SEAL

SUBJECT : PHYSICS	DAY – 2
SESSION : MORNING	TIME : 10.30 A.M. TO 11.50 A.M.

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	

516561

DOs :

1. Check whether the CET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. This Question Booklet is issued to you by the invigilator after the **2nd Bell i.e., after 10.30 a.m.**
3. The Serial Number of this question booklet should be entered on the OMR answer sheet.
4. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'TS :

1. **THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.**
2. The **3rd Bell rings at 10.40 a.m., till then;**
   - Do not remove the paper seals present on all the 3 sides of this question booklet.
   - Do not look inside this question booklet.
   - Do not start answering on the OMR answer sheet.

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 60 questions and each question will have one statement and four distracters. (Four different options / choices.)
2. After the **3rd Bell is rung at 10.40 a.m.,** remove the paper seals of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
3. During the subsequent 70 minutes:
   - Read each question carefully.
   - Choose the correct answer from out of the four available distracters (options / choices) given under each question / statement.
   - **Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALL POINT PEN against the question number on the OMR answer sheet.**

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

(1) ● (3) (4)

4. Please note that even a minute unintended ink dot on the OMR answer sheet will also be recognised and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
5. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
6. After the **last bell is rung at 11.50 a.m.,** stop writing on the OMR answer sheet and affix your LEFT HAND THUMB IMPRESSION on the OMR answer sheet as per the instructions.
7. Hand over the **OMR ANSWER SHEET** to the room invigilator as it is.
8. After separating the top sheet (Our Copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
9. Preserve the replica of the OMR answer sheet for a minimum period of ONE year.

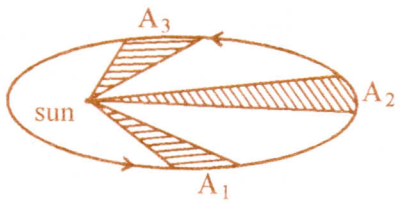
SEAL

1. The dimensional formula of physical quantity is $M^a L^b T^c$. Then that physical quantity is
   (1) surface tension if $a = 1, b = 1, c = -2$
   (2) force if $a = 1, b = 1, c = 2$
   (3) angular frequency if $a = 0, b = 0, c = -1$
   (4) spring constant if $a = 1, b = -1, c = -2$

2. A person throws balls into air vertically upward in regular intervals of time of one second. The next ball is thrown when the velocity of the ball thrown earlier becomes zero. The height to which the balls rise is .....
   (Assume, $g = 10\ ms^{-2}$)
   (1) 5 m (2) 10 m
   (3) 7.5 m (4) 20 m

3. The circular motion of a particle with constant speed is
   (1) periodic but not SHM (2) SHM but not periodic
   (3) periodic and also SHM (4) neither periodic nor SHM

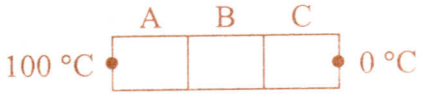
4. A planet moving around sun sweeps area A_1 in 2 days, A_2 in 3 days and A_3 in 6 days. Then the relation between A_1, A_2 and A_3 is



   (1) $3A_1 = 2A_2 = A_3$ (2) $2A_1 = 3A_2 = 6A_3$
   (3) $3A_1 = 2A_2 = 6A_3$ (4) $6A_1 = 3A_2 = 2A_3$

Space For Rough Work

5. A, B and C are the three identical conductors but made from different materials. They are kept in contact as shown.

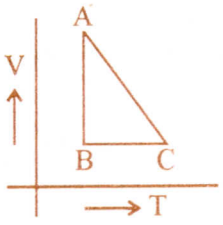


Their thermal conductivities are K, 2 K and $\frac{K}{2}$. The free end of A is at 100 °C and the free end of C is at 0 °C. During steady state, the temperature of the junction of A and B is nearly .... °C.

(1) 71 (2) 29

(3) 63 (4) 37

6. One mole of an ideal gas is taken from A to B, from B to C and then back to A. The variation of its volume with temperature for that change is as shown. Its pressure at A is P_0, volume is V_0. Then, the internal energy



(1) at A is more than at B (2) at C is less than at B

(3) at B is more than at A (4) at A and B are equal

7. Which of the following is incorrect ?

(1) If the wave is longitudinal, it must be a mechanical wave.

(2) If the wave is mechanical, it may OR may not be a transverse wave.

(3) Mechanical waves cannot propagate in vacuum.

