

KERALA BOARD CLASS 12

Physics March 2018 Question Paper

Reg:

Code No. 9015

Number:

TIME – 2 hours

Cool-Off Time- 15 minutes

Second Year- March 2018

Part –III
PHYSICS
Maximum – 60 Scores

General Instructions to Candidates:

- There is a cool-off time of 15 minutes in addition to the writing time
- Use the cool-time to get familiar with the questions and to plan your answers
- Read the questions carefully before answering
- Read the instructions carefully
- Calculations, figures, graphs should be shown in the answer sheet itself
- Give equations wherever necessary
- Electronic devices except non-programmable calculators are not allowed in the examination hall

The given value of the constants can be used wherever necessary.

Velocity of light in vacuum, $c = 3 \times 10^8 \text{ m/s}$

Plank's constant, $h = 6.64 \times 10^{-34} \text{ Js}$

Charge of electron, $e = 1.6 \times 10^{-19} \text{ C}$

Mass of the electron, $m = 9.1 \times 10^{-31} \text{ kg}$

Avogadro number = $6.025 \times 10^{23} \text{ atom/mol}$

$\epsilon_0 = 8.854 \times 10^{-12} \text{ C}^2\text{N}^{-1}\text{m}^{-2}$

$\mu_0 = 4\pi \times 10^{-7} \text{ Tm/A}$

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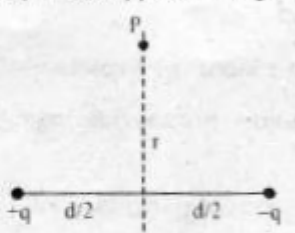
Questions 1 and 2 carry 1 Score each. Answer both. (Scores : $2 \times 1 = 2$)

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1. How will you represent a resistance of $3700 \Omega \pm 5\%$ using colour code ?
2. Draw the symbol of NAND gate.

Answer any six questions from question number 3 to 10. Each question carries 2 Scores. (Scores : $6 \times 2 = 12$)

3. Two equal and opposite charges placed in air as shown in figure :

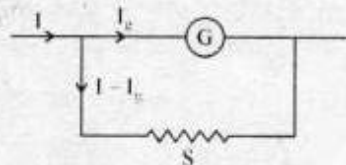


 - (a) Redraw the figure and show the direction of dipole moment (P), direction of resultant electric field (E) at P.
 - (b) Write an equation to find out the electric field at P.
4. Calculate the electrical capacitance of earth. The radius of earth is 6400 km.
5. What do you mean by drift velocity ? Write the relation between drift velocity and electric current.

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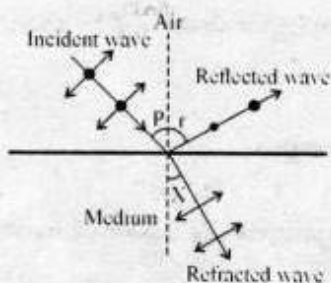
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6. A galvanometer is connected as shown in the figure :



- (a) This combination can be used as _____. (voltmeter/rheostat/ammeter)
- (b) Derive an expression to find the value of resistance S .

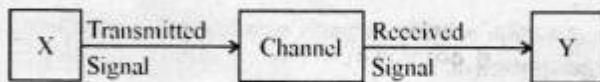
7. An unpolarised light incident on a medium as shown in figure.



Show that the direction of reflected and refracted waves are mutually perpendicular.

8. How many electrons, protons and neutrons are there in 16g of ${}_8\text{O}^{16}$?

9. The given block diagram shows general form of a Communication system.



- (a) Identify the blocks X and Y .
- (b) What is the difference between attenuation and amplification?

10. What is the population covered by the transmission, if the average population density around the tower is 1200 km^{-2} ? The antenna height is 160 m.

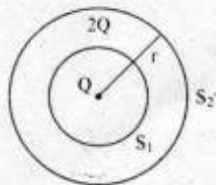
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Answer any five questions from question number 11 to 16. Each question carries 3 Scores.

