COMMON ENTRANCE TEST - 2004

Subject : PHYSICS	2 0 = 0 0	QUESTION BOOKLET	
DATE : 19.05.2004		VERSION CODE	SERIAL NUMBER
TIME : 10.30 A.M. TO 11.50 A.M.	Please fill your CET No. below		
MAXIMUM MARKS : 60		A 1	002369
MAXIMUM TIME : 80 MINUTES			

IMPORTANT INSTRUCTIONS TO CANDIDATES

(Please read the following instructions carefully, before you start answering on the OMR answer sheet)

1. The OMR answer sheet is issued at the start of the examination at 10.15 a.m., the candidate should first enter only Name and CET No. on the OMR answer sheet.

2. After the 2nd bell at 10.30 a.m. the Question Papers will be issued. Now, the candidate should enter the Version Code and Serial Number of question booklet on the OMR answer sheet. But, he shall not remove the staples on the right side of this booklet OR look inside the question booklet OR start answering on the OMR answer sheet until the 3rd bell rings.

   As answer sheets are designed to suit the Optical Mark Reader (OMR) system, special care should be taken to fill those items accurately.

   DO NOT DAMAGE OR MUTILATE THE TIMING, MARKS ON THE OMR ANSWER SHEETS.

3. Remove the staples at the right side to open the question paper booklet only after the 3rd bell at 10.40 a.m.

4. This question booklet contains 60 questions.

5. During the subsequent 70 minutes :

   a) Read each question carefully.

   b) Determine the correct answer from out of the four available choices given under each question.

   c) **Completely darken / shade the relevant circle with a blue or black ink ballpoint pen against the question number on the OMR answer sheet.**

   For example :

   Q. No. 14 : The product of 0.5×0.05 is : 1) 0.05   2) 0.005   3) 0.025   4) 0.25

   As the correct answer is option no. 3, the candidate should darken the circle corresponding to option no. 3 completely with a blue or black ink ballpoint pen on the OMR answer sheet, as shown below :

   ① ② ⬤ ④

6. For each correct answer, one mark will be awarded. For each wrong answer, quarter (1/4) mark will be deducted and if more than one circle is darkened for a given question, one mark will be deducted. **Even a minute unintended dot will also be recognised and recorded by the scanner. Please avoid multiple markings of any kind.**

7. Rough work should be done only on the blank space provided on each page of the question booklet. Rough work should not be done on the OMR answer sheet.

8. Please stop writing when the last bell rings at 11.50 a.m. Hand over the OMR answer paper set to the invigilator, who will separate the top sheet and will retain the same with him and return the bottom sheet replica to you to carry home.

NOTE : The candidate should safely preserve the replica of the OMR answer sheet for a minimum period of one year from the date of Common Entrance Test.

RL - 33

002869

PHYSICS

1. A thin plano-convex lens acts like a concave mirror of focal length 0.2 m when silvered from its plane surface. The refractive index of the material of the lens is 1.5. The radius of curvature of the convex surface of the lens will be ....

    1)   0.4 m   2)   0.2 m

    3)   0.1 m   4)   0.75 m

2. The physical quantity having the same dimensions as Planck's constant h is ....

    1) Boltzmann constant   2) force

    3) linear momentum   4) angular momentum

3. A balloon is rising vertically up with a velocity of $29 \, ms^{-1}$. A stone is dropped from it and it reaches the ground in 10 seconds. The height of the balloon when the stone was dropped from it is ($g = 9.8 \, ms^{-2}$)

    1) 100 m   2) 200 m

    3) 400 m   4) 150 m

4. A thread is tied slightly loose to a wire frame as in figure and the frame is dipped into a soap solution and taken out. The frame is completely covered with the film. When the portion A is punctured with a pin, the thread ....

    1) becomes concave towards A

    2) becomes convex towards A

    3) remains in the initial position

    4) either (1) or (2) depending on the size of A w.r.t. B

5. Oxygen is 16 times heavier than hydrogen. Equal volumes of hydrogen and oxygen are mixed. The ratio of speed of sound in the mixture to that in hydrogen is ....

