International Indian School Dammam

Preliminary Examination-2015

Class-XII

Physics (Theory)

Time allowed: 3 Hours   *Maximum Marks: 70*

Set A

GENERAL INSTRUCTIONS:

1. All questions are compulsory. **There are 26 questions in all.**
2. Question paper contains five sections: section A, section B, section C, section D and section E. **Total number of printed pages is 5.**
3. Section A contains five questions of one mark each, Section B contains five questions of two marks each, Section C contains twelve questions of three marks each, Section D contains one value based question of four marks and Section E contains three questions of five marks each
4. There is no overall choice. However an internal choice has been provided in one question of two marks, one question of three mark and all three questions of five marks each. You have to attempt only one of the given choices in such questions.
5. Use of calculators is not permitted. However you may use log tables if necessary.
6. You may use the following values of physical constants wherever necessary.
7. Attempt all parts of a question together. Symbols have their usual meaning.
8. Draw necessary diagrams to explain your answer.

$c = 3 \times 10^8 \, m/s$ $h = 6.63 \times 10^{-34} \, J \, s$

$e = 1.6 \times 10^{-19} \, C$ $\mu_0 = 4\pi \times 10^{-7} \, T \, m \, A^{-1}$

$\varepsilon_0 = 8.854 \times 10^{-12} \, C^2 \, N^{-1} \, m^{-2}$ $1/4\pi\varepsilon_0 = 9 \times 10^9 \, N \, m^2/C^2$

$m_e = 9.1 \times 10^{-31} \, kg$ $m_p = 1.673 \times 10^{-27} \, kg$

$m_n = 1.675 \times 10^{-27} \, kg$

Avogadro Number $= 6.022 \times 10^{23}$ per gram mole

Boltzmann constant $= 1.38 \times 10^{-23} \, J \, K^{-1}$

Rydberg Constant $R = 1.097 \times 10^7 \, m^{-1}$

SECTION A

1. What is the ratio of the resistances of two bulbs whose ratings are 100W, 220V and 25W,110V.

2. The amplitude of the magnetic field of an electromagnetic wave in vaccum is $B_0 = 510 \times 10^{-9}$ T. What is the amplitude of electric field part of the wave?

3. What is stopping potential? The maximum kinetic energy with which a photo electron is coming out from a metal surface is 2.75 eV. What is the stopping potential required for this?

4. Write nuclear reactions showing β^- and β^+ decay from a nucleus ^AX_Z.

5. In the given two situations, mention which is forward biased and which is reverse biased?
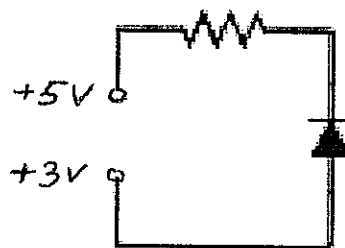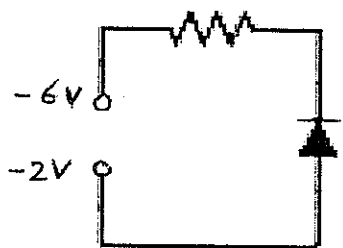
Section B

6. An alternating current from a source is represented by $I = 10 \sin 314t$
   Write the corresponding values of (i) its effective value and (ii) frequency of the source. I is in Ampere and t is in second.

7. An electric heater of 800W 80V is to be operated with a 100V 50Hz a.c. What is the value of the inductance of inductor required to be connected in series with this heater?

8. What is displacement current? Show that it is equal to the conduction current (dq/dt) in the circuit.

9. What is half life time of a radioactive substance? Establish a relation between half life time and Decay constant (λ).

Obtain expression for the radius of the electronic orbit of H-atom, by using Bohr's quantization conditions.

10. What is Amplitude modulation? Draw A.M. wave and define modulation index.

Section C

11. Obtain an expression for the electric potential due to an electric dipole. What is the net electric potential at the middle of the electric dipole?

12. Voltmeter can't measure emf of the cell, explain why? A voltmeter is connected in parallel with a cell of emf E and internal resistance r connected in series with an external resistance R. How will the reading of the voltmeter change on (i) increasing current through the cell, and (ii) increasing the value of external resistance R? Explain with Mathematical support.

