

Question Booklet Series: **A**

Question Booklet Serial No.: **111535**

**CET (UG) – 2022**

**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. 1/4<sup>th</sup> 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 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 of the following pairs of quantities do not have same units?  
(A) Frequency and velocity gradient      (B) Surface tension and force gradient  
(C) Electric field strength and potential      (D) Impulse and energy gradient
- If the wavelength of a wave is 50 m, then what is the frequency of the wave?  
(A) 50 kHz      (B) 1 MHz      (C) 6 MHz      (D) 100 kHz
- A satellite is moving around the earth with speed  $v$  in a circular orbit of radius  $r$ . If the orbit radius is decreased by 1%, speed will  
(A) Increase by 0.5%      (B) Decrease by 0.5%  
(C) Increase by 1%      (D) Decrease by 1%
- Who was the first to use Boolean algebra for describing the operation of logic gates?  
(A) Zener      (B) Schottky      (C) Shannon      (D) Boole
- A train starts from rest and acquires a speed  $v$  with uniform acceleration  $\alpha$ . Then it comes to stop with uniform retardation  $\beta$ . What will be the average velocity of the train?  
(A)  $(\alpha+\beta)/\alpha\beta$       (B)  $\alpha\beta/(\alpha+\beta)$       (C)  $v$       (D)  $v/2$
- Energy released in the fission of a single  $^{235}_{92}\text{U}$  nucleus is 200 MeV. The fission rate of a  $^{235}_{92}\text{U}$  fuelled reactor operating at a power level of 5 W is:  
(A)  $1.56 \times 10^{-16} \text{ s}^{-1}$       (B)  $1.56 \times 10^{-11} \text{ s}^{-1}$   
(C)  $1.56 \times 10^{-17} \text{ s}^{-1}$       (D)  $1.56 \times 10^{-10} \text{ s}^{-1}$
- A block slides from an inclination of  $45^\circ$ . If it takes time twice with friction than to that without friction, then coefficient of friction for surface is given by:  
(A) 0.25      (B) 0.5      (C) 0.75      (D) 1
- The coefficient of absorption of X-rays is related to the wavelength as:  
(A)  $\lambda^2$       (B)  $\lambda$       (C)  $\lambda^4$       (D)  $\lambda^3$
- A bomb explodes into two fragments of masses 3 kg and 1 kg. Total kinetic energy of the fragments is 6 MJ. What is the ratio of the kinetic energies of smaller mass to the larger mass?  
(A) 1/9      (B) 9      (C) 1/3      (D) 3
- A thin prism  $P_1$  with angle  $4^\circ$  and made from glass of refractive index 1.54 is combined with another thin prism  $P_2$  made from glass of refractive index 1.72 to produce dispersion without deviation. The angle of prism  $P_2$  is:  
(A)  $2.6^\circ$       (B)  $3^\circ$       (C)  $4^\circ$       (D)  $5.33^\circ$

11. In a uniform magnetic field of induction  $B$  a wire in the form of a semicircle of radius  $r$  rotates about the diameter of the circle with an angular frequency  $\omega$ . The axes of rotation is perpendicular to the field. If the total resistance of the circuit is  $R$ , the mean power generated per period of rotation is:  
 (A)  $[(B\pi r^2\omega)^2/8R]$  (B)  $[(B\pi r^2\omega/2R)]$  (C)  $[(B\pi r\omega^2)^2/8R]$  (D)  $[(B\pi r\omega)^2/2R]$
12. The angular momentum of a wheel changes for  $2L$  to  $5L$  in 3 seconds. What is the magnitude of the torque acting on it?  
 (A)  $L$  (B)  $L/5$  (C)  $L/3$  (D)  $L/2$
13. An electron moves at right angle to magnetic field of  $1.5 \times 10^{-2}$  tesla with a speed of  $6 \times 10^7$  m/s. If the specific charge of the electron is 17 coul./kg, the radius of the circular path will be:  
 (A) 2.35 cm (B) 2.01 cm (C) 2.9 cm (D) 3.9 cm
14. In a potentiometer experiment the balancing with a cell is at length 240 cm. On shunting the cell with a resistance of 2 ohm, the balancing length becomes 120 cm. The internal resistance of the cell is:  
 (A) 2 ohm (B) 2.5 ohm (C) 1.5 ohm (D) 1.0 ohm
15. A metallic rod breaks when strain produced is 0.2%. The Young's modulus of the material of the rod is  $7 \times 10^9$  Nm<sup>-2</sup>. What should be its area of cross-section to support a load of  $10^4$  N?  
 (A)  $7.1 \times 10^{-4}$  m<sup>2</sup> (B)  $7.1 \times 10^{-2}$  m<sup>2</sup> (C)  $7.1 \times 10^{-6}$  m<sup>2</sup> (D)  $7.1 \times 10^{-8}$  m<sup>2</sup>
16. The inward and outward electric flux from a closed surface are respectively  $8 \times 10^3$  and  $4 \times 10^3$  units. Then the net charge inside the closed surface is:  
 (A)  $(-4 \times 10^3 \epsilon_0)$  coulomb (B)  $(-4 \times 10^3/\epsilon_0)$  coulomb  
 (C)  $(4 \times 10^3)$  coulomb (D)  $(4 \times 10^3/\epsilon_0)$  coulomb
17. A lead sphere of mass  $m$  falls in a viscous liquid with a terminal velocity  $v_0$ . Another lead sphere of mass  $64m$  will fall through the same liquid with a terminal velocity  
 (A)  $64v_0$  (B)  $4v_0$  (C)  $v_0$  (D)  $16v_0$
18. When air is replaced by dielectric medium of constant ' $k$ ', the maximum force of attraction between two charges separated by a distance  
 (A) Increases  $k$  times (B) Increases  $1/k$  times  
 (C) Remains unchanged (D) Decreases  $k$  times
19. The speeds of 5 molecules of gas (in arbitrary units) are: 2, 3, 4, 5, 6. The root mean square speed for these molecules is:  
 (A) 3.52 (B) 4.00 (C) 4.24 (D) 2.91

