COMMON ENTRANCE TEST-2016

DATE	SUBJECT	TIME
DAY-2	PHYSICS	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	570769

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 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 a.m.,** remove the paper 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 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 answer sheet is as shown below :

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 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.

1. A body falls freely for 10 sec. Its average velocity during this journey (take $g = 10\ ms^{-2}$)

(1) $100\ ms^{-1}$ (2) $10\ ms^{-1}$

(3) $50\ ms^{-1}$ (4) $5\ ms^{-1}$

2. Three projectiles A, B and C are projected at an angle of 30°, 45°, 60° respectively. If R_A, R_B and R_C are ranges of A, B and C respectively, then (velocity of projection is same for A, B & C)

(1) $R_A = R_B = R_C$ (2) $R_A = R_C > R_B$

(3) $R_A < R_B < R_C$ (4) $R_A = R_C < R_B$

3. The component of a vector $\vec{r}$ along x – axis will have a maximum value if

(1) $\vec{r}$ is along + ve x – axis

(2) $\vec{r}$ is along + ve y – axis

(3) $\vec{r}$ is along – ve y – axis

(4) $\vec{r}$ makes an angle of 45° with the x – axis

4. Maximum acceleration of the train in which a 50 kg box lying on its floor will remain stationary (Given : Co-efficient of static friction between the box and the train's floor is 0.3 and $g = 10\ ms^{-2}$)

(1) $5.0\ ms^{-2}$ (2) $3.0\ ms^{-2}$

(3) $1.5\ ms^{-2}$ (4) $15\ ms^{-2}$

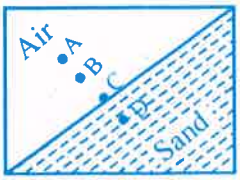
5. A 12 kg bomb at rest explodes into two pieces of 4 kg and 8 kg. If the momentum of 4 kg piece is 20 Ns, the kinetic energy of the 8 kg piece is

(1) 25 J (2) 20 J

(3) 50 J (4) 40 J

Space For Rough Work

6. Which of the points is likely position of the centre of mass of the system shown in the figure ?

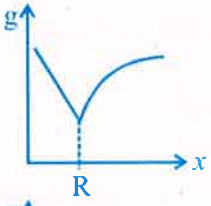


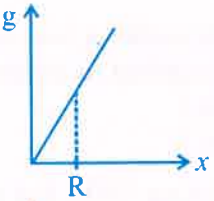
(1) A
(2) D
(3) B
(4) C

7. Three bodies a ring (R), a solid cylinder (C) and a solid sphere (S) having same mass and same radius roll down the inclined plane without slipping. They start from rest, if v_R, v_C and v_S are velocities of respective bodies on reaching the bottom of the plane, then

(1) $v_R = v_C = v_S$
(2) $v_R > v_C > v_S$
(3) $v_R < v_C < v_S$
(4) $v_R = v_C > v_S$

8. Variation of acceleration due to gravity (g) with distance x from the centre of the earth is best represented by (R → Radius of the earth)

(1)


(2)


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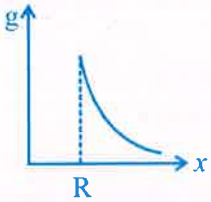

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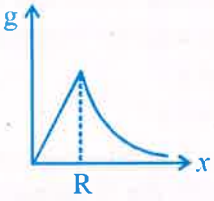
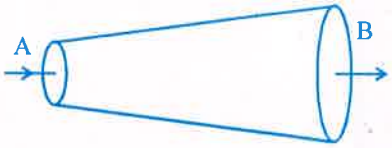


9. A spring is stretched by applying a load to its free end. The strain produced in the spring is

(1) Volumetric
(2) Shear
(3) Longitudinal & Shear
(4) Longitudinal

Space For Rough Work

10. An ideal fluid flows through a pipe of circular cross section with diameters 5 cm and 10 cm as shown. The ratio of velocities of fluid at A and B is



