# CANDIDATE ANSWER BOOKLET
# JEE

Learn At Quest

## CANDIDATE DETAILS

**NAME OF STUDENT** ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

**DATE OF EXAMINATION** ☐☐ / ☐☐ / ☐☐☐☐

**CLASS** ☐☐

**BOARD** ☐☐☐☐

**TIME DURATION** ☐☐ : ☐☐ To ☐☐ : ☐☐

### Read The Instructions Carefully

- Please read these instructions carefully. A candidate who breaches any of the Examination Regulations will be liable to disciplinary action
- Examinations will be conducted during the allocated times shown in the examination timetable.
- Do NOT turn over the question paper until instructed at the time of commencement of the examination.
- Any unauthorised materials or devices found in your possession after the start of the examination will be confiscated, and you will be liable to disciplinary action.
- Handphones brought into the examination hall must be switched off at ALL times. If your handphone is found to be switched on in the examination hall, the handphone will be confiscated and retained for investigation of possible violation of regulations.
- Please check that you have the correct question paper and read the instructions printed on your examination question paper carefully.
- You are not allowed to communicate by word of mouth or otherwise with other candidates (this includes the time when answer scripts are being collected).
- Please raise your hand if you wish to communicate with an invigilator.
- Unless granted permission by an invigilator, you are not allowed to leave your seat.
- Once you have entered the examination hall, you will not be allowed to leave the hall until one hour after the examination has commenced.

### Question Paper Format

- Each question carries 4 marks.
- For correct answer, +4 marks. For wrong answer, -1 marks. For no attempt, 0 marks.
- All questions are compulsory.
- The question paper contains 25 objective type questions.
- Total time duration of the examination is 60 minutes.

### Score Card

+4 ☐

0 ☐

-1 ☐

**Total Score**

☐

**Pass Score**

☐

**Result**

Pass/Fail

## CHAPTER: MODERN PHYSICS

**1.** The wavelength of $K_\alpha$ X-ray of an element having atomic number z = 11 is $\lambda$ . The wavelength of $K_\alpha$ X-ray of another element of atomic number z' is $4\lambda$. Then z' is

(A) 11 (B) 44 (C) 6 (D) 4

**2.** A photon of 10.2 eV energy collides with a hydrogen atom in ground state inelastically. After few microseconds one more photon of energy 15 eV collides with the same hydrogen atom. Then what can be detected by a suitable detector.

(A) one photon of 10.2 eV and an electron of energy 1.4 eV
(B) 2 photons of energy 10.2 eV
(C) 2 photons of energy 3.4 eV
(D) 1 photon of 3.4 eV and one electron of 1.4 eV

**3.** Helium nuclie combines to form an oxygen nucleus. The binding energy per nucleon of oxygen nucleus is if $m_0$ = 15.834 amu and $m_{He}$ = 4.0026 amu

(A) 10.24 MeV (B) 0 MeV (C) 5.24 MeV (D) 4 MeV

**4.** The nucleus of element X (A = 220) undergoes $\alpha$-decay. If Q-value of the reaction is 5.5 MeV, then the kinetic energy of $\alpha$-particle is :

(A) 5.4 MeV (B) 10.8 MeV (C) 2.7 MeV (D) None

**5.** The volume and mass of a nucleus are related as

(A) $v \propto m$ (B) $v \propto 1/m$ (C) $v \propto m^2$ (D) $v \propto 1/m^2$

**Space for rough work**

## CHAPTER: MODERN PHYSICS

**6.** Which of the following processes represents a gamma - decay?

(A) ${}^{A}X_{Z} + \gamma \longrightarrow {}^{A}X_{Z-1} + a + b$ (B) ${}^{A}X_{Z} + {}^{1}n_{0} \longrightarrow {}^{A-3}X_{Z-2} + c$

(C) ${}^{A}X_{Z} \longrightarrow {}^{A}X_{Z} + f$ (D) ${}^{A}X_{Z} + e_{-1} \longrightarrow {}^{A}X_{Z-1} + g$

