

# COMMON ENTRANCE TEST - 2011

DATE	SUBJECT	TIME
28-04-2011	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
	<b>A - 1</b>	<b>538497</b>

## 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 **2<sup>nd</sup> 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 be shaded completely.
5. Compulsory sign at the bottom portion of the OMR answer sheet in the space provided.

## DONTs :

1. The timing and marks printed on the OMR answer sheet should not be damaged/mutilated/spoiled.
2. The **3<sup>rd</sup> Bell** rings at **10.40 a.m.** till then;
  - Do not remove the seal/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.

## 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 **3<sup>rd</sup> Bell** is rung at **10.40 a.m.**, remove the seal/staple present on the right hand side of this question booklet 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 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 :**



4. Please note that even a minute unintended ink dot on the OMR sheet will also be recognized 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 and retaining the top sheet (KEA 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.

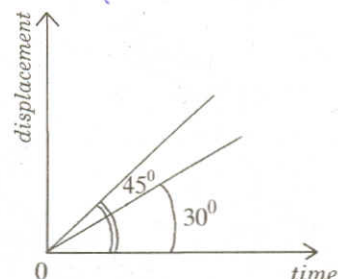
## PHYSICS

1. If  $C$  be the capacitance and  $V$  be the electric potential, then the dimensional formula of  $CV^2$  is .....

- 1)  $M^1 L^2 T^{-2} A^0$                       2)  $M^1 L^1 T^{-2} A^{-1}$   
 3)  $M^0 L^1 T^{-2} A^0$                       4)  $M^1 L^{-3} T^1 A^1$

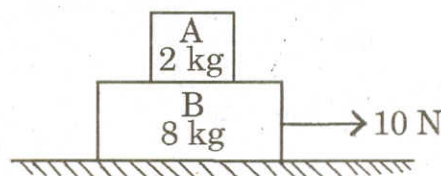
2. The displacement-time graphs of two moving particles make angles of  $30^\circ$  and  $45^\circ$  with the  $X$ -axis. The ratio of their velocities is .....

- 1)  $\sqrt{3} : 2$   
 2)  $1 : 1$   
 3)  $1 : 2$   
 4)  $1 : \sqrt{3}$



3. Block A of mass 2 kg is placed over block B of mass 8 kg. The combination is placed over a rough horizontal surface. Coefficient of friction between B and the floor is 0.5. Coefficient of friction between A and B is 0.4. A horizontal force of 10 N is applied on block B. The force of friction between A and B is ..... ( $g = 10 \text{ ms}^{-2}$ ).

- 1) 100 N  
 2) 40 N  
 3) 50 N  
 4) zero



4. The height  $y$  and the distance  $x$  along the horizontal plane of a projectile on a certain planet (with no surrounding atmosphere) are given by  $y = 8t - 5t^2$  meter and  $x = 6t$  meter, where  $t$  is in seconds. The velocity with which the projectile is projected is .....

- 1)  $6 \text{ ms}^{-1}$                       2)  $8 \text{ ms}^{-1}$   
 3)  $10 \text{ ms}^{-1}$                       4)  $14 \text{ ms}^{-1}$

5. A body of mass 5 kg is thrown vertically up with a kinetic energy of 490 J. The height at which the kinetic energy of the body becomes half of the original value is ..... (acceleration due to gravity =  $9.8 \text{ ms}^{-2}$ ).

- 1) 5 m                      2) 2.5 m  
 3) 10 m                      4) 12.5 m

(Space for Rough Work)