20. The length of a metal rod at  $0^{\circ}\text{C}$  is 0.5m. When it is heated, its length increases by 2.7mm. The final temperature of the rod is (coefficient of linear expansion of the metal =  $9 \times 10^{-5}/^{\circ}\text{C}$ ):  
 (A)  $60^{\circ}\text{C}$                       (B)  $40^{\circ}\text{C}$                       (C)  $30^{\circ}\text{C}$                       (D)  $20^{\circ}\text{C}$
21. If an ideal flask containing hot coffee is shaken, the temperature of the coffee will:  
 (A) Decrease  
 (B) Decrease if temperature is below  $4^{\circ}\text{C}$  and increase if temperature is equal to or more than  $4^{\circ}\text{C}$   
 (C) Increase  
 (D) Remain same
22. A potential barrier of 0.50 V exists across a p-n junction. If the depletion region is  $5.0 \times 10^{-7}$  m wide, the intensity of the electric field in this region is:  
 (A)  $2.0 \times 10^6$  V/m    (B)  $2.0 \times 10^5$  V/m    (C)  $1.0 \times 10^5$  V/m    (D)  $1.0 \times 10^6$  V/m
23. A copper ball cools from  $70^{\circ}\text{C}$  to  $60^{\circ}\text{C}$  in 600 seconds and to  $52^{\circ}\text{C}$  in next 600 seconds. What is the temperature of surrounding and temperature of the ball at the end of next 600 seconds?  
 (A)  $20^{\circ}\text{C}$  and  $45.6^{\circ}\text{C}$     (B)  $20^{\circ}\text{C}$  and  $46.6^{\circ}\text{C}$     (C)  $25^{\circ}\text{C}$  and  $45.6^{\circ}\text{C}$     (D)  $25^{\circ}\text{C}$  and  $46.6^{\circ}\text{C}$
24. Hydrogen atom emits blue light when it changes from  $n = 4$  energy level to the  $n = 2$  level. Which colour of light would the atom emit when it changes from the  $n = 5$  level to the  $n = 2$  level?  
 (A) Green                      (B) Yellow                      (C) Red                      (D) Violet
25. The amplitude of a damped oscillator becomes one half after  $t$  seconds. If the amplitude becomes  $(1/n)$  after  $3t$  seconds, then  $n$  is equal to:  
 (A)  $1/8$                       (B)  $1/4$                       (C) 4                      (D) 8
26. The refractive index of water is  $4/3$  and that of glass is  $5/3$ . What will be the critical angle for the ray of light entering water from the glass?  
 (A)  $\sin^{-1}(1/2)$                       (B)  $\sin^{-1}(5/4)$                       (C)  $\sin^{-1}(4/5)$                       (D)  $\sin^{-1} 2$
27. A man is carrying a load equal to his own weight ( $W$ ) on his head. If he jumps from roof of a building, during his fall, the weight experienced by the man will be:  
 (A)  $W$                       (B)  $2W$                       (C) Zero                      (D)  $3W$
28. An eagle is flying away from a bird watcher and directly towards a distant cliff at a speed 15 m/s. This eagle produces a shrill cry of 800 Hz. The bird watcher will hear this directly (not the echo) with the frequency (given velocity of sound in air 340 m/s):  
 (A) 766 Hz                      (B) 815 Hz                      (C) 785 Hz                      (D) 834 Hz