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

11. A pan filled with hot food cools from 94 °C to 86 °C in 2 minutes. When the room temperature is 20 °C. How long will it cool from 74 °C to 66 °C ?
(1) 2 minutes (2) 2.8 minutes
(3) 2.5 minutes (4) 1.8 minutes

12. Four rods with different radii r and length l are used to connect two heat reservoirs at different temperature. Which one will conduct most heat ?
(1) r = 1 cm, l = 1 m (2) r = 1 cm, $l = \frac{1}{2}$ m
(3) r = 2 cm, l = 2 m (4) r = 2 cm, $l = \frac{1}{2}$ m

13. A Carnot engine working between 300 K and 400 K has 800 J of useful work. The amount of heat energy supplied to the engine from the source is
(1) 2400 J (2) 3200 J
(3) 1200 J (4) 3600 J

14. A particle executing SHM has a maximum speed of 0.5 ms^{-1} and maximum acceleration of 1.0 ms^{-2}. The angular frequency of oscillation is
(1) 2 rad s^{-1} (2) 0.5 rad s^{-1}
(3) 2π rad s^{-1} (4) 0.5π rad s^{-1}

15. A source of sound is moving with a velocity of 50 ms^{-1} towards a stationary observer. The observer measures the frequency of sound as 500 Hz. The apparent frequency of sound as heard by the observer when source is moving away from him with the same speed is (Speed of sound at room temperature 350 ms^{-1})
(1) 400 Hz (2) 666 Hz
(3) 375 Hz (4) 177.5 Hz

Space For Rough Work

16. If there are only one type of charge in the universe, then
($\vec{E}$ → Electric field, $\vec{ds}$ → Area vector)

(1) $\oint \vec{E} \cdot \vec{ds} \neq 0$ on any surface

(2) $\oint \vec{E} \cdot \vec{ds}$ could not be defined

(3) $\oint E \cdot ds = \infty$ if charge is inside

(4) $\oint E \cdot ds = 0$ if charge is outside,

$= \frac{q}{\epsilon_0}$ if charge is inside

17. An electron of mass m, charge e falls through a distance h meter in a uniform electric field E. Then time of fall

(1) $t = \sqrt{\frac{2hm}{eE}}$ (2) $t = \frac{2hm}{eE}$

(3) $t = \sqrt{\frac{2eE}{hm}}$ (4) $t = \frac{2eE}{hm}$

18. If $\vec{E}_{ax}$ and $\vec{E}_{eq}$ represents electric field at a point on the axial and equatorial line of a dipole. If points are at a distance r from the centre of the dipole, for r≫a

(1) $\vec{E}_{ax} = \vec{E}_{eq}$ (2) $\vec{E}_{ax} = -\vec{E}_{eq}$

(3) $\vec{E}_{ax} = -2\vec{E}_{eq}$ (4) $\vec{E}_{eq} = 2\vec{E}_{ax}$

19. Nature of equipotential surface for a point charge is

(1) Ellipsoid with charge at foci.

(2) Sphere with charge at the centre of the sphere.

(3) Sphere with charge on the surface of the sphere.

(4) Plane with charge on the surface.

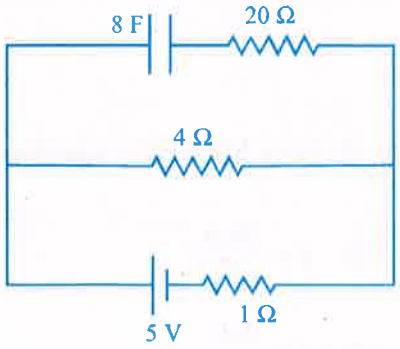
Space For Rough Work

20. A particle of mass 1 gm and charge 1 μC is held at rest on a frictionless horizontal surface at distance 1 m from the fixed charge 2 mC. If the particle is released, it will be repelled. The speed of the particle when it is at a distance of 10 m from the fixed charge

