

Question Booklet Series: **A**

Question Booklet Serial No.: **211778**

CET (UG) – 2021

Important: Please consult your Admit Card/Roll No. slip before filling your Roll Number on the Test Booklet and Answer Sheet.

Roll No.

(In Figure)

(In Words)

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O.M.R. Answer Sheet Serial No.

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Signature of Candidate: _____

Signature of Invigilator: _____

SUBJECT: PHYSICS

Time: 70 Minutes

Number of Questions: 60

Maximum Marks: 120

DO NOT OPEN THE SEAL ON THE BOOKLET UNTIL ASKED TO DO SO.

INSTRUCTIONS:

1. Write your Roll No. on the Questions Booklet and also on the OMR Answer Sheet in the space provided and nowhere else.
2. Enter the Question Booklet Serial No. on the OMR Answer Sheet. Darken the corresponding bubbles with **Black Ball Point/Black Gel Pen**.
3. Do not make any identification mark on the Answer Sheet or Question Booklet.
4. The medium of examination shall be **English** only.
5. Please check that this Question Booklet contains **60** Questions. In case of any discrepancy, inform the Assistant Superintendent within 10 minutes of the start of Test.
6. Each question has four alternative answer (A,B,C,D) of which only one is correct. For each question, darken only one bubble (A or B or C or D), whichever you think is the correct answer, on the Answer Sheet with **Black Ball Point/Black Gel Pen**.
7. If you do not want to answer a question, leave all the bubbles corresponding to that question blank in the Answer Booklet. No marks will be deducted in such cases.
8. Darken the bubbles in the OMR Answer Sheet according to the Serial No. of the question given in the Question Booklet.
9. **Negative marking will be adopted for evaluation i.e. 1/4th of the marks of the question will be deducted for each wrong answer. A wrong answer means incorrect answer or wrong filling of bubble.**
10. For calculations, use of simple log tables is permitted. Borrowing of log tables and any other material is not allowed.
11. For rough work only the blank sheet at the end of the Question Booklet be used.
12. The Answer Sheet is designed for computer evaluation. Therefore, if you do not follow the instructions given on the Answer Sheet, it may make evaluation by the computer difficult. **Any resultant loss to the candidate on the above account, i.e. not following the instructions completely, shall be of the candidate only.**
13. After the test, hand over the Question Booklet and the Answer Sheet to the Assistant Superintendent on duty.
14. In no case the Answer Sheet, the Question Booklet, or its part or any material copied/noted from this Booklet is to be taken out of the examination hall. Any candidate found doing so would be expelled from the examination.
15. **20 minutes** extra should be given to the visually handicapped/Person with Disability (PwD) for each paper.
16. A candidate who creates disturbance of any kind or changes his/her seat or is found in possession of any paper possibly of any assistant or found giving or receiving assistant or found using any other unfair means during the examination will be expelled from the examination by the Centre Superintendent/Observer whose decision shall be final.
17. Tele-communication equipment such as Cellular phones, pager, wireless, scanner, camera or any electronic/digital gadget etc., is not permitted inside the examination hall. **Use of calculators is not allowed.**
18. The candidates will not be allowed to leave the Examination Hall/Room before the expiry of the allotted time.

(PHY - A)