6. A solid sphere of mass  $m$  rolls down an inclined plane without slipping, starting from rest at the top of an inclined plane. The linear speed of the sphere at the bottom of the inclined plane is  $v$ . The kinetic energy of the sphere at the bottom is .....
- 1)  $\frac{1}{2}mv^2$                       2)  $\frac{5}{3}mv^2$   
3)  $\frac{2}{5}mv^2$                       4)  $\frac{7}{10}mv^2$
7. Two satellites of mass  $m$  and  $9m$  are orbiting a planet in orbits of radius  $R$ . Their periods of revolution will be in the ratio of .....
- 1) 9 : 1                      2) 3 : 1  
3) 1 : 1                      4) 1 : 3
8. The following four wires of length  $L$  and radius  $r$  are made of the same material. Which of these will have the largest extension, when the same tension is applied?
- 1)  $L = 100$  cm,  $r = 0.2$  mm                      2)  $L = 200$  cm,  $r = 0.4$  mm  
3)  $L = 300$  cm,  $r = 0.6$  mm                      4)  $L = 400$  cm,  $r = 0.8$  mm
9. The resultant of two forces acting at an angle of  $120^\circ$  is 10 kg wt and is perpendicular to one of the forces. That force is .....
- 1)  $10\sqrt{3}$  kg wt                      2)  $20\sqrt{3}$  kg wt  
3) 10 kg wt                      4)  $\frac{10}{\sqrt{3}}$  kg wt
10. Eight equal drops of water are falling through air with a steady velocity of  $10 \text{ cm s}^{-1}$ . If the drops combine to form a single drop big in size, then the terminal velocity of this big drop is .....
- 1)  $40 \text{ cm s}^{-1}$                       2)  $10 \text{ cm s}^{-1}$   
3)  $30 \text{ cm s}^{-1}$                       4)  $80 \text{ cm s}^{-1}$

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(Space for Rough Work)



11. Two capillary tubes of different diameters are dipped in water. The rise of water is .....

- 1) the same in both tubes
- 2) greater in the tube of larger diameter
- 3) greater in the tube of smaller diameter
- 4) independent of the diameter of the tube

12. A perfect gas at  $27^{\circ}\text{C}$  is heated at constant pressure so as to double its volume. The increase in temperature of the gas will be .....

- 1)  $600^{\circ}\text{C}$
- 2)  $327^{\circ}\text{C}$
- 3)  $54^{\circ}\text{C}$
- 4)  $300^{\circ}\text{C}$

13. Three identical rods A, B and C are placed end to end. A temperature difference is maintained between the free ends of A and C. The thermal conductivity of B is THRICE that of C and HALF of that of A. The effective thermal conductivity of the system will be ..... ( $K_A$  is the thermal conductivity of rod A).

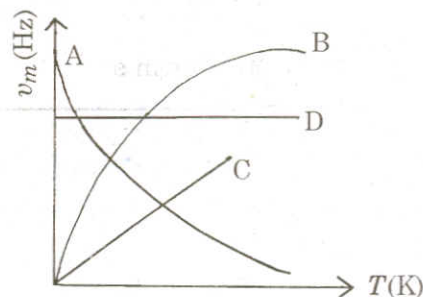
- 1)  $\frac{1}{3} K_A$
- 2)  $3 K_A$
- 3)  $2 K_A$
- 4)  $\frac{2}{3} K_A$

14. The quantities of heat required to raise the temperatures of two copper spheres of radii  $r_1$  and  $r_2$  ( $r_1 = 1.5 r_2$ ) through 1 K are in the ratio of .....

- 1)  $\frac{27}{8}$
- 2)  $\frac{9}{4}$
- 3)  $\frac{3}{2}$
- 4) 1

15. Which one of the following is  $\nu_m - T$  graph for perfectly black body?  $\nu_m$  is the frequency of radiation with maximum intensity.  $T$  is the absolute temperature.

- 1) A
- 2) B
- 3) C
- 4) D



(Space for Rough Work)

- (Space for Rough Work)

- (Space for Rough Work)