**7.** ${}^{22}Ne$ nucleus, after absorbing energy, decays into two $\alpha$–particles and an unknown nucleus. The unknown nucleus is

(A) nitrogen (B) carbon (C) boron (D) oxygen

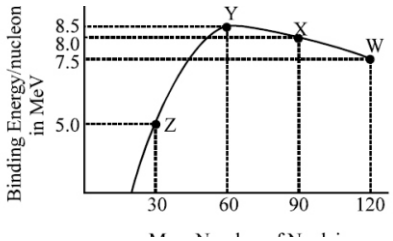
**8.** Order of magnitude of density of Uranium nucleus is, $[m_p = 1.67 \times 10^{-27}\ kg]$

(A) $10^{20}\ kg/m^3$ (B) $10^{17} kg/m^3$ (C) $10^{14} kg/m^3$ (D) $10^{11} kg/m^3$

**9.** Let $m_p$ be the mass of a proton, $m_n$ the mass of a neutron, $M_1$ the mass of a ${}^{20}_{10}Ne$ nucleus & $M_2$ the mass of a ${}^{40}_{20}Ca$ nucleus. Then :

(A) $M_2 = 2\ M_1$ (B) $M_2 > 2\ M_1$ (C) $M_2 < 2\ M_1$ (D) $M_1 < 10\ (m_n + m_p)$

**10.** Binding energy per nucleon vs. mass number curve for nuclei is shown in the figure. W, X, Y and Z are four nuclei indicated on the curve. The process that would release energy is




(A) $Y \rightarrow 2Z$ (B) $W \rightarrow X + Z$

(C) $W \rightarrow 2Y$ (D) $X \rightarrow Y + Z$

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## CHAPTER: MODERN PHYSICS

**11.** As per Bohr model, the minimum energy (in eV) required to remove an electron from the ground state of doubly ionized Li atom (Z = 3) is
(A) 1.51 (B) 13.6 (C) 40.8 (D) 122.4

**12.** An energy of 24.6 eV is required to remove one of the electrons from a neutral helium atom. The energy (In eV) required to remove both the electrons form a neutral helium atom is :
(A) 38.2 (B) 49.2 (C) 51.8 (D) 79.0

**13.** The work function of a substance is 4.0 eV . The longest wavelength of light that can cause photoelectron emission from this substance is approximately :
(A) 540 nm (B) 400 nm (C) 310 nm (D) 220 nm

**14.** The electron in a hydrogen atom makes a transition $n_1 \longrightarrow n_2$, where $n_1$ & $n_2$ are the principal quantum numbers of the two states . Assume the Bohr model to be valid . The time period of the electron in the initial state is eight times that in the final state . The possible values of $n_1$ & $n_2$ are :
(A) $n_1 = 4, n_2 = 2$ (B) $n_1 = 8, n_2 = 2$
(C) $n_1 = 8, n_2 = 1$ (D) $n_1 = 6, n_2 = 3$

**15.** The potential difference applied to an X - ray tube is 5 kV and the current through it is 3.2 mA. Then the number of electrons striking the target per second is
(A) $2 \times 10^{16}$ (B) $5 \times 10^{16}$ (C) $1 \times 10^{17}$ (D) $4 \times 10^{17}$

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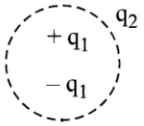
## CHAPTER: ELECTROSTATICS

**16.** Consider the charge configuration and a spherical Gaussian surface as shown in the figure. When calculating the flux of the electric field over the spherical surface, the electric field will be due to




(A) $q_2$ (B) only the positive charges

(C) all the charges (D) $+q_1$ and $-q_1$

**17.** Two equal point charges are fixed at x = –a and x = +a on the x-axis. Another point charge Q is placed at the origin. The change in the electrical potential energy of Q, when it is displaced by a small distance x along the x-axis, is approximately proportional to

