SHRI SHIKSHAYATAN SCHOOL

MID-TERM EXAMINATION –2017

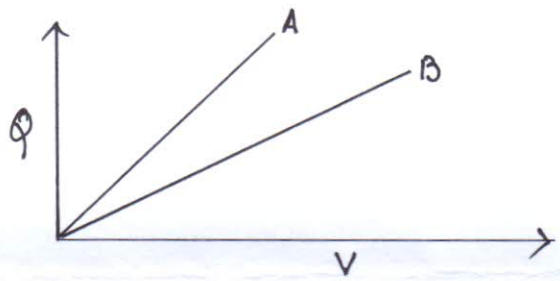
CLASS –XII ; SUBJECT – PHYSICS (042)

TIME – 3 Hours ; MARKS -- 70

- *All questions are compulsory. There are 26 questions in all*
- *This paper has five sections: A,B,C,D,E*
- *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*
- *There is no overall choice. However internal choices have been provided in some questions*

SECTION – A

1. Define the term mobility of charge carriers in a conductor.Write its S.I unit. (1/2+1/2)
2. How does the angle of minimum deviation of a glass prism vary, if the incident violet light is replaced by red light? (1)
3. Ni and Cu wires of same length and same radius are connected in series. Current I is passed through them .Which wire gets heated up more? Justify your answer. (1)
4. How much average power over a complete cycle does an a.c source supply to a capacitor? (1)
5. The given graph shows variation of charge Q and p.d V for 2 capacitors C(1) and C(2). Both of them have same plate separation but plate area of C(2) is greater than the other. Which line correspond to C(1) and why? (1)



SECTION – B

6. The short wavelength limit for Lyman series of hydrogen atom is 913.4 Å. Calculate the short wavelength limit for Balmer series of hydrogen spectra. (2)

7. A battery of emf E and internal resistance r Ω when connected across an external resistance of 5 Ω produces a current of 1A. When connected across a resistance of 11 Ω

,it produces a current of 0.5 A.Determine (i) the emf and (ii) the internal resistance of the cell. (1+1)

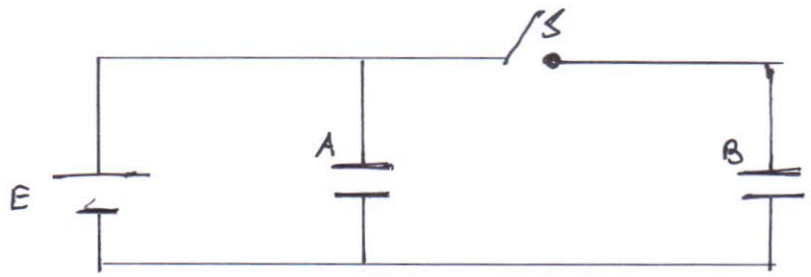
8. Monochromatic light of wavelength 589 nm is incident from air to water surface.If μ for water is 1.33, find the wavelength and frequency of the refracted light. (1+1)
9. Write the expression for Lorentz force on a particle of charge' q 'moving with velocity 'v 'in a magnetic field 'B '.Show that no work is done by this force on the charged particle. (1/2+ 1½)
10. Net capacitance of 3 identical capacitors in series is 1μF. What will be their net capacitance if connected in parallel? (2)

SECTION – C

11. (a) Write the principle of working of a Meter Bridge.

    (b) In a meter bridge , the null point is found at a distance of 40cm from A.If a resistance of 12 ohm is connected in parallel with S, the null point occurs at 50cm from A.Find the values of R and S. (1+2)

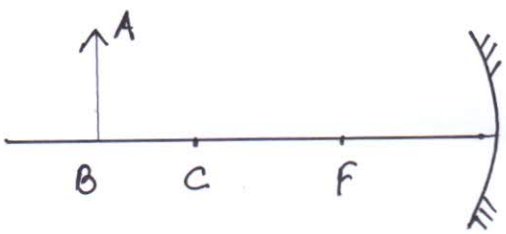
12. Two identical parallel plate capacitors A and B are connected to a battery of V volt with the switch S closed.The switch is now opened and the free space between the plates of the capacitors is filled with a dielectric of constant K. Find the ratio of the total electrostatic energy stored in both capacitors before and after the introduction of dielectric.



(3)

13. (a) State Biot-Savart law in vector form.
    (b)Two identical circular coils P and Q each of radius R and carrying current I are kept in perpendicular planes such that they have a common centre. Find the magnitude and direction of the magnetic field at the common centre of the coils. (1+2)

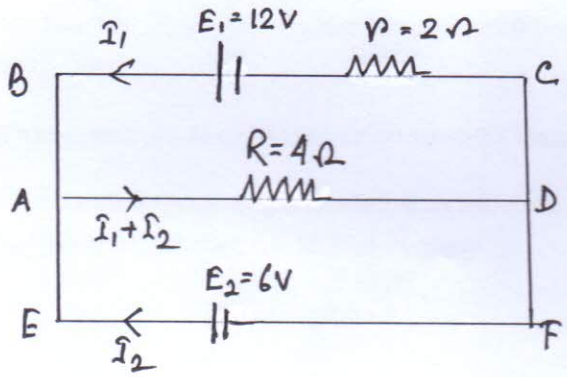
14. Write Einstein's photoelectric equation with proper explanation of symbols.
    Write the 3 salient features observed in photoelectric effect which can be explained using this equation. (1½ + 1½)
15. An object AB is placed in front of a concave mirror as shown in the fig.



