COMMON ENTRANCE TEST - 2005

DATE	SUBJECT	TIME
04 - 05 - 2005	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	017793

20 = 60

IMPORTANT INSTRUCTIONS TO CANDIDATES

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

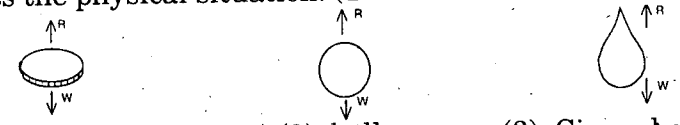
1. Ensure that you have entered your Name and CET Number on the top portion of the OMR answer sheet.
2. **ENSURE THAT THE TIMING MARKS ON THE OMR ANSWER SHEET ARE NOT DAMAGED / MUTILATED / SPOILED.**
3. This Question Booklet is issued to you by the invigilator after the 2nd Bell. i.e., after 10.35 a.m.
4. Carefully enter the Version Code and Serial Number of this question booklet on the top portion of the OMR answer sheet.
5. As answer sheets are designed to suit the Optical Mark Reader (OMR) system, please take special care while filling the entries pertaining to CET Number and Version Code.
6. 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.
7. 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.
8. This question booklet contains 60 questions and each question will have four different options / choices.
9. 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 :

10. Please note that :
    - For each correct answer : ONE mark will be awarded.
    - For each wrong answer : QUARTER (1/4) mark will be deducted.
    - If more than one circle is shaded : ONE mark will be deducted.
    - **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.**
11. 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.
12. After the last bell is rung at 11.50 a.m., stop writing on the OMR answer sheet.
13. Hand over the OMR ANSWER SHEET to the room invigilator as it is.
14. 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.
15. **Preserve the replica of the OMR answer sheet for a minimum period of One year.**

PHYSICS

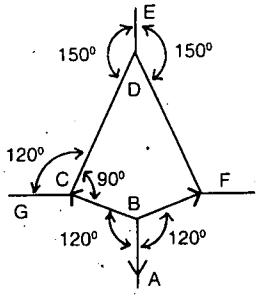
1. When a body falls in air, the resistance of air depends to a great extent on the shape of the body. 3 different shapes are given. Identify the combination of air resistances which truly represents the physical situation. (The cross sectional areas are the same)



(1) Disc (2) ball (3) Cigar shaped

1) $1 < 2 < 3$ 2) $2 < 3 < 1$
3) $3 < 2 < 1$ 4) $3 < 1 < 2$

2. The adjacent figure is the part of a horizontally stretched net. Section AB is stretched with a force of 10N. The tensions in the sections BC and BF are .....

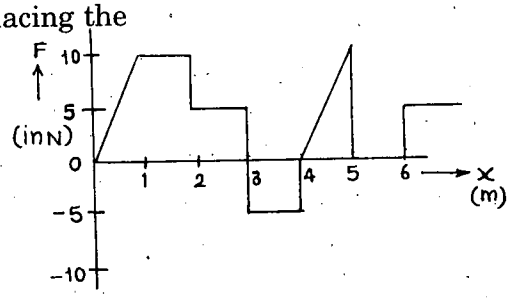


1) 10 N, 11 N
2) 10 N, 6 N
3) 10 N, 10 N
4) Can't calculate due to insufficient data

3. Out of the following four dimensional quantities, which one qualifies to be called a dimensional constant ?

1) acceleration due to gravity 2) surface tension of water
3) weight of a standard kilogram mass 4) the velocity of light in vacuum

4. The relationship between the force F and position x of a body is as shown in the figure. The work done in displacing the body from $x = 1m$ to $x = 5m$ will be .....



1) 30 J
2) 15 J
3) 25 J
4) 20 J

5. From the top of a tower two stones, whose masses are in the ratio 1 : 2 are thrown - one straight up with an initial speed u and the second straight down with the same speed u. Then, neglecting air resistance .....

1) the heavier stone hits the ground with a higher speed
2) the lighter stone hits the ground with a higher speed.
3) both the stones will have the same speed when they hit the ground
4) the speed can't be determined with the given data.

(Space for Rough Work)

6. If M is the mass of the earth and R its radius, the ratio of the gravitational acceleration and the gravitational constant is .....

