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Pre-Board –II Examination

CLASS-XII **SUBJECT: PHYSICS**

M.M.: 70 Marks **TIME: 3 hours.**

General Instructions:

(1) There are 35 questions in all. All questions are compulsory.

(2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E. All the sections are compulsory.

(3) Section A contains eighteen MCQ of 1 mark each, Section B contains seven questions of two marks each, Section C contains five questions of three marks each, section D contains three long questions of five marks each and Section E contains two case study based questions of 4 marks each.

(4) There is no overall choice. However, an internal choice has been provided in section B, C, D and E. You have to attempt only one of the choices in such questions.

5. Use of calculators is not allowed.

Section A

Q1- The electromagnetic wave travels in a medium with a speed of 2×10^8 m/s. The relative magnetic permeability of the medium is 1. The relative electric permittivity is

(a) 1.25 (b) 1 (c) 1.8 (d) 2.25

Q2- A bulb and a capacitor is connected in series to the A.C. source. The bulb glows with some brightness. When a dielectric is inserted between the plates of the capacitor then

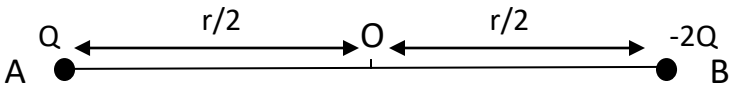
(a) Brightness of the bulb will increase

(b) Brightness of the bulb will decrease

(c)Brightness of the bulb will remain same

(d) Impedance of the circuit increase

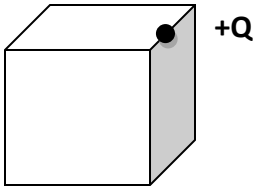
Q3- Two charges Q and -2Q are placed at point A and B as shown in the figure. The magnitude of electric field at the centre 'O' of line joining A and B is E. The electric field at point A is



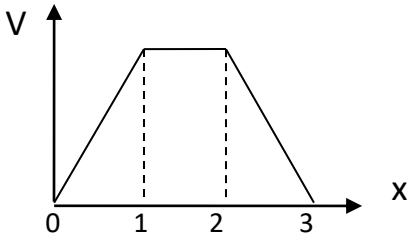
(a) E/2 (b) E/3 (c) E/4 (d) E/6

Q4-In figure a charge +Q is located at one of the edge of a cube. The electric flux through the cube is

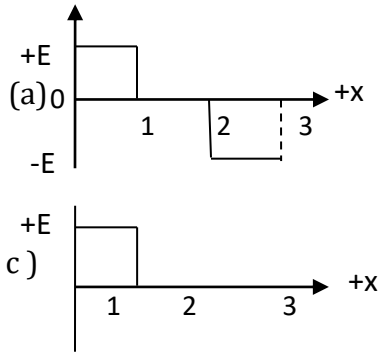
(a) $\frac{Q}{\varepsilon_0}$ (b) $\frac{Q}{2\varepsilon_0}$ (c) $\frac{Q}{4\varepsilon_0}$ (d) $\frac{Q}{8\varepsilon_0}$

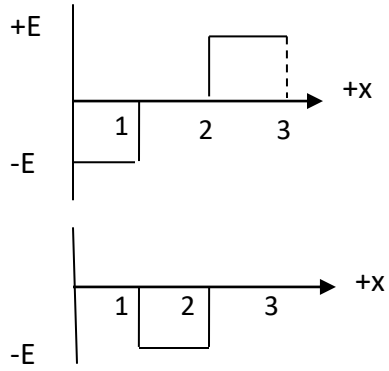


Q5- The electric potential as a function of distance x is shown in figure.



Which of the following graph correctly represents the variation of electric field intensity E as a function of x





Q6-A current of 2A flows through a 2 Ω resistance when connected across a battery. The same battery supplies a current of 0.5 A when connected across a 9 Ω resister. The internal resistance of the battery is

(a) 1/2 Ω (b) 1/3 Ω (c) 1/4 Ω (d) 1 Ω

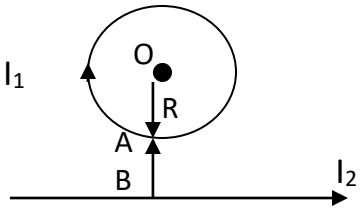
Q7- A wire that's cross sectional area is increasing linearly from its one end to another; it is connected to a battery of V volt. Which of the following quantity remain constant?

