PHYSICS

2012 – 2013: CLASS XII

ALL SUBJECTIVE ASSESSMENT TEST ASAT

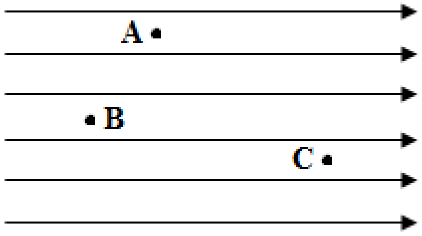
MM MARKS: 70] *[TIME: 3 HOUR*

General Instructions:

- ***All the questions are compulsory***
- ***Question no. 1 to 8 consist of one marks questions, which are very short answer type questions.***
- ***Question no. 9 to 18 consist of two marks questions, which are short answer type questions.***
- ***Question no. 19 to 27 consists of three marks questions, which are long answer type questions.***
- ***Question no. 28 to 30 consists of five marks question, which are very long answer type question.***
- ***There is no overall choice given. However internal choice is given in three questions of two marks, tree questions of three marks and all the three questions of five marks.***
- ***You have to attempt only one choice in such question.***
- ***Use of calculators is not permitted.***
- ***You may use the value of the following physical constants:***

Speed of light (c)	**3×10^8m/s**
Plank's constant(h)	**6.626×10^{-34}Js**
Electric charge (e)	**1.602×10^{-19}C**
Permeability for free space	**$4\pi \times 10^{-7}$Tm/A**
$\frac{1}{4\pi\varepsilon_0}$	**9×10^9Nm^2/C^2**
Mass of Neutron (m_N)	**1.67×10^{-27}Kg**
Mass of proton (m_P)	**1.67×10^{-27}Kg**
Mass of electron (m_e)	**9.10×10^{-31}Kg**
Boltzmann's constant (k)	**1.38×10^{-23}J/K**
Avogadro number (N_A)	**6.022×10^{23}/ mole**

1. Figure given below show three points A, B and C in uniform electrostatic field. At which points will the electric potential be maximum and the intensity of electric field is minimum.

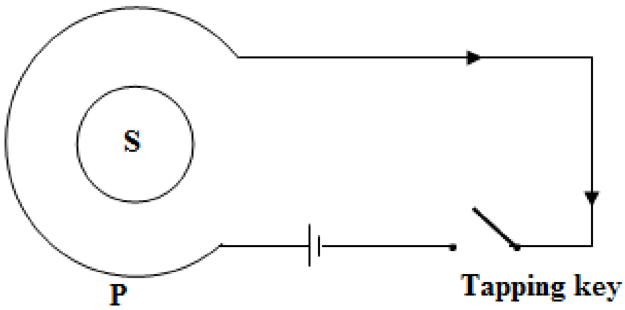


2. Identify the part of the electromagnetic spectrum which is :

a) Produced by bombarding a metal target by high speed electrons.

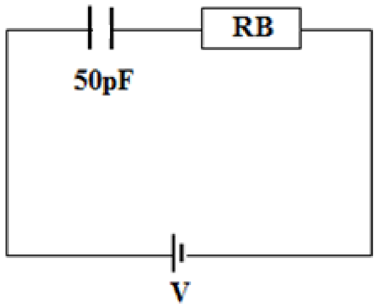
b) Suitable RADAR systems used in aircraft navigation.

3. Two coils P and Q are arranged as shown in the figure. What will be the direction of the induced current when switch is closed? What will be the direction when the switch is open?



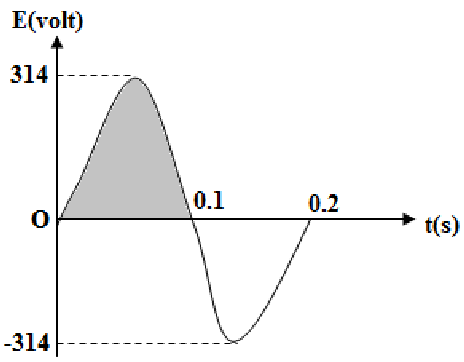
4. Nichrome and copper wires have same length and area of cross-section are connected in series, current is passed through them. Why does the nichrome wire get heated first?

5. Find the value of the current across the capacitor in CR circuit as shown in the figure.



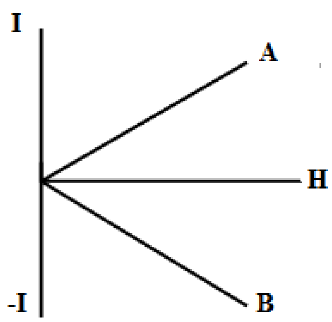
6. A magnetic dipole is placed in position of stable equilibrium in uniform magnetic field B. If it is rotated through 180^{o}, then what will be the amount of work done?