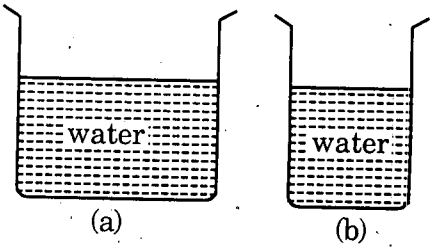
1) $\frac{R^2}{M}$ 2) $\frac{M}{R^2}$

3) MR^2 4) $\frac{M}{R}$

7. A student unable to answer a question on Newton's laws of motion attempts to pull himself up by tugging on his hair. He will not succeed .....

1) as the force exerted is small
2) the frictional force while gripping, is small
3) Newton's law of inertia is not applicable to living beings
4) as the force applied is internal to the system

8. From the adjacent figure, the correct observation is .....



1) The pressure on the bottom of tank (a) is greater than at the bottom of (b)
2) The pressure on the bottom of tank (a) is smaller than at the bottom of (b)
3) The pressure depend on the shape of the container.
4) The pressure on the bottom of (a) and (b) is the same

9. Which one of the following is not a unit of Young's modulus ?

1) Nm^{-1} 2) Nm^{-2}

3) dyne cm^{-2} 4) Mega Pascal

10. A piece of blue glass heated to a high temperature and a piece of red glass at room temperature, are taken inside a dimly lit room. Then .....

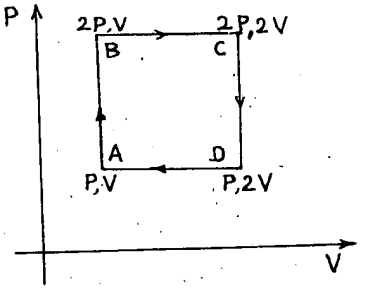
1) the blue piece will look blue and red will look as usual
2) red look brighter red and blue look ordinary blue.
3) blue shines like brighter red compared to the red piece
4) both the pieces will look equally red

(Space for Rough Work)

11. The wavelength of the radiation emitted by a body depends upon .....

1) the nature of the surface
2) the area of the surface
3) the temperature of the surface
4) all of the above factors

12. An ideal monoatomic gas is taken around the cycle *ABCDA* as shown in the P-V diagram. The work done during the cycle is given by .....



1) $\frac{1}{2} PV$
2) PV
3) $2\,PV$
4) $4\,PV$

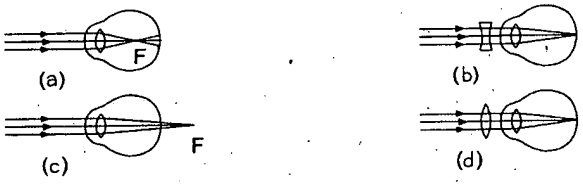
13. Which mirror is to be used to obtain a parallel beam of light from a small lamp ?

1) Plane mirror
2) Convex mirror
3) Concave mirror
4) Any one of the above

14. Which of the following is a wrong statement ?

1) $D = \frac{1}{f}$ where f is the focal length and D is called the refractive power of a lens.
2) Power is called a dioptre when f is in metres.
3) Power is called a diptre and does not depend on the system of unit used to measure f.
4) D is positive for convergent lens and negative for divergent lens.

15.



Identify the wrong description of the above figures.

1) (a) represents far - sightedness
2) (b) correction for short sightedness
3) (c) represents far - sightedness
4) (d) correction for far - sightedness

(Space for Rough Work)

16. Infrared radiation was discovered in 1800 by .....

1) William Wollaston
2) William Herschel
3) Wilhelm Roentgen
4) Thomas Young

17. A particle on the trough of a wave at any instant will come to the mean position after a time (T = time period) .....

1) $\frac{T}{2}$
2) $\frac{T}{4}$
3) T
4) $2T$

18. The disc of a siren containing 60 holes rotates at a constant speed of 360 rpm. The emitted sound is in unison with a tuning fork of frequency .....

1) 10 Hz
2) 360 Hz
3) 216 kHz
4) 6 Hz

19. The ratio of velocity of sound in hydrogen and oxygen at STP is .....

1) 16 : 1
2) 8 : 1
3) 4 : 1
4) 2 : 1

20. In an experiment with sonometer a tuning fork of frequency 256 Hz resonates with a length of 25 cm and another tuning fork resonates with a length of 16 cm. Tension of the string remaining constant the frequency of the second tuning fork is .....

1) 163.84 Hz
2) 400 Hz
3) 320 Hz
4) 204.8 Hz

(Space for Rough Work)

21. The apparent frequency of a note is 200 Hz. When a listener is moving with a velocity of 40 ms^{-1} towards a stationary source. When he moves away from the same source with the same speed, the apparent frequency of the same note is 160 Hz. The velocity of sound in air in m/s is .....

