, S, T, U and V are sitting on a row, facing north. U is immediate right of T. T is 4th to the right of V. R is the neighbour of Q and S. Person who is third to the left of S is at one of ends.

12. Who is/are sitting to the left of R ?

(A) Only Q (B) V, Q and S

(C) V and Q (D) S, T, U and P

13. Who are the neighbours of Q ?

(A) R and S (B) R and V

(C) V and U (D) R and T

14. What is position of P ?

(A) Between T and S (B) Extreme left

(C) Extreme right (D) Centre

15. Five years ago, the average age of P and Q was 25. The average age of P, Q and R today is 25. Age of R after 5 years will be _____

(A) 15 years
(B) 20 years
(C) 25 years
(D) 30 years

16. What is the colour of SO_2 gas?

(A) Blue
(B) Grey
(C) Brown
(D) Colorless

17. When is World Environment Day celebrated?

(A) 5th June
(B) 6th June
(C) 8th June
(D) 10th June

18. Recently, who has become the oldest woman to climb Mount Everest?

(A) Kami Rita
(B) Jyoti Ratre
(C) Sangeeta Bahl
(D) Premlata Agarwal

19. Who recently become the first Indian woman cricketer to score consecutive centuries in ODIs?

(A) Mithali Raj
(B) Harmanpreet Kaur
(C) Smriti Mandhana
(D) Deepti Sharma

20. How many medals did India won at the 2024 BRIC Games in Russia?

(A) 12
(B) 16
(C) 29
(D) 32

PART–B

21. In reflected light, the central fringe of Newton's ring is :

(A) Dark
(B) Bright
(C) Non-uniform
(D) None of these

22. In simple harmonic motion, the time period is independent of :

(A) Mass
(B) Amplitude
(C) Spring constant
(D) None of the above

23. A cylindrical container of radius r and height h is moving at a speed of 0.8 c along its axis (i.e., the direction of motion is parallel to its height). What will be the volume of the cylinder as observed by a stationary observer?

(A) 20% of the volume at rest
(B) 40% of the volume at rest
(C) 10% of the volume at rest
(D) Volume does not change

24. Which of the following is not true for a central force

(A) Its magnitude is time-independent.
(B) It acts along the line joining of centers between two particles.
(C) Its magnitude depends on the distance of particle from a fixed point.
(D) Its magnitude is time-dependent

25. The efficiency of a carnot engine depends on

(A) Only the temperature of the hot reservoir
(B) Only the temperature of the cold reservoir
(C) Both the temperatures of the hot and cold reservoirs
(D) Neither temperature

26. The work-energy theorem states that the work done on an object is equal to:

(A) The change in its velocity
(B) The change in its acceleration
(C) The change in its kinetic energy
(D) The change in its potential energy

27. Positive sign of Hall coefficient is due to

(A) Protons
(B) Ions
(C) Positron
(D) Holes

28. If we have a quantum mechanical free particle in a 1D box of length L. If the boundary of box acts as infinite barrier for particle, then, in ground state which one of the following is not true

(A) Its energy will be determined by the dimensions of the box.
(B) Its energy will be minimum.
(C) Its energy will be determined by the position of the particle inside the box.
(D) The particle has maximum position probability at center of the box.

29. The wave function in quantum mechanics provides information about :

(A) The probability of finding a particle at a particular point
(B) The exact position of a particle
(C) The exact momentum of a particle
(D) The energy of a particle