13. State and prove wheat stone bridge condition.

14. Obtain an expression for the magnetic field due to a current carrying circular loop and write expression for its dipole moment.

OR

Obtain an expression for the magnetic dipole moment of an H-atom and also define Bohr magneton.

15. What is Polarisation of light? State Brewster law. How would the intensity of transmitted light change when (i) polarizer is rotated and (ii) analyser is rotated.

16. What is dispersion? Dispersion takes place when white light passes through prism, why it does't take place when it passes through rectangular glass slab, explain. By a diagram show the position of colour pattern in a primary rainbow.

17. For a photosensitive surface, threshold wavelength is λ_0. Does photoemission occur if the wavelength of radiation is (i) more than λ_0 and (ii) less than λ_0? Write Einstein photoelectric equation and hence define work function in terms of threshold frequency.

18. What is Bohr's quantization rule? By using this rule, obtain expression for the radius of electron's orbit of H-atom.

19. What are input and output characteristic curve of an npn-transitor in common emitter configuration? Write one significant feature of each of this curve.

20. What is sky wave propagation? Why is this mode of propagation restricted to the frequencies only up to 30MHz? Write the expression of maximum distance between the transmitting tower and receiving tower for LOS communication.

21. What are coherent sources of light? What are the conditions required for the sustained interference pattern.

22. Draw the circuit diagram of the npn transistor amplifier in CE configuration.
Show, only by logic circuit diagram, that how we can get OR and AND gates by using only NOR gates.

Section D

23. *Ashita used to go to her school on bicycle. She studied electromagnetic induction in her physics class. She attached a small dynamo and an LED with the axel of the cycle. This way during the ride she used to enjoy the glowing of LED.*
    (a) What values do you think is inculcated in ashita after understanding physics?
    (b) What is the principle on which dynamo is based? Does the device obey principle of conservation of energy?

Section E

24. (i) Show that the electric field is expressed as negative of electric potential gradient. What is the significance of the negative sign?

(ii) A capacitor of capacitance 80µF is charged by a battery of 12V. It is disconnected from the battery and then the space between the plates is doubled. What will be the values of (i) its capacitance and (ii) p.d. between the plates?

OR

(i) Obtain an expression for the work done in rotating an electric dipole from its stable equilibrium position to unstable equilibrium position when placed in a region of uniform electric field. Mention that whether energy is consumed or released in this process.

(ii) Four point charges q, -3q , 5q and Q are placed at the corners of a square of side a. For what value of Q (in terms of q), the net electric potential at the centre of the square is zero?

25. (i) By using Huygen's principle, prove Snell's law of refraction.