(1) $60\ ms^{-1}$ (2) $100\ ms^{-1}$

(3) $90\ ms^{-1}$ (4) $180\ ms^{-1}$

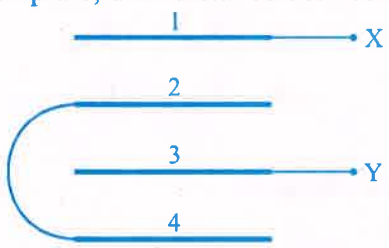
21. A capacitor of 8 F is connected as shown. Charge on the plates of the capacitor



(1) 32 C (2) 40 C

(3) 0 C (4) 80 C

22. Four metal plates are arranged as shown. Capacitance between X and Y
(A → Area of each plate, d → distance between the plates)



(1) $\frac{3}{2}\frac{\epsilon_0 A}{d}$ (2) $\frac{2\epsilon_0 A}{d}$

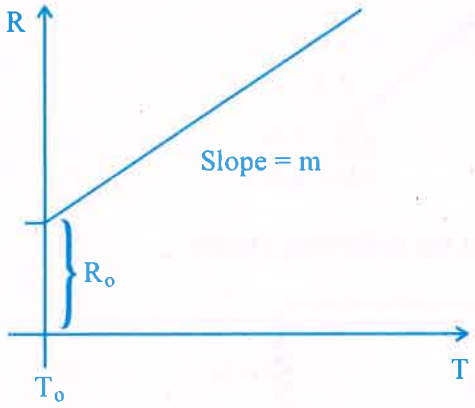
(3) $\frac{2}{3}\frac{\epsilon_0 A}{d}$ (4) $\frac{3\epsilon_0 A}{d}$

Space For Rough Work

23. Mobility of free electrons in a conductor is

(1) directly proportional to electron density.
(2) directly proportional to relaxation time.
(3) inversely proportional to electron density.
(4) inversely proportional to relaxation time.

24. Variation of resistance of the conductor with temperature is as shown

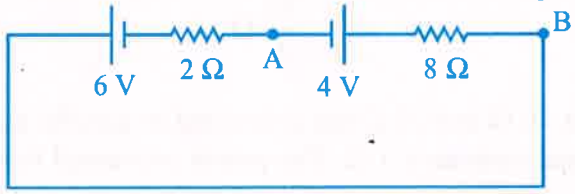


The temperature co-efficient (α) of the conductor is

(1) $\frac{R_o}{m}$ (2) mR_o

(3) m^2R_o (4) $\frac{m}{R_o}$

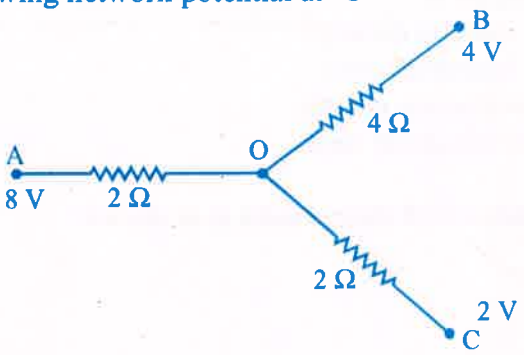
25. Potential difference between A and B in the following circuit



(1) 4 V (2) 5.6 V
(3) 2.8 V (4) 6 V

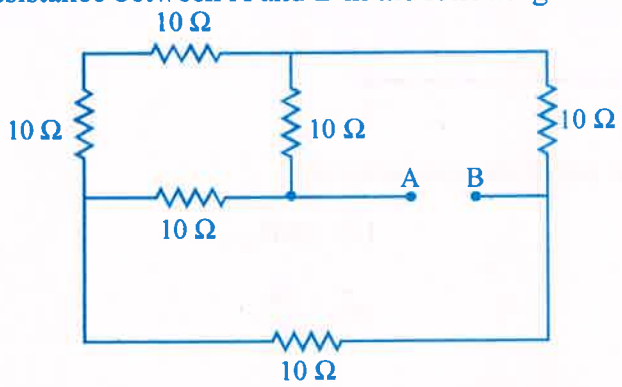
Space For Rough Work

26. In the following network potential at 'O'



(1) 4 V
(2) 3 V
(3) 6 V
(4) 4.8 V

27. Effective resistance between A and B in the following circuit



(1) 10 Ω
(2) 20 Ω
(3) 5 Ω
(4) $\frac{20}{3}$ Ω

28. Two heating coils of resistances 10 Ω and 20 Ω are connected in parallel and connected to a battery of emf 12 V and internal resistance 1 Ω. The power consumed by them are in the ratio