29. An electric kettle has two heating coils. When one of the coils is connected to an a.c. source, the water in the kettle boils in 10 minutes. When the other coil is used the water boils in 40 minutes. If both the coils are connected in parallel, the time taken by the same quantity of water to boil will be:  
 (A) 25 min                      (B) 15 min                      (C) 8 min                      (D) 4 min
30. Entropy of a thermodynamic system does not change when this system is used for:  
 (A) Conversion of heat into internal energy isochorically  
 (B) Conversion of heat into work, isobarically  
 (C) Conversion of work into heat isothermally  
 (D) Conversion of heat from a hot reservoir to a cold reservoir
31. Water rises in a capillary tube through a height  $h$ . If the tube is inclined to the liquid surface at  $30^\circ\text{C}$ , the liquid will rise in the tube upto its length equal to:  
 (A)  $2h$                       (B)  $4h$                       (C)  $h$                       (D)  $h/2$
32. As one penetrates uniformly charged conducting sphere, what happens to the electric field strength?  
 (A) Increases inversely as the square of distance  
 (B) Decreases inversely as the square of distance  
 (C) Decreases inversely as the distance  
 (D) Becomes zero
33. Why the dam of water reservoir is thick at the bottom?  
 (A) Density of water increases with depth  
 (B) Pressure of water increases with depth  
 (C) Quantity of water increases with depth  
 (D) Temperature of water increases with depth
34. The nature of capacity of electrostatic capacitor depends on:  
 (A) Thickness of plates                      (B) Size  
 (C) Area                      (D) Shape
35. Velocity of sound in air is  $320\text{m/s}$ . A pipe closed at one end has a length of  $1\text{m}$ . Neglecting end correction, the air column in the pipe can resonate for sound of frequency:  
 (A)  $400\text{ Hz}$                       (B)  $320\text{ Hz}$                       (C)  $240\text{ Hz}$                       (D)  $80\text{ Hz}$
36. A battery sends current through a resistance  $R_1$  for time  $t$  and the heat produced in the resistor is  $Q$ . It sends the current through another resistance  $R_2$  for time  $t$  and again the heat produced is  $Q$ . What is the internal resistance of the battery?  
 (A)  $R_1R_2$                       (B)  $\sqrt{(R_1R_2)}$                       (C)  $(R_1 + R_2)/2$                       (D)  $(R_1 - R_2)/2$

37. A satellite revolves around a planet in an elliptical orbit of minor and major axes 'a' and 'b' respectively. If T be the time period of the satellite, then  $T^2$  is proportional to:  
 (A)  $a^3$  (B)  $b^3$  (C)  $[(a-b)/2]^3$  (D)  $[(a+b)/2]^3$
38. A galvanometer gives full scale deflection when the current passes through it is 1 mA. Its resistance is 100 ohm. Without connecting additional resistance in series with it, it can be used as a voltmeter of range:  
 (A) 0.001 V (B) 0.010 V (C) 0.100 V (D) 1.000 V
39. When an aeroplane moves at a speed higher than the velocity of sound in air, a loud bang is heard. This is because:  
 (A) The normal engine noise undergoes a Doppler shift to generate the bang  
 (B) Its wings vibrate so violently that the bang is heard  
 (C) It explodes  
 (D) It produces shock wave which is received at the bang
40. A coil of 1000 turns and area  $20 \text{ cm}^2$  is placed in a magnetic field of  $1000/\pi$  ampere turn/m. The magnetic field makes angle  $30^\circ$  with the plane of the coil. If the field is reduced to zero in 0.2s, then what is the induced emf set up in the coil?  
 (A) 4 mV (B) 8 mV (C) 2 mV (D) 16 mV
41. About which of the following axis, the moment of inertia of a thin circular disc is minimum?  
 (A) Tangential and perpendicular to the surface  
 (B) Through centre parallel to the surface  
 (C) Tangential and parallel to the surface  
 (D) Through centre perpendicular to the surface
42. A coil of 1000 turns of wire is wound on a book and this book is lying on the table. The vertical component of earth's magnetic field is  $0.6 \times 10^{-4} \text{ T}$  and the area of the coil is  $0.05 \text{ m}^2$ . The book is turned over once about a horizontal axis in 0.1s. The average emf induced in the coil is:  
 (A) 0.06 V (B) 0.6 V (C) 0.03 V (D) Zero
43. The angular speed of a motor increases from 600 rpm to 1200 rpm in 10 s. What is the angular acceleration of the motor?  
 (A)  $2\pi \text{ rad/s}^2$  (B)  $60\pi \text{ rad/s}^2$  (C)  $60 \text{ rad/s}^2$  (D)  $600 \text{ rad/s}^2$
44. A star is moving away from the earth with a velocity of 100 km/s. If the velocity of light is  $3 \times 10^8 \text{ m/s}$ , then the shift of its spectral line of wavelength  $5700 \text{ \AA}$  due to Doppler's effect will be:  
 (A)  $5.70 \text{ \AA}$  (B)  $0.63 \text{ \AA}$  (C)  $3.80 \text{ \AA}$  (D)  $1.90 \text{ \AA}$

