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INDIAN SCHOOL SOHAR
SECOND TERM EXAM- 2016
PHYSICS – THEORY

CLASS: XII **MARKS:70**
DATE: 26 /11/2016 **TIME: 3hrs**

General Instructions:
1. All questions are compulsory.
2. There are 26 questions in all .Questions 1 to 5 carry one mark each, questions 6 to 10 carry two marks each, questions 11 to 22 carry three marks each. Question 23 is a value based question carrying four marks and questions 24 to 26 carry five marks each.
3. There is no overall choice. However, internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each.
4. You have to attempt only one of the given choices in such questions.
5. Use of calculator is not permitted.
6. You may use the following physical constants wherever necessary.

SECTION-A

1.A proton is moving along positive X- axis in the presence of uniform magnetic field along positive Y –axis. What is direction of the force acting on it? (1)

2. Two wires of equal length, one of copper and the other of mangnin have the same resistance. Which wire is thicker ? (1)

3. Why does the sky appear blue? (1)

4. The a.c. current gain of a transistor is 120. What is the change in the collector current in the transistor whose base current changes by 100 μA ? (1)

5. Which part of electromagnetic spectrum is used in radar systems? (1)

SECTION-B

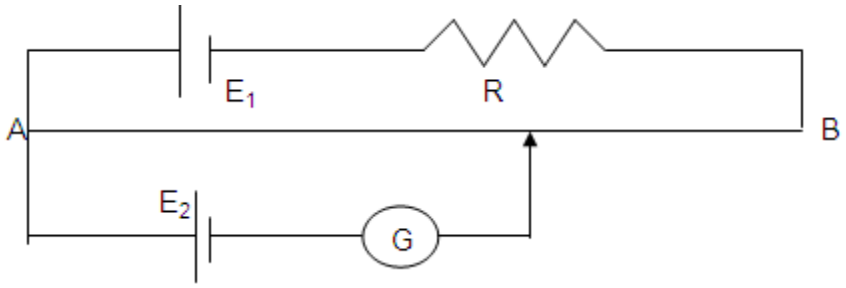
6.The force of attraction between two point charges placed at a distance "d" apart in a medium is "F". What should be the distance apart in the same medium so that the force of attraction between them becomes F/4. (2)

7. Identify the following electromagnetic radiations as per the wavelengths given below. Write one application of each.
(a) 10^{-3} nm
(b) 10^{-3} m (2)

8. Describe how a p-type semiconductor is formed with the help of diagram and energy band diagram. (2)

9. In the circuit diagram given below AB is a uniform wire of resistance 10 ohms and length 1m. It is connected to a series arrangement of cell E_1 of emf 2.0V and negligible internal resistance and a resistor R. Terminal A is also connected to an electrochemical cell E_2 of emf 100 mV and a

galvanometer G. In this set-up balancing point is obtained at 40 cm mark from A. Calculate the resistance R. If the E_2 were to have an emf of 300 mV where will you expect the balancing point to be?



OR

9**.** AB is 1 meter long uniform wire of 10 ohms resistance. The other data are as shown in the circuit diagram given below calculate
(i) potential gradient along AB, and
(ii) length AO of the wire, when the galvanometer shows no deflection.

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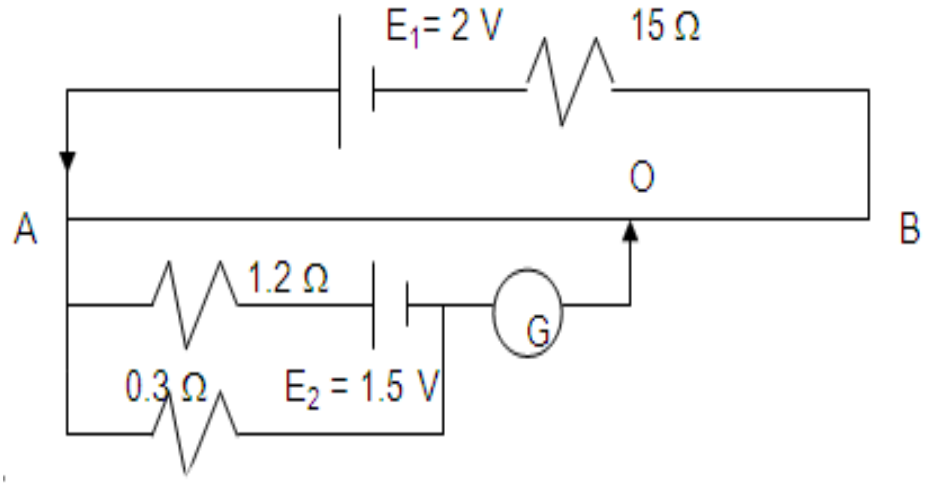