7. In the figure shows the variation of an alternating emf with time. What is the average value of the emf for the shaded part of the graph?



8. An electron moving with a velocity of 10^{7} m/s enters a uniform magnetic field 1T, along the direction parallel to the field. What will be the trajectory of the electron in this field?

9. The following figure shows the variation of intensity of magnetization versus the applied magnetic field intensity H , for two magnetic material A and B:



(a) Identify the materials A and B.

(b) Draw the variation of susceptibility with temperature for A and B.

10. Answer the following:

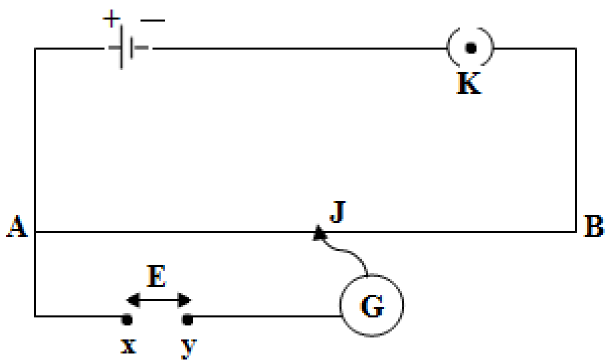
(a) Give the relation between the velocity of electromagnetic wave in vacuum and the permeability and permittivity of free space.

(b) Arrange the following in increasing order of frequency:
Microwaves ,infrared rays, cathode rays, α rays , X rays and β rays.

11. Three identical cells each of emf 2V and unknown internal resistance are connected in parallel. This combination is connected to a 5 ohm resistor. If the terminal voltage across the cells is 1.5V, what is the internal resistance of each cell?

OR

For the potentiometer shown in the figure, point x and y represent the two terminals of an unknown emfξ. A student observed that when the jockey is moved from A to B of the potentiometer wire, the deflection of the galvanometer remains constant in the same direction. What are the possible faults in the circuit that could result in this observation? If the galvanometer deflection at B is (i) more (ii) less than that at end A, which of the two faults, listed above would be there in the circuit. Give reasons for your answer.



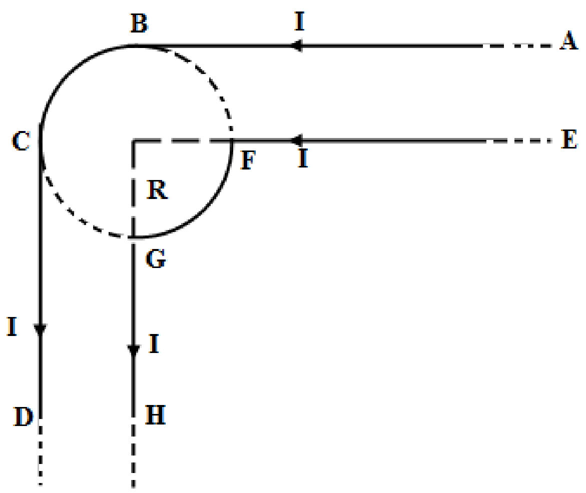
12. The two rails of a railway track insulated from each other and ground are connected to a milli –voltmeter. What is the reading of the voltmeter when a train travels at a speed of 180Km/hr along the track , given that the vertical component of earth's magnetic field is 3×10^{-5}Wb/m^2 and the rails are separated by 1m.

OR

A fan blade of length 2a rotates with a frequency f cycles per second perpendicular to the magnetic field B. Find the potential difference between the centre and the end of the blade.

13. Show that the capacitance od a parallel plate capacitor increases when a dielectric slab is inserted between the plates. Assume the slab thickness less than the plate separation. Hence explain what will happen if the thickness of the slab becomes equal to the separation between the plates.

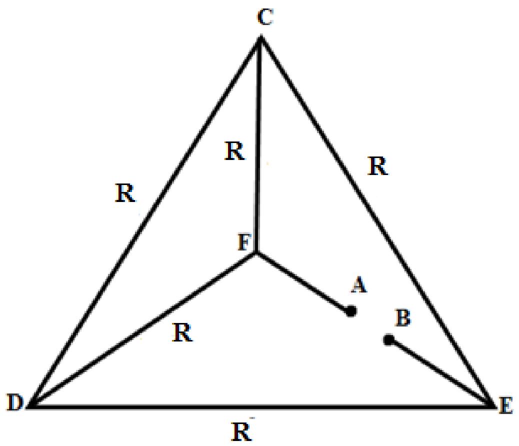
14. Two infinitely long wires carry equal current I. each wire follows a 90^o arc along the circumference of the same circle of radius R as shown in the figure. Find the magnetic field induction at centre O.



