INTERNATIONAL INDIAN SCHOOL DAMMAM

MODEL EXAMINATION JAN-2018

PHYSICS (SET A)

Class: XII

Max. Time: 3 hours. Max. Marks: 70

General Instructions:

i. All questions are compulsory. There are 26 questions in all.

ii. Question paper contains five sections: section A, section B, section C, section D and section E.

iii. 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

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

v. Use of calculators is not permitted. However you may use log tables if necessary.

vi. You may use the following values of physical constants wherever necessary.

vii. Attempt all parts of a question together. Symbols have their usual meaning.

viii. Draw necessary diagrams to explain your answer.

$c = 3 \times 10^{8}\ ms^{-1}$

$h = 6.626 \times 10^{-34}\ Js$

$e = 1.602 \times 10^{-19}\ C$

$\frac{1}{4\pi\varepsilon_0} = 9\times10^{9}\ Nm^{2}C^{-2}$

$\mu_0 = 4\pi \times 10^{-7}\ TmA^{-1}$

Rydberg's constant $= 1.03 \times 10^{7} m^{-1}$

Boltzmann constant $k = 1.38 \times 10^{-23}\ JK^{-1}$

Avogadro's number $N_A = 6.023 \times 10^{23}$ /mole

Mass of neutron $m_n = 1.675 \times 10^{-27}$ kg

Mass of electron $m_e = 9.1 \times 10^{-31}$ kg

Radius of Earth=6400 km

1. State the Faraday's law of electromagnetic induction.
2. Define one electron-volt.

3. Define intensity of radiation on the basis of photon picture of light. Write its SI unit.
4. Draw the reverse bias characteristics of a diode.
5. How does the angular separation between fringes in single-slit diffraction experiment change when the distance of separation between the slit and screen is doubled?
6. Two capacitors C_1 and C_2 having same plate area A, plate separations d_1 and d_2 and vacuum between their plates are connected in series. Derive an expression for their equivalent capacitance.

OR

Two spherical conductors of radii R_1 and R_2 are maintained at same potential. What is ratio of surface charge densities on these spheres?

7. Draw a ray diagram to show how a right isosceles prism made of crown glass can be used to obtain the inverted image of an object on same side as that of object and on opposite side of the object.
8. Current flowing through an inductor of self-inductance L is continuously increasing. Plot a graph showing the variation of
   (i) Magnetic flux versus the current
   (ii) Induced EMF versus dI/dt.
9. What is equipotential surface? Explain why electric field should be perpendicular to equipotential surface.
10. Obtain an expression for current through a conductor in terms of drift velocity.
11. Derive an expression for torque acting on electric dipole placed in electric field.
12. Explain use of diode as full wave rectifier.
13. A beam of monochromatic radiation is incident on a photosensitive surface. Answer the following questions giving reasons:
    a) Do the emitted photoelectrons have the same kinetic energy?
    b) Does the kinetic energy of the emitted electrons depend on the intensity of incident radiation?
    c) On what factors does the number of emitted photoelectrons depend?

OR

State De Broglie hypothesis. Using it derive an expression for wavelength associated with an electron accelerated through potential V.

14. Using Gauss' theorem derives formula for electric field due a charged hollow sphere of radius R (i) at point inside it (ii) at a point outside it. Show variation of field with distance from its centre on a graph.
15. A rod of length l is moved horizontally with a uniform velocity v in a direction perpendicular to its length through a region in which a uniform magnetic field is acting vertically downward. Derive an expression for the emf induced across the ends of the rod.
16. A radioactive nucleus has a decay constant $\lambda = 0.3465\ day^{-1}$. How long would it take the nucleus to decay by 75% of its initial amount?
17. Explain limit of resolution. State the factors on which limit of resolution of compound microscope depends.
18. Distinguish between conductors, semiconductor and insulator on the basis of energy band diagrams.