(a) Drift speed (b) Current density (c) Electric current (d) all above

Q8-A proton and α-particle enters in a region of uniform magnetic field B perpendicular to the magnetic field. If the radius of circular path for both the particles are equal and kinetic energy of proton is 1MeV.The kinetic energy of alpha particle will be

(a) 4 MeV (b) 0.5 MeV (c) 1 MeV (d) 2 MeV

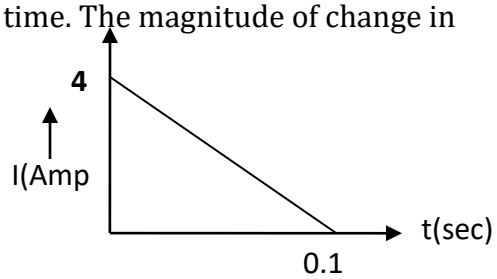
Q9-In the given figure I_1 and I_2 are the current in the loop and straight conductor respectively and OA=AB =R. The net magnetic field at the centre of the loop is zero. The ratio of current in the loop and straight conductor is



(a) π (b) 2π

(c) 1/ π (d) 1/2π

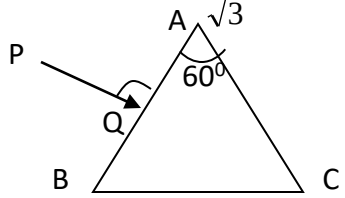
Q10-In a coil of resistance 10Ω the induced current develop by changing the magnetic flux through it is shown in the figure as a function of time. The magnitude of change in magnetic flux in Weber is



(a) 8 (b) 6

(c) 4 (d) 2

Q11- A ray PQ is incident normally on the face AB of a triangular prism . The angle of prism is 60^0 and the prism is made of transparent material of refractive index $\frac{2}{\sqrt{3}}$ as shown in the figure. The angle of emergence from face AC is



(a) 30^0 (b) 60^0

(c) 45^0 (d) 90^0

Q12- A proton and an α-particle are accelerated through the same potential difference. The ratio of de-Broglie wavelength of proton to de-Broglie wavelength of alpha particle will be

(a) 1 : 2 (b) $2\sqrt{2}$: 1 (c) 2 : 1 (d) 1: 1

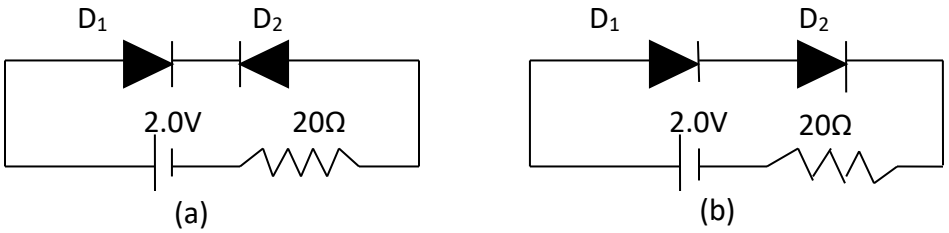
Q13-In Balmer series, the ratio of maximum to minimum wavelength of emitted spectral line is

(a) 4 : 3 (b) 9: 5 (c) 17: 16 (d) 36 : 11

Q14-The speed of electron in the innermost orbit in hydrogen atom is 2.19 x 10^6 m/s. The speed of electron in the 3rd exited state will be nearly

(a) 0.73 x 10^6 m/s (b) 0.24 x 10^6 m/s (c) 0.55 x 10^6 m/s (d) 0.14 x 10^6 m/s

Q15-The current through the resistance for ideal diode in the circuit (a) and (b) are



(a) 0.1A and 0.2A (b) 0 and 0.05A (c) 0.1 A and 0.1 A (d) 0 and 0.1 A

For question number 16, 17 and 18, two statements are given- one labeled as **Assertion (A)** and other labeled **Reason (R)**. Select the correct answer to these question from the code (a),(b),(c) and (d) as given below

(a) Both A and R true and R is the correct explanation of A.

(b) Both A and R true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false and R is also false.

Q16-**Assertion** - An electric bulb start glowing instantly as it is switched on.

Reason - Drift speed of electron in the wire is very large.

Q17- **Assertion** - Colours are seen in the thin layer of oil on the surface of water.