15. A potential difference of 2V is applied between the points A and B Shown in the network where R = 2Ω Calculate:

(a) The equivalent resistance of the network between the points A to B.

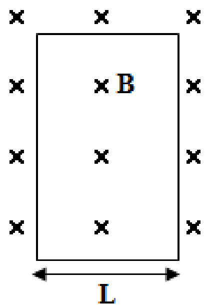
(b) The magnitude of the current flowing in arm AFDEB.



16. State Lenz's law. A copper coil L wound on a soft iron core and a lamp B are connected to a battery E through a tapping key K. When the key is closed, the lamp glows dimly. But when the key is suddenly opened, the lamp flashes for an instant to much greater brightness. Explain.

OR

In the figure show a rectangular, conducting loop of length l, mass m and resistance R placed partly in a perpendicular magnetic field B .With what velocity should it be pushed downwards so that it may continue to fall without any acceleration.



17. State the ampere circuital law and hence derive the magnetic field induction inside a conductor and at the end of the solenoid.

18. A circuit draws a power of 550 W from a 220V, 50HZ. The power factor of the circuit is 0.8. The current in the circuit lags behind the voltage. Show that a capacitor of about $\frac{1}{42\pi} \times 10^{-2} F$ will have to be connected to bring it power factor to unity.

19. The oscillating magnetic field in a plane electromagnetic wave is given by :

$B_Y = (8 \times 10^{-6}) \sin[2 \times 10^{11} t + 300\pi x] T$

(a) Calculate the wavelength of the electromagnetic wave.

(b) Write down the expression for the oscillating electric field.

(c) Sketch a schematic diagram depicting electric and magnetic field for the given electromagnetic wave propagating in Z –axis.

20. Answer The Following:

(a) A coil n turns and radius R carries a current I. it is would and rewound to make another coil R/2, current remaining the same. Calculate the ratio of magnetic moments of the new oil and the original coil.

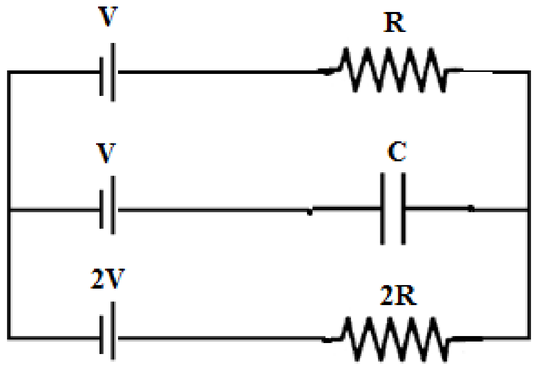
(b) A compass needle pivoted about the horizontal axis and forced to move in the magnetic meridian, it is observed along (i) Vertical direction of A (ii) Horizontal direction of B. Give the value of angle of dip at these two places.

21. In a metre bridge experiment, two resistances P and Q are connected in series in the left gap. When the resistance in the right gap is 50 ohm, the balance point is at the centre of the slide wire. If P and Q are connected in parallel in th left gap, the resistance in the right gap has to be changed to 12 ohm so as to obtain the balance point in the same position. Find P and Q.

OR

(a) What do you mean by the sensitivity of a Wheatstone bridge?

(b) In the given circuit, find the potential drop across the capacitor?



22. Explain how can we convert a galvanometer into an ammeter and hence show that shunt has negligible resistance. A galvanometer with a scale divided into 100 equal divisions has a current sensitivity of 10 divisions per mA and voltage sensitivity of 2 divisions per mV. What adoptions are required to read 5A for full scale?

OR

State biot- savart’s law and apply it to find the magnetic field due to a circular current carrying loop at a point on the axis of the loop, hence find the magnetic field induction at the centre of the loop.

