

PU-CET-2009

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Code No.: 209101

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

Roll No.

In Figures

In Words

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O.M.R. Answer Sheet Serial No.

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Signature of the Candidate : _____

Paper : II

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 Question Booklet and also on the OMR Answer Sheet in the space provided and nowhere else.
2. Enter the Subject and Code No. of Question Booklet 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. To open the Question Booklet remove the paper seal (s) gently when asked to do so.
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 answers (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 Sheet. No marks will be deducted in such cases.
8. Darken the bubbles in the OMR Answer Sheet according to the Serial No. of the questions 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 sheets marked "Rough Work" 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. A candidate who creates disturbance of any kind or changes his/her seat or is found in possession of any paper possibly of any assistance or found giving or receiving assistance 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.
16. **Telecommunication equipment such as pager, cellular phone, wireless, scanner, etc., is not permitted inside the examination hall. Use of calculators is not allowed.**

1. **The coefficient of viscosity has the following dimensions :**
 (A) $[ML^{-1}T^{-1}]$ (B) $[ML^2T^{-3}]$
 (C) $[ML^{-1}T^{-2}]$ (D) $[ML^2T^4]$
2. **The number of significant figures in 0.00150 is :**
 (A) 2 (B) 3
 (C) 4 (D) 5
3. **The velocity of an object is given as a function of time by $v = 4t - 3t^2$, where v is in m/s and t in seconds. Its average velocity over the interval from $t = 0$ to $t = 2$ seconds is :**
 (A) 0 (B) -2 m/s
 (C) 2 m/s (D) -4 m/s
4. **We send a beam of light, travelling at the speed of light c , toward a distant galaxy, which is receding from us with a speed of $0.90c$. Observers in the galaxy see the light coming toward them with a speed of ?**
 (A) 0 (B) $0.10c$
 (C) c (D) $1.9c$
5. **A particle is executing circular motion. At any moment the position of the particle is $(\hat{i} + \hat{j})$ cm. The velocity of the particle at this moment will be along the direction :**
 (A) \hat{i} (B) \hat{j}
 (C) $(\hat{i} + \hat{j})$ (D) $(\hat{i} - \hat{j})$
6. **A ball is thrown downward from the edge of a cliff with an initial speed that is greater than the terminal speed. Initially its acceleration is :**
 (A) 0 (B) upward
 (C) downward and greater than g (D) downward and less than g
7. **A particle moves 5m in the +x direction while being acted upon by a constant force $\vec{F} = (4\hat{i} + 2\hat{j} - 4\hat{k})$ N. The work (in Joules) done on the particle by this force is :**
 (A) 20J (B) 10J
 (C) -20 J (D) 30J
8. **A block slides across a rough horizontal table top. The work done by friction changes :**
 (A) only the kinetic energy (B) only the potential energy
 (C) only the kinetic and potential energy (D) only the kinetic and internal energy
9. **A 75 kg man is riding in a 30 kg cart at 2.0 m/s. He jumps off in such a way as to land on the ground with no horizontal velocity. The resulting change in speed of the cart is :**
 (A) 0 (B) 2.0 m/s
 (C) 3.0 m/s (D) 5.0 m/s
10. **The angular momentum vector of the Earth about its rotation axis, due to its daily rotation, is directed :**
 (A) tangent to the equator toward the east (B) tangent to the equator toward the west
 (C) due north (D) due south