(A) x (B) $x^2$ (C) $x^3$ (D) $1/x$

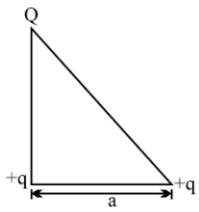
**18.** Two small balls having equal positive charge Q (coulomb) on each are suspended by two insulating strings of equal length L, from a hook fixed to a stand. If the whole set up is taken in a satellite then the angle $\theta$ between the two strings is : (in equillibrium)

(A) O$^\circ$ (B) 90$^\circ$ (C) 180$^\circ$ (D) $0^\circ < \theta < 180^\circ$

**19.** In above question the tension in each string is :

(A) 0 (B) $\frac{1}{4\pi\varepsilon_0}\cdot\frac{Q^2}{L^2}$ (C) $\frac{1}{4\pi\varepsilon_0}\cdot\frac{Q^2}{2L^2}$ (D) $\frac{1}{4\pi\varepsilon_0}\cdot\frac{Q^2}{4L^2}$

**20.** Three charges Q, +q and +q are placed at the vertices of a right-angled isosceles triangle as shown . The net electrostatic energy of the configuration is zero if Q is equal to :




(A) $\frac{-q}{1+\sqrt{2}}$ (B) $\frac{-2q}{2+\sqrt{2}}$

(C) $-2q$ (D) $+q$

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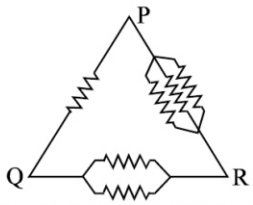
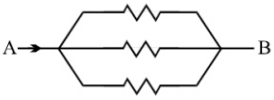
## CHAPTER: CURRENT ELECTRICITY

**21.** Six equal resistances are connected between points P, Q and R as shown in the figure. Then the net resistance will be maximum between

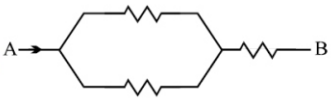



(A) P and Q
(B) Q and R
(C) P and R
(D) any two points

**22.** Arrange the order of power dissipated in the given circuits, if the same current is passing through all circuits and each resistor is 'r'

(I) 

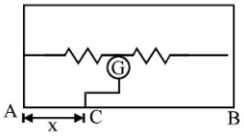

(II) 


(III) 


(IV) 

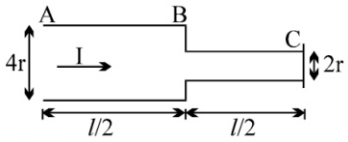

(A) $P_2 > P_3 > P_4 > P_1$ (B) $P_3 > P_2 > P_4 > P_1$ (C) $P_4 > P_3 > P_2 > P_1$ (D) $P_1 > P_2 > P_3 > P_4$

**23.** In the given circuit, no current is passing through the galvanometer. If the cross-sectional diameter of AB is doubled then for null point of galvanometer the value of AC would



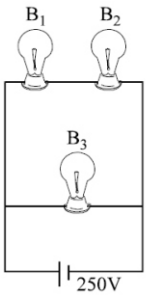

(A) x (B) x/2 (C) 2x (D) None

**24.** Consider a cylindrical element as shown in the figure. Current flowing the through element is I and resistivity of material of the cylinder is ρ. Choose the correct option out the following.




(A) Power loss in second half is four times the power loss in first half.
(B) Voltage drop in first half is twice of voltage drop in second half.
(C) Current density in both halves are equal.
(D) Electric field in both halves is equal.

**25.** A 100 W bulb $B_1$, and two 60 W bulbs $B_2$ and $B_3$, are connected to a 250 V source, as shown in the figure. Now $W_1$, $W_2$ and $W_3$ are the output powers of the bulbs $B_1$, $B_2$ and $B_3$ respectively. Then




(A) $W_1 > W_2 = W_3$
(B) $W_1 > W_2 > W_3$
(C) $W_1 < W_2 = W_3$
(D) $W_1 < W_2 < W_3$

**Space for rough work**

## CHAPTER: RAY OPTICS AND WAVE OPTICS

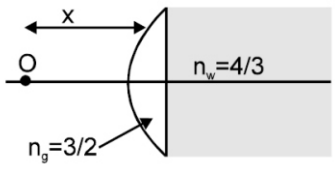
**26.** Yellow light emitted by sodium lamp in Young's double slit experiment is replaced by monochromatic blue light of the same intensity :
(A) fringe width will decrease. (B) fringe width will increase.
(C) fringe width will remain unchanged. (D) fringes will become less intense.