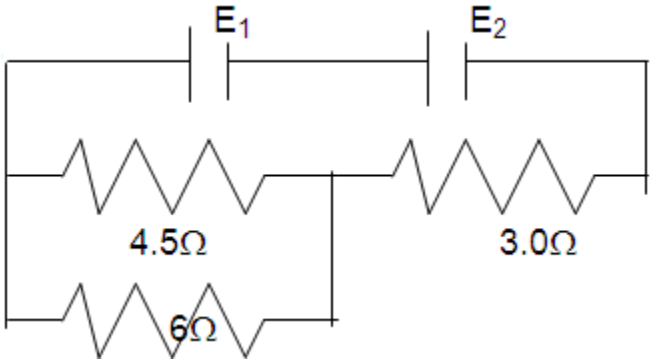
10.Explain, with the help of a ray diagram, the working of an astronomical telescope. (2)

SECTION-C

11.(i). Draw the general shape of the "transfer characteristics" of a transistor.
(ii) Which regions of this characteristic of a transistor are used when it works (a) as a switch (b) as an amplifier ?
(iii) Why is the output voltage of the CE amplifier opposite in face with the input voltage? (3)

12.What are eddy currents ? How are these minimized? Mention two application of eddy currents. (3)

13. (i)State Kirchhoff's rules.
(ii)In the circuit diagram given the cells E_1 and E_2 have EMF of 4 V and 8 V and internal resistance 0.5 ohm and 1 ohm respectively. Calculate the current in each resistance.



14. (a) Define an equipotential surface.
(b) Two points charge 3 μC and -3μC are placed at point A and B, 5 cm apart
(i)Draw the equipotential surface of the system
(ii)Why do the equipotential surfaces get close to each other near to potential charge? (3)

15.(i)Define torque acting on a dipole of dipole moment **P** placed in a uniform electric field **E** Express it in vector form and point out the direction along which it acts. (ii) What happens if the field is non uniform.(iii) What would happen if the external field is increasing (a) parallel to **P** and (b) antiparallel to **P.** (3)

16.(a) Explain the term electrostatic shielding.
(b) A charge of 8mC is located at the origin. Calculate the work done is taking a small charge of -2×10^{-9} C from a point P (0, 0, 3cm) to a point Q (0, 4cm, 0) via point R (0, 6cm, 9cm). (3)

17.(a) State Bohr postulate of hydrogen atom that gives the relationship for the frequency of emitted photon in a transition . (b) Use de-Broglie's hypothesis to write the relation for the n^{th} radius of Bohr orbit in terms of Bohr's quantization condition of orbital angular momentum. (3)

18.A short bar magnet placed with its axis at 30^0 with an external field of 800G experiences a torque of 0.016 Nm.

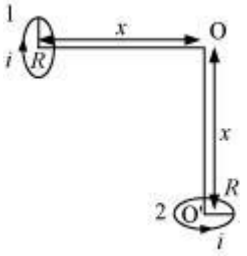
(a) What is magnetic moment of magnet ?
(b) What is work done in moving it from its most stable to most unstable position?
(c) The bar magnet is replaced by a solenoid of cross sectional area of 2×10^{-4} m ^{2} with 1000 turns ,but of the same magnetic moment. Determine the current flowing through the solenoid. (3)

19. A small compass needle of the magnetic moment M and moment of inertia I is free to oscillate in a magnetic field B. It is slightly disturbed from its equilibrium position and then released. Show that it executes simple harmonic motion. Hence, write the expression for its time period. (3)

20.Define drift velocity. A conductor of length of l is connected to a DC source of potential V. If the length of the conductor is tripled by gradually stretching it, keeping V constant how will

(a) Drift speed of electrons and
(b) The resistance of the conductor be affected ?Justify your answer. (3)

21. State the Biot-Savart law.Two small identical circular coils marked 1, 2 carry equal currents and are placed with their geometric axes perpendicular to each other as shown in the figure. Derive an expression for the resultant magnetic field at O.