(i) Complete the ray diagram showing the image formation of the object.

(ii) How will the position and intensity of the image be affected if the lower half of the mirror's reflecting surface is painted black. (2 + ½ +½)

16. In the electric network shown in the fig , use Kirchoff's rules to calculate the power consumed by the resistance R = 4 ohm.



(3)

17. (a) Using Bohr's postulates , derive the expression for the total energy of the electron in the stationary state of the Hydrogen atom.

(b)Explain the significance of the negative sign in the energy expression. (2+1)

18. Give 6 points to distinguish between a Paramagnetic and a Diamagnetic substance. (3)

19. The currents flowing in the 2 coils of self inductance L_3 = 16mH and L_3= 12mH are increasing in the same rate . If the power supplied to the 2 coils are equal , find the ratio of (i) induced voltages, (ii) the currents and (iii) the energies stored in the coils at a given instant. (1+1+1)

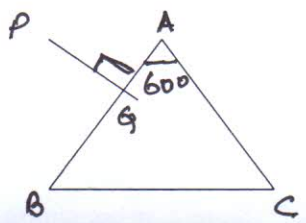
20. Using Gauss's theorem , deduce an expression for the electric field intensity at any point due to a thin infinitely long wire of charge / length λ C/m (3)

21. (a) Find the ratio of the de- Broglie wavelengths, associated with

(i) protons , accelerated through a potential of 128V, and (ii) α- particle , accelerated through a potential of 64 V.

(b) Show graphically the variation of the de-Broglie wavelength with the potential through which an electron is accelerated from rest. (2+1)

22. A ray PQ is incident normally on the face AB of a triangular prism of refracting angle of 60º , made of transparent material of R.I 2/√3, as shown in the fig.Trace the path of the ray as it passes through the prism. Also calculate the angle of emergence and angle of deviation (2+1)



SECTION – D

23. Bala and Rama of class X students ,were assigned a project based on magnetism.In their project work , they had calculated the value of earth's magnetic field.When they submitted their project for verification, Mr Santosh , their Physics teacher corrected the mistakes.He also suggested few books which could be use to them.

(a) What values did Mr. Santosh exibit towards his students?

(b) Mention the three magnetic elements required to calculate the value of the earth's magnetic field, and draw a neat diagram to explain them.

(1+3)

SECTION- E

24. (a) Draw a labelled diagram of an a.c generator and state its working principle.

(b) How is magnetic flux linked with the armature coil changed in a generator?

(c) derive the expression for maximum value of the induced emf and state the rule that gives the direction of induced current.

(d) Show the variation of the emf generated versus time of rotation of armature coil.

(2+1+1+1)

OR

24. (a) With the help of a labeled diagram , describe briefly the underlying principle and working of a step-up transformer.

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

(c) A step-up transformer converts a low input to high output voltage. Does it violet law of conservation of energy? Explain.

(3+1+1)

25. (a) Under what condition does a biconvex lens of glass having a certain R.I act as a plane glass sheet when immersed in a liquid.

(b)When light travels from a rarer to denser medium, its speed decreases.Does it imply a decrease in the energy carried by the light wave ? Justify your answer.

(c) A small bulb (point source) is placed at the bottom of a tank containing water to depth of 80 cm. Find out the area of the water surface through which light from the bulb can emerge. Take the R.I of water is 4/3.

(1+1+3)

OR

25. (a) Draw a ray diagram to show refraction of a ray of monochromatic light passing through a glass prism.

Deduce the expression for the R.I of glass in terms of angle of prism and angle of minimum deviation.

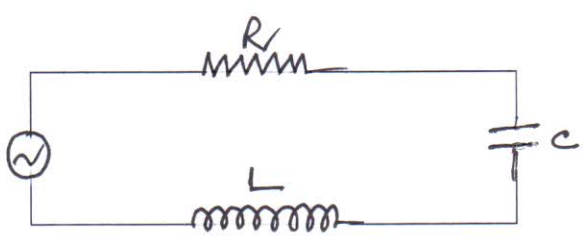
(b) Explain briefly how the phenomenon of total internal reflection is used in fibre optics. (1+2+2)

26.(a) Derive an expression for the impedance of a series LCR circuit connected to an AC supply of variable frequency.

(b) Plot a graph showing variation of current with the frequency of applied voltage.Explain how the phenomenon of resonance in the circuit occurs.What is Q factor? (2+1+1+1)

OR

26. (a) The figure shows a series LCR circuit with L=5H, C=80μF, R= 40Ω connected to a variable frequency of 240V source. Calculate



(i) The angular frequency of the source which drives the circuit at resonance.

(ii) The current at the resonating frequency

(iii) The rms potential drop across the capacitor at resonance.

(b) Predict your observation when the system (a lamp is in series with a capacitor) is connected first across a d.c and then an a.c source.What happens in each case if the capacitance of the capacitor is reduced.

(3+1+1)