11. A 2.0 kg block starts from rest on the positive x axis 3.0m from the origin and thereafter has acceleration given by, $a = 4.0 \hat{i} - 3.0 \hat{j}$ in m/s. The torque, relative to the origin, acting on it at the end of 2.0 s is :
- (A) 0 (B) $(-12 \text{ N.m}) \hat{k}$
 (C) $(+24 \text{ N.m}) \hat{k}$ (D) $(-144 \text{ N.m}) \hat{k}$
12. An ice skater with rotational inertia I_0 is spinning with angular speed ω_0 . She pulls her arms in, decreasing her rotational inertia to $I_0/3$. Her angular speed becomes :
- (A) $3 \omega_0$ (B) ω_0
 (C) $\omega_0 / \sqrt{3}$ (D) $\omega_0 / 3$
13. A certain wire stretches 1cm. when a force F is applied on it. The same force is applied to a wire of the same material but with twice the diameter and twice the length. The second wire stretches :
- (A) 0.25 cm (B) 0.5 cm
 (C) 1 cm (D) 2 cm
14. Two particles, each of mass m, are a distance d apart. To bring a third particle, also with mass m, from far away to the point midway between the two particles an external agent does work given by :
- (A) $4G m^2 / d$ (B) $-4G m^2 / d$
 (C) $4Gm^2 / d^2$ (D) $-4Gm^2 / d^2$
15. A student standardizes the concentration of a salt water solution by slowly adding salt until an egg will just float. The procedure is based on the assumption that :
- (A) all eggs have the same volume (B) all eggs have the same weight
 (C) all eggs have the same density (D) all eggs have the same shape.
16. A constriction in a pipe reduces its diameter from 4.0 cm to 2.0 cm. Where the pipe is wide the water velocity is 8.0 m/s. Where it is narrow the water velocity is :
- (A) 4.0 m/s (B) 8.0 m/s
 (C) 16.0 m/s (D) 32.0 m/s
17. A particle moves in simple harmonic motion according to $x = 2 \cos (50 t)$, where x is in meters and t in seconds. Its maximum velocity in m/s is :
- (A) $100 \sin (50t)$ (B) $100 \cos (50t)$
 (C) 100 (D) 200
18. A string carries a sinusoidal wave with an amplitude of 2.0 cm. and frequency of 100Hz. The maximum speed of any point on the string is :
- (A) 13.0 m/s (B) 1.30 m/s
 (C) 0.13 m/s (D) 6.3 m/s
19. A source S generates circular outgoing waves on a lake. The wave speed is 5.0m/s and the crest-to-crest distance is 2.0m. A person in a motor boat heads directly toward S at 3.0 m/s to this person, the frequency of these waves is :
- (A) 1.0 Hz (B) 1.5Hz
 (C) 2.0Hz (D) 4.0Hz

20. When work W is done on an ideal gas of diatomic molecules in thermal isolation the increase in the total translational kinetic energy of the molecules is :
- (A) W (B) $3W/5$
 (C) $2W/5$ (D) $2W/3$
21. An ideal gas of N diatomic molecules has temperature T . If the number of molecules is doubled without changing the temperature, the internal energy increases by :
- (A) $1/2NkT$ (B) $3/2NkT$
 (C) $5/2NkT$ (D) 0
22. Which of the following process leads to no change in entropy ?
- (A) Non-cyclic isobaric (B) Non-cyclic isochoric
 (C) Non-cyclic isothermal (D) Any closed cycle
23. In a thermally insulated kitchen, an ordinary refrigerator is turned on and its door is left open. The temperature of the room :
- (A) remains constant by first law of thermodynamics
 (B) increases by first law of thermodynamics
 (C) decreases by first law of thermodynamics
 (D) remains constant by second law of thermodynamics
24. A perfectly reversible heat pump supplies heat to a building to maintain its temperature at 27°C . The cold reservoir is a river at 7°C . If work is supplied to the pump at the rate of 1 k W , at what rate does the pump supply heat to the building :
- (A) 15 kW (B) 3.85 kW
 (C) 1.35 kW (D) 30.0 kW
25. If wavelengths of maximum intensity of radiation emitted by sun and moon are $0.5 \times 10^{-6}\text{ m}$ and 10^{-4} m respectively, the ratio of their temperature is :
- (A) $1/100$ (B) $1/200$
 (C) 100 (D) 200
26. The height through which a liquid rises in a capillary depends upon :
- (A) surface tension of the liquid and the radius of the capillary
 (B) surface tension and density of the liquid and the radius of the capillary
 (C) surface tension only
 (D) surface tension and the density of the liquid.
27. A uniform U – tube is partially filled with water. Oil, of density 0.75 gm/cm^3 , is poured into the right arm until the water level in the left arm rises 3 cm . The length of the oil column is :
- (A) 2.25 cm (B) 8 cm
 (C) 10 cm (D) 4 cm
28. The coefficient of linear expansion of iron is 10^{-5} per $^\circ\text{C}$. The volume of an iron cube, 5 cm on edge will increase by what amount if it is heated from 10°C to 6°C ?
- (A) 0.00375 cm^3 (B) 0.1875 cm^3
 (C) 0.0225 cm^3 (D) 0.00125 cm^3
29. The excess of pressure inside a soap bubble is twice the excess pressure inside a second soap bubble. The volume of the first bubble is n times the volume of the second, where n is :
- (A) 0.125 (B) 0.250
 (C) 2 (D) 4

