PHYSICS

BOOKS - CBSE COMPLEMENTARY MATERIAL PHYSICS (HINGLISH)

2018 QUESTION PAPER (DELHI)

Section A

1. A proton and an electron travelling along parallel paths enter a region of uniform

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2. Name the electromagnetic radiations used for (a) water purification, and (b) eye surgery.

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3. Darw graphs showing variation of photoelctric current with applied voltage for two incident radiations of equal frequecny and

different intensities. Mark the graph for the radiaiton of higher intensity.

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4. Four nuclei of an elements undergo fusion to form a heavier nucles, with release of energy. Which of the two - the parent or the daughter nucleus - would have higher binding energy per nucleon ?

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Section B

1. Two elelctric bulbs P and Q have their resistance in the ratio of 1: 2. They are connected in series across a battery. Find the ratio of the power dissipation in these bulbs.

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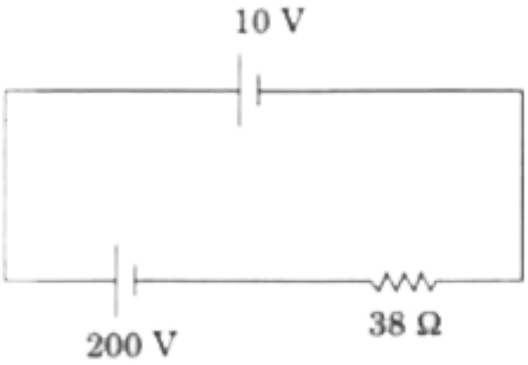
2. A 10 V cells of negligible internal resistance is connected in parallel across a battery of emf 200 V and internal resistance 38Q . As shown

in the figures , Find the value of current in the circuit



In a potentiometer arrangement for determining the emf . of a cell the balance point of the cell in open circuit is 350 cm. When a resistance of 9Q . is used in the external circuit of the cells the balance point shift to 300 cm. Determine the internal resistance of the cell.

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3. (a) Why are infrared waves often called heat waves? Explain.

(b) What do you understand by the statement, "Electromagnetic waves transport momentum"?

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5. If light of wavelength 412.5 nm is incident on each of the metals given below, which one will show photoelectric emission and why ?

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6. A carrier wave of peak voltage 15 V is used to transmit a message signal. Find the peak voltage of the modulating signal in order to have a modulation index of 60%.

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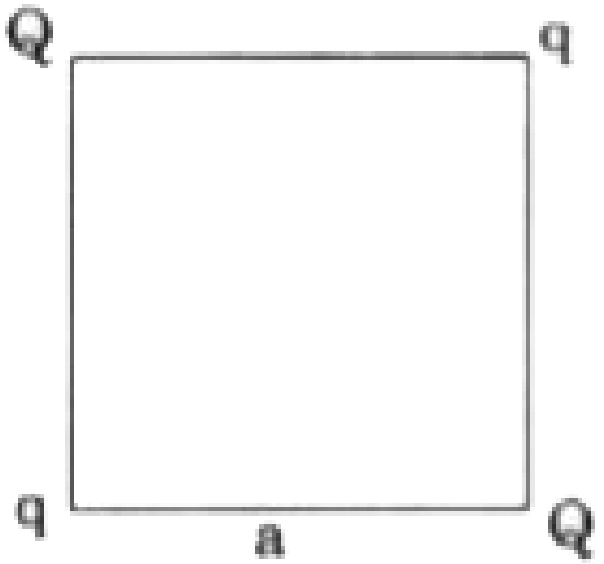
7. Four point charges Q.q Q and q are placed at the corners of a square side 'a' as shown in the figures.



Find the resultant electric force on a charge Q,

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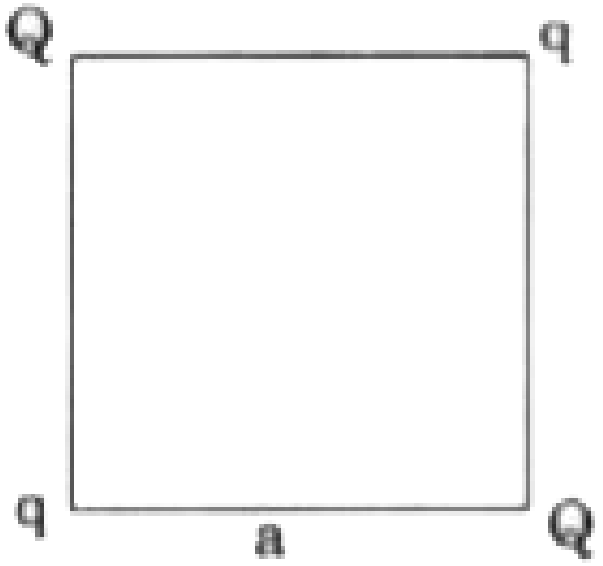
the figures.