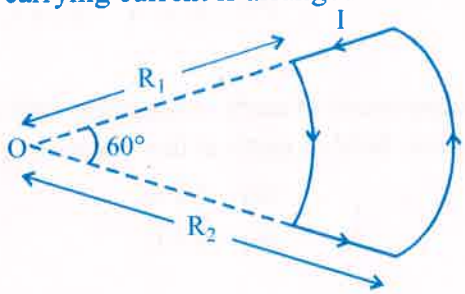
(1) 1 : 4
(2) 1 : 3
(3) 2 : 1
(4) 4 : 1

Space For Rough Work

29. A proton is projected with a uniform velocity 'v' along the axis of a current carrying solenoid, then
(1) the proton will be accelerated along the axis.
(2) the proton path will be circular about the axis.
(3) the proton move along helical path.
(4) the proton will continue to move with velocity 'v' along the axis.

30. In the cyclotron, as radius of the circular path of the charged particle increases (ω = angular velocity, v = linear velocity)
(1) both ω and v increases
(2) ω only increases, v remains constant
(3) v increases, ω remains constant
(4) v increases, ω decreases

31. A conducting wire carrying current is arranged as shown. The magnetic field at 'O'



(1) $\frac{\mu_0 i}{12}\left[\frac{1}{R_1}-\frac{1}{R_2}\right]$
(2) $\frac{\mu_0 i}{12}\left[\frac{1}{R_1}+\frac{1}{R_2}\right]$
(3) $\frac{\mu_0 i}{6}\left[\frac{1}{R_1}-\frac{1}{R_2}\right]$
(4) $\frac{\mu_0 i}{6}\left[\frac{1}{R_1}+\frac{1}{R_2}\right]$

32. The quantity of a charge that will be transferred by a current flow of 20 A over 1 hour 30 minutes period is
(1) 10.8×10^3 C
(2) 10.8×10^4 C
(3) 5.4×10^3 C
(4) 1.8×10^4 C

Space For Rough Work

33. A galvanometer coil has a resistance of 50 Ω and the meter shows full scale deflection for a current of 5 mA. This galvanometer is converted into voltmeter of range 0 – 20 V by connecting

(1) 3950 Ω in series with galvanometer

(2) 4050 Ω in series with galvanometer

(3) 3950 Ω in parallel with galvanometer

(4) 4050 Ω in parallel with galvanometer

34. χ_1 and χ_2 are susceptibility of a paramagnetic material at temperatures T_1K and T_2K respectively, then

(1) $\chi_1 = \chi_2$ (2) $\chi_1 T_1 = \chi_2 T_2$

(3) $\chi_1 T_2 = \chi_2 T_1$ (4) $\chi_1 \sqrt{T_1} = \chi_2 \sqrt{T_2}$

35. At certain place, the horizontal component of earth's magnetic field is 3.0 G and the angle dip at that place is 30°. The magnetic field of earth at that location

(1) 4.5 G (2) 5.1 G

(3) 3.5 G (4) 6.0 G

36. The process of super imposing message signal on high frequency carrier wave is called

(1) Amplification (2) Demodulation

(3) Transmission (4) Modulation

37. A long solenoid with 40 turns per cm carries a current of 1 A. The magnetic energy stored per unit volume is _____ J/m^3.

(1) 3.2 π (2) 32 π

(3) 1.6 π (4) 6.4 π

Space For Rough Work

38. A wheel with 10 spokes each of length 'L' m is rotated with a uniform angular velocity 'ω' in a plane normal to the magnetic field 'B'. The emf induced between the axle and the rim of the wheel.