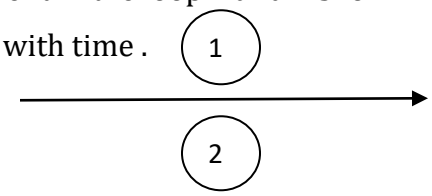
Reason- White light is composed of several colours.

Q18- **Assertion**- The de Broglie wavelength of molecules of a gas varies inversely as the square root of temperature.

Reason- The root mean square velocity of molecules depends on temperature.

Section B

Q19- State Lenz's Law. Predict the direction of induced current in the loop 1 and 2 shown in the figure , when the current in the straight wire decreases with time .



Q20- Draw the variation of Binding Energy per nucleons with mass number. Explain with the help of this graph the release of energy in the process of nuclear fusion and fission.

OR

A neutron is absorbed by a $_3Li^6$, with subsequent emission of alpha particle. Write the corresponding nuclear reaction and calculate the energy released in this reaction.

m($_3Li^6$) =6.015126 amu

m($_2He^4$)=4.0026044 amu

m($_0n^1$)=1.0086654 amu

m($_1H^3$)=3.016049 amu

Q21-Name the e.m. wave having the wavelength range

(a) 1.0 nm to 10^{-3} nm (b) 0.1 m to 1.0 mm

How these waves are generated.

Q22-Two convex lens of focal length f_1 and f_2 are placed in contact to each other. Find the expression for effective focal length of the combined lens. Write the power of combined lens in terms of f_1 and f_2 .

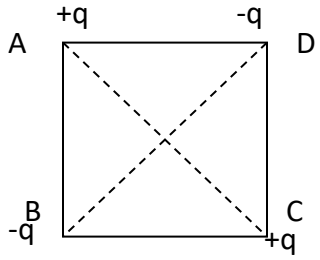
Q23- A plane wave front is incident at an angle of incident 'i' on a reflecting surface. Draw a diagram showing the incident wave front and reflected wave front, and verify the laws of refraction on the basis of Huygens's wave theory.

Q24- A semiconductor has equal electron and hole concentration of 6×10^8 m^{-3}. On doping with certain impurity electron concentration increases to 9×10^{12} m^{-3}.
(i) Identify the new semiconductor obtain after doping and draw its energy band diagram.
(ii) Calculate new hole concentration in the semiconductor.

Q25-Find the ratio of potential difference that must be applied to the series and parallel combination of two capacitors of equal capacitance, so that the energy stored in the two cases becomes equal.

OR

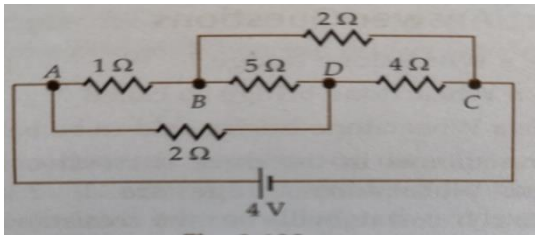
Four charges are arranged at the corner of a square ABCD of side ‘d’ as shown in the figure. Find (i) work done required to put together this arrangement (ii) Potential at ‘O’.



Section C-

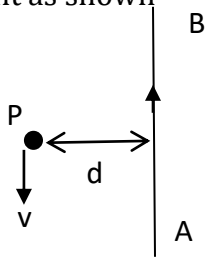
Q26 (i) Use Kirchhoff’s Laws to find balance condition of Wheatstone bridge.

(ii) Calculate the current drawn from the battery by the network of resistance shown in the figure.

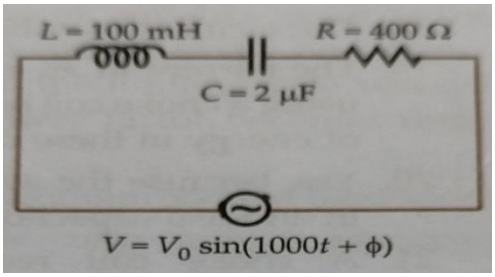


Q27- (i) Derive the expression for force acting between two infinitely long parallel current carrying conductors.

(ii) A long straight wire carries current ‘I’. A proton ‘P’ travels with a speed ‘v’ parallel to the wire at a distance ‘d’ from it in a direction opposite to the direction of current as shown in figure. What is the force experienced by the proton and what is its direction.



