COMMON ENTRANCE TEST – 2017

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<tr>
<th>DATE</th>
<th>SUBJECT</th>
<th>TIME</th>
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<tr>
<td>03-05-2017</td>
<td>PHYSICS</td>
<td>10.30 am to 11.50 am</td>
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<th>MAXIMUM MARKS</th>
<th>TOTAL DURATION</th>
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<td>60</td>
<td>80 Minutes</td>
<td>70 Minutes</td>
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MENTION YOUR CET NUMBER

QUESTION BOOKLET DETAILS

VERSION CODE / SERIAL NUMBER

XXXXXXX

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 am.
3. The Version Code / Serial Number of this question booklet should be entered on the OMR Answer Sheet and the respective circles should also be shaded completely.
4. Compulsorily affix the complete signature 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 3rd Bell rings at 10.40 am, till then;
   - Do not remove the seal 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 3rd Bell is rung at 10.40 am, remove the seal on the right hand side 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 immediately by complete test booklet by showing it to Room Invigilator. 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 ballpoint pen against the question number on the OMR answer sheet.

Correct Method of shading the circles on the OMR Answer Sheet is:

A  B  C  D

4. Please note that even a minute unintended ink dot on the OMR Answer 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 am, 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 (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.
10. In case of any discrepancy in the English and Kannada versions, the English version will be taken as final.
1. A substance of mass 49.53 g occupies 1.5 cm$^3$ of volume. The density of the substance (in g cm$^{-3}$) with correct number of significant figures is
(A) 3.302 (B) 3.300 (C) 3.3 (D) 3.30

2. A car moving with a velocity of 20 m/s is stopped in a distance of 40 m. If the same car is travelling at double the velocity, the distance travelled by it for same retardation is
(A) 640 m (B) 320 m (C) 1280 m (D) 160 m

3. The angle between velocity and acceleration of a particle describing uniform circular motion is
(A) 45° (B) 60° (C) 90° (D) 180°

4. If $\vec{A} = 2\hat{i} + 3\hat{j} + 8\hat{k}$ is perpendicular to $\vec{B} = 4\hat{j} - 4\hat{i} + \alpha\hat{k}$, then the value of $\alpha$ is
(A) $\frac{1}{2}$ (B) $-\frac{1}{2}$ (C) 1 (D) $-1$

5. A body of mass 50 kg, is suspended using a spring balance inside a lift at rest. If the lift starts falling freely, the reading of the spring balance is
(A) $= 50$ kg (B) $> 50$ kg (C) $< 50$ kg (D) $= 0$
6. A motor pump lifts 6 tonnes of water from a well of depth 25 m to the first floor of height 35 m from the ground floor in 20 minutes. The power of the pump (in kW) is \([g = 10 \text{ ms}^{-2}]\)
(A) 3  \hspace{1cm} (B) 6  \hspace{1cm} (C) 1.5  \hspace{1cm} (D) 12

7. Two balls are thrown simultaneously in air. The acceleration of the centre of mass of the two balls when in air,
(A) depends on the masses of the two balls  
(B) depends on the speeds of the two balls  
(C) is equal to \(g\) (Acceleration due to gravity)  
(D) depends on the direction of motion of the two balls.

8. The value of acceleration due to gravity at a depth of 1600 km is equal to \([\text{Radius of earth } = 6400 \text{ km}]\)
(A) 9.8 ms\(^{-2}\)  \hspace{1cm} (B) 4.9 ms\(^{-2}\)  
(C) 19.6 ms\(^{-2}\)  \hspace{1cm} (D) 7.35 ms\(^{-2}\)

9. ‘Young’s modulus’ is defined as the ratio of
(A) tensile stress and longitudinal strain  
(B) hydraulic stress and hydraulic strain  
(C) shearing stress and shearing strain  
(D) bulk stress and longitudinal strain

10. ‘Hydraulic lift’ works on the basis of
(A) Stoke’s Law  \hspace{1cm} (B) Toricelli’s Law  
(C) Pascal’s Law  \hspace{1cm} (D) Bernoulli’s Law
11. The S.I. unit of specific heat capacity is
(A) $J \text{ mol}^{-1} \text{ K}^{-1}$  (B) $J \text{ kg}^{-1} \text{ K}^{-1}$
(C) $J \text{ K}^{-1}$  (D) $J \text{ kg}^{-1}$

Question Id: 11

12. For which combination of working temperatures, the efficiency of 'Carnot’s engine' is the least?
(A) 60 K, 40 K  (B) 40 K, 20 K
(C) 80 K, 60 K  (D) 100 K, 80 K