30. The unit of electric flux is :

(A) Volt
(B) Coulomb
(C) Weber
(D) Tesla

31. Colours in thin films are because of :

(A) Polarization
(B) Dispersion
(C) Interference
(D) Diffraction

32. Polarized light can be produced by :

(A) Transmittance
(B) Double refraction
(C) Refraction
(D) Absorbance

33. Optical fibre communication is based on the phenomenon of :

(A) Refraction
(B) Polarisation
(C) Total internal reflection
(D) Diffraction

34. The charge on a n-type semiconductor is :

(A) Positive
(B) Zero
(C) Negative
(D) None of these

35. When a pure semiconductor is heated, its resistance :

(A) Increases
(B) Remains the same
(C) Decreases
(D) None of these

36. The ripple factor of a half-wave rectifier is :

(A) 3
(B) 1.21
(C) 2.5
(D) 0.48

37. The maximum efficiency of a half-wave rectifier is :

(A) 40.6%
(B) 50%
(C) 81.2%
(D) 25%

38. In ruby laser the ions give rise to the laser action :

(A) Al_2O_3
(B) Cr^{3+}
(C) Al^{3+}
(D) None of these

39. In Debye's theory, at lower temperature the lattice specific heat varies as :

(A) T^3
(B) T
(C) $1/T^3$
(D) 1/T

40. A superconducting material when placed in a magnetic field will :

(A) attract the magnetic field toward its centre

(B) repel all the magnetic lines of forces passing through it

(C) attract the magnetic field but transfer it into a concentrated zone

(D) not influence the magnetic field

41. Which of the following relations is true for quartz crystal?

(A) $\mu e > \mu o$ (B) $\mu e = \mu o$

(C) $\mu e < \mu o$ (D) None of these

42. Two waves of same frequency with amplitudes 1.0 and 2.0 units, interfere at a point, where the phase difference is 60°. Then the resultant amplitude is :

(A) 1.20 units (B) 3.14 units

(C) 2.65 units (D) None of these

43. The resolving power of grating increases :

(A) As the number of ruled lines per cm of grating increases

(B) As the number of ruled lines per cm of grating decreases

(C) As grating element decreases

(D) None of the above

44. The phase difference between the output voltage and input voltages of common base amplifier is :

(A) 90° (B) 0°

(C) 180° (D) 270°

45. The packing factor of the fcc structure is :

(A) 52% (B) 92%

(C) 74% (D) None of these

46. Davisson and Germer experiments relate to :

(A) Electron diffraction (B) Polarization

(C) Interference (D) Refraction

47. Bohr postulated in his model quantization of :

(A) Energy (B) Angular momentum

(C) Linear momentum (D) spin

48. The control rod in a nuclear reactor is :

(A) Uranium (B) Cadmium

(C) Graphite (D) Platinum

49. Maxwell-Boltzmann statistics is applicable for :

(A) Photon (B) Electron

(C) Ideal gas (D) Proton

50. In the case of a forced oscillation, the frequency of oscillation is :

(A) The natural undamped frequency

(B) The natural damped frequency

(C) The frequency of the external period force

(D) Some other frequencies

51. Maximum kinetic energy of photoelectrons emitting from a metal surface depends upon :

(A) The intensity of the incident light (B) The wavelength of the incident light

(C) The polarisation of the incident light (D) None of the above

52. If a vector field $\mathbf{F}$ is conservative, then:

(A) $\nabla \cdot \mathbf{F} = 0$ (B) $\nabla \times \mathbf{F} = 0$

(C) $\mathbf{F}$ is zero everywhere (D) $\nabla \cdot \mathbf{F} \neq 0$

53. The maximum Compton shift occurs when the photon is scattered at an angle :

(A) 0° (B) 90°

(C) 180° (D) 45°

34. If the temperature of an ideal gas is quadrupled, the de Broglie wavelength of its molecules :

(A) Doubles (B) Becomes half

(C) Becomes four times (D) Becomes half of the square root of 4

35. In ideal gases, as pressure increases (at constant temperature), viscosity :

(A) Increases linearly (B) Decreases

(C) Remains nearly constant (D) Becomes zero

36. The slope of the curve between natural logarithm of pressure and reciprocal of absolute temperature is proportional to :