**27.** The distance between two slits in a Young's double slit experiment is 3 mm. The distance of the screen from the slits is 1 m. Microwaves of wavelength 1 mm are incident on the plane of the slits normally. The distance of the first maxima on the screen from the central maxima will be:
(A) 33.33 cm (B) 35.35 cm (C) 17.7 cm (D) 18 cm

**28.** In a YDSE: D = 1 m, d = 1 mm and $\lambda$ = 5000 nm. The distance of $1000^{th}$ maxima from the central maxima is:
(A) 0.5 m (B) 0.577 m (C) 0.495 m (D) does not exist

**29.** In a Young's double slit experiment, d = 1 mm, $\lambda$ = 6000 Å & D = 1 m. The slits produce same intensity on the screen. The minimum distance between two points on the screen having 75% intensity of the maximum intensity is:
(A) 0.45 mm (B) 0.40 mm (C) 0.30 mm (D) 0.20mm

**30.** An object ' O ' is kept in air in front of a thin plano convex lens of radius of curvature 10 cm. It's refractive index is 3/2 and the medium towards right of plane surface is water of refractive index 4/3. What should be the distance ' x ' of the object so that the rays become parallel finally.
(A) 5 cm (B) 10 cm
(C) 20 cm (D) none of these

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## INTEGER TYPE QUESTIONS

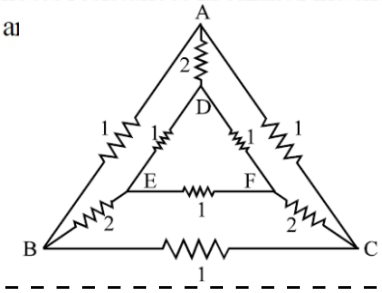
1. A solid conducting sphere of radius 10 cm is enclosed by a thin metallic shell of radius 20 cm. A charge q = 20μC is given to the inner sphere. Find the heat generated in the process, the inner sphere is connected to the shell by a conducting wire

Answer: ☐

2. A hydrogen like atom has its single electron orbiting around its stationary nucleus. The energy to excite the electron from the second Bohr orbit to the third Bohr orbit is 47.2 eV. The atomic number of this nucleus is _____.

Answer: ☐

3. A network of nine conductors connects six points A, B, C, D, E and F as shown in figure. The figure denotes resistances in ohms. Find the equivalent resistance between A a




Answer: ☐

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## OMR

| | | | | |
|---|---|---|---|---|
| 1 | ○ | ○ | ○ | ○ |
| 2 | ○ | ○ | ○ | ○ |
| 3 | ○ | ○ | ○ | ○ |
| 4 | ○ | ○ | ○ | ○ |
| 5 | ○ | ○ | ○ | ○ |
| 6 | ○ | ○ | ○ | ○ |
| 7 | ○ | ○ | ○ | ○ |
| 8 | ○ | ○ | ○ | ○ |
| 9 | ○ | ○ | ○ | ○ |
| 10 | ○ | ○ | ○ | ○ |
| 11 | ○ | ○ | ○ | ○ |
| 12 | ○ | ○ | ○ | ○ |
| 13 | ○ | ○ | ○ | ○ |
| 14 | ○ | ○ | ○ | ○ |
| 15 | ○ | ○ | ○ | ○ |
| 16 | ○ | ○ | ○ | ○ |
| 17 | ○ | ○ | ○ | ○ |
| 18 | ○ | ○ | ○ | ○ |
| 19 | ○ | ○ | ○ | ○ |
| 20 | ○ | ○ | ○ | ○ |
| 21 | ○ | ○ | ○ | ○ |
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| 37 | ○ | ○ | ○ | ○ |
| 38 | ○ | ○ | ○ | ○ |
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| 40 | ○ | ○ | ○ | ○ |