23. An inductor 200mH, capacitor 500μF, resistor 10 ohm are connected in series with 100V, variable frequency ac source. Calculate the :

(a) Frequency at which the power factor of the circuit is unity

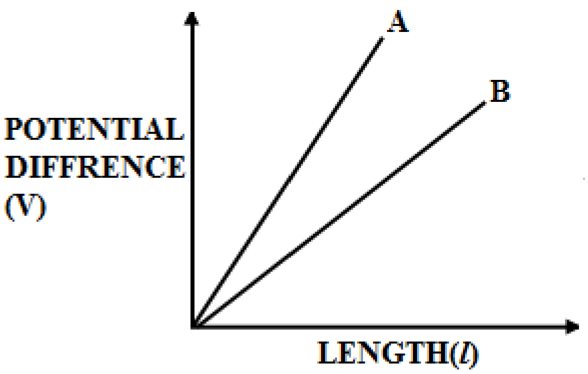
(b) Current amplitude at this frequency

(c) Quality factor of the circuit

24. What do you understand by mutual inductance? Derive the expression for the mutual inductance of two long coaxial solenoids. State the factors on which mutual inductance depend hence explain when it is maximum and minimum with respect to the orientation of the coils.

25. State the principle of potentiometer. With the help of a circuit diagram, explain how can a potentiometer be used to measure the internal resistance of a primary cell.

The variation of potential difference V and length l in case of two potentiometers A and B are shown. Which of these two prefer for comparing the emf’s of two primary cells?



26. State gauss theorem of electrostatics hence derive the expression for the electric field E (i) to the left of the sheets (ii) between the sheets, (iii) to the right of the sheets for two infinite parallel planes having uniform charge density of$\pm$ $\boldsymbol{\sigma}$**.**

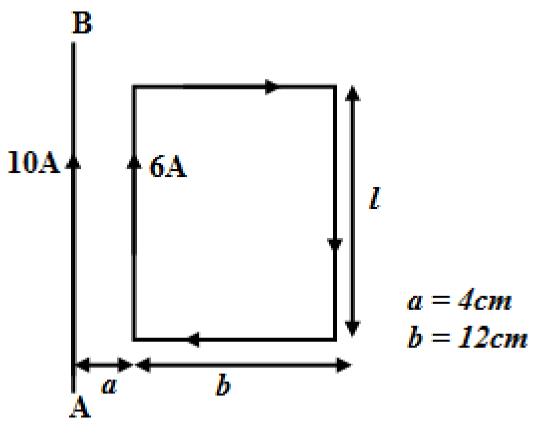
OR

An electric dipole of dipole moment p is placed in a uniform electric field E. Derive th expression for the torque experienced by the dipole. Identify two pair's perpendicular vectors in the expression. Show diagrammatically the orientation for which the torque is:

(a) Maximum
(b) Half the maximum value
(c) Zero

27. A square loop PQRS carrying a current 6A is placed near a long wire AB carrying a current 10A, as shown in the figure.

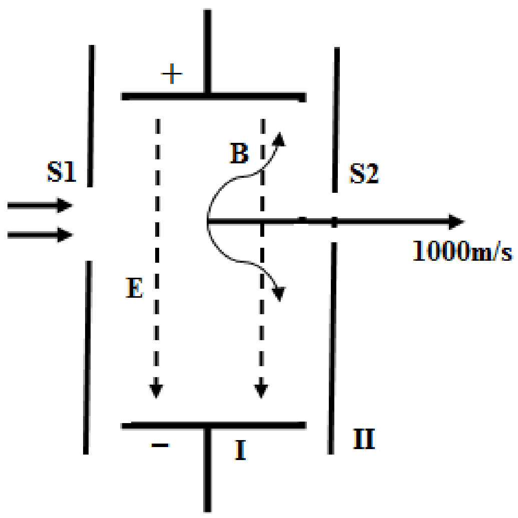
(a) Show that the magnetic force acting on the part PQ is equal and opposite on the part RS.
(b) Find the net magnetic force on the square loop.



28. Answer the following:

(a) What is a cyclotron? Discuss the principle, construction and working with the help of a well labeled diagram. Derive the expression for the maximum kinetic energy acquired by the accelerated charged particles. Give any one limitation and its remedy.

(b) A stream of charged particles possessing enters a region I after passing through the slit S_1. In region I there exists crossed (perpendicular) electric field and magnetic field. The electric field has a magnitude of 100V/m. we want the particles emerging from S_2 into region II to have a fixed velocity 1000m/s. what should be the value of the uniform magnetic field in region I.