26. Wavefront is the locus of all points, where the particles of the medium vibrate with the same .....
- 1) phase
  - 2) amplitude
  - 3) frequency
  - 4) period
27. Two monochromatic light waves of amplitudes  $3A$  and  $2A$  interfering at a point have a phase difference of  $60^\circ$ . The intensity at that point will be proportional to .....
- 1)  $5A^2$
  - 2)  $13A^2$
  - 3)  $7A^2$
  - 4)  $19A^2$
28. Consider the following statements in case of Young's double slit experiment.
- a) A slit  $S$  is necessary if we use an ordinary extended source of light.
  - b) A slit  $S$  is not needed if we use an ordinary but well collimated beam of light.
  - c) A slit  $S$  is not needed if we use a spatially coherent source of light.
- Which of the above statements are correct?
- 1) a), b) and c)
  - 2) a) and b)
  - 3) b) and c)
  - 4) a) and c)
29. A parallel beam of light of wavelength  $6000\text{ \AA}$  gets diffracted by a single slit of width  $0.3\text{ mm}$ . The angular position of the first minima of diffracted light is .....
- 1)  $2 \times 10^{-3}\text{ rad}$
  - 2)  $3 \times 10^{-3}\text{ rad}$
  - 3)  $1.8 \times 10^{-3}\text{ rad}$
  - 4)  $6 \times 10^{-3}\text{ rad}$
30. The critical angle of a certain medium is  $\sin^{-1}\left(\frac{3}{5}\right)$ . The polarizing angle of the medium is .....
- 1)  $\sin^{-1}\left(\frac{4}{5}\right)$
  - 2)  $\tan^{-1}\left(\frac{5}{3}\right)$
  - 3)  $\tan^{-1}\left(\frac{3}{4}\right)$
  - 4)  $\tan^{-1}\left(\frac{4}{3}\right)$

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(Space for Rough Work)

31. Two identical charged spheres of material density  $\rho$ , suspended from the same point by inextensible strings of equal length make an angle  $\theta$  between the strings. When suspended in a liquid of density  $\sigma$  the angle  $\theta$  remains the same. The dielectric constant  $K$  of the liquid is .....

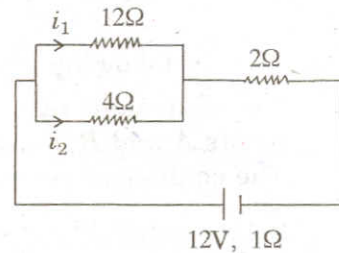
1)  $\frac{\rho}{\rho - \sigma}$       2)  $\frac{\rho - \sigma}{\rho}$       3)  $\frac{\rho}{\rho + \sigma}$       4)  $\frac{\rho + \sigma}{\rho}$

32. The electric field at a point due to an electric dipole, on an axis inclined at an angle  $\theta (< 90^\circ)$  to the dipole axis, is perpendicular to the dipole axis, if the angle  $\theta$  is .....

1)  $\tan^{-1}(2)$       2)  $\tan^{-1}\left(\frac{1}{2}\right)$       3)  $\tan^{-1}(\sqrt{2})$       4)  $\tan^{-1}\left(\frac{1}{\sqrt{2}}\right)$

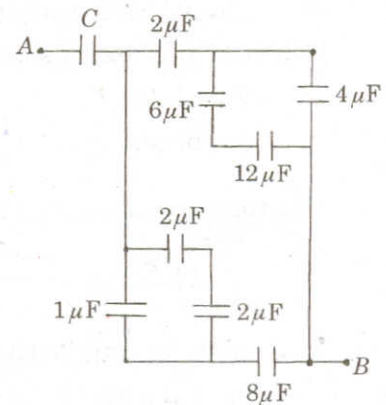
33. In the circuit shown, the currents  $i_1$  and  $i_2$  are .....

1)  $i_1 = 1.5 \text{ A}, i_2 = 0.5 \text{ A}$   
 2)  $i_1 = 0.5 \text{ A}, i_2 = 1.5 \text{ A}$   
 3)  $i_1 = 1 \text{ A}, i_2 = 3 \text{ A}$   
 4)  $i_1 = 3 \text{ A}, i_2 = 1 \text{ A}$



34. In the given network, the value of  $C$ , so that an equivalent capacitance between  $A$  and  $B$  is  $3\mu\text{F}$ , is .....

1)  $\frac{1}{5} \mu\text{F}$   
 2)  $\frac{31}{5} \mu\text{F}$   
 3)  $48 \mu\text{F}$   
 4)  $36 \mu\text{F}$



35. A conductor wire having  $10^{29}$  free electrons/ $\text{m}^3$  carries a current of 20A. If the cross-section of the wire is  $1\text{mm}^2$ , then the drift velocity of electrons will be ..... ( $e = 1.6 \times 10^{-19} \text{ C}$ ).

