COMMON ENTRANCE TEST - 2006

DATE	SUBJECT	TIME
10 - 05 - 2006	PHYSICS	10.30 AM to 11.50 AM

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
60	80 MINUTES	70 MINUTES

MENTION YOUR CET NUMBER	QUESTION BOOKLET DETAILS	
	VERSION CODE	SERIAL NUMBER
	A - 1	25793

IMPORTANT INSTRUCTIONS TO CANDIDATES

(Candidates are advised to read the following instructions carefully, before answering on the OMR answer sheet.)

1. Ensure that you have entered your Name and CET Number on the top portion of the OMR answer sheet.
2. **ENSURE THAT THE BAR CODES, TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET ARE NOT DAMAGED / MUTILATED / SPOILED.**
3. This Question Booklet is issued to you by the invigilator after the 2nd Bell. i.e., after 10.35 a.m.
4. Enter the Serial Number of this question booklet on the top portion of the OMR answer sheet.
5. Carefully enter the Version Code of this question booklet on the bottom portion of the OMR answer sheet and SHADE the respective circle completely.
6. As answer sheets are designed to suit the Optical Mark Reader (OMR) system, please take special care while filling and shading the Version Code of this question booklet.
7. **DO NOT FORGET TO SIGN ON BOTH TOP AND BOTTOM PORTION OF OMR ANSWER SHEET IN THE SPACE PROVIDED.**
8. Until the 3rd Bell is rung at 10.40 a.m. :
   - Do not remove the staple present on the right hand side of this question booklet.
   - Do not look inside this question booklet.
   - Do not start answering on the OMR answer sheet.
9. After the 3rd Bell is rung at 10.40 a.m., remove the staple present on the right hand side of this question booklet and start answering on the bottom portion of the OMR answer sheet.
10. This question booklet contains 60 questions and each question will have four different options / choices.
11. During the subsequent 70 minutes :
    - Read each question carefully.
    - Determine the correct answer from out of the four available options / choices given under each question.
    - **Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALLPOINT PEN against the question number on the OMR answer sheet.**

CORRECT METHOD OF SHADING THE CIRCLE ON THE OMR SHEET IS AS SHOWN BELOW :

12. Please note that even a minute unintended ink dot on the OMR sheet will also be recognised and recorded by the scanner. Therefore, avoid multiple markings of any kind.
13. Use the space provided on each page of the question booklet for Rough work AND do not use the OMR answer sheet for the same.
14. After the last bell is rung at 11.50 a.m., stop writing on the OMR answer sheet.
15. Hand over the OMR ANSWER SHEET to the room invigilator as it is.
16. After separating and retaining the top sheet (CET Cell Copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
17. **Preserve the replica of the OMR answer sheet for a minimum period of One year.**

PHYSICS

1. The twinkling effect of star light is due to

1) total internal reflection
2) high dense matter of star
3) constant burning of hydrogen in the star
4) the fluctuating apparent position of the star being slightly different from the actual position of the star.

2. The width of the diffraction band varies

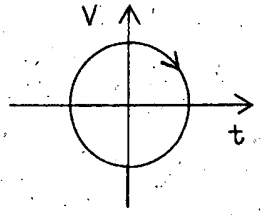
1) inversely as the wavelength
2) directly as the width of the slit
3) directly as the distance between the slit and the screen
4) inversely as the size of the source from which the slit is illuminated.

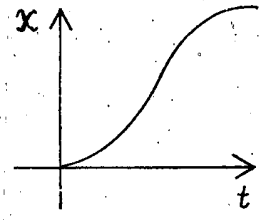
3. An unpolarised beam of intensity I_0 is incident on a pair of nicols making an angle of 60^0 with each other. The intensity of light emerging from the pair is

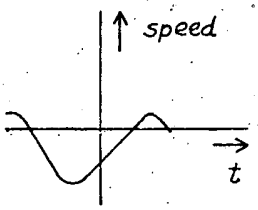
1) I_0 2) $I_{0/2}$

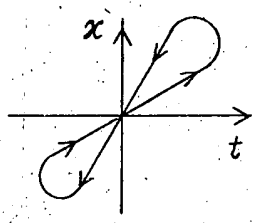
3) $I_{0/4}$ 4) $I_{0/8}$

4. Look at the graph (1) to (4) carefully and indicate which of these possibly represents one dimensional motion of a particle.