(4) 'Diffraction' helps us to distinguish between sound wave and light wave.

Space For Rough Work

8. Intensity level of sound whose intensity is 10^{-8} wm^{-2} is ..... dB

(1) 8 (2) 4

(3) 40 (4) 80

9. A point source of light is kept below the surface of water ($n_w = 4/3$) at a depth of $\sqrt{7}$ m. The radius of the circular bright patch of light noticed on the surface of water is .....m.

(1) $\frac{3}{\sqrt{7}}$ (2) 3

(3) $\frac{\sqrt{7}}{3}$ (4) $\sqrt{7}$

10. A monochromatic beam of light is travelling from medium A of refractive index n_1 to a medium B of refractive index n_2. In the medium A, there are x number of waves in certain distance. In the medium B, there are y number of waves in the same distance. Then, refractive index of medium A with respect to medium B is ....

(1) $\frac{y}{x}$ (2) $\sqrt{\frac{x}{y}}$

(3) $\frac{x}{y-x}$ (4) $\frac{x}{y}$

11. In Young's double slit experiment, fringes of width β are produced on a screen kept at a distance of 1 m from the slit. When the screen is moved away by 5×10^{-2} m, fringe width changes by 3×10^{-5} m. The separation between the slits is 1×10^{-3} m. The wavelength of the light used is ..... nm.

(1) 500 (2) 600

(3) 700 (4) 400

Space For Rough Work

12. For sustained interference fringes in double slit experiment, essential condition/s is/are

(a) sources must be coherent

(b) the intensities of the two sources must be equal

Here, the correct option/s is/are

(1) both (a) (b) (2) only (a)

(3) only (b) (4) neither (a) nor (b)

13. In single slit experiment, the width of the slit is reduced. Then, the linear width of the principal maxima.....

(1) increases but becomes less bright

(2) decreases but becomes more bright

(3) increases but becomes more bright

(4) decreases but becomes less bright

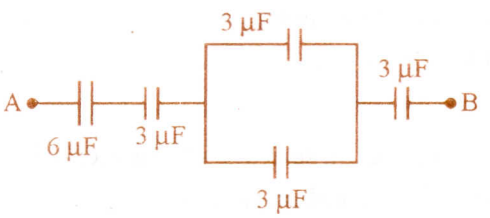
14. In the uniform electric field of $E = 1 \times 10^4\ NC^{-1}$, an electron is accelerated from rest. The velocity of the electron when it has travelled a distance of 2×10^{-2} m is nearly ..... ms^{-1}

($\frac{e}{m}$ of electron $\simeq 1.8 \times 10^{11}\ Ckg^{-1}$)

(1) 1.6×10^6 (2) 0.85×10^6

(3) 0.425×10^6 (4) 8.5×10^6

15. In this diagram, the P.D. between A and B is 60 V, The P.D. across 6 μF capacitor is V

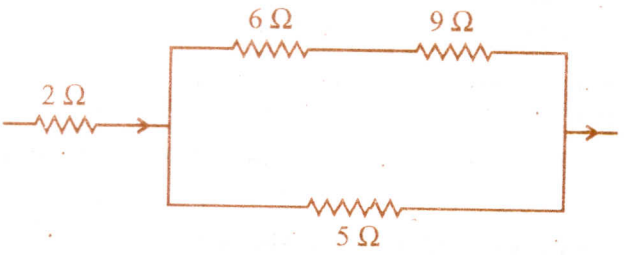


(1) 10 (2) 5

(3) 20 (4) 4

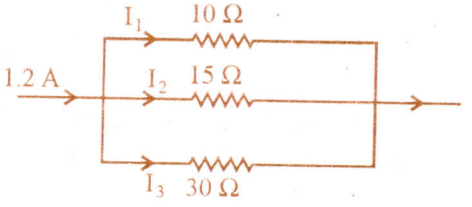
Space For Rough Work

16. In this circuit, when certain current flows, the heat produced in 5 Ω is 4.05 J in a time t. The heat produced in 2 Ω coil in the same time interval is



(1) 5.76 (2) 1.44
(3) 2.88 (4) 2.02

17. In this circuit, the value of I_2 is



(1) 0.2 A (2) 0.3 A
(3) 0.4 A (4) 0.6 A

18. A straight current carrying conductor is kept along the axis of circular loop carrying current. The force exerted by the straight conductor on the loop is _____.
(1) perpendicular to the plane of the loop
(2) in the plane of the loop, away from the center
(3) in the plane of the loop, towards the center
(4) zero

19. A resistor of 500 Ω, an inductance of 0.5 H are in series with an a.c. which is given by $V = 100\sqrt{2}\sin(1000\,t)$. The power factor of the combination is
(1) $\frac{1}{\sqrt{2}}$ (2) $\frac{1}{\sqrt{3}}$
(3) 0.5 (4) 0.6

Space For Rough Work

20. Pick out the WRONG statement.

(1) The gain in the K.E. of the electron moving at right angles to the magnetic field is zero.