1) 340 2) 330

3) 360 4) 320

22. The wave theory of light, in its original form, was first postulated by .....

1) Isaac Newton 2) Christian Huygens

3) Thomas Young 4) Augustin Jean Fresnel

23. If a liquid does not wet glass, its angle of contact is .....

1) zero 2) acute

3) obtuse 4) right angle

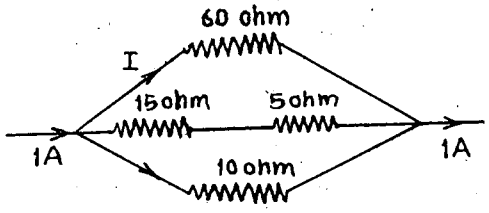
24. The magnitude of I in ampere unit is .....

1) 0.1

2) 0.3

3) 0.6

4) none of these



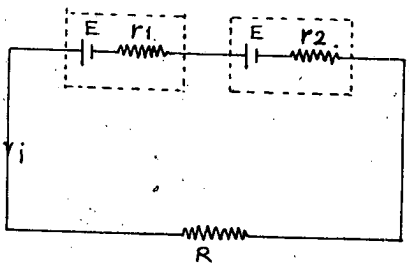
25. Electron of mass m and charge q is travelling with a speed v along a circular path of radius r at right angles to a uniform magnetic field of intensity B. If the speed of the electron is doubled and the magnetic field is halved the resulting path would have a radius

1) $2r$ 2) $4r$

3) $\frac{r}{4}$ 4) $\frac{r}{2}$

(Space for Rough Work)

26. If the potential difference across the internal resistance r_1 is equal to the emf E of the battery, then .....



1) $R = r_1 + r_2$
2) $R = \frac{r_1}{r_2}$
3) $R = r_1 - r_2$
4) $R = \frac{r_2}{r_1}$

27. By using only two resistance coils-singly, in series, or in Parallel-one should be able to obtain resistances of 3, 4, 12 and 16 ohms. The separate resistances of the coil are .....

1) 3 and 4
2) 4 and 12
3) 12 and 16
4) 16 and 3

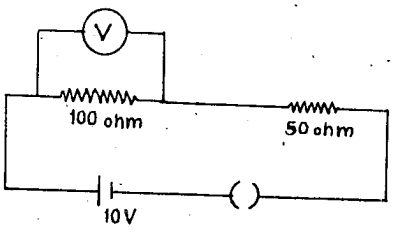
28. The electrons in the beam of a television tube move horizontally from South to North. The vertical component of the earth's magnetic field points down. The electron is deflected towards .....

1) West
2) no deflection
3) East
4) North to South

29. A tangent Galvanometer has a reduction factor of 1A and it is placed with the plane of its coil perpendicular to the magnetic meridian. The deflection produced when a current of 1A is passed through it is .....

1) 60^0
2) 45^0
3) 30^0
4) None of these

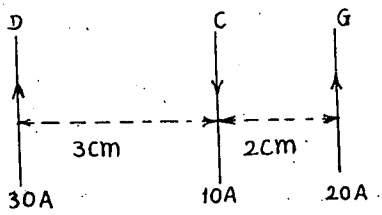
30. In the given circuit, the voltmeter records 5 volts. The resistance of the voltmeter in ohms is .....



1) 200
2) 100
3) 10
4) 50

(Space for Rough Work)

31. Three long, straight and parallel wires, carrying current, are arranged as shown in figure. The force experienced by a 25 cm length of wire C is .....



1) $10^{-3}\ N$
2) $2.5 \times 10^{-3}\ N$
3) zero
4) $1.5 \times 10^{-3}\ N$

32. A 5.0 amp current is setup in an external circuit by a 6.0 volt storage battery for 6.0 minutes. The chemical energy of the battery is reduced by .....

1) $1.08 \times 10^{4}\ J$
2) 1.08×10^{4} volt
3) $1.8 \times 10^{4}\ J$
4) 1.8×10^{4} volt

33. The current in a simple series circuit is 5.0 amp. When an additional resistance of 2.0 ohms is inserted, the current drops to 4.0 amp. The original resistance of the circuit in ohms was .....