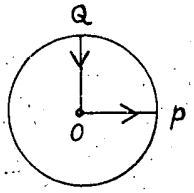
1) 

2) 

3) 

4) 

5. A cyclist starts from the centre O of a circular park of radius one kilometre, reaches the edge P of the park, then cycles along the circumference and returns to the centre along QO as shown in figure. If the round trip takes ten minutes, the net displacement and average speed of the cyclist (in metre and kilometre per hour) is .....



1) 0, 1 2) $\frac{\pi+4}{2}$, 0

3) 21.4, $\frac{\pi+4}{2}$ 4) 0, 21.4

(Space for Rough Work)

6. When a low flying aircraft passes over head, we sometimes notice a slight shaking of the picture on our TV screen. This is due to
   1) diffraction of the signal received from the antenna.
   2) interference of the direct signal received by the antenna with the weak signal reflected by the passing aircraft.
   3) change of magnetic flux occuring due to the passage of aircraft.
   4) vibrations created by the passage of aircraft.

7. 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 cm 2) 1.2 mm
   3) 2.4 cm 4) 2.4 mm

8. The physical quantity having the dimensions $\left[M^{-1}L^{-3}T^{3}A^{2}\right]$ is
   1) resistance 2) resistivity
   3) electrical conductivity 4) electromotive force

9. A battery of emf 10 V and internal resistance 3 ohm is connected to a resistor. The current in the circuit is 0.5 A. The terminal voltage of the battery when the circuit is closed is .....
   1) 10 V 2) 0 V
   3) 1.5 V 4) 8.5 V

10. A galvanometer coil has a resistance of 15 ohm and gives full scale deflection for a current of 4 mA. To convert it to an ammeter of range 0 to 6 A,
   1) 10 mΩ resistance is to be connected in parallel to the galvanometer.
   2) 10 mΩ resistance is to be connected in series with the galvanometer.
   3) 0.1 Ω resistance is to be connected in parallel to the galvanometer.
   4) 0.1 Ω resistance is to be connected in series with the galvanometer.

(Space for Rough Work)

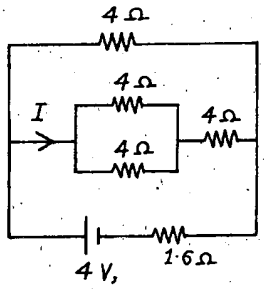
11. The electron drift speed is small and the charge of the electron is also small but still, we obtain large current in a conductor. This is due to

1) the conducting property of the conductor
2) the resistance of the conductor is small
3) the electron number density of the conductor is small
4) the electron number density of the conductor is enormous.

12. A straight wire of mass 200 g and length 1.5 m carries a current of 2 A. It is suspended in mid-air by a uniform horizontal magnetic field B. The magnitude of B (in tesla) is ..... (Assume $g = 9.9\ ms^{-2}$)

1) 2
2) 1.5
3) 0.55
4) 0.66

13. In the circuit shown the value of I in ampere is .....



1) 1
2) 0.60
3) 0.4
4) 1.5

14. A gaussian sphere encloses an electric dipole within it. The total flux across the sphere is ....

1) zero
2) half that due to a single charge
3) double that due to a single charge
4) dependent on the position of the dipole

15. A parallel plate air capacitor has a capacitance C. When it is half filled with a dielectric of dielectric constant 5, the percentage increase in the capacitance will be .....

1) 400 %
2) 66.6 %
3) 33.3 %
4) 200 %

(Space for Rough Work)

16. A comb run through one's dry hair attracts small bits of paper. This is due to
    1) comb is a good conductor
    2) paper is a good conductor
    3) the atoms in the paper get polarised by the charged comb.
    4) the comb possesses magnetic properties

17. The top of the atmosphere is at about 400 kV with respect to the surface of the earth, corresponding to an electric field that decreases with altitude. Near the surface of the earth, the field is about 100 Vm^{-1}. Still, we do not get an electric shock as we step out of our house into the open because (assume the house to be a steel cage so that there is no field inside)
    1) there is a pd between our body and the ground
    2) 100 Vm^{-1} is not a high electric field so that we do not feel the shock.
    3) our body and the ground forms an equipotential surface.
    4) the atmosphere is not a conductor.