(2) When an electron is shot at right angles to the electric field, it traces a parabolic path.

(3) An electron moving in the direction of the electric field gains K.E.

(4) An electron at rest experiences no force in the magnetic field.

21. A proton and an alpha particle are accelerated under the same potential difference. The ratio of de-Broglie wavelengths of the proton and the alpha particle is

(1) $\sqrt{8}$ (2) $\frac{1}{\sqrt{8}}$

(3) 1 (4) 2

22. Spectrum of sunlight is an example for

(1) Band emission spectrum (2) Line absorption spectrum

(3) Continuous emission spectrum (4) Continuous absorption spectrum

23. In hydrogen atom, electron excites from ground state to higher energy state and its orbital velocity is reduced to $\frac{1}{3}$rd of its initial value. The radius of the orbit in the ground state is R. The radius of the orbit in that higher energy state is.....

(1) 2 R (2) 3 R

(3) 27 R (4) 9 R

24. Decay constants of two radio-active samples A and B are $15x$ and $3x$ respectively. They have equal number of initial nuclei. The ratio of the number of nuclei left in A and B after a time $\frac{1}{6x}$ is

(1) e (2) e^2

(3) e^{-1} (4) e^{-2}

Space For Rough Work

25. Mass numbers of the elements A, B, C and D are 30, 60, 90 and 120 respectively. The specific binding energy of them are 5 MeV, 8.5 MeV, 8 MeV and 7 MeV respectively. Then, in which of the following reaction/s energy is released ?

(a) $D \rightarrow 2B$

(b) $C \rightarrow B + A$

(c) $B \rightarrow 2A$

(1) only in (a) (2) in (b), (c)

(3) in (a), (c) (4) in (a), (b) and (c)

26. Copper and Germanium are cooled from room temperature to 100 K. Then the resistance of

(1) Germanium decreases, Copper increases

(2) Germanium decreases, Copper decreases

(3) Germanium increases, Copper decreases

(4) Germanium increases, Copper increases

27. The most stable particle in the Baryon group is

(1) neutron (2) proton

(3) lamda particle (4) sigma particle

28. Frequencies of light incident on a system of scattering particles are in the ratio of 1 : 2. Then, the intensity of scattered light in a particular direction is .....

(1) 1 : 4 (2) 1 : 2

(3) 1 : 8 (4) 1 : 16

29. The ratio of the magnetic dipole moment to the angular momentum of the electron in the 1st orbit of hydrogen atom is

(1) $\frac{e}{2m}$ (2) $\frac{e}{m}$

(3) $\frac{2m}{e}$ (4) $\frac{m}{e}$

Space For Rough Work

30. Milk is an example for

(1) inelastic gel (2) foam

(3) elastic gel (4) emulsion

31. A body of mass 'm' is travelling with a velocity 'u'. When a constant retarding force 'F' is applied, it comes to rest after travelling a distance 's_1'. If the initial velocity is '2u', with the same force 'F', the distance travelled before it comes to rest is 's_2'. Then

(1) $s_2 = 2s_1$ (2) $s_2 = \frac{s_1}{2}$

(3) $s_2 = s_1$ (4) $s_2 = 4s_1$

32. A block kept on a rough surface starts sliding when the inclination of the surface is 'θ' with respect to the horizontal. The coefficient of static friction between the block and the surface is

(1) $\sin\theta$ (2) $\tan\theta$

(3) $\cos\theta$ (4) $\sec\theta$

33. Two bodies of masses m_1 and m_2 are acted upon by a constant force F for a time t. They start from rest and acquire kinetic energies E_1 and E_2 respectively. Then $\frac{E_1}{E_2}$ is