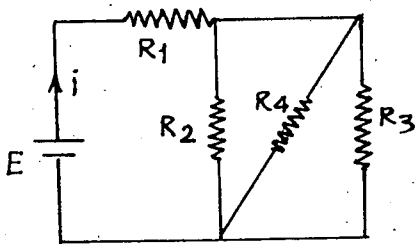
1) 1.25
2) 8
3) 10
4) 20

34. In the circuit given $E = 6.0V$, $R_1 = 100$ ohms

$R_2 = R_3 = 50$ ohms

$R_4 = 75$ ohms

The equivalent resistance of the circuit, in ohms, is .....



1) 11.875
2) 26.31
3) 118.75
4) none of these

35. Two resistances are connected in two gaps of a metrebridge. The balance point is 20 cm. from the zero end. A resistance of 15 ohms is connected in series with the smaller of the two. The null point shifts to 40 cm. The value of the smaller resistance, in ohms, is .....

1) 3
2) 6
3) 9
4) 12

(Space for Rough Work)

36. An electric field of 1500 v/m and a magnetic field of 0.40 weber/metre^2 act on a moving electron. The minimum uniform speed along a straight line the electron could have is .....

1) $1.6 \times 10^{15}\, m/s$
2) $6 \times 10^{-16}\, m/s$
3) $3.75 \times 10^{3}\, m/s$
4) $3.75 \times 10^{2}\, m/s$

37. In an ammeter 10% of main current is passing through the Galvanometer. If the resistance of the Galvanometer is G, then the shunt resistance, in ohms, is .....

1) $9\,G$
2) $\frac{G}{9}$
3) $90\,G$
4) $\frac{G}{90}$

38. Among the following properties describing diamagnetism identify the property that is wrongly stated-

a) diamagnetic material do not have permanent magnetic moment.
b) diamagnetism is explained in terms of electromagnetic induction.
c) diamagnetic materials have a small positive susceptibility.
d) the magnetic moment of individual electrons neutralise each other.

1) a
2) b
3) c
4) d

39. The induction coil works on the principle of .....

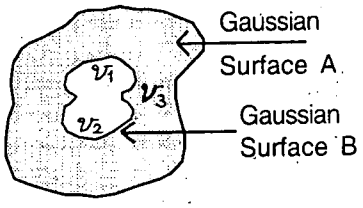
1) self-induction
2) mutual induction
3) Ampere's rule
4) Fleming's right hand rule

40. The square root of the product of inductance and capacitance has the dimension of .....

1) length
2) mass
3) time
4) no dimension

(Space for Rough Work)

41. The electric flux for Gaussian surface A that enclose the charged particles in free space is .....



(given $q_1 = -14nc, q_2 = 78.85\ nc,\ q_3 = -56\ nc$)

1) $10^3\ Nm^2C^{-1}$ 2) $10^3\ CN^{-1}m^{-2}$

3) $6.32 \times 10^3\ Nm^2C^{-1}$ 4) $6.32 \times 10^3\ CN^{-1}m^{-2}$

42. Four metal conductors having different shapes .....

a) a sphere b) cylindrical

c) pear d) lightning conductor

are mounted on insulating stands and charged. The one which is best suited to retain the charges for a longer time is .....

1) a 2) b

3) c 4) d

43. The potential to which a conductor is raised, depends on .....

1) the amount of charge 2) geometry and size of the conductor

3) both (1) and (2) 4) only on (1)

44. The work done in carrying a charge q once round a circle of radius r with a charge Q at the centre is .....

1) $\frac{qQ}{4\pi\epsilon_0 r}$ 2) $\frac{qQ}{4\pi\epsilon_0^2 r^2}$

3) $\frac{qQ}{4\pi\epsilon_0 r^2}$ 4) None of these

45. An air filled parallel plate condenser has a capacity of 2PF. The separation of the plates is doubled and the interspace between the plates is filled with wax. If the capacity is increased to 6PF, the dielectric constant of wax is .....

1) 2 2) 3

3) 4 4) 6

(Space for Rough Work)

46. Identify the wrong statement in the following. Coulomb's law correctly describes the electric force that .....

1) binds the electrons of an atom to its nucleus.
2) binds the protons and neutrons in the nucleus of an atom.
3) binds atoms together to form molecules.
4) binds atoms and molecules to form solids.

47. A single slit of width a is illuminated by violet light of wavelength 400 nm and the width of the diffraction pattern is measured as y. When half of the slit width is covered and illuminated by yellow light of wavelength 600 nm, the width of the diffraction pattern is .....

1) the pattern vanishes and the width is zero
2) $\frac{y}{3}$
3) $3y$
4) none of these

48. At Kavalur in India, the astronomers using a telescope whose objective had a diameter of one metre started using a telescope of diameter 2.54 m. this resulted in .....