Find the Potential energy of this system.

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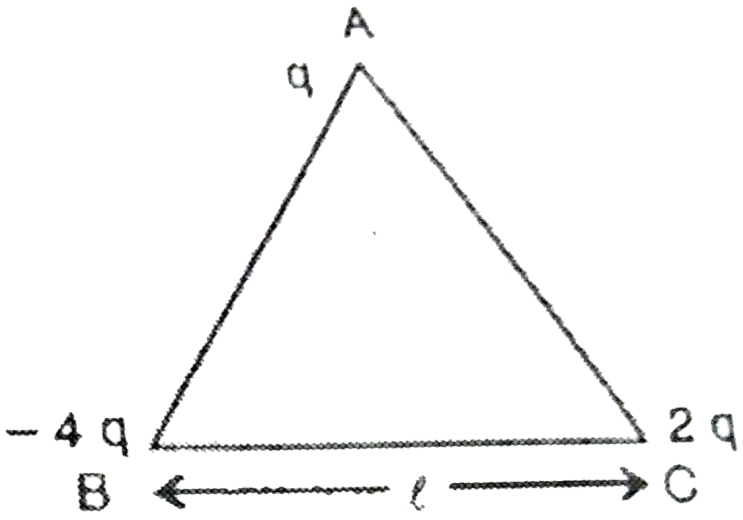
9. (a) Three point charges q,-4q and 2q are placed at the vertices of an equilateral triangle ABC of side 'l' as shown in the figure. Obtain the expression for the magnitude of the resultant electric force acting on the charge q.

(b) Find out the amount of the work done to separate the charges at infinite distance.



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10. Find out the amount of the work done to separate the charges at infinite distance.

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11. Define the term electrical conductivity of a metallic wire. Write its SI unit.

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12. Using the concept of free electrons in a conductior , derive the expression for the conductivity of a wire in terms of number density and relaxation time . Hence obtain the relation between current density and the applied electric field E.

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13. A bar magnet of magnetic moment 6 J/T is aligned at 60° with a uniform external magnetic field of 0.44 T. Calculate (a) the work

done in turning the magnet to align its magnetic moment (i) normal to the magnetic field, (ii) opposite to the magnetic field, and (b) the torque on the magnet in the final orientation in case (ii).

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14. The torque on the magnet in the final orientation

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15. (a) An iron ring of relative permeability μ_r has windings of insulated copper wire of n turns per metre. When the current in the windings is I, find the expression for the magnetic field in the ring.

(b) The susceptibility of a magnetic material is 0.9853. Identify the type of magnetic material. Draw the modification of the field pattern on keeping a piece of this material in a uniform magnetic field.

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17. Show using a proper diagram how unpolarised light can be linearly polarised by reflection from a transparent glass surface.

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18. (a) Show using a proper diagram how unpolarised light can be linearly polarised by reflection from a transparent glass surface.

(b) The figure shows a ray of light falling normally on. the face AB of an equilateral glass prism having refractive index 3/2, placed A in water of refractive index 4/3. Will this ray suffer total internal reflection on striking the face AC? Justify your answer.

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19. (a) If one of two identical slits producing interference in Young's experiment is covered with glass so that the light intensity passing through it is reduced to 50%, find the ratio of the maximu and minimum intensity of the fringe in the interference pattern.

(b) What kind of fringes do you expect to observe if white light is used instead of monochromatic light ?