(1) $\frac{m_1}{m_2}$ (2) $\frac{m_2}{m_1}$

(3) 1 (4) $\frac{\sqrt{m_1 m_2}}{m_1 + m_2}$

34. The X and Y components of a force F acting at 30° to x-axis are respectively

(1) $\frac{F}{\sqrt{2}}, F$ (2) $\frac{F}{2}, \frac{\sqrt{3}}{2}F$

(3) $\frac{\sqrt{3}}{2}F, \frac{1}{2}F$ (4) $F, \frac{F}{\sqrt{2}}$

Space For Rough Work

35. Spheres of iron and lead having same mass are completely immersed in water. Density of lead is more than that of iron. Apparent loss of weight is W_1 for iron sphere and W_2 for lead sphere. Then $\frac{W_1}{W_2}$ is

(1) $= 1$
(2) between 0 and 1
(3) $= 0$
(4) > 1

36. A hot body is allowed to cool. The surrounding temperature is constant at 30 °C. The body takes time t_1 to cool from 90 °C to 89 °C and time t_2 to cool from 60 °C to 59.5 °C. Then,

(1) $t_2 = 2t_1$
(2) $t_2 = \frac{t_1}{2}$
(3) $t_2 = 4t_1$
(4) $t_2 = t_1$

37. A particle executes SHM with amplitude 0.2 m and time period 24 s. The time required for it to move from the mean position to a point 0.1 m from the mean position is

(1) 2 s
(2) 3 s
(3) 8 s
(4) 12 s

38. White light is incident normally on a glass slab. Inside the glass slab,

(1) red light travels faster than other colours
(2) violet light travels faster than other colours
(3) yellow light travels faster than other colours
(4) all colours travel with the same speed

39. Two thin plano-convex lenses each of focal length f are placed as shown in the figure. The ratio of their effective focal lengths in the three cases is

(i) (ii) (iii)

(1) 1 : 2 : 3
(2) 1 : 2 : 1
(3) 1 : 1 : 1
(4) 3 : 2 : 1

Space For Rough Work

40. If the two slits in Young's double slit experiment are of unequal width, then
    (1) the bright fringes will have unequal spacing.
    (2) the bright fringes will have unequal brightness.
    (3) the fringes do not appear.
    (4) the dark fringes are not perfectly dark.

41. The phenomenon of polarization shows that light has _____ nature.
    (1) particle (2) transverse
    (3) longitudinal (4) dual

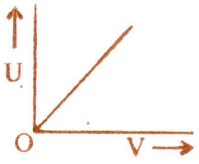
42. Acceleration of a charged particle of charge 'q' and mass 'm' moving in a uniform electric field of strength 'E' is
    (1) $\frac{qE}{m}$ (2) $\frac{m}{qE}$
    (3) mqE (4) $\frac{q}{mE}$

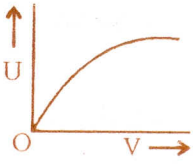
43. Two fixed charges A and B of 5 μC each are separated by a distance of 6 m. C is the mid point of the line joining A and B. A charge 'Q' of –5 μC is shot perpendicular to the line joining A and B through C with a kinetic energy of 0.06 J. The charge 'Q' comes to rest at a point D. The distance CD is
    (1) 3 m (2) $\sqrt{3}$ m
    (3) $3\sqrt{3}$ m (4) 4 m

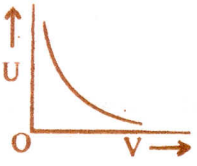
44. A capacitor of capacitance 10 μF is charged to 10 V. The energy stored in it is
    (1) 100 μJ (2) 500 μJ
    (3) 1000 μJ (4) 1 μJ

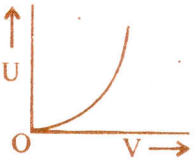
Space For Rough Work

45. Which of the following graphs correctly represents the variation of heat energy (U) produced in a metallic conductor in a given time as a function of potential difference (V) across the conductor ?