(3)

22.Trace the rays of light showing the formation of an image due to a point object placed on the axis of a spherical surface separating the two media of refractive indices n_1 and n_2. Mention the relation between the distances of the object, the image and the radius of curvature from the central point of the spherical surface. Hence derive the expression of the lens maker's formula.

OR

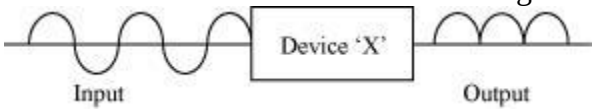
22.Draw the labelled ray diagram for the formation of image by a compound microscope.Derive the expression for the total magnification of a compound microscope. (3)

SECTION-D

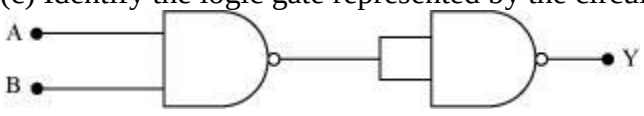
23. Lakshika used to go to her school by bicycle. She studied electromagnetic induction in her physics class. An idea occurred to her. She attached a small dynamo and a LED with the axle of the cycle. This way during the ride she enjoyed the glowing of LED.
(a) What values do you think are inculcated in Lakshika after understanding physics?
(b) Describe the construction and working of a LED. (4)

SECTION-E

24. (a) Explain the formation of depletion layer and potential barrier in a p−n junction.(b) In the figure given below the input waveform is converted into the output waveform by a device 'X'. Name the device and draw its circuit diagram.



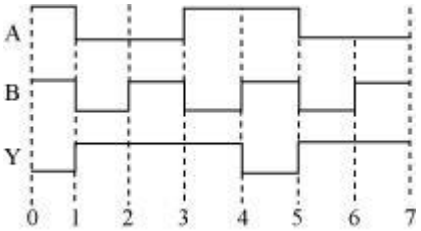
(c) Identify the logic gate represented by the circuit as shown and write its truth table.



OR

24.(a) With the help of circuit diagram explain the working principle of a transistor amplifier as an oscillator.(b) Distinguish between a conductor, a semiconductor and an insulator on the basis of energy band diagrams.
(c)The following figure shows the input waveforms (A, B) and the output waveform (Y) of a

gate. Identify the gate, write its truth table and draw its logic symbol. (5)



25.Describe briefly, with the help of a labelled diagram, the basic elements of an A.C. generator. State its underlying principle. Show diagrammatically how an alternating emf is generated by a loop of wire rotating in a magnetic field. Write the expression for the instantaneous value of the emf induced in the rotating loop.

OR

25.(a)Obtain the condition for resonance to occur.
(b) Define 'power factor'. State the conditions under which it is (i) maximum and (ii) minimum.
(c) Calculate the quality factor of a series LCR circuit with L=2.0 H, C=2μF and R = 10 ohms. Mention the significance of quality factor in LCR circuit. (5)

26.(a)State Huygens's principle. Show, with the help of a suitable diagram, how this principle is used to obtain the diffraction pattern by a single slit.
(b)Draw a plot of intensity distribution and explain clearly why the secondary maxima becomes weaker with increasing order (n) of the secondary maxima.

OR

26 (a).Draw a schematic diagram of a single optical fibre structure. On what principle does such a device work? Explain the mechanism of propagation of light signal through an optical fibre.
(b)Define the term 'resolving power' of an astronomical telescope. How does it get affected on (i) Increasing the aperture of the objective lens?(ii) Increasing the wavelength of the light used? Justify your answer in each case. (5)