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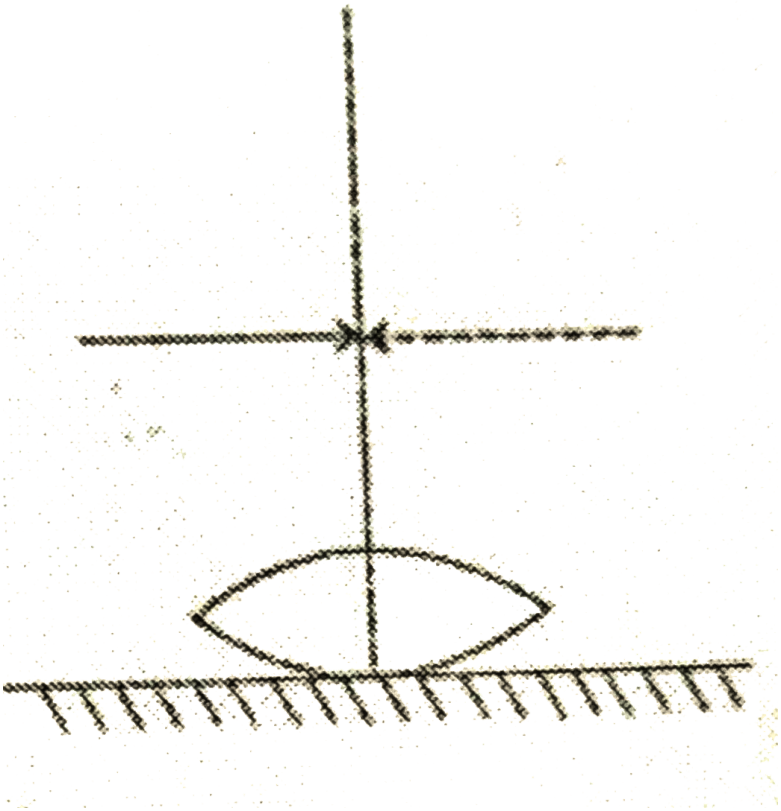
21. A symmetric biconvex lens of radius of curvature R and made of glass of refractive index 1.5, is placed on a layer of liquid placed on top of a plane mirror as shown in the figure. An optical needle with its tip on the principal axis of the lens is moved along the axis until its real, inverted image coincides with the needle itself. The distance of the needle from the lens is measured to be x. On removing the liquid layer and repeating the experiment, the distance is found to be y. Obtain the expression for the refractive index

of the liquid in terms of x and y.



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22. (a) State Bohr's postulate to define stable orbits in hydrogen atom. How does de Broglie's hypothesis explain the stability of these orbits ?

(b) A hydrogen atom initially in the ground state absorbs a photon which excites it to then n = 4 level . Estimate the frequeny of the photon.

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24. (a) Explain the processes of nuclear fission and nuclear fusion by using the plot of binding energy per nucleon (BE/A) versus the mass number A.

(b) A radioactive isotope has a hald -life of 10 years. How long will it take for the activity to reduce to 3.125%.

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25. A radioactive isotope has a half-life of 10 year.How long will it take for the activity to reduce to 3-125% ?

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26. (a) A student wants to use tow p-n junction diodes to convert alternating current in to direct curent draw the labelled circuit diagram she would use and explain how it works

(b) give the truth table and circuit symbol for NAND gate

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Section E

1. Define electric flux. Is it a scalar or a vector quantity?

A point charge q is at a distance of d/2 directly above the centre of a square of side , as shown in the figure .Use Gauss, law to obtain the

expression for the electric flux through the square.

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2. If the point charge is now moved to a distance 'd' form the centre of the square and the side of the square is doubled explain how the electric flux will be affected.

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3. Using Gauss's law, derive an expression for the electric field intensity at any point near a uniformly charged thin wire of $charge/length = \lambda C/m.$

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4. Draw a graph to show the variation of E with perpendicular distance r from line of charge.

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5. Find the work done in the bringing a charge q from perpendicular distance from the line of charge .

A device X is connected an ac source of voltage $V = V_0 \sin \omega t$. The current through X is given as $I = I_s \sin\left(\omega t + \frac{\pi}{2}\right)$

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6. Identify the device X and write the expression for its rectance

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7. Draw graph showing variation of voltage and current with time over one cycle of ac.for X

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8. How does the reactance of the device X vary with frequency of the ac? Show this variation graphically?

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9. Draw the phasor diagram for the devices X.

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10. Draw a ray diagram to show image formation when the concave mirror produces a real inverted and magnified image of the object

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11. Obtain the mirror formula and write the expression for the linear magnification.

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12. Explain two advantage of a reflecting telescope over a refracting telescoope.

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13. Define a wavefront . Using Huygens principle ,verify the laws of reflection at a plane surface.

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14. In a single slit diffraction experiment ,the width of the slit is made double the originals width.How does this affect the size and intensity of the central diffraction band ? Explain.

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15. When a tiny circular obstacle is placed in the path of light from distant source. A bright spot is seen at the centre of the obstacle . Explain why.

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