Q28-(i) Find the value of phase difference between current and voltage in series LCR circuit shown in the figure. Which one lead in phase current or voltage.



(ii) Without making any other change find the value of additional capacitor C1 to be connected in parallel with C, in order to make the power factor of circuit unity.

OR

A small town with a demand of 800kW of electric power at 220V is situated 15Km away from an electric plant generating power at 440V. The resistance of two wire line carrying power is 0.5Ω per Km. The town get power from the line through a 4000-220V step down transformer at a substation in the town.

(a) Estimate the line power loss in the form of heat

(b) How much power must the plant supply assuming there is negligible power loss due to leakage.

(c) Characterise the step up transformer at the plant.

Q29- (a) Define the term (i) stopping potential (ii) threshold frequency, in the relation to the photoelectric effect.

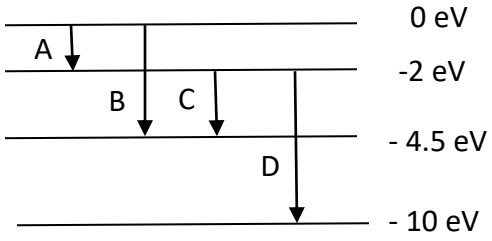
(b) Draw the graph showing the variation of stopping potential (Vo) with frequency of incident radiation (ν). How Plank constant is determine by this graph.

Q30- (a) State Bohr's postulate for the 'permitted orbit' for the electron in Hydrogen atom.

(b) Use Bohr's postulates to obtain the expression for total energy in the nth orbit of hydrogen atom.

OR

(a) The energy level of an atom are shown in the figure. By doing necessary calculation, state which transition is corresponding to emission of a photon of wave length 275nm.



(b) Which transition is corresponds to emission of radiation of (i) maximum wavelength (ii) minimum wavelength.

Section D

Q31-(a) State Gauss theorem and use it to find the electric field intensity due to a infinitely long uniformly charged wire of charge density λ.

(b) Draw the graph showing the variation of electric field intensity E with the distance 'r'.

(c) Calculate work done in moving a charge 'q' from perpendicular distance r_1 to r_2($r_1 < r_2$) from straight wire.

OR

(a) A parallel plate capacitor of capacitance C is charged by a batter of 'V' volt. Without disconnecting the battery a dielectric of dielectric constant 'K' is fully inserted between the plates. What change if any, will takes place in (i) charge on the plates (ii) Electric field intensity between the plates (ii) Capacitance of the capacitor.

(b) A slab of material of dielectric constant 'K' has same area as the plates of parallel plate capacitor but has thickness d/2, where d is the separation between the plates. Find the expression for the capacitance when the slab inserted between the plates.

Q32-(a) With the help of labelled diagram, explain the principle and working of moving coil galvanometer.

(b) What is the importance of radial magnetic field and how it is produced.

(c) “Increasing current sensitivity of galvanometer may not necessarily increase voltage sensitivity” Justify this statement.

OR

(a) Explain briefly, with the help of a labelled diagram the basic principle of working of A.C. generator. In a A.C. generator a coil of N turns and area A is rotated with constant angular velocity ω in a uniform magnetic field B. Derive the expression for instantaneous value of emf induced in the coil.

(b) Why emf is maximum when plane of the armature is parallel to the magnetic field.

Q33-(a) In Young’s experiment deduce the condition for constructive and destructive interference fringes. Hence deduce the expression for fringe width.

(b) How the fringe width change if whole apparatus is immersed in a medium of refractive index μ .

OR

(a) Draw the intensity pattern for single slit diffraction and double slit interference.

(b)State two differences between interference and diffraction pattern.