1) the increase in the resolving power by 2.54 times for the same λ
2) the increase in the limiting angle by 2.54 times for the same λ
3) decrease in the resolving power.
4) no effect on the limiting angle.

49. When unpolarized light beam is incident from air onto glass $(n = 1.5)$ at the polarizing angle .....

1) reflected beam is polarized 100 percent .
2) reflected and refracted beams are partially polarized.
3) the reason for (1) is that almost all the light is reflected.
4) All of the above

50. Select the right option in the following

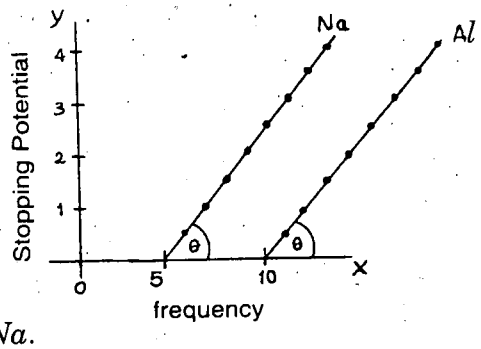
1) Christian Huygens, a contemporary of Newton established the wave theory of light by assuming that light waves were transverse
2) Maxwell provided the compelling theoretical evidence that light is a transverse wave.
3) Thomas Young experimentally proved the wave behaviour of light and Huygens assumption.
4) All three statements given above, correctly answers the question 'what is light' ?

(Space for Rough Work)

51. Two coherent light beams of intensity I and $4I$ are superposed. The maximum and minimum possible intensities in the resulting beam are .....

1) $9I$ and I
2) $9I$ and $3I$
3) $5I$ and I
4) $5I$ and $3I$

52. From the figure describing photoelectric effect we may infer correctly that .....



1) *Na* and *Al* both have the same threshold frequency.
2) Maximum kinetic energy for both the metals depend linearly on the frequency.
3) The stopping potentials are different for *Na* and *Al* for the same change in frequency.
4) *Al* is a better photo sensitive material than *Na*.

53. The electron in a hydrogen atom makes a transition from $n = n_1$ to $n = n_2$ state. The time period of the electron in the initial state (n_1) is eight times that in the final state (n_2). The possible values of n_1 and n_2 are .....

1) $n_1 = 8,\ n_2 = 1$
2) $n_1 = 4,\ n_2 = 2$
3) $n_1 = 2,\ n_2 = 4$
4) $n_1 = 1,\ n_2 = 8$

54. If the forward voltage in a diode is increased, the width of the depletion region .....

1) increases
2) decreases
3) fluctuates
4) no change

55. Two nucleons are at a separation of one Fermi. Protons have a charge of $+ 1.6 \times 10^{-19}\,C$. The net nuclear force between them is F_1, if both are neutrons, F_2 if both are protons and F_3 if one is proton and the other is neutron. Then .....

1) $F_1 = F_2 > F_3$
2) $F_1 = F_2 = F_3$
3) $F_1 < F_2 < F_3$
4) $F_1 > F_2 > F_3$

(Space for Rough Work)

56. The energy that should be added to an electron to reduce its de Broglie wavelength from one nm to 0.5 nm is .....

1) four times the initial energy
2) equal to the initial energy
3) twice the initial energy
4) thrice the initial energy

57. Mean life of a radioactive sample is 100 seconds. Then its half life (in minutes) is .....

1) 0.693
2) 1
3) 10^{-4}
4) 1.155

58. Consider two nuclei of the same radioactive nuclide. One of the nuclei was created in a supernova explosion 5 billion years ago. The other was created in a nuclear reactor 5 minutes ago. The probability of decay during the next time is .....

1) different for each nuclei
2) nuclei created in explosion decays first
3) nuclei created in the reactor decays first.
4) independent of the time of creation.

59. Bohr's atom model assumes .....

1) The nucleus is of infinite mass and is at rest.
2) Electrons in a quantised orbit will not radiate energy.
3) mass of the electron remains constant.
4) All the above conditions.

60. Identify the property which is not characteristic for a semi-conductor.....

1) at a very low temperatures it behaves like an insulator.
2) at higher temperatures two types of charge carriers will cause conductivity.
3) The charge carriers are electrons and holes in the valance band at higher temperatures.
4) the semiconductor is electrically neutral.

(Space for Rough Work)

(Space for Rough Work)

A-1