- Which one of the followings has same dimensions?
(A) Force and Torque (B) Torque and Potential Energy
(C) Potential Energy and Force (D) Linear momentum and Planck's constant
- The SI unit of activity of a radioactive sample is
(A) Curie (B) Rutherford (C) Einstein (D) Becquerel
- A boy standing on the top of a tower of 45 meter height drops a stone. Assuming $g = 10 \text{ ms}^{-2}$, the velocity with which it hits the ground is
(A) 30 ms^{-1} (B) 20 ms^{-1} (C) 25 ms^{-1} (D) 40 ms^{-1}
- A ball thrown vertically upward with an initial velocity of 9.8 m/s returns in 4 second. The total displacement of the ball is
(A) 9.8 m (B) Zero (C) 19.6 m (D) 4.9 m
- The position x of a particle varies with time t as $x = at^2 - bt^3$. The acceleration of the particle will be zero at time t equal to
(A) $\frac{2a}{3b}$ (B) $\frac{1}{b}$ (C) $\frac{a}{3b}$ (D) $\frac{a}{b}$
- A missile is fired for maximum range with an initial velocity of 20 ms^{-1} . If $g = 10 \text{ ms}^{-2}$, the range of the missile is
(A) 40 m (B) 20 m (C) 80 m (D) 60 m
- A ball is projected horizontally with a velocity of 5 ms^{-1} from the top of a building of 19.6 m height. How long the ball take to hit the ground?
(A) $\sqrt{2}$ sec (B) $\sqrt{3}$ sec (C) 3 sec (D) 2 sec
- Choose the incorrect statement
(A) All the central forces are non-conservative
(B) No work is done if the displacement is perpendicular to the direction of applied force
(C) Kinetic energy is conserved in elastic collision
(D) Frictional force is non-conservative
- A car moving with a speed of 50 km/hour can be stopped by brakes over a distance of 6 meter. If the same car is moving with a speed of 100 km/hour , the stopping distance is
(A) 12 m (B) 18 m (C) 24 m (D) 30 m
- A cubical block rests on an inclined plane of coefficient of friction $\mu = \frac{1}{\sqrt{3}}$. What should be the angle of inclination so that the block just slides down the inclined plane?
(A) 30° (B) 45° (C) 60° (D) 90°
- If the linear momentum is increased by 50%, then kinetic energy will be increased by
(A) 50% (B) 100% (C) 125% (D) 25%
- The work done by an applied variable force $F = x(1 + x)$ from $x = 0$ to $x = 2$ meter, where x is displacement is
(A) 6 Joule (B) 8 Joule (C) 10 Joule (D) 12 Joule

13. A body is moving in a circular path with acceleration a . If the speed gets doubled, find the ratio of acceleration after and before the speed is changed.
 (A) 1 : 2 (B) 2 : 1 (C) 1 : 4 (D) 4 : 1
14. A particle moves in a circle of radius 5 cm with constant speed and time period of 0.2π s. The acceleration of the particle is
 (A) 25 ms^{-2} (B) 5 ms^{-2} (C) 20 ms^{-2} (D) 15 ms^{-2}
15. In an elastic collision
 (A) Neither kinetic energy nor momentum is conserved
 (B) Only kinetic energy is conserved
 (C) Only momentum is conserved
 (D) Both momentum and kinetic energy are conserved
16. Two balls are thrown simultaneously in air. The acceleration of the centre of mass of the two balls while in air
 (A) Depends upon direction of motion of the balls
 (B) Depends on the masses of the two balls
 (C) Depends on the speed of two balls
 (D) Is always equal to acceleration due to gravity
17. If a person standing on a rotating disc stretches out his hands, the angular speed will
 (A) Remain same (B) Increase
 (C) Decrease (D) None of the above
18. If a sphere is rolling, then the ratio its rotational kinetic energy to total kinetic energy is
 (A) 2 : 7 (B) 1 : 2 (C) 2 : 5 (D) 5 : 7
19. The ratio of distance of two satellites from the centre of earth is 1 : 4. The ratio of their time periods of rotation will be
 (A) 8 : 1 (B) 1 : 8 (C) 1 : 4 (D) 4 : 1
20. The escape velocity for an object from the surface of earth (radius R) is
 (A) $\sqrt{2gR^2}$ (B) \sqrt{gR} (C) $\sqrt{2gR}$ (D) $\sqrt{gR^2}$
21. In a simple harmonic oscillator, at the mean position
 (A) Kinetic energy is maximum and potential energy is minimum
 (B) Kinetic energy is minimum and potential energy is maximum
 (C) Both kinetic and potential energies are minimum
 (D) Both kinetic and potential energies are maximum
22. The total energy of the body executing simple harmonic motion is E . Then the kinetic energy when the displacement is half of its amplitude is
 (A) $\frac{E}{2}$ (B) $\frac{E}{4}$ (C) $\frac{\sqrt{3}E}{4}$ (D) $\frac{3E}{4}$
23. One-fourth length of a spring of force constant k is cut away. The force constant of the remaining spring will be
 (A) Exactly $0.75 k$ (B) Approximately $1.33 k$
 (C) Exactly k (D) Approximately $4 k$