Question Id: 12

13. The mean energy of a molecule of an ideal gas is
(A) 2 KT  (B) \( \frac{3}{2} \) KT
(C) KT  (D) \( \frac{1}{2} \) KT

Question Id: 13

14. Two simple pendulums A and B are made to oscillate simultaneously, and it is found that A completes 10 oscillations in 20 sec and B completes 8 oscillations in 10 sec. The ratio of the lengths of A and B is
(A) \( \frac{8}{5} \)  (B) \( \frac{64}{25} \)
(C) \( \frac{5}{4} \)  (D) \( \frac{25}{64} \)

Question Id: 14

15. The waves set up in a closed pipe are
(A) Transverse and Progressive
(B) Longitudinal and Stationary
(C) Transverse and Stationary
(D) Longitudinal and Progressive

Question Id: 15
16. Two spheres of electric charges $+2 \text{nC}$ and $-8 \text{nC}$ are placed at a distance $d'$ apart. If they are allowed to touch each other, what is the new distance between them to get a repulsive force of same magnitude as before?

(A) $\frac{4d}{3}$  
(B) $\frac{3d}{4}$  
(C) $d$  
(D) $\frac{d}{2}$

Question Id : 16

17. Three point charges of $+2q$, $+2q$ and $-4q$ are placed at the corners A, B and C of an equilateral triangle ABC of side $x$. The magnitude of the electric dipole moment of this system is

(A) $2qx$  
(B) $2\sqrt{3}qx$  
(C) $3\sqrt{2}qx$  
(D) $3qx$

Question Id : 17

18. $4 \times 10^{10}$ electrons are removed from a neutral metal sphere of diameter 20 cm placed in air. The magnitude of the electric field (in $\text{NC}^{-1}$) at a distance of 20 cm from its center is

(A) 5760  
(B) 1440  
(C) 640  
(D) Zero

Question Id : 18

19. Two point charges A = $+3 \text{nC}$ and B = $+1 \text{nC}$ are placed 5 cm apart in air. The work done to move charge B towards A by 1 cm is

(A) $1.35 \times 10^{-7} \text{J}$  
(B) $2.7 \times 10^{-7} \text{J}$  
(C) $2.0 \times 10^{-7} \text{J}$  
(D) $12.1 \times 10^{-7} \text{J}$

Question Id : 19

20. A system of 2 capacitors of capacitance $2 \mu \text{F}$ and $4 \mu \text{F}$ is connected in series across a potential difference of 6V. The electric charge and energy stored in the system are

(A) $10 \mu \text{C}$ and $30 \mu \text{J}$  
(B) $36 \mu \text{C}$ and $108 \mu \text{J}$  
(C) $8 \mu \text{C}$ and $24 \mu \text{J}$  
(D) $1 \mu \text{C}$ and $3 \mu \text{J}$

Question Id : 20
21. The minimum value of effective capacitance that can be obtained by combining 3 capacitors of capacitances 1 pF, 2 pF and 4 pF is
(A) $\frac{4}{7}$ pF  (B) 1 pF
(C) $\frac{7}{4}$ pF  (D) 2 pF

21. $1 \text{ pF}, 2 \text{ pF} \text{ and } 4 \text{ pF}$

22. A cylindrical conductor of diameter 0.1 mm carries a current of 90 mA. The current density (in $\text{Am}^{-2}$) is $(\pi \approx 3)$
(A) $1.2 \times 10^{7}$  (B) $2.4 \times 10^{7}$
(C) $3 \times 10^{6}$  (D) $6 \times 10^{6}$

22. $0.1 \text{ mm}$

23. A piece of copper is to be shaped into a conducting wire of maximum resistance. The suitable length and diameter are _______ and _______ respectively.
(A) $L$ and $d$  (B) $2L$ and $d$
(C) $L/2$ and $2d$  (D) $2L$ and $d/2$

23. $L$ and $d$

24. Of the following graphs, the one that correctly represents the I-V. characteristics of a ‘Ohmic device’ is
(A)  
(B)  
(C)  
(D)  

24. $I - V$ relationship for an ‘Ohmic device’
25. The value of I in the figure shown below is

(A) 8A  (B) 21A  (C) 19A  (D) 4A

26. The power dissipated in 3Ω resistance in the following circuit is

4.5 V, 1Ω  2Ω  6Ω  4Ω

(A) 0.75 W  (B) 0.25 W  (C) 1 W  (D) 0.5 W

27. In metre bridge experiment, with a standard resistance in the right gap and a resistance coil dipped in water (in a beaker) in the left gap, the balancing length obtained is 'l'. If the temperature of water is increased, the new balancing length is

(A) > 1  (B) < 1  (C) = 1  (D) = 0

28. A proton, a deuteron and an α-particle are projected perpendicular to the direction of a uniform magnetic field with same kinetic energy. The ratio of the radii of the circular paths described by them is

