BVN

Name Anandita Class & Section _____ Roll No. _____

FIRST TERMINAL EXAMINATION-2014-2015

Class-XII

Subject-Physics

Time Allowed : 3 Hrs. **M.M. : 70**

Please Check the Total Marks

Do not write any answers on the questions paper. Check the total marks.

General Instructions :

(i) *All questions are compulsory.*

(ii) *There is no overall choice. However an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks. You have to attempt only one of the choices in such questions.*

(iii) *Question numbers 1 to 5 are very short answer type questions, carrying one mark each.*

(iv) *Question numbers 6 to 10 are short answer type questions, carrying two marks each.*

(v) *Question numbers 11 to 22 are also short answer type questions, carrying three marks each.*

(vi) *Questions numbers 23 is a value based question, carrying 4 marks.*

(vii) *Questions numbers 24 to 26 are long answer type questions, carrying five marks each.*

(viii) *Use of calculators is not permitted.*

Q1. Charges of magnitudes 2Q and –Q are located at a points (a, 0, 0) and (4a, 0, 0). Find the ratio of the flux of electric field, due to these charges, through concentric spheres of radii 2a and 8a centered at the origin. (1)

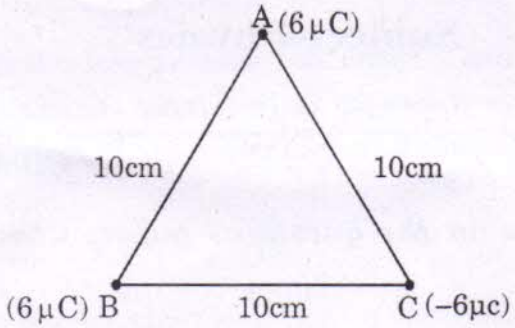
Q2. Two conducting wires X and Y of same diameter, but different materials are joined in series across a battery. If the number density of electrons in X is twice that in Y, find the ratio of drift velocity of electrons in the two wires. (1)

Q3. Draw a graph showing variation of 'Intensity of magnetisation' with 'magnetising field intensity' for a ferromagnetic substance. (1)

Q4. Mention two uses of eddy currents. (1)

Q5. A ray of light after refraction through a convave lens travels parallel to its principal axis. By drawing a ray diagram state the condition for it to occur ? (1)

Q6. Find the amount of work done in arranging the three point charges, on the vertices of an equilateral triangle ABC, of side 10cm, as shown in fig.



(2)

Q7. You are given n resistors each of resistance r. These are first connected to get minimum possible resistance. In the second case, these are again connected differently to get maximum possible resistance. Compute the ratio between the minimum and maximum value of resistance so obtained. (2)

Q8. Write the relation for current sensitivity and voltage sensitivity of a moving coil galvanometer. Using these relations, explain the fact that increasing the current sensitivity may not necessary increase the voltage sensitivity. (2)

OR

Using the relation for potential energy of a current carrying planer loop, in a uniform magnetic field, obtain the expression for the work done in moving the planer loop from its unstable (equilibrium) position to its stable (equilibrium) position. (2)

Q9. A wire AB is carrying a current of 12 A and is lying on the table. Another wire CD, carrying a current of 5A, is arranged just above AB at a height of 1 mm. What should be the weight, per unit length of this wire, so that CD remains suspended at its position ? Indicate the direction of current in CD. (2)

Q10. An electric heater is connected, turn by turn, to d.c. and a.c. sources of equal voltages. Will the rate of heat production be same in the two cases ? Explain. (2)

Q11. Define the term 'Electric Field intensity'. (3)

Two charged conducting spheres of radii a and b are connected to each other by a wire. What is the ratio of electric fields at the surfaces of the two spheres? (3)

Q12. A dielectric slab of thickness 't' is introduced, without touching, between the plates of a parallel plate capacitor, separated by a distance 'd' (t<d). Derive an expression for the capacitance of capacitor. (3)

Q13. Define the term resistivity of a conductor. Give its SI unit. Show the resistance R of a conductor in given by $\frac{ml}{ne^2\tau A}$ where symbols have their usual meanings. (3)

Q14. (a) If the magnetic monopoles were to exist, how would the Gauss Law of magnetism get modified ?

(b) How will the angle of dip vary when one goes from a place, where the acceteration due to gravity is maximum, to a place where it is minimum, on the surface of earth ? (3)

Q15. Identify the class of materials for which :

(i) $-1 \leq \chi < 0$

(ii) $0 < \chi < n$ ($n \rightarrow$ small positive no.)

(iii) Write the range of relative magnetic permeability for these materials.

(iv) Also draw the pattern of magnetic field lines when these materials are placed in an external magnetic field. (3)

Q16. Obtain an expression for mechanical power required to move a conductor of length l with a uniform speed v in a direction perpendicular to its length, when a uniform magnetic field B is acting normally to the plane containing l and v. Where does this power go ?

OR

Name the factor which is responsible for the production of induced emf in a coil. Derive an expression for the self-inductance of a long air-cored solenoid of length l and number of turns N. (3)

Q17. (a) Draw a phasor diagram for a series LCR circuit when capacitive reactance exceeds the inductive reactance.