24. The Young's modulus of the material of a wire is equal to the
 (A) Stress acting on it
 (B) Strain produced in it
 (C) Stress required to increase its length four times
 (D) Stress required to produce unit strain
25. A body floats in water with 40% of its volume outside water. When the same body floats in oil, 60% of its volume remains outside oil. The relative density of oil is
 (A) 1.5 (B) 1.2 (C) 1.0 (D) 0.5
26. Bernoulli's theorem is a consequence of conservation of
 (A) Linear momentum (B) Angular momentum
 (C) Energy (D) Mass
27. According to Maxwell's law of distribution of velocities of molecules, the most probable velocity is
 (A) Greater than the mean velocity
 (B) Equal to the mean velocity
 (C) Equal to the root mean square velocity
 (D) Less than the root mean square velocity
28. The temperature of a gas contained in a closed vessel of constant volume increases by 1°C when the pressure of the gas is increased by 1%. The initial temperature is
 (A) 200 K (B) 100 K (C) 100°C (D) 273°C
29. The thermodynamic process in which no heat flows between the system and surroundings is
 (A) Adiabatic (B) Isobaric (C) Isothermal (D) Cyclic
30. Specific heat of a gas undergoing adiabatic change is
 (A) Infinite (B) Positive (C) Zero (D) Negative
31. Two black metallic spheres of radius 4 m, at 2000 K and 1 m, at 4000 K will have ratio of energy radiation as
 (A) 1 : 1 (B) 4 : 1 (C) 1 : 4 (D) 1 : 2
32. A black body has a wavelength λ at a temperature of 2000 K. Its corresponding wavelength at temperature 3000 K will be
 (A) $\frac{2\lambda}{3}$ (B) $\frac{3\lambda}{2}$ (C) $\frac{4\lambda}{9}$ (D) $\frac{9\lambda}{4}$
33. When two sinusoidal waves moving at right angle to each other superimpose, they produce
 (A) Beats (B) Interference (C) Stationary waves (D) Lissajous figure
34. The equation of longitudinal wave represented by $y = 10 \cos \pi(50t - x)$ cm. Then its wavelength is
 (A) 20 cm (B) 50 cm (C) 2 cm (D) 5 cm

35. An electron of mass m and charge q is accelerated from rest in a uniform electric field of strength E . The velocity acquired by it as it travels a distance s is
 (A) $\sqrt{\frac{2Eq}{ms}}$ (B) $\sqrt{\frac{2Eq s}{m}}$ (C) $\sqrt{\frac{2Em}{qs}}$ (D) $\sqrt{\frac{Eq}{ms}}$
36. Two capacitors, one 4 pF and the other 6 pF, connected in parallel are charged by a 100 Volt battery. The energy stored in capacitors is
 (A) 1.2×10^{-8} J (B) 2.4×10^{-8} J (C) 5.0×10^{-8} J (D) 6.0×10^{-8} J
37. The following four wires are made of the same material and are at same temperature. Which one of them has higher electrical resistance?
 (A) Length = 50 cm, diameter = 0.5 mm
 (B) Length = 100 cm, diameter = 1.0 mm
 (C) Length = 200 cm, diameter = 2.0 mm
 (D) Length = 300 cm, diameter = 3.0 mm
38. A 36Ω galvanometer is shunted by resistance 4Ω . The percentage of the total current, which passes through the galvanometer, is
 (A) 8% (B) 9% (C) 10% (D) 90%
39. A wire carrying current i and other carrying $2i$ in the same direction produce a magnetic field B at the mid-point. What will be the field when $2i$ current is switched off?
 (A) $B/2$ (B) B (C) $2B$ (D) $4B$
40. The ratio of magnetic field and magnetic moment at the centre of a current carrying loop is y . When both the current and radius is doubled the ratio will be
 (A) $y/8$ (B) $y/4$ (C) $y/2$ (D) $2y$
41. A magnetic needle is kept in a non-uniform magnetic field. It experiences
 (A) A force only but not a torque (B) A torque only but not a force
 (C) Neither a torque nor a force (D) A force and torque both
42. The unit of intensity of magnetisation is
 (A) A-m (B) $A\text{-m}^2$ (C) A/m (D) W/m
43. What should be the value of self inductance of an inductor that should be connected to 220 V, 50 Hz supply so that a maximum current of 0.9 A flows through it?
 (A) 2.44 H (B) 3.66 H (C) 4.88 H (D) 6.0 H
44. The equivalent quantity of mass in an inductor circuit is
 (A) Charge (B) Potential (C) Current (D) Inductance
45. A resistance and a capacitor are connected in series with an AC source. If the potential drop across the capacitor is 5 V and across resistor is 12 V, then applied voltage is
 (A) 13 V (B) 17 V (C) 7 V (D) 12 V
46. The choke used in an ac circuit is of
 (A) Low inductance and high resistance
 (B) High inductance and low resistance
 (C) Low inductance and resistance both
 (D) High inductance and resistance both