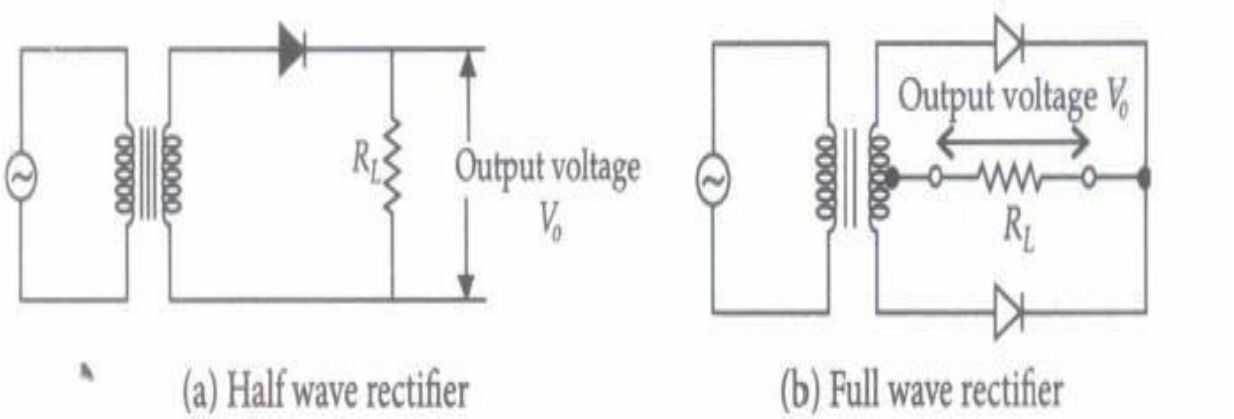
(c) In the diffraction due to a single slit experiment the width of the slit is 3mm and screen is placed 1.5m away from the slit. If monochromatic light of wavelength 620nm is incident normally on the slit. Calculate the separation between the first order minima and 3^{rd} order maxima on one side of the screen.

Section E

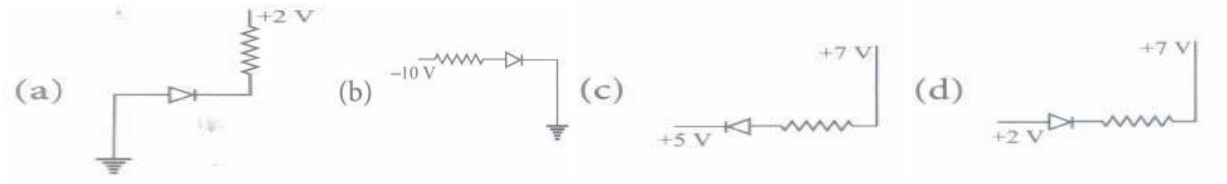
Read the following paragraph and answer the questions.

Q34-Case Study

When the diode is forward biased, it is found that beyond forward voltage V = V_B, called barrier voltage, the conductivity is very high. At this value of battery biasing for p-n junction, the potential barrier is overcome and the current increases rapidly with increase in forward voltage. When the diode is reverse biased, the reverse bias voltage produces a very small current about a few microamperes which almost remains constant with bias. This small current is reverse saturation current. Rectifier is a device which is used for converting alternating current or voltage into direct current or voltage. Its working is based on the fact that the resistance of p-n junction becomes low when forward biased and becomes high when reverse biased. A half-wave rectifier uses only a single diode while a full wave rectifier use two diode as shown in figure (a) and (b).



(i) In which of the following figures, the p-n diode is forward biased



(ii) Draw the input and output waveform for full wave rectifier.

(iii) Name the process involved in the formation of p-n junction diode.

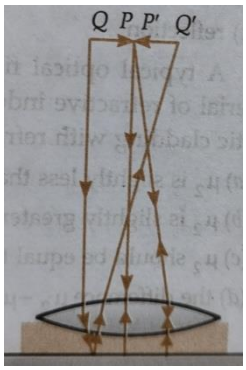
OR

Draw the V-I characteristic curve for p-n junction diode in forward and reverse bias .

Q35- Case Study

A lens is a piece of a refracting material bounded by two surfaces, at least one of which is a curved surface. Conversing and diverging are two type of lenses. A beam of light parallel to principle axis either converse to a point or appear to diverse from a point on the principle axis after refraction from the lens. This point is called focal point of the lens.

A biconvex lens (of refractive index 1.5) in contact with a liquid layer is placed on top of a plane mirror. A small needle with it tip on the principle axis is moved along the axis until its inverted image is found at the position of the needle. The distance of the needle from the lens is measures 45.0 cm. When the liquid is removed and experiment is repeated. The new distance between lens and needle is measured 30.0 cm.



(i) What is the focal length of convex lens.

(ii) What is focal length of liquid lens.

(ii) Calculate refractive index of liquid on top of mirror.

OR

A convex lens of focal length 30 cm made of material of refractive index 1.5 is dipped in water of refractive index 4/3. Calculate change in focal length of the lens.