(A) 1:√2:1  (B) 1:√2:√2  (C) √2:1:1  (D) √2:√2:1
29. A galvanometer of resistance 50 Ω is connected to a battery of 3V along with a resistance of 2950 Ω in series shows full-scale deflection of 30 divisions. The additional series resistance required to reduce the deflection to 20 divisions is

(A) 1500 Ω  
(B) 4440 Ω  
(C) 7400 Ω  
(D) 2950 Ω

30. The magnetic field at the center of a current carrying loop of radius 0.1 m is \(5\sqrt{5}\) times that at a point along its axis. The distance of this point from the centre of the loop is

(A) 0.2 m  
(B) 0.1 m  
(C) 0.05 m  
(D) 0.25 m

31. A straight wire of length 50 cm carrying a current of 2.5 A is suspended in mid-air by a uniform magnetic field of 0.5 T (as shown in figure). The mass of the wire is \(g = 10 \text{ ms}^{-2}\)

(B) 250 gm  
(C) 125 gm  
(D) 100 gm

32. Which of the following properties is ‘False’ for a bar magnet?

(A) Its poles cannot be separated.  
(B) It points in North-South direction when suspended.  
(C) Its like poles repel and unlike poles attract.  
(D) It doesn’t produce magnetic field.
33. A magnetic dipole of magnetic moment \( 6 \times 10^{-2} \text{ Am}^2 \) and moment of inertia \( 12 \times 10^{-6} \text{ kg m}^2 \) performs oscillations in a magnetic field of \( 2 \times 10^{-2} \text{ T} \). The time taken by the dipole to complete 20 oscillations is \((\pi \approx 3)\)

(A) 36 s  
(B) 6 s  
(C) 12 s  
(D) 18 s  

Question Id: 33

34. The susceptibility of a ferromagnetic substance is

(A) \( \gg 1 \)  
(B) \( > 1 \)  
(C) \( < 1 \)  
(D) Zero  

Question Id: 34

35. A bar magnet is allowed to fall vertically through a copper coil placed in a horizontal plane. The magnet falls with a net acceleration

\[
\begin{align*}
S & \quad N \\
\text{---} & \quad \text{---}
\end{align*}
\]

(A) \( = g \)  
(B) \( > g \)  
(C) \( < g \)  
(D) Zero  

Question Id: 35

36. The working of magnetic braking of trains is based on

(A) Alternating current  
(B) Eddy current  
(C) Steady current  
(D) Pulsating current  

Question Id: 36
37. A jet plane of wing span 20 m is travelling towards west at a speed of 400 ms\(^{-1}\). If the earth’s total magnetic field is \(4 \times 10^{-4}\) T and the dip angle is 30°, at that place, the voltage difference developed across the ends of the wing is

(A) 1.6 V  
(B) 3.2 V  
(C) 0.8 V  
(D) 6.4 V

Question Id : 37

38. In the A.C. circuit shown, keeping ‘K’ pressed, if an iron rod is inserted into the coil, the bulb in the circuit,

(A) glows more brightly  
(B) glows less brightly  
(C) glows with same brightness (as before the rod is inserted)  
(D) gets damaged

![A.C. circuit diagram]

Question Id : 38

39. The output of a step down transformer is measured to be 48 V when connected to a 12 W bulb. The value of peak current is

(A) \(\frac{1}{\sqrt{2}}\) A  
(B) \(\sqrt{2}\) A  
(C) \(\frac{1}{2\sqrt{2}}\) A  
(D) \(\frac{1}{4}\) A

Question Id : 39
40. A coil of inductive reactance \( 1/\sqrt{3} \) \( \Omega \) and resistance 1 \( \Omega \) is connected to a 200 V, 50 Hz A.C. supply. The time lag between maximum voltage and current is

(A) \( \frac{1}{300} \) s  
(B) \( \frac{1}{600} \) s  
(C) \( \frac{1}{500} \) s  
(D) \( \frac{1}{200} \) s

Question Id: 40

41. If \( \vec{E} \) and \( \vec{B} \) represent electric and magnetic field vectors of an electromagnetic wave, the direction of propagation of the wave is along

(A) \( \vec{E} \)  
(B) \( \vec{B} \)  
(C) \( \vec{E} \times \vec{B} \)  
(D) \( \vec{B} \times \vec{E} \)

Question Id: 41

42. According to Cartesian sign convention, in ray optics

(A) all distances are taken positive  
(B) all distances are taken negative  
(C) all distances in the direction of incident ray are taken positive  
(D) all distances in the direction of incident ray are taken negative