(b) Hence deduce a relation for the impedance of the circuit. (3)

Q18. (a) Give one difference between conduction current and displacement current.

(b) A capacitor of capacitance C, is being charged up by connecting it across a d.c. voltage source of voltage V. How do the conduction and displacement currents, in this set-up compare with each other :

(a) during the charging up process ?

(b) after the capacitor gets fully charged ?

Explain. (1+2=3)

9.1×10^{-31} 1.6×10^{-19}

Q19. Name the radiations of electromagnetic spectrum which are used in

(i) warfare to look through fog.

(ii) RADAR and geostationary satellite

(iii) Studying the structure and properties of atoms and molecules.

Q20. A 5cm. long needle in placed 10 cm from a convex mirror of focal length 40 cm. Find the position, nature and size of the image of the needle.

What happens to the size of image when the needle is moved farther away from the mirror ? (3)

Q21. (a) A ray of light incident on an euqilateral glass prism ($\mu_{glass} = \sqrt{3}$) moves parallel to the base of the prism, inside it. What is the angle of incidence for this ray ?

(b) Show by drawing a ray diagram, how a totally reflecting prism may be used to invert the image without changing its size and direction.

(c) What is the cause of dispersion in a prism ? (3)

Q22. How does the mutual inductance of a pair of coils change, when (i) distance between the coils is increased (ii) number of turns in each coil is decreased (iii) Relative orientation is changed from perpendicular to parallel ? Justify each answer. (3)

Q23. Alka and her sister were watching a movie in which the phenomenon of aurora borealis was shown. Alka could not believe her eyes that such a colourful display could be created by nature. She went to the library, but could not find the right book. So she consulted her teacher who guided her. Hence, Alka understood that during a solar flare, a large number of electrons and protons are ejected from the sun. Some of these get trapped in the earth's magnetic field and move in a helical path along the field lines. As the density of the field lines increases near the poles, these particles collide with atoms and molecules of the atmosphere emitting green and pink light. Alka shared this knowledge with her class when they studied the chapter of moving charges in magnetic field.

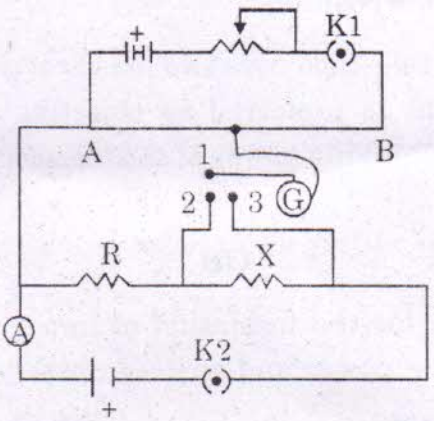
(a) What values did Alka have ? Mention any two.

(b) What is the radius of the path of an electron moving at a speed of 3×10^7 m/sec in a magnetic field of 6 Gauss perpendicular to it ? What is its frequency? Calculate its energy in kilo electron volt. (1+3=4)

Q24. (a) A student makes a neat and tight potentiometer circuit to compare emfs of two primary cells yet it shows one sided deflection. Give two possible reasons for the same.

(b) A potentiometer circuit is set up as shown. The potential gradient across the potentiometer wire in 0.025 V/cm & the ammeter present in the circuit

reads 0.1 A, when the two way key is completely switched off. The balance point when the key between the terminals (i) 1 and 2 (ii) 1 and 3 is plugged in, are found to be at lengths 40 cm and 100 cm respectively. Find the values of R and X.

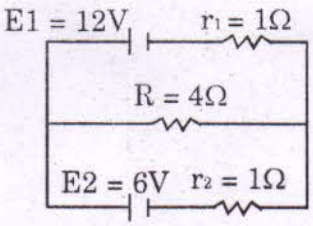


(2+3=5)

OR

(a) Why the grouping of cells is required ? What type of grouping should be used when the net internal resistance of cells is much smaller than the external resistance in the circuit ?

(b) Find the potential difference across each cell and the rate of energy dissipated in R.



(2+3=5)

Q25. (i) With the help of a labelled diagram, describe briefly the underlying principle and working of a step up transformer.

(ii) Write any two sources of energy loss in a transformer.

(iii) A step up transformer converts a low input voltage into a high output voltage. Does it violate the law of conservation of energy ? Explain.

(3+1+1=5)

OR

(i) State the principle of AC generator.

(ii) Show its construction in a labelled diagram.

(iii) Using Fleming's rule, explain how the current direction is reversed.

(iv) Obtain the expression for emf generated.

(v) State one limitation of this device. (1+1+1+1.5+0.5=5)

Q26. (a) Draw a diagram for the formation of image by an astronomical telescope in normal adjustment position.

(b) An astronomical telescope uses two lenses of power 10D and 1D. State with reason which lens is preferred as objective and which one as eyepiece. Calculate the magnifying power of the telescope if the final image is formed at near point. (2+2+1=5)

OR

(a) Draw a diagram for the formation of image by a compound microscope. Define magnifying power and write an expression for it.

(b) If you are given three convex lenses of short aperture having powers 4D, 12D and 25D respectively, state with reason which one will you select as an objective and which one as eyepiece for constructing a compound microscope. (2+1+2=5)