(A) Inverse of latent heat (B) Latent heat

(C) Heat capacity (D) Thermal conductivity

37. A body at 600 K radiates energy at the rate of R. At 1200 K, it will radiate at :

(A) 2 R (B) 4 R

(C) 8 R (D) 16 R

38. Which of the following is typically observed in atoms with a total spin quantum number equal to zero?

(A) Fine structure (B) Normal Zeeman effect

(C) Anomalous Zeeman effect (D) Hyperfine structure

39. During a first-order phase transition, which quantity remains constant?

(A) Entropy (B) Enthalpy

(C) Temperature (D) Volume

40. Who is not a recipient of Nobel Prize;

(A) Max Planck
(B) Paul Dirac
(C) James C. Maxwell
(D) Hendrik Lorentz

41. Which of the following is true about the Fermi level in an intrinsic semiconductor at absolute zero?

(A) It lies exactly in the middle of the band gap
(B) It lies at the bottom of the conduction band
(C) It lies at the top of the valence band
(D) It depends on the impurity concentration

42. An elementary particle have life time of ~ 10^{-23} sec, spread/variation in its rest mass is about

(a) 10 MeV
(b) 100 MeV
(c) 1 Mev
(d) 10 keV

43. Which statement is true for radiation emitted by electric dipole configuration;

(A) Maximum radiation flux is along the dipole direction
(B) Radiation flux is proportional to ω^{-4}
(C) Radiation flux is maximum perpendicular to the dipole direction
(D) It is independent to the electrical dipole moment

44. A hydrogenic atom consists of only one e^- orbiting a nucleus with Z proton (all other e^-, s are stripped off), then Bohr energy E_n (Z) and Bohr radius, a_n, vary with Z as,

(A) $E_n \propto Z^2$, $a_n \propto Z$
(B) $E_n \propto Z^2$, $a_n \propto Z^2$
(C) $E_n \propto Z$, $a_n \propto Z^2$
(D) $E_n \propto Z^2$, $a_n \propto 1/Z$

45. A blackbody cavity is kept at 290 K, the wavelength at which blackbody energy density is maximum, is

(A) 10^{-3} m
(B) 10^{-5} m
(C) 10^{-7} m
(D) 10^{-9} m

46. A photodiode is normally:

(A) Emitting light
(B) Forward biased
(C) Reverse biased
(D) Neither forward nor reverse biased

47. Which atom will have highest atomic polarizability (α)

(A) Hydrogen (H)
(B) Beryllium (Be)
(C) Argon (Ar)
(D) Potassium (K)

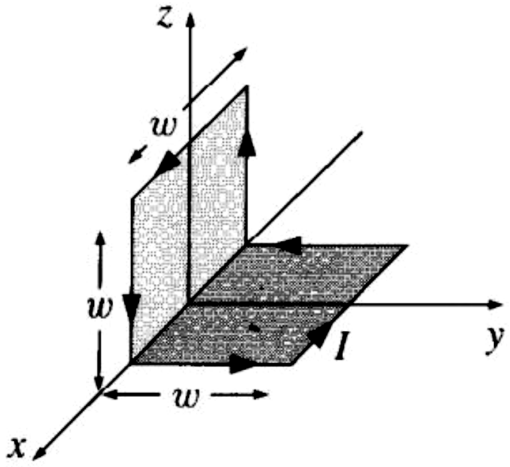
48. Which material will have highest dielectric constant

(A) Argon
(B) Benzene
(C) Water
(D) Ice

49. In lab frame, $\vec{B}$ points in x-direction while $\vec{E}$ points along z-direction. If a charge particle at rest is released from origin, it will follow,

(A) Cycloid trajectory
(B) Circular trajectory
(C) Helical trajectory
(D) Parabolic trajectory

50. Magnitude of total magnetic dipole moment due to square loops of sides '*w*' in *zx* and *xy* planes, shown below, is,



(A) $\sqrt{2}I\omega^2$
(B) $\sqrt{2}I\omega$
(C) $2I\omega^2$
(D) $I\omega^2$

ROUGH WORK

ROUGH WORK