30. When a certain string is clamped at both ends, the lowest four resonant frequencies are 50, 100, 150, and 200 Hz. When the string is also clamped at its mid point, the lowest four resonant frequencies are :
- (A) 50, 100, 150, and 200 Hz (B) 50, 150, 250, and 300 Hz
(C) 100, 200, 300, and 400 Hz (D) 25, 50, 75, and 100 Hz
31. The proton is the nucleus of the hydrogen atom, and it attracts the electron that orbits it. Relative to this force, the electron attracts the proton with :
- (A) more force (B) less force
(C) same force (D) force depending on mass of proton and electron
32. Five identical point charges are placed at the corners of a regular hexagon of side L metres. Resultant force on a -q charge placed at centre of hexagon is :
- (A) 0 (B) kq^2/L^2
(C) kq/L^2 (D) $2kq^2/L^2$
33. The capacitance of a parallel plate capacitor is $2.5 \mu\text{F}$. When it is half filled with dielectric, its capacitance becomes $5\mu\text{F}$. The dielectric constant of the dielectric is :



- (A) 7.5 (B) 3
(C) 0.3 (D) 4
34. A human being can just feel the effect of electric current if the current is in the order of of :
- (A) micro ampere (B) milli ampere
(C) 1 A (D) 10 A
35. 12 wires of equal resistance R, are connected to form a cube. The effective resistance between diagonal ends will be :
- (A) $5R/6$ (B) $6R/5$
(C) $3R$ (D) $12 R$
36. If length, thickness, specific resistance and current flowing in the potentiometer wire is doubled, then the potential gradient will be :
- (A) quadrupled (B) 8 times
(C) twice (D) unchanged
37. Two bar magnets of same mass and dimensions but having magnetic moment M and 2M are joined together pole to pole and suspended by a string. The time period of assembly in a magnetic field H is 3s. If now the polarity of one of the magnets is reversed and the combination is again made to oscillate in the same field, the time of oscillation is :
- (A) $\sqrt{3}s$ (B) $3\sqrt{3}s$
(C) 3s (D) 6s
38. The magnetic moment of the magnet of mass 75g is $9 \times 10^{-7} \text{ Am}^2$. If the density of magnetic material is 7500kg/m^3 , then intensity of magnetisation is :
- (A) 0.9A/m (B) 0.09A/m
(C) 9A/m (D) 90A/m