    1) $\sqrt{1/8}$ 2) $\sqrt{\dfrac{32}{17}}$

    3) $\sqrt{8}$ 4) $\sqrt{\dfrac{2}{17}}$
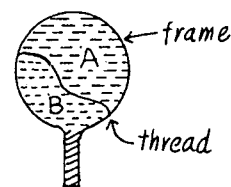
(Space for Rough Work)

6. When light is incident on a diffraction grating the zero order principal maximum will be .....

    1) one of the component colours   2) absent

    3) spectrum of the colours   4) white

7. H - polaroid is prepared by ....

    1) stretching polyvinyl alcohol and then heated with dehydrating agent

    2) stretching polyvinyl alcohol and then impregnating with iodine.

    3) orienting herapathite crystal in the same direction in nitrocellulose.

    4) by using thin tourmaline crystals.

8. SI unit of permittivity is ....

    1) $C^2 m^2 N^{-1}$ 2) $C^{-1} m^2 N^{-2}$

    3) $C^2 m^2 N^2$ 4) $C^2 m^{-2} N^{-1}$

9. A spherical drop of capacitance 1 μF is broken into eight drops of equal radius. Then, the capacitance of each small drop is ....

    1) $\dfrac{1}{8} \mu F$ 2) $8 \mu F$

    3) $\dfrac{1}{2} \mu F$ 4) $\dfrac{1}{4} \mu F$

10. Two equal forces (P each) act at a point inclined to each other at an angle of 120^0. The magnitude of their resultant is ....

    1) P 2) $2P$

    3) $P/2$ 4) $P/4$

(Space for Rough Work)

11. If two waves of the same frequency and amplitude respectively on superposition produce a resultant disturbance of the same amplitude the waves differ in phase by ....

1) $\pi/3$

2) $2\pi/3$

3) π

4) zero

12. A man, standing between two cliffs, claps his hands and starts hearing a series of echoes at intervals of one second. If the speed of sound in air is 340 ms^{-1}, the distance between the cliffs is ....

1) 340 m

2) 1620 m

3) 680 m

4) 1700 m

13. A beam of light of wavelength 600 nm from a distant source falls on a single slit 1mm wide and the resulting diffraction pattern is observed on a screen 2m away. The distance between the first dark fringes on either side of the central bright fringe is ....

1) 1.2 mm

2) 1.2 cm

3) 2.4 cm

4) 2.4 mm

14. Specific rotation of sugar solution is 0.01 SI units. 200 kgm^{-3} of impure sugar solution is taken in a polarimeter tube of length 0.25 m and an optical rotation of 0.4 rad is observed. The percentage of purity of sugar in the sample is ....

1) 80%

2) 89%

3) 11%

4) 20%

15. An electron is accelerated through a pd of 45.5 volt. The velocity acquired by it is (in ms^{-1})......

1) 4×10^6

2) 4×10^4

3) 10^6

4) zero

(Space for Rough Work)

16. When a body is earth connected, electrons from the earth flow into the body. This means the body is ....

    1) uncharged   2) charged positively

    3) charged negatively   4) an insulator

17. Effective capacitance between A and B in the figure shown is (all capacitances are in μF)

    1) $21\,\mu F$ 2) $23\,\mu F$

    3) $\dfrac{3}{14}\mu F$ 4) $\dfrac{14}{3}\mu F$
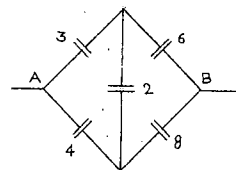
18. Which state of triply ionised Baryllium (Be^{+++}) has the same orbital radius as that of the ground state of hydrogen ?

    1) $n = 1$ 2) $n = 2$

    3) $n = 3$ 4) $n = 4$

19. If M is the atomic mass and A is the mass number, packing fraction is given by ....

    1) $\dfrac{A}{M - A}$ 2) $\dfrac{A - M}{A}$

    3) $\dfrac{M}{M - A}$ 4) $\dfrac{M - A}{A}$

20. A count rate meter shows a count of 240 per minute from a given radioactive source. One hour later the meter shows a count rate of 30 per minute. The half-life of the source is ....

    1) 20 min   2) 30 min

    3) 80 min   4) 120 min

(Space for Rough Work)

21. The refractive index of a particular material is 1.67 for blue light, 1.65 for yellow light and 1.63 for red light. The dispersive power of the material is ....