47. In optical fibres, the refractive index of the core is
 (A) Greater than that of the cladding (B) Equal to that of the cladding
 (C) Smaller than that of the cladding (D) Independent of that of the cladding
48. A convex lens of focal length 40 cm is in contact with a concave lens of focal length 25 cm. The power of combination is
 (A) + 6.5 D (B) - 6.5 D (C) + 1.5 D (D) -1.5 D
49. If the ratio of maximum and minimum intensities of an interference pattern is 25: 1, then the ratio of amplitudes of the two interfering waves will be
 (A) 3: 2 (B) 5: 1 (C) 2: 1 (D) 13: 12
50. Transverse nature of light was confirmed by the phenomenon of
 (A) Reflection of light (B) Diffraction of light
 (C) Polarisation of light (D) Dispersion of light
51. The average magnetic energy density of an electromagnetic wave of wavelength λ travelling in free space is given by
 (A) $\frac{B^2}{2\lambda}$ (B) $\frac{B^2}{2\mu_0}$ (C) $\frac{2B^2}{\mu_0 \lambda}$ (D) $\frac{B}{\mu_0 \lambda}$
52. The maximum kinetic energy of photoelectrons
 (A) Is independent of energy of incident radiation
 (B) Varies linearly with intensity of incident radiation
 (C) Varies linearly with the wavelength of incident radiation
 (D) Varies linearly with the frequency of incident radiation
53. If ${}_{92}^{238}\text{U}$ emits 8 α -particles and 6 β -particles, then the resulting nucleus is
 (A) ${}_{82}^{206}\text{Pb}$ (B) ${}_{82}^{210}\text{Pb}$ (C) ${}_{82}^{212}\text{Pb}$ (D) ${}_{82}^{216}\text{Pb}$
54. In gamma ray emission from a nucleus
 (A) Only the neutron number changes
 (B) Only the proton number changes
 (C) Both the neutron number and the proton number change
 (D) There is no change in the neutron number and the proton number
55. In a reverse biased p-n junction, when the applied bias voltage is equal to the breakdown voltage, then
 (A) Current remains constant while voltage increases sharply
 (B) Voltage remains constant while current increases sharply
 (C) Current and voltage increase
 (D) Current and voltage decrease
56. An npn-transistor is operated in common emitter configuration with $V_{cc} = 9\text{ V}$ such that a change in the base current from $100\mu\text{A}$ to $300\mu\text{A}$ produces a change in the collector current from 15 mA to 25 mA. The current gain is
 (A) 100 (B) 75 (C) 50 (D) 25

57. The total energy E of a subatomic particle of rest mass m moving at non-relativistic speed v is
(A) mc^2 (B) $\frac{1}{2}mv^2$ (C) $mc^2 + \frac{1}{2}mv^2$ (D) $mc^2 - \frac{1}{2}mv^2$
58. At what speed would the relativistic value for the linear momentum of a particle would be twice the classical values?
(A) $v = \frac{\sqrt{3}}{2}c$ (B) $v = \frac{\sqrt{5}}{2}c$ (C) $v = 0.5c$ (D) $v = \sqrt{\frac{3}{2}}c$
59. If NOT gates are placed at the input terminals of two input NAND gate, it behaves as
(A) OR gate (B) AND gate (C) XOR gate (D) NOR gate
60. Which one of the following does not depict the correct link between technology and physics?
(A) Optical fibres \leftrightarrow total internal reflection of light
(B) Nuclear reactors \leftrightarrow nuclear fission
(C) Electron microscope \leftrightarrow wave nature of electrons
(D) Electric generator \leftrightarrow laws of electromagnetic induction

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