(1) 

(2) 

(3) 

(4) 

46. A current of 2 A is passing through a metal wire of cross sectional area 2×10^{-6} m^2. If the number density of free electrons in the wire is 5×10^{26} m^{-3}, the drift speed of electrons is (given e = 1.6×10^{-19} C)

(1) $\frac{1}{16}$ ms^{-1} (2) $\frac{1}{40}$ ms^{-1}

(3) $\frac{1}{80}$ ms^{-1} (4) $\frac{1}{32}$ ms^{-1}

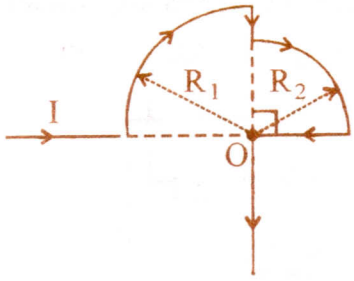
47. Magnetic field at a distance r from an infinitely long straight conductor carrying a steady current varies as

(1) $\frac{1}{r^2}$ (2) $\frac{1}{r}$

(3) $\frac{1}{r^3}$ (4) $\frac{1}{\sqrt{r}}$

Space For Rough Work

48. In the loop shown, the magnetic induction at the point 'O' is



(1) $\frac{\mu_0 I}{8}\left(\frac{R_1 - R_2}{R_1 R_2}\right)$

(2) $\frac{\mu_0 I}{8}\left(\frac{R_1 + R_2}{R_1 R_2}\right)$

(3) $\frac{\mu_0 I}{8}\left(\frac{R_1 R_2}{R_1 + R_2}\right)$

(4) Zero

49. An α-particle and a proton moving with the same kinetic energy enter a region of uniform magnetic field at right angles to the field. The ratio of the radii of the paths of α-particle to that of the proton is

(1) 1 : 1

(2) 1 : 2

(3) 1 : 4

(4) 1 : 8

50. Direction of current induced in a wire moving in a magnetic field is found using

(1) Fleming's left hand rule

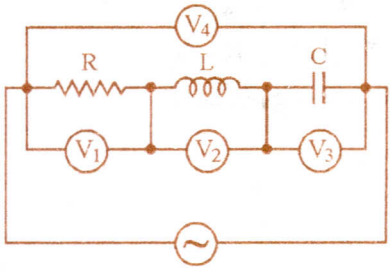
(2) Fleming's right hand rule

(3) Ampere's rule

(4) Right hand clasp rule

Space For Rough Work

51. An ideal resistance R, ideal inductance L, ideal capacitance C and AC volt meters V_1, V_2, V_3 and V_4 are connected to an AC source as shown. At resonance,



(1) reading in V_3 = reading in V_1 (2) reading in V_1 = reading in V_2

(3) reading in V_2 = reading in V_4 (4) reading in V_2 = reading in V_3

52. X-rays, gamma rays and microwaves travelling in vacuum have

(1) same wavelengths but different velocities

(2) same frequency but different velocities

(3) same velocity but different wavelengths

(4) same velocity and same frequency

53. If n is the orbit number of the electron in a hydrogen atom, the correct statement among the following is

(1) electron energy increases as n increases

(2) hydrogen emits infrared rays for the electron transition from $n = \infty$ to $n = 1$.

(3) electron energy is zero for $n = 1$

(4) electron energy varies as n^2.

54. In a Ruby laser, the colour of laser light is due to _____ atom.

(1) Oxygen (2) Aluminium

(3) Xenon (4) Chromium

Space For Rough Work

55. The radius of $_{29}Cu^{64}$ nucleus in Fermi is (given $R_0 = 1.2 \times 10^{-15}$ m)

(1) 4.8 (2) 1.2
(3) 7.7 (4) 9.6

56. In a radioactive decay, an element $_ZX^A$ emits four α-particles, three β-particles and eight gamma photons. The atomic number and mass number of the resulting final nucleus are

(1) Z – 11, A – 16 (2) Z – 5, A – 13
(3) Z – 5, A – 16 (4) Z – 8, A – 13

57. For a transistor, $\beta = 100$. The value of α is

(1) 1.01 (2) 0.99
(3) 100 (4) 0.01

58. The following truth table with A and B as inputs is for _____ gate.

A	B	Output
1	0	1
1	1	0
0	1	1
0	0	0

(1) AND (2) OR
(3) XOR (4) NOR

59. 'n' photons of wavelength 'λ' are absorbed by a black body of mass 'm'. The momentum gained by the body is

(1) $\frac{h}{m\lambda}$ (2) $\frac{mnh}{\lambda}$
(3) $\frac{nh}{m\lambda}$ (4) $\frac{nh}{\lambda}$

60. A radioactive nucleus has specific binding energy 'E_1'. It emits an α-particle. The resulting nucleus has specific binding energy 'E_2'. Then

(1) $E_2 = E_1$ (2) $E_2 < E_1$
(3) $E_2 > E_1$ (4) $E_2 = 0$

Space For Rough Work

SEAL

SEAL

A-1

SEAL