39. **Electric power is generally transmitted over long distances at high voltage AC. The reason is :**
- (A) the high voltage on transmission line prevents theft of line wire
 (B) power can be transmitted more quickly
 (C) there is less wastage of power in transmission at high voltages
 (D) large amounts of power cannot be generated at low voltages
40. **An electric generator is based on the principle of :**
- (A) Ohm's law
 (B) variation in magnetic flux due to rotation of armature coil in the region of magnetic field
 (C) variation of electric flux across the armature coil
 (D) chemical energy conversion to electrical energy
41. **The current flowing through the inductance coil of resistance 173 ohm which is connected to 50 Hz A.C. is found to lag the supply voltage by an angle of 30°. The inductance of the coil is about :**
- (A) 0.4H (B) 0.2H
 (C) 0.3H (D) 0.1H
42. **Radio wave is :**
- (A) long wavelength light wave (B) highly penetrative light wave
 (C) Sound wave (D) low wavelength light wave
43. **In Young's experiment the wavelength of blue and red lights are 78 μ m and 52 μ m respectively. The value of n for which (n+1)th blue bright band coincides with nth red bright band is :**
- (A) 4 (B) 3
 (C) 2 (D) 1
44. **A diffraction pattern is observed using red light. What happens if the red light is replaced by the blue light ?**
- (A) no change (B) diffraction bands become narrower
 (C) bands become broader (D) bands disappear
45. **In LCR circuit, the sharpness of the resonance curve :**
- (A) decreases with increase of inductance L (B) decreases with increase of capacitance C
 (C) doesn't depend upon value of L, C, R (D) decreases with increase of resistance R
46. **The focal length of a convex lens of glass of refractive index 1.50 is 2cm. The focal length of this lens when it is immersed in a liquid of refractive index 1.25 will be :**
- (A) 1 cm (B) 2.5 cm
 (C) 4 cm (D) 5 cm
47. **As the quantum numbers increase, the difference in consecutive energy levels of the hydrogen atom :**
- (A) remains same (B) decreases
 (C) increases (D) can not be predicted
48. **When the ${}_{88}\text{Ra}^{236}$ decays in a series by emission of 3 α particles and a β particle, the daughter nucleus formed will be :**
- (A) ${}_{83}\text{Bi}^{224}$ (B) ${}_{84}\text{Po}^{224}$
 (C) ${}_{85}\text{At}^{220}$ (D) ${}_{87}\text{Fr}^{223}$
49. **If a sample of radioactive isotope has a half-life of 1 day, how much of the original sample will remain at the end of third day ?**
- (A) 1/2 of original sample (B) 3/4 of original sample
 (C) 1/3 of original sample (D) 1/8 of original sample
50. **Energy generation in stars is mainly due to :**
- (A) fission of heavy nuclei (B) fission of light nuclei
 (C) fusion of light nuclei (D) fusion of heavy nuclei

- 51. On increasing the reverse bias voltage to a large value in a pn junction diode the current :**
 (A) increases slowly (B) remains constant
 (C) suddenly increases (D) decreases slowly
- 52. Which of the following is the ideal diode I-V Characteristic curve ?**

Diagram.

- 53. The three primary colours are :**
 (A) red, blue and green (B) red, orange and blue
 (C) red, green and yellow (D) red, yellow and blue
- 54. From which layer of atmosphere, radio waves are reflected back ?**
 (A) troposphere (B) mesosphere
 (C) stratosphere (D) ionosphere
- 55. The velocity of electromagnetic wave in free space is :**
 (A) $\sqrt{(\mu_0/\epsilon_0)}$ (B) $\sqrt{(\mu_0 \epsilon_0)}$
 (C) $\sqrt{(1/\mu_0 \epsilon_0)}$ (D) $\sqrt{(\epsilon_0/\mu_0)}$
- 56. How many frequencies are there in the visible part of electromagnetic spectrum ?**
 (A) three (B) seven
 (C) zero (D) infinite number
- 57. Boolean expression for NAND gate is :**
 (A) $A = \bar{A}$ (B) $A + B + C = y$
 (C) $\overline{AB} = y$ (D) $\overline{A + B} = y$
- 58. Electric conduction in a semiconductor takes place due to :**
 (A) electrons only (B) holes only
 (C) electrons and holes (D) neither electrons nor holes
- 59. When an impurity is doped into an intrinsic semiconductor, the conductivity of the semiconductor**
 (A) increases (B) decreases
 (C) becomes zero (D) remains same
- 60. A logical circuit can be constructed by using only :**
 (A) AND gates (B) OR gates
 (C) NOR gates (D) NOT gates

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