Question Id: 42

43. A linear object of height 10 cm is kept in front of a concave mirror of radius of curvature 15 cm, at a distance of 10 cm. The image formed is

(A) magnified and erect  
(B) magnified and inverted  
(C) diminished and erect  
(D) diminished and inverted

Question Id: 43
44. During scattering of light, the amount of scattering is inversely proportional to _______ of wavelength of light.
   (A) cube  (B) square  
   (C) fourth power  (D) half  

45. In Young’s double-slit experiment if yellow light is replaced by blue light, the interference fringes become
   (A) wider  (B) narrower  
   (C) brighter  (D) darker  

46. According to Huygens’ principle, during refraction of light from air to a denser medium
   (A) Wavelength and speed decrease  
   (B) Wavelength and speed increase  
   (C) Wavelength increases but speed decreases  
   (D) Wavelength decreases but speed increases  

47. In a system of two crossed polarisers, it is found that the intensity of light from the second polariser is half from that of first polariser. The angle between their pass axes is
   (A) 45°  (B) 60°  
   (C) 30°  (D) 0°
48. From the following graph of photo current against collector plate potential, for two different intensities of light $I_1$ and $I_2$, one can conclude

(A) $I_1 = I_2$  
(B) $I_1 > I_2$  
(C) $I_1 < I_2$  
(D) Comparison is not possible.

49. A particle is dropped from a height ‘H’. The de’Broglie wavelength of the particle depends on height as

(A) $H$  
(B) $H^0$  
(C) $H^{1/2}$  
(D) $H^{-1/2}$

50. The scientist who is credited with the discovery of ‘nucleus’ in an atom is

(A) J.J. Thomson  
(B) Rutherford  
(C) Niels Bohr  
(D) Balmer

51. The energy (in eV) required to excite an electron from $n = 2$ to $n = 4$ state in hydrogen atom is

(A) +2.55  
(B) −3.4  
(C) −0.85  
(D) +4.25
52. In a nuclear reactor the function of the Moderator is to decrease
(A) number of neutrons (B) speed of neutrons
(C) escape of neutrons
(D) temperature of the reactor

53. The particles emitted in the decay of $^{238}\text{U}$ to $^{234}\text{U}$
(A) $1\alpha$ and $2\beta$ (B) $1\alpha$ only
(C) $1\alpha$ and $1\beta$ (D) $2\alpha$ and $2\beta$

54. The mass defect of $^{4}\text{He}$ is 0.03 u. The binding energy per nucleon of helium (in MeV) is
(A) 27.93 (B) 6.9825
(C) 2.793 (D) 69.825

55. The energy gap in case of which of the following is less than 3 eV ?
(A) Copper (B) Iron
(C) Aluminium (D) Germanium

56. Which of the following semi-conducting devices is used as voltage regulator ?
(A) Photo diode (B) LASER diode
(C) Zener diode (D) Solar cell

57. In the three parts of a transistor, ‘Emitter’ is of
(A) moderate size and heavily doped
(B) large size and lightly doped
(C) thin size and heavily doped
(D) large size and moderately doped
58. In the figure shown, if the diode forward voltage drop is 0.2 V, the voltage difference between A and B is

- (A) 1.3 V
- (B) 2.2 V
- (C) 0
- (D) 0.5 V

59. Which of the following logic gates is considered as ‘universal’?

- (A) A → B
- (B) A → Y
- (C) A → Y
- (D) A → Y

60. A basic communication system consists of
(a) Transmitter
(b) Information source
(c) User of information
(d) Channel
(e) Receiver
The correct sequence of the arrangement is

- (A) a, b, c, d and e
- (B) b, a, d, e and c
- (C) b, d, a, c and e
- (D) b, e, a, d and c
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ಉಪಯೋಗಿಸಿರಬೇಕಾದ ಪ್ರತಿಪಾದಿತೆ/ಅಂಕಗಳು:

1. ಸ್ವತಂತ್ರವರು ಆತನದ ಸಂದರ್ಭದಲ್ಲಿ ೬, ೮, ೧೦, ೧೨ ಅಂಕಗಳನ್ನು ಸೂಚಿಸಿದ್ದಾರೆ. ಇನ್ನೂ ಅಂಕಗಳನ್ನು ಸೂಚಿಸಿದ್ದಾರೆ.
2. ಸ್ವತಂತ್ರವರು ಆತನದ ಸಂದರ್ಭದಲ್ಲಿ ೧೦.೪೦ ಅಗ್ಗಿ ೧೧.೫೦ ಓಳಗೆ ಸೂಚಿಸಿದ್ದಾರೆ. ಇನ್ನೂ ಅಂಕಗಳನ್ನು ಸೂಚಿಸಿದ್ದಾರೆ.
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