(1) $\frac{1}{2}N\omega BL^2$ (2) $\frac{1}{2}\omega BL^2$

(3) ωbL^2 (4) $N\omega BL^2$

39. The rms value of current in a 50 Hz AC circuit is 6 A. The average value of AC current over a cycle is

(1) $6\sqrt{2}$ (2) $\frac{3}{\pi\sqrt{2}}$

(3) Zero (4) $\frac{6}{\pi\sqrt{2}}$

40. A capacitor of capacitance 10 μF is connected to an AC source and an AC Ammeter. If the source voltage varies as $V = 50\sqrt{2}$ sin 100t, the reading of the ammeter is

(1) 50 mA (2) 70.7 mA

(3) 5.0 mA (4) 7.07 mA

41. In a series L.C.R circuit, the potential drop across L, C and R respectively are 40 V, 120 V and 60 V. Then the source voltage is

(1) 220 V (2) 160 V

(3) 180 V (4) 100 V

42. In a series L.C.R. circuit an alternating emf (v) and current (i) are given by the equation $v = v_0 \sin \omega t$, $i = i_0 \sin\left(\omega t + \frac{\pi}{3}\right)$

The average power discipated in the circuit over a cycle of AC is

(1) $\frac{v_0 i_0}{2}$ (2) $\frac{v_0 i_0}{4}$

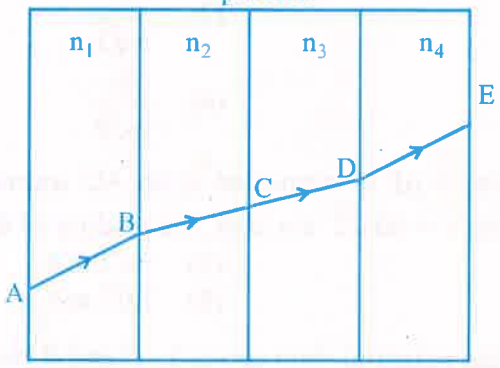
(3) $\frac{\sqrt{3}}{2} v_0 i_0$ (4) Zero

Space For Rough Work

43. Electromagnetic radiation used to sterilise milk is
(1) X-ray (2) γ–ray
(3) UV rays (4) Radiowaves

44. A plane glass plate is placed over a various coloured letters (violet, green, yellow, red). The letter which appears to raised more
(1) Red (2) Yellow
(3) Green (4) Violet

45. A ray of light passes through four transparent media with refractive index n_1, n_2, n_3 and n_4 as shown. The surfaces of all media are parallel



If the emergent ray DE is parallel to incident ray AB, then
(1) $n_1 = n_4$ (2) $n_2 = n_4$
(3) $n_3 = n_4$ (4) $n_1 = \frac{n_2 + n_3 + n_4}{3}$

46. Focal length of a convex lens is 20 cm and its RI is 1.5. It produces an erect, enlarged image if the distance of the object from the lens is
(1) 40 cm (2) 30 cm
(3) 15 cm (4) 20 cm

47. A ray of light suffers a minimum deviation when incident on an equilateral prism of refractive index $\sqrt{2}$. The angle of incidence is
(1) 30° (2) 45°
(3) 60° (4) 50°

Space For Rough Work

48. In Young's double slit experiment the source is white light. One slit is covered with red filter and the other with blue filter. There shall be

(1) Alternate red & blue fringes (2) Alternate dark & pink fringes

(3) Alternate dark & yellow fringes (4) No interference

49. Light of wavelength 600 ηm is incident normally on a slit of width 0.2 mm. The angular width of central maxima in the diffraction pattern is (measured from minimum to minimum)