18. The specific charge of a proton is 9.6×10^{7} C kg^{-1}. The specific charge of an alpha particle will be .....
    1) 9.6×10^{7} C kg^{-1}
    2) 19.2×10^{7} C kg^{-1}
    3) 4.8×10^{7} C kg^{-1}
    4) 2.4×10^{7} C kg^{-1}

19. When light of wavelength 300 nm falls on a photoelectric emitter, photoelectrons are liberated. For another emitter, light of wavelength 600 nm is sufficient for liberating photoelectrons. The ratio of the work function of the two emitters is
    1) 1 : 2
    2) 2 : 1
    3) 4 : 1
    4) 1 : 4

20. White light is passed through a dilute solution of potassium permanganate. The spectrum produced by the emergent light is
    1) band emission spectrum
    2) line emission spectrum
    3) band absorption spectrum
    4) line absorption spectrum

(Space for Rough Work)

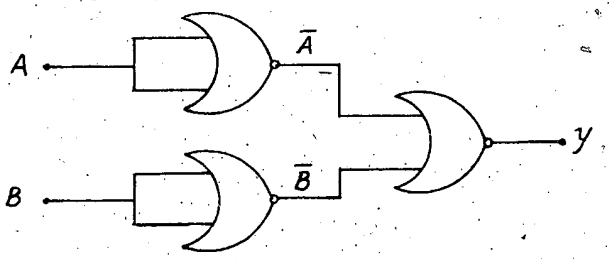
21. If λ_1 and λ_2 are the wavelengths of the first members of the Lyman and Paschen series respectively, then $\lambda_1 : \lambda_2$ is .....

1) 1 : 3
2) 1 : 30
3) 7 : 50
4) 7 : 108

22. Activity of a radioactive sample decreases to $\left(\frac{1}{3}\right)^{rd}$ of its original value in 3 days. Then, in 9 days its activity will become .....

1) $\left(\frac{1}{27}\right)$ of the original value
2) $\left(\frac{1}{9}\right)$ of the original value
3) $\left(\frac{1}{18}\right)$ of the original value
4) $\left(\frac{1}{3}\right)$ of the original value

23. Identify the logic operation performed by the circuit given below.



1) NOT
2) AND
3) OR
4) NAND

24. The working of which of the following is similar to that of a slide projector ?

1) Electron microscope
2) Scanning electron microscope
3) Transmission electron microscope
4) Atomic force microscope.

25. In a transistor the collector current is always less than the emitter current because,

1) collector side is reverse-biased and the emitter side is forward - biased.
2) a few electrons are lost in the base and only remaining ones reach the collector.
3) collector being reverse biased, attracts less electrons
4) collector side is forward-biased and emitter side is reverse-biased.

(Space for Rough Work)

26. A transparent cube of 0.21 m edge contains a small air bubble. Its apparent distance when viewed through one face of the cube is 0.10 m and when viewed from the opposite face is 0.04 m. The actual distance of the bubble from the second face of the cube is

1) 0.06 m 2) 0.17 m
3) 0.05 m 4) 0.04 m

27. White light is incident on one of the refracting surfaces of a prism of angle 5^0. If the refractive indices for red and blue colours are 1.641 and 1.659 respectively, the angular separation between these two colours when they emerge out of the prism is

1) 0.9^0 2) 0.09^0
3) 1.8^0 4) 1.2^0

28. For a given lens, the magnification was found to be twice as large as when the object was 0.15 m distant from it as when the distance was 0.2 m. The focal length of the lens is

1) 0.15 m 2) 0.20 m
3) 0.10 m 4) 0.05 m

29. To a fish under water, viewing obliquely a fisherman standing on the bank of a lake, the man looks

1) taller than what he actually is 2) shorter than what he actually is
3) the same height as he actually is 4) depends on the obliquity

30. A thin prism P_1 with angle 4^0 and made from a 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 the prism P_2 is

1) 5.33^0 2) 4^0
3) 3^0 4) 2.6^0

(Space for Rough Work)

31. If white light is used in the Newton's rings experiment, the colour observed in the reflected light is complementary to that observed in the transmitted light through the same point. This is due to

1) 90^0 change of phase in one of the reflected waves
2) 180^0 change of phase in one of the reflected waves
3) 145^0 change of phase in one of the reflected waves
4) 45^0 change of phase in one of the reflected waves

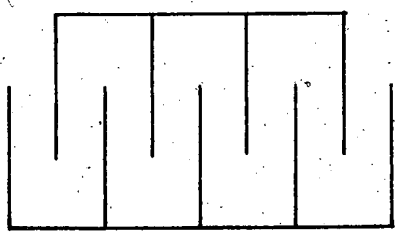
32. Specific rotation of sugar solution is 0.5 deg m^2 kg^{-1}. 200 kgm^{-3} of impure sugar solution is taken in a sample polarimeter tube of length 20 cm and optical rotation is found to be 19^0. The percentage of purity of sugar is .....