(Scores : $5 \times 3 = 15$)

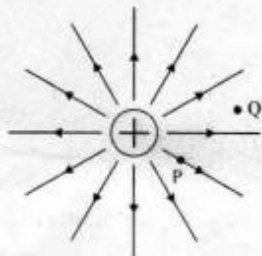
11. Two spheres encloses charges as shown in figure :



- (a) Derive an expression for electric field intensity at any point on the surface S_2 .
- (b) What is the ratio of electric flux through S_1 and S_2 ?

(Scores : 2+1)

12. The electric field lines of a positive charge is as shown in figure :



- (a) Give the sign of potential difference $V_p - V_q$.
- (b) Give the sign of work done by the field in moving a small positive charge from 'Q' to 'P'.
- (c) What is the shape of equipotential surface near the charge ?

(Scores : 1+1+1)

13. (a) Name the part of electromagnetic spectrum :

- (i) used in radar systems.
- (ii) produced by bombarding a metal target by a high speed electrons.

- (b) Electromagnetic waves are produced by _____.
(charges at rest/charges in uniform motion/charges in accelerated motion)

- (c) Why only microwaves are used in microwave ovens ?

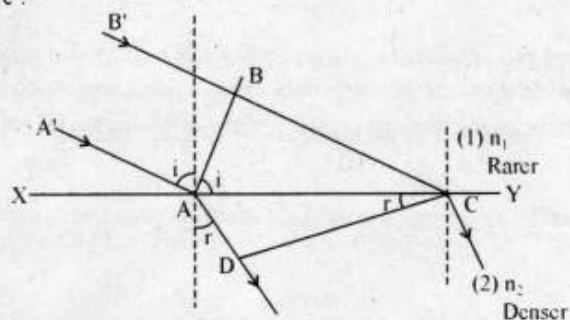
(Scores : 1+1+1)

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14. Two thin convex lenses of focal length f_1 and f_2 are placed in contact :
- If the object is at principal axis, draw ray diagram of the image formation by this combination of lenses.
 - Obtain a general expression for effective focal length of the combination in terms of f_1 and f_2 . (Scores : 1+2)

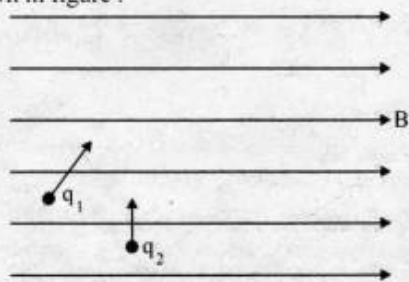
15. A plane wave-front AB incident on a surface XY and undergoes refraction as shown in figure :



- Prove Snell's law of refraction by using this figure.
 - What is the change in speed of propagation and frequency of the refracted wave? (Scores : 2 + 1)
16. (a) State radioactive decay law. (Scores : 1 + 2)
 (b) Prove the relation $N(t) = N_0 e^{-\lambda t}$

Answer any four questions from question number 17 to 21. Each question carries 4 Scores. (Scores : $4 \times 4 = 16$)

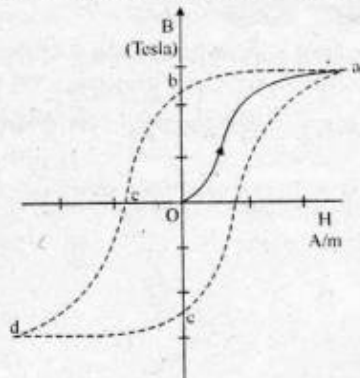
17. Two charged particles q_1 and q_2 are moving through a uniform magnetic field (B) as shown in figure :



- What is the shape of path of q_1 and q_2 .
- Derive an expression for cyclotron frequency with the help of a neat diagram. (Scores : 1+3)

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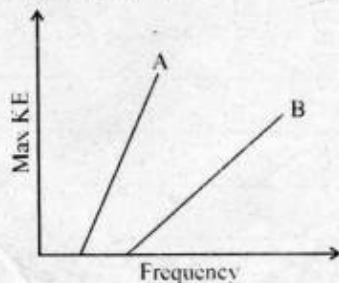
18. The B-