1)  $1.25 \times 10^{-4} \text{ ms}^{-1}$       2)  $1.25 \times 10^{-3} \text{ ms}^{-1}$   
 3)  $1.25 \times 10^{-5} \text{ ms}^{-1}$       4)  $6.25 \times 10^{-3} \text{ ms}^{-1}$

(Space for Rough Work)

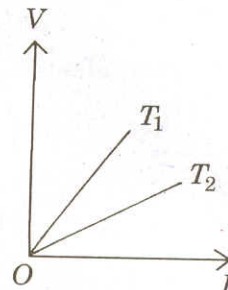


36. A resistor has a colour code of green, blue, brown and silver. What is its resistance?

- 1)  $56\Omega \pm 5\%$
- 2)  $560\Omega \pm 10\%$
- 3)  $560\Omega \pm 5\%$
- 4)  $5600\Omega \pm 10\%$

37. The voltage  $V$  and current  $I$  graphs for a conductor at two different temperatures  $T_1$  and  $T_2$  are shown in the figure. The relation between  $T_1$  and  $T_2$  is .....

- 1)  $T_1 > T_2$
- 2)  $T_1 < T_2$
- 3)  $T_1 = T_2$
- 4)  $T_1 = \frac{1}{T_2}$

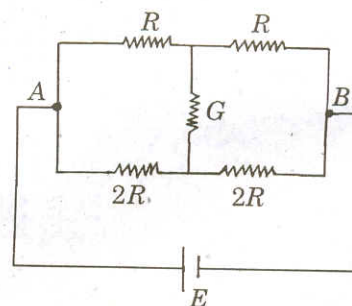


38. Consider the following statements regarding the network shown in the figure.

- a) The equivalent resistance of the network between points A and B is independent of value of  $G$ .
- b) The equivalent resistance of the network between points A and B is  $\frac{4}{3}R$ .
- c) The current through  $G$  is zero.

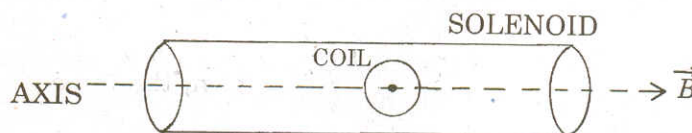
Which of the above statements is/are TRUE?

- 1) a) alone
- 2) b) alone
- 3) b) and c)
- 4) a), b) and c)



39. The torque required to hold a small circular coil of 10 turns, area  $1\text{ mm}^2$  and carrying a current of  $\left(\frac{21}{44}\right)\text{A}$  in the middle of a long solenoid of  $10^3$  turns/m carrying a current of  $2.5\text{A}$ , with its axis perpendicular to the axis of the solenoid is .....

- 1)  $1.5 \times 10^{-6}\text{ N-m}$
- 2)  $1.5 \times 10^{-8}\text{ N-m}$
- 3)  $1.5 \times 10^{+6}\text{ N-m}$
- 4)  $1.5 \times 10^{+8}\text{ N-m}$



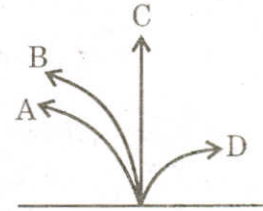
40. A particle of charge  $e$  and mass  $m$  moves with a velocity  $v$  in a magnetic field  $B$  applied perpendicular to the motion of the particle. The radius  $r$  of its path in the field is .....

- 1)  $\frac{mv}{Be}$
- 2)  $\frac{Be}{mv}$
- 3)  $\frac{ev}{Bm}$
- 4)  $\frac{Bv}{em}$

(Space for Rough Work)

41. A neutron, a proton, an electron and an  $\alpha$ -particle enter a region of uniform magnetic field with the same velocities. The magnetic field is perpendicular and directed into the plane of the paper. The tracks of the particles are labelled in the figure. The electron follows the track .....

- 1) A
- 2) B
- 3) C
- 4) D



42. The deflection in a moving coil galvanometer is reduced to half when it is shunted with a  $40\ \Omega$  coil. The resistance of the galvanometer is .....

- 1)  $80\ \Omega$
- 2)  $40\ \Omega$
- 3)  $20\ \Omega$
- 4)  $15\ \Omega$

43. A current of  $\left(\frac{2}{\sqrt{3}}\right)\text{A}$  produces a deflection of  $60^\circ$  in a tangent galvanometer. The reduction factor is .....