    1) 0.0615   2) 0.024

    3) 0.031   4) 1.60

22. An ideal gas heat engine operates in a Carnot's cycle between 227^0C and 127^0C. It absorbs 6×10^4 J at high temperature. The amount of heat converted into work is ....

    1) 4.8×10^4 J   2) 3.5×10^4 J

    3) 1.6×10^4 J   4) 1.2×10^4 J

23. Which one of the following graphs represents the behaviour of an ideal gas ?

    1)   2)

    3)   4)
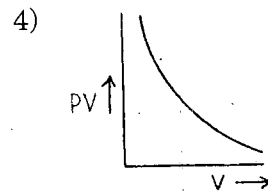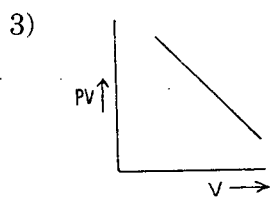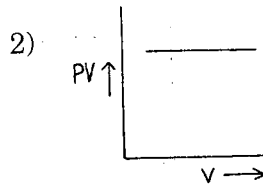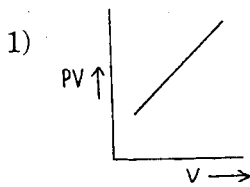
24. Rainbow is formed due to ....

    1) refraction   2) dispersion and total internal reflection

    3) total internal reflection   4) scattering

25. A beam of parallel rays is brought to a focus by a plano-convex lens. A thin concave lens of the same focal length is joined to the first lens. The effect of this is ....

    1) the focal point shifts away from the lens by a small distance.

    2) the focus remains undisturbed.

    3) the focus shifts to infinity.

    4) the focal point shifts towards the lens by a small distance.

(Space for Rough Work)

26. Two conductors of the same material have their diameters in the ratio 1 : 2 and their lengths in the ratio 2 : 1. If the temperature difference between their ends is the same, then the ratio of amounts of heat conducted per second through them will be -

1) 8 : 1

2) 1 : 8

3) 4 : 1

4) 1 : 4

27. Blowing air with open mouth is an example of ....
1) isothermal process
2) adiabatic process
3) isobaric process
4) isochoric process

28. Sound waves in air are always longitudinal because,

1) air is a mixture of several gases

2) density of air is very small

3) of the inherent characteristics of sound waves in air.

4) air does not have a modulus of rigidity.

29. In Young's double slit experiment if monochromatic light used is replaced by white light, then ....

1) all bright fringes become white.

2) all bright fringes have colours between violet and red.

3) no fringes are observed.

4) only central fringe is white, all other fringes are coloured.

30. In a Young's double slit experiment, the separation between the two slits is 0.9 mm and the fringes are observed one metre away. If it produces the second dark fringe at a distance of 1 mm from the central fringe, the wavelength of the monochromatic source of light used is ....

1) 500 nm

2) 600 nm

3) 450 nm

4) 400 nm

(Space for Rough Work)

31. An uncharged sphere of metal is placed inside a charged parallel plate capacitor. The lines of force will look like ....

1)

2)

3)

4)
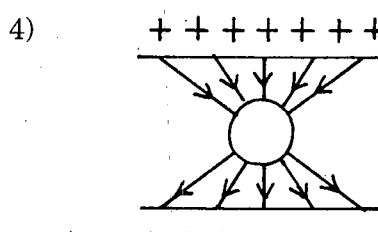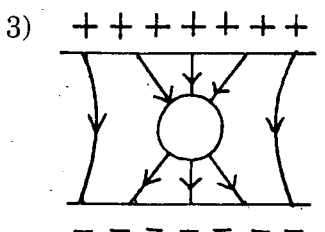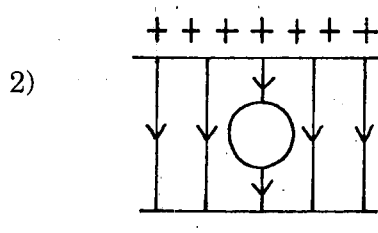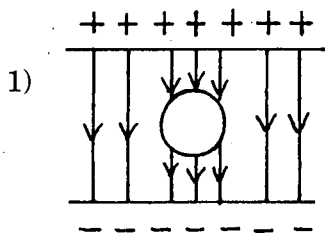
32. A wire has a resistance of $6\,\Omega$. It is cut into two parts and both half values are connected in parallel. The new resistance is ....