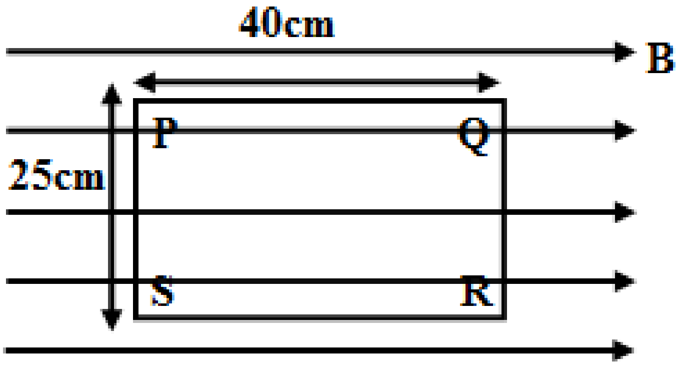


OR

Answer the following:

(a) Derive the expression for the torque acting on a current carrying loop suspended in a uniform magnetic field and hence describe the principle of moving coil galvanometer with a well labeled diagram. Why is phosphor bronze used in making the suspension wire?

(b) A rectangular coil PQRS is placed in a uniform magnetic field in the figure. Find the torque on the coil when it carries a current of 2A. The magnetic field B is 0.02T.



29. Answer the following:

(a) Define electric potential at a point. When kept in an electric field, does a proton move from lower to higher potential or vice-versa. Give reason.

(b) A large hollow metallic sphere A is charged positively to a potential of 100V and a small sphere B to a potential of 50V. Now B is placed inside A and they are connected with a wire. In which direction will the charge flow?

(c) Draw 3 equipotential surfaces corresponding to field that uniformly increases in magnitude but remains constant along Z – direction. How are these surfaces different from that of a constant electric field along Z axis?

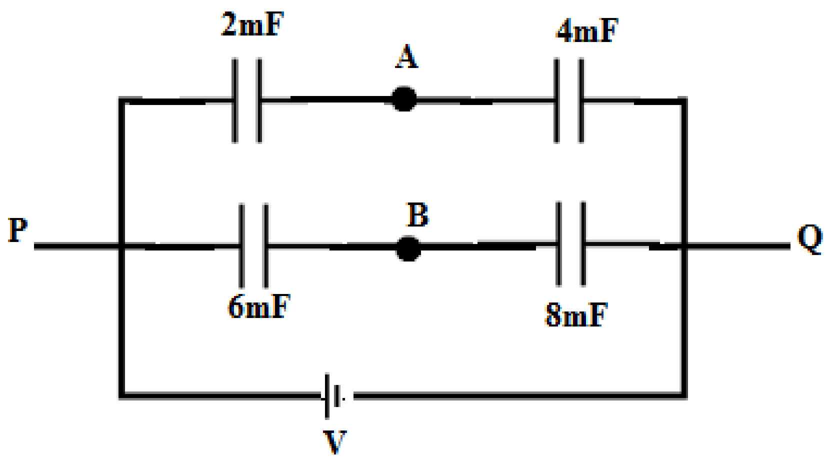
OR

Answer the following:

(a) A 80µF capacitor is charged by a 50V battery. The capacitor is disconnected from the battery and then connected across another uncharged 320µF capacitor. Calculate the charge on the second capacitor.

(b) Sketch a graph to show how the capacitance C varies the charge Q given to it.

(c) Determine the potential difference V_A - V_B between points A and B of the circuit shown in the given figure. Under what condition will it be zero?



30. An ac voltage $\xi = \xi_o \sin\omega t$, is applied across series combination of an inductor L, Capacitor C and a resistor. Use the phasor diagram to obtain the expressions :(i) impedance of the circuit (ii) the phase angle between the applied voltage and the resulting current in the circuit. Hence state the resonance condition of LCR circuit and show that the current:

(i) Leads the voltage when $\omega < \frac{1}{\sqrt{LC}}$.

(ii) Is in phase with the voltage when $\omega = \frac{1}{\sqrt{LC}}$.

(iii) Lags the voltage when $\omega > \frac{1}{\sqrt{LC}}$.

OR

Answer the following:

(a) Prove mathematically that the average value of alternating current over one complete cycle is zero.

(b) When a circuit element X is connected across a n ac source, a current of $\sqrt{2}$A flows through it and the current I in phase with the applied voltage. When another circuit element Y is connected across the same ac source, the same current flows in the circuit but it leads the voltage by an angle of π/2 radians.

(i) Name the circuit elements X and Y.

(ii) Find the current that flows in the circuit when the series combination of X and Y is connected across the same ac voltage.

(iii) Plot the graph showing the variation of the net impedance of this series combination of X and Y as a function of angular frequency of the applied voltage.