1) 20 %
2) 80 %
3) 95 %
4) 89 %

33. A simple pendulum has a length l and the mass of the bob is m. The bob is given a charge q coulomb. The pendulum is suspended between the vertical plates of a charged parallel plate capacitor. If E is the electric field strength between the plates, the time period of the pendulum is given by

1) $2\pi\sqrt{l/g}$
2) $2\pi\sqrt{\frac{l}{\sqrt{g+\frac{qE}{m}}}}$
3) $2\pi\sqrt{\frac{l}{\sqrt{g-\frac{qE}{m}}}}$
4) $2\pi\sqrt{\frac{l}{\sqrt{g^2+\left(\frac{qE}{m}\right)^2}}}$

34. A gang capacitor is formed by interlocking a number of plates as shown in figure. The distance between the consecutive plates is 0.885 cm and the overlapping area of the plates is 5 cm^2. The capacity of the unit is



1) 1.06 *PF*
2) 4 *PF*
3) 6.36 *PF*
4) 12.72 *PF*

35. A satellite in a circular orbit of radius R has a period of 4 hours. Another satellite with orbital radius 3 R around the same planet will have a period (in hours)

1) 16
2) 4
3) $4\sqrt{27}$
4) $4\sqrt{8}$

(Space for Rough Work)

36. The freezer in a refrigerator is located at the top section so that

1) the entire chamber of the refrigerator is cooled quickly due to convection
2) the motor is not heated
3) the heat gained from the environment is high
4) the heat gained from the environment is low.

37. The unit of Stefan's constant is

1) $Wm^{-2}k^{-1}$ 2) Wmk^{-4}
3) $Wm^{-2}k^{-4}$ 4) $Nm^{-2}k^{4}$

38. A monoatomic gas is suddenly compressed to $\left(\frac{1}{8}\right)^{th}$ of its initial volume adiabatically. The ratio of its final pressure to the initial pressure is (given the ratio of the specific heat of the given gas to be 5/3)

1) 32 2) $\frac{40}{3}$
3) $\frac{24}{5}$ 4) 8

39. A Carnot heat engine takes heat from a reservoir at 627^{0}C and rejects heat to a sink at 27^{0}C. Its efficiency will be

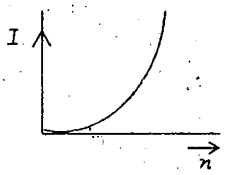
1) $\frac{3}{5}$ 2) $\frac{1}{3}$
3) $\frac{2}{3}$ 4) $\frac{200}{209}$

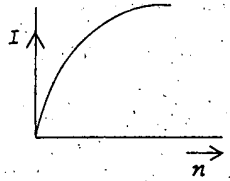
40. A 30 V, 90 W lamp is to be operated on a 120 V D.C. line. For proper glow, a resistor of ..... ohm should be connected in series with the lamp.

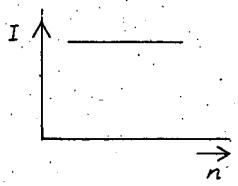
1) 40 2) 10
3) 20 4) 30

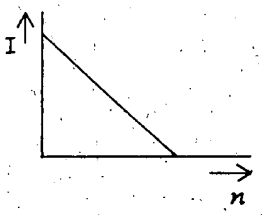
(Space for Rough Work)

41. A battery consists of a variable number (n) of identical cells, each having an internal resistance r connected in series. The terminals of the battery are short-circuited. A graph of current (I) in the circuit verses the number of cells will be as shown in figure.

1) 

2) 

3) 

4) 

42. A tuning fork A produces 4 beats per second with another tuning fork B of frequency 320 Hz. On filing one of the prongs of A, 4 beats per second are again heard when sounded with the same fork B. Then the frequency of the fork A before filing is

1) 328 Hz
2) 316 Hz
3) 324 Hz
4) 320 Hz

43. When the length of the vibrating segment of a sonometer wire is increased by 1 %, the percentage change in its frequency is

1) $\frac{100}{101}$
2) $\frac{99}{100}$
3) 1
4) 2

44. The sprinkling of water reduces slightly the temperature of a closed room because

1) temperature of water is less than that of the room
2) specific heat of water is high
3) water has large latent heat of vapourisation
4) water is a bad conductor of heat

45. The equation of a simple harmonic wave is given by $y = 5Sin\frac{\pi}{2}(100t - x)$ where x and y are in metre and time is in second. The period of the wave in second will be

1) 0.04
2) 0.01
3) 1
4) 5

(Space for Rough Work)

46. 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

47. For ordinary terrestrial experiments, the observer in an inertial frame in the following cases is .....

1) a child revolving in a giant wheel
2) a driver in a sports car moving with a constant high speed of 200 kmh^{-1} on a straight road
3) the pilot of an aeroplane which is taking off
4) a cyclist negotiating a sharp curve.