(1) 6×10^{-3} rad (2) 4×10^{-3} rad

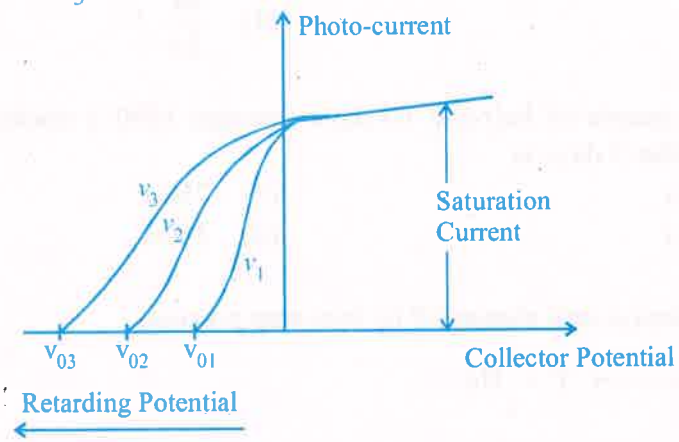
(3) 2.4×10^{-3} rad (4) 4.5×10^{-3} rad

50. For what distance is ray optics is good approximation when the aperture is 4 mm and the wavelength of light is 400 ηm ?

(1) 24 m (2) 40 m

(3) 18 m (4) 30 m

51. The variation of photo-current with collector potential for different frequencies of incident radiation ν_1, ν_2 and ν_3 is as shown in the graph, then



(1) $\nu_1 = \nu_2 = \nu_3$ (2) $\nu_1 > \nu_2 > \nu_3$

(3) $\nu_1 < \nu_2 < \nu_3$ (4) $\nu_3 = \frac{\nu_1 + \nu_2}{2}$

Space For Rough Work

52. The de Broglie wavelength of an electron accelerated to a potential of 400 V is approximately

(1) 0.03 nm (2) 0.04 nm

(3) 0.12 nm (4) 0.06 nm

53. Total energy of electron in an excited state of hydrogen atom is – 3.4 eV. The kinetic and potential energy of electron in this state

(1) K = – 3.4 eV U = – 6.8 eV

(2) K = 3.4 eV U = – 6.8 eV

(3) K = – 6.8 eV U = + 3.4 eV

(4) K = + 10.2 eV U = – 13.6 eV

54. When electron jumps from n = 4 level to n = 1 level, the angular momentum of electron changes by

(1) $\frac{h}{2\pi}$ (2) $\frac{2h}{2\pi}$

(3) $\frac{3h}{2\pi}$ (4) $\frac{4h}{2\pi}$

55. A radio-active sample of half-life 10 days contains 1000 x nuclei. Number of original nuclei present after 5 days is

(1) 707 x (2) 750 x

(3) 500 x (4) 250 x

56. An element X decays into element Z by two-step process.

$$X \longrightarrow Y + {}^{4}_{2}He$$

$$Y \longrightarrow Z + 2\bar{e} \text{ then}$$

(1) X & Z are isobars. (2) X & Y are isotopes.

(3) X & Z are isotones. (4) X & Z are isotopes.

Space For Rough Work

57. A nucleus of mass 20 u emits a γ photon of energy 6 MeV. If the emission assume to occur when nucleus is free and rest, then the nucleus will have kinetic energy nearest to (take $1u = 1.6 \times 10^{-27}$ kg)

(1) 10 KeV
(2) 1 KeV
(3) 0.1 KeV
(4) 100 KeV

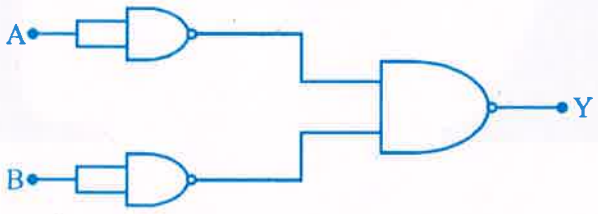
58. Constant DC voltage is required from a variable AC voltage. Which of the following is correct order of operation ?

(1) Regulator, filter, rectifier
(2) Rectifier, regulator, filter
(3) Rectifier, filter, regulator
(4) Filter, regulator, rectifier

59. In a transistor, the collector current varies by 0.49 mA and emitter current varies by 0.50 mA. Current gain β measured is

(1) 49
(2) 150
(3) 99
(4) 100

60. Identify the logic operation carried out by the following circuit.



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

Space For Rough Work

A-1