1) $12\,\Omega$ 2) $1.5\,\Omega$

3) $3\,\Omega$ 4) $6\,\Omega$

33. A current flows in a conductor from east to west. The direction of the magnetic field at a point above the conductor is ....

1) towards north   2) towards south

3) towards east   4) towards west

34. A bar magnet is equivalent to ....

1) solenoid carrying current   2) circular coil carrying current

3) torroid carrying current   4) straight conductor carrying current

35. Excitation energy of a hydrogen like ion in its first excitation state is 40.8 eV. Energy needed to remove the electron from the ion in ground state is ....

1) 54.4 eV   2) 13.6 eV

3) 40.8 eV   4) 27.2 eV

(Space for Rough Work)

36. Threshold wavelength for photoelectric emission from a metal surface is 5200 $\overset{0}{A}$. Photoelectrons will be emitted when this surface is illuminated with monochromatic radiation from ....

<table>
<tr><td>1) 50 W IR lamp</td><td>2) 10 W IR lamp</td></tr>
<tr><td>3) 1 W IR lamp</td><td>4) 50 W UV lamp</td></tr>
</table>

37. The emitter-base junction of a transistor is .... biased while the collector-base junction is .... biased.

<table>
<tr><td>1) reverse, forward</td><td>2) reverse, reverse</td></tr>
<tr><td>3) forward, forward</td><td>4) forward, reverse</td></tr>
</table>

**38.** In a forward biased p-n junction diode, the potential barrier in the depletion region is of the form ....

1)

2)

3)

4)
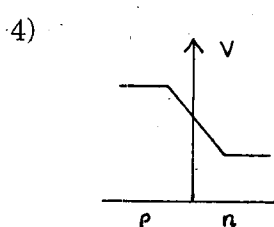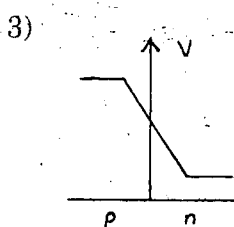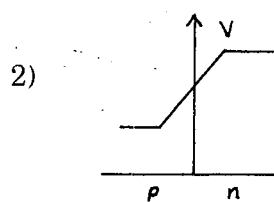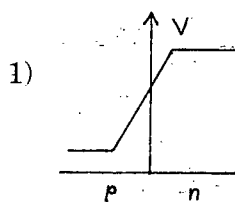
39. A cylinder of radius r and length l is placed in an uniform electric field E parallel to the axis of the cylinder. The total flux for the surface of the cylinder is given by ....

<table>
<tr><td>1) $\pi r^2 E$</td><td>2) $\left(\pi r^2 + \pi l^2\right)E$</td></tr>
<tr><td>3) zero</td><td>4) $2\pi r^2 E$</td></tr>
</table>

40. Two electric bulbs A and B are rated as 60 W and 100 W. They are connected in parallel to the same source. Then,

1) both draw the same current
2) A draws more current than B
3) B draws more current than A
4) current drawn are in the ratio of their resistances.

(Space for Rough Work)

41. Three long straight wires A, B and C are carrying currents as shown in figure. Then the resultant force on B is directed ....

    1) towards A.

    2) towards C.

    3) perpendicular to the plane of paper and outward.

    4) perpendicular to the plane of paper and inward.
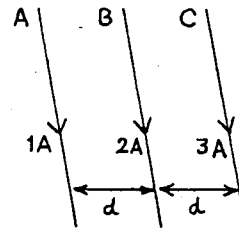
**42.** Curie-Weiss law is obeyed by iron at a temperature ....

    1) below Curie temperature   2) above Curie temperature

    3) at Curie temperature only   4) at all temperatures

43. The dimensional formula for inductance is ....

    1) $ML^2\ T^{-1}\ A^{-2}$ 2) $ML^2\ T^{-2} A^{-1}$

    3) $ML^2 T^{-2} A^{-2}$ 4) $ML^2 T A^{-2}$

44. A magnet NS is suspended from a spring and while it oscillates, the magnet moves in and out of the coil C. The coil is connected to a galvanometer G. Then, as the magnet oscillates,

    1) G shows deflection to the left and right with constant amplitude.

    2) G shows deflection on one side.

    3) G shows no deflection.