19. A small compass needle of 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.
20. Write three characteristic features to distinguish between the interference fringes in Young's double slit experiment and the diffraction pattern obtained due to a narrow single slit.
21. How does oscillating charge produce electromagnetic waves? Sketch a schematic diagram depicting oscillating electric and magnetic fields of an electromagnetic wave propagating along + z direction.
22. State Bohr's postulates of hydrogen atom. Write mathematical form of each postulate.
23. Ajit had a high tension tower erected on his farm land. He kept complaining to the authorities to remove it as it was occupying a large portion of his land. His uncle, who was a teacher, explained to him the need for erected these towers for efficient transmission of power. As Ajit realized its significance, he stopped complaining.
    a) Why is it necessary to transport power at high voltage?
    b) A low power factor implies large power loss. Explain.
    c) Write two values each displayed by Ajit and his uncle.
24. A) State Biot - Savart law. Derive formula for magnetic field at the centre of a coil having N turns and current I through it.

B) An ammeter of resistance 0.8 ohm can measure current up to 1.0A. What must be the value of shunt resistance to enable the ammeter to measure current up to 5.0 A?

OR

A) Discuss the nature of path followed by a charged particle in each of the following cases.
    i) When its velocity is parallel to magnetic field.
    ii) When its velocity is perpendicular to magnetic field.
    iii) When its velocity makes an acute angle with magnetic field.

B) What is force acting a conductor of length 10 cm carrying a current of 2A placed in a uniform magnetic field of 0.3 T art angle 30 degrees with the field?

25. A) Draw a ray diagram for formation of image of a point object by a thin double convex lens having radii of curvatures R_1 and R_2 and hence derive lens maker's formula. How does focal length of lens depend on wavelength of light?

B) If a convex lens of focal length 50 cm is placed in contact coaxially with a concave lens of focal length 20 cm, what is the power of the combination?

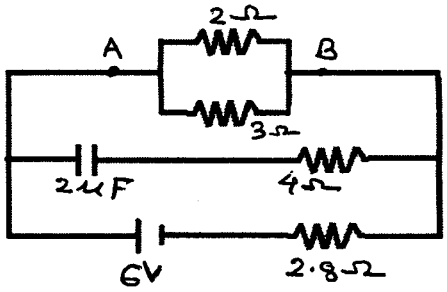
OR

A) With the help of a suitable ray diagram, derive the mirror formula for a concave mirror.

B) A person can not read comfortably when book is held closer than 50 cm from the eye. What is the power of the lens required to enable the person to read clearly a book held at 25 cm from the eye?

26. A) Define EMF and internal resistance of a cell. State factors on which internal resistance of cell depends. Draw a graph to show variation of I and V through a cell.

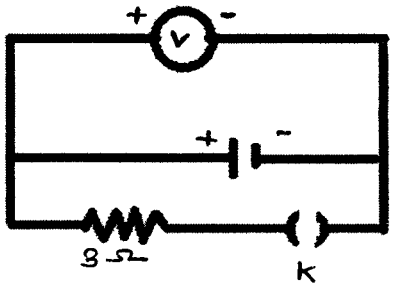
B) Calculate the steady current through the 2 ohm resistor in the circuit below.



OR

A) Define terminal P.D. of a cell. Write on expression for terminal P.D. in terms of internal resistance, EMF and external resistance. Show variation of PD. With external resistance on graph.

B) The reading on a high resistance voltmeter, when a cell is connected across it, is 2.0 V. When the terminals of the cell are also connected to a resistance of 3 ohm as shown in the circuit, the voltmeter reading drops to 1.5 V. find the internal resistance of the cell.



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MODEL EXAMINATION JAN-2018
PHYSICS (SET B)
Class: XII

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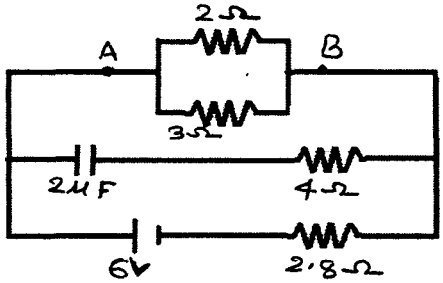

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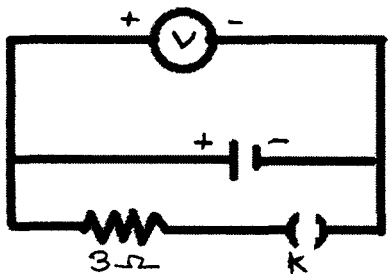

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