48. A rectangular vessel when full of water, takes 10 minutes to be emptied through an orifice in its bottom. How much time will it take to be emptied when half filled with water ?

1) 9 minutes
2) 7 minutes
3) 5 minutes
4) 3 minutes

49. If there were no gravity, which of the following will not be there for a fluid ?

1) viscosity
2) surface tension
3) pressure
4) Archimedes' upward thrust

50. In a *LCR* series circuit, the pd between the terminals of the inductance is 60 V, between the terminals of the capacitor is 30 V and that across the resistance is 40 V. Then, the supply voltage will be equal to

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

(Space for Rough Work)

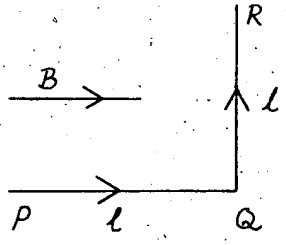
51. When dueterium and helium are subjected to an accelerating field simultaneously then,

1) both acquire same energy
2) dueterium accelerates faster
3) helium accelerates faster
4) neither of them is accelerated

52. A solenoid 1.5 m long and 0.4 cm in diameter possesses 10 turns per cm length. A current of 5 A flows through it. The magnetic field at the axis inside the solenoid is

1) $2\pi\times10^{-3}\,T$
2) $2\pi\times10^{-5}\,T$
3) $4\pi\times10^{-2}\,T$
4) $4\pi\times10^{-3}\,T$

53. A wire PQR is bent as shown in figure and is placed in a region of uniform magnetic field B. The length of $PQ = QR = l$. A current I ampere flows through the wire as shown. The magnitude of the force on PQ and QR will be

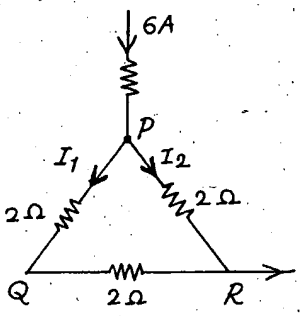


1) BIl, 0
2) $2\,BIl$, 0
3) 0, BIl
4) 0, 0

54. A choke is preferred to a resistance for limiting current in AC circuit because

1) choke is cheap
2) there is no wastage of power
3) choke is compact in size
4) choke is a good absorber of heat

55. A current of 6 A enters one corner P of an equilateral triangle PQR having 3 wires of resistances 2 Ω each and leaves by the corner R. Then the current I_1 and I_2 are



1) 2 A, 4 A
2) 4 A, 2 A
3) 1 A, 2 A
4) 2 A, 3 A

(Space for Rough Work)

56. To a germanium crystal equal number of aluminium and indium atoms are added. Then,

1) it remains an intrinsic semiconductor 2) it becomes a n-type semiconductor

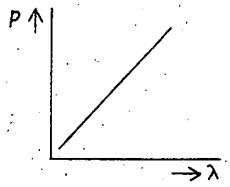
3) it becomes a p-type semiconductor 4) it becomes an insulator

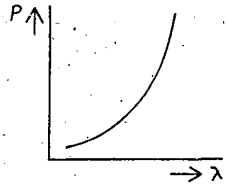
57. Maximum velocity of the photoelectrons emitted by a metel surface is 1.2×10^6 ms^{-1}. Assuming the specific charge of the electron to be 1.8×10^{11} C kg^{-1}, the value of the stopping potential in volt will be

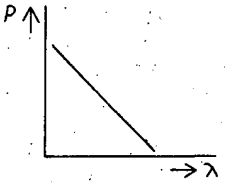
1) 2 2) 3

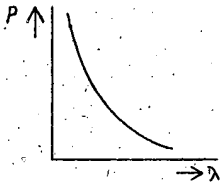
3) 4 4) 6

58. Which of the following figure represents the variation of particle momentum and associated de Broglie wavelength ?

1) 

2) 

3) 

4) 

59. The term liquid crystal refers to a state that is intermediate between

1) crystalline solid and amorphous liquid

2) crystalline solid and vapour

3) amorphous liquid and its vapour

4) a crystal immersed in a liquid

60. If r_1 and r_2 are the radii of the atomic nuclei of mass numbers 64 and 125 respectively, then the ratio $\left(\frac{r_1}{r_2}\right)$ is

1) $\frac{64}{125}$ 2) $\sqrt{\frac{64}{125}}$

3) $\frac{5}{4}$ 4) $\frac{4}{5}$

(Space for Rough Work)

(Space for Rough Work)

A-1