    4) G shows deflection to the left and right but the amplitude steadily decreases.
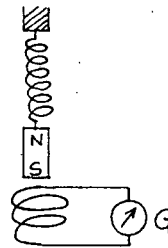
45. The maximum current that can be measured by a galvanometer of resistance $40\,\Omega$ is $10\,mA$. It is converted into a voltmeter that can read upto $50\,V$. The resistance to be connected in series with the galvanometer is .... (in ohm)

    1) 5040   2) 4960

   3) 2010   4) 4050

(Space for Rough Work)

46. An unknown resistance R_1 is connected in series with a resistance of $10\,\Omega$. This combination is connected to one gap of a metre bridge while a resistance R_2 is connected in the other gap. The balance point is at 50 cm. Now, when the $10\,\Omega$ resistance is removed the balance point shifts to 40 cm. The value of R_1 is (in ohm)

1) 60	2) 40
3) 20	4) 10

47. In the circuit shown, the internal resistance of the cell is negligible. The steady state current in the $2\,\Omega$ resistor is ....

1) 0.9 A	2) 1.5 A
3) 0.6 A	4) 1.2 A
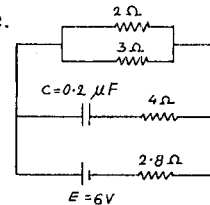
48. A rectangular coil of 300 turns has an average area of 25 cm x 10 cm. The coil rotates with a speed of 50 cps in a uniform magnetic field of strength $4 \times 10^{-2}\,T$ about an axis perpendicular to the field. The peak value of the induced emf is (in volt)

1) $3\,\pi$	2) $30\,\pi$
3) $300\,\pi$	4) $3000\,\pi$

49. In a LCR circuit the pd between the terminals of the inductance is 60 V, between the terminals of the capacitor is 30 V and that between the terminals of resistance is 40 V. The supply voltage will be equal to ....

1) 50 V	2) 70 V
3) 130 V	4) 10 V

50. A vertical circular coil of radius 0.1 m and having 10 turns carries a steady current. When the plane of the coil is normal to the magnetic meridian, a neutral point is observed at the centre of the coil. If $B_H = 0.314 \times 10^{-4}\,T$, the current in the coil is ....

1) 2 A	2) 1 A
3) 0.5 A	4) 0.25 A

(Space for Rough Work)

51. The spectrum obtained from the chromosphere of the sun at the time of total solar eclipse is ....

1) continuous emission spectrum. 2) line absorption spectrum.
3) line emission spectrum. 4) band absorption spectrum

52. Heavy water is ....

1) water, in which soap does not lather
2) compound of heavy oxygen and heavy hydrogen
3) compound of deuterium and oxygen
4) water at 4^0C

53. The nuclear reactor at Kaiga is a ....

1) breeder reactor 2) power reactor
3) research reactor 4) fusion reactor

54. When a body moves in a circular path, no work is done by the force since,

1) there is no displacement
2) there is no net force
3) force and displacement are perpendicular to each other
4) the force is always away from the centre

55. A bullet moving with a speed of 100 ms^{-1} can just penetrate two planks of equal thickness. Then, the number of such planks penetrated by the same bullet when the speed is doubled will be ....

1) 4 2) 8
3) 6 4) 10

(Space for Rough Work)

56. Two bodies of masses 1 kg and 2 kg have equal momentum. Then, the ratio of their kinetic energies is ....

1) 1 : 3

2) 1 : 1

3) 2 : 1

4) 3 : 1

57. The loudness and pitch of a sound note depends on ....

1) intensity and frequency

2) frequency and number of harmonics

3) Intensity and velocity

4) frequency and velocity

58. Absorption co-efficient of an open window is ....

1) zero

2) 0.5

3) 1

4) 0.25

59. In Melde's experiment in the transverse mode, the frequency of the tuning fork and the frequency of the waves in the string are in the ratio ....

1) 1 : 1

2) 1 : 2

3) 2 : 1

4) 4 : 1

60. The difference between the apparant frequency of a source of sound as perceived by the observer during its approach and recession is 2% of the frequency of the source. If the speed of sound in air is 300 ms^{-1} the velocity of the source is ....

1) 6 ms^{-1}

2) 3 ms^{-1}

3) 1.5 ms^{-1}

4) 12 ms^{-1}

(Space for Rough Work)

(Space for Rough Work)

(Space for Rough Work)

A-1