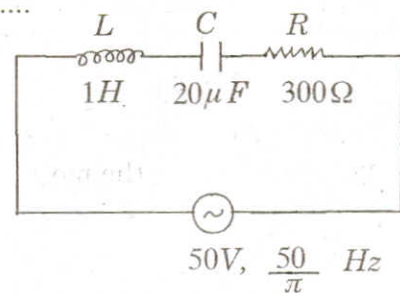
- 1)  $\left(\frac{2}{\sqrt{3}}\right)\text{A}$
- 2)  $\left(\frac{2}{3}\right)\text{A}$
- 3)  $2\text{A}$
- 4)  $\left(\frac{3}{2}\right)\text{A}$

44. In an A.C. circuit,  $V$  and  $I$  are given by  $V = 150 \sin(150t)$  volt and  $I = 150 \sin\left(150t + \frac{\pi}{3}\right)$  ampere. The power dissipated in the circuit is .....

- 1)  $106\text{ W}$
- 2)  $150\text{ W}$
- 3)  $5625\text{ W}$
- 4) zero

45. In the series  $L$ - $C$ - $R$  circuit shown, the impedance is .....

- 1)  $200\ \Omega$
- 2)  $100\ \Omega$
- 3)  $300\ \Omega$
- 4)  $500\ \Omega$



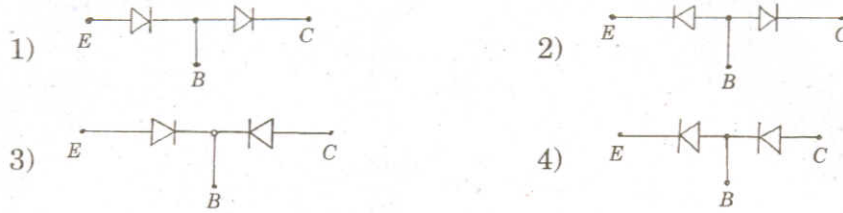
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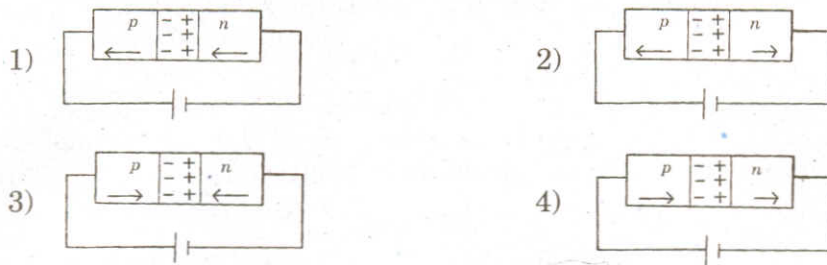


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56. An  $n-p-n$  transistor can be considered to be equivalent to two diodes, connected. Which of the following figures is the CORRECT ONE?



57. In the case of forward biasing of a  $p-n$  junction diode, which one of the following figures correctly depicts the direction of conventional current (indicated by an arrow mark)?



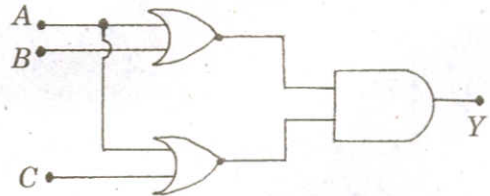
58. An electron of mass  $m_e$  and a proton of mass  $m_p$  are moving with the same speed.

The ratio of their de-Broglie's wavelengths  $\lambda_e/\lambda_p$  is .....

- 1) 1  
2) 1836  
3)  $\frac{1}{1836}$   
4) 918

59. The output of given logic circuit is .....

- 1)  $A \cdot (B + C)$   
2)  $A \cdot (B \cdot C)$   
3)  $(A + B) \cdot (A + C)$   
4)  $A + B + C$



60. If the scattering intensity of a liquid is 8 units at a wavelength of 500 nm, then the scattering intensity at a wavelength of 400 nm will be approximately .....

- 1) 13 units  
2) 16 units  
3) 20 units  
4) 24 units

(Space for Rough Work)