(ii) What is wave front. A point light source is placed at the focus of a convex lens. Draw wave fronts for the incident an refracted(emergent) light.
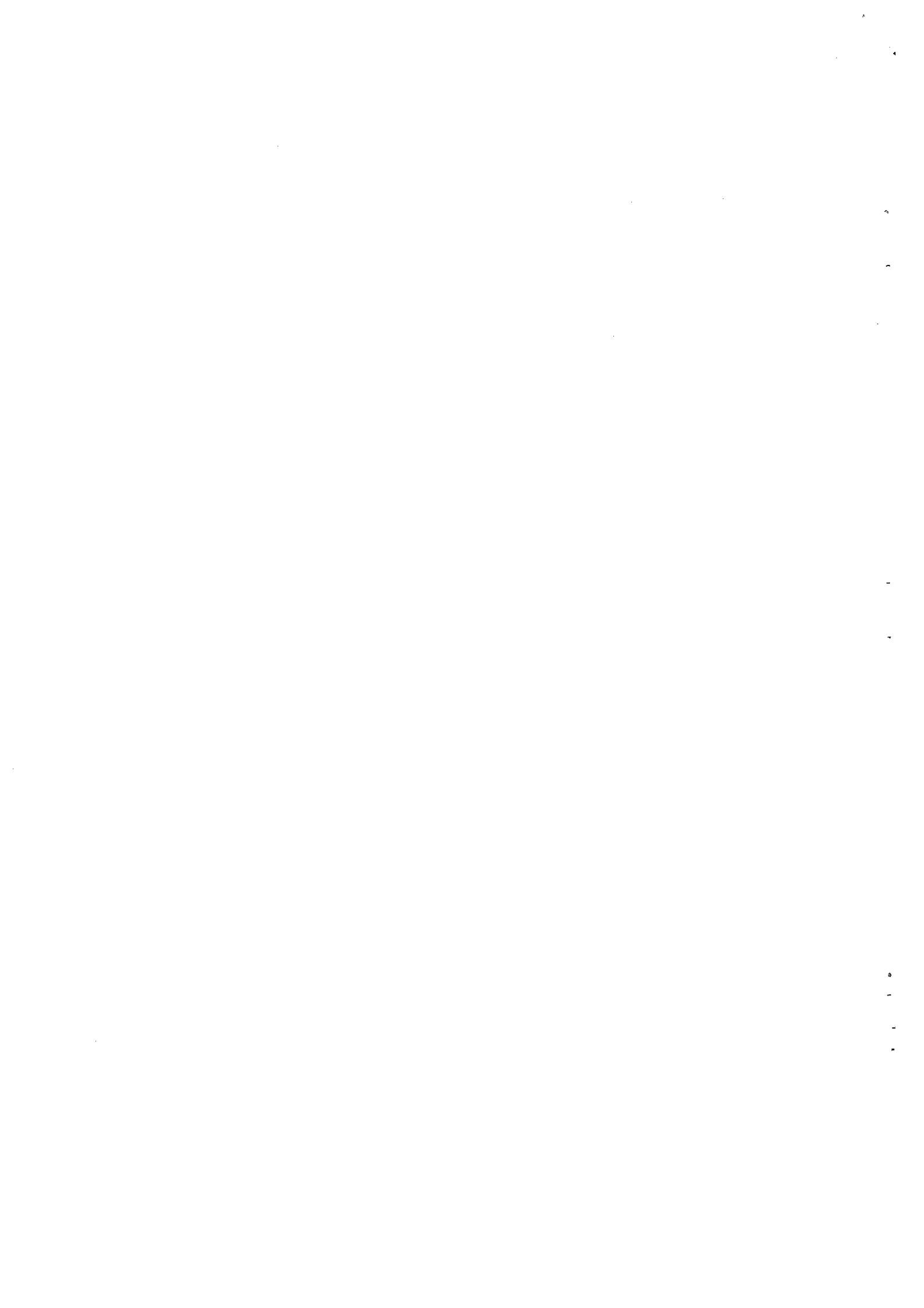
OR

(i) Draw labeled diagram of a reflecting telescope. Write any three advantages of reflecting telescope over refracting telescope.

(ii) A prism is set for minimum deviation position. The angle of incidence is 45° and refractive angle of the prism material is 1.6. What is the angle of prism? (Use $Sin^{-1}(0.4419) = 26.2^0$)

26. (i) Describe principle and working of a moving coil galvanometer

(ii) A galvanometer of 100 Ω shows a full deflection for 0.01 A of current. How it can be converted into a voltmeter reading up to 25V?

OR

(i) State and prove Curie law in magnetism.

(ii) A long straight wire having a mass 0.6 g/cm is held in equilibrium in a horizontal position in the gravity of earth without any support by applying a perpendicular magnetic field of 0.1T. What is current in wire? g = 10 m/s².

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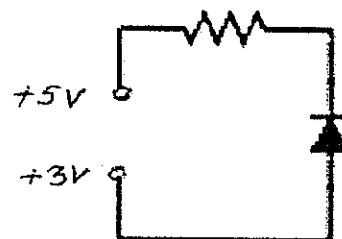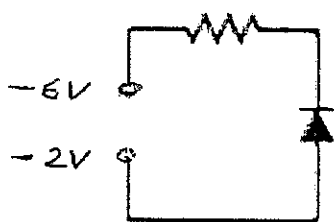
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