45. Two waves of intensities  $I$  and  $4I$  superimpose. The minimum and maximum intensities will respectively be:  
 (A)  $I, 9I$  (B)  $I, 5I$  (C)  $3I, 5I$  (D)  $3I, 9I$
46. An achromatic combination of concave and convex lenses has power  $5\text{ D}$ . If the power of convex lens is  $4\text{ D}$ , then the magnitude of focal length of concave lens is:  
 (A)  $100\text{ cm}$  (B)  $200\text{ cm}$  (C)  $10\text{ cm}$  (D)  $20\text{ cm}$
47. The kinetic energy of a body is increased by  $300\%$ . Its momentum will be increased by:  
 (A)  $200\%$  (B)  $100\%$  (C)  $400\%$  (D)  $300\%$
48. Light of frequency  $1.5$  times the threshold frequency is incident on photo-sensitive material. If the frequency is halved and intensity is doubled, the photocurrent becomes:  
 (A) Halved (B) Zero (C) Doubled (D) Quadrupled
49. Which property gives the crystalline solids a sharp melting point?  
 (A) Isotropic conductivity (B) Long range order  
 (C) Viscosity (D) Bond strength
50. Two radioactive materials  $X_1$  and  $X_2$  have decay constants  $10\lambda$  and  $\lambda$  respectively. If initially they have the same number of nuclei, then the ratio of the number of nuclei of  $X_1$  to that of  $X_2$  will be  $1/e$  after a time:  
 (A)  $11/10\lambda$  (B)  $1/10\lambda$  (C)  $1/9\lambda$  (D)  $1/11\lambda$
51. A body is moving with a speed  $1\text{ m/s}$  and a force is needed to stop it within a distance  $x$ . If the speed of the body is  $3\text{ m/s}$ , the force needed to stop it within the same distance ( $x$ ) will be:  
 (A)  $9\text{ F}$  (B)  $6\text{ F}$  (C)  $3\text{ F}$  (D)  $1.5\text{ F}$
52. A photosensitive plate is irradiated from a distance of  $1\text{ m}$ . The photoelectric current is  $0.1\text{ A}$ . If the source of radiations is brought nearer to a distance of  $50\text{ cm}$ , the photoelectric current will be:  
 (A)  $0.4\text{ A}$  (B)  $0.8\text{ A}$  (C)  $0.1\text{ A}$  (D)  $0.2\text{ A}$
53. A particle executes simple harmonic motion along a straight line path. Its amplitude is  $A$ . The potential energy of the particle is equal to the kinetic energy, when the displacement of the particles from the mean position is:  
 (A)  $\pm A$  (B)  $\pm A/2$  (C)  $\pm A/\sqrt{2}$  (D) Zero
54. Which of the following is NOT a parameter defined for a transistor amplifier?  
 (A) Energy Gain (B) Resistance gain (C) Current gain (D) Power gain

55. A river is 300 m wide. It is flowing at a speed of 3 m/s. A man, who can swim in still water at 3 m/s crosses the river always directing his motion perpendicular to the flow. How long will he take to cross the river?  
(A) 200 s                      (B) 150 s                      (C) 100 s                      (D) 50 s
56. The typical ionization energy of a donor in silicon is:  
(A) 0.001 eV                      (B) 0.1 eV                      (C) 1.0 eV                      (D) 10.0 eV
57. A Carnot engine working between 300 K and 600 K has work output of 800 J per cycle. What is the amount of heat energy supplied to the engine from source per cycle?  
(A) 1000 J/cycle                      (B) 1600 J/cycle                      (C) 1800 J/cycle                      (D) 2000 J/cycle
58. Determine the binary equivalent of 6.25  
(A) 11.01                      (B) 110.01                      (C) 1100.01                      (D) 11.001
59. The length of a cylinder is measured with a meter rod having least count 0.1 cm. Its diameter is measured with vernier caliper having least count 0.01 cm. Given that length is 5.0 cm and radius is 2.00 cm. The percentage error in the calculated value of the volume will be:  
(A) 2%                      (B) 3%                      (C) 1%                      (D) 4%
60. How many NAND gates are used to form AND gate?  
(A) 2                      (B) 3                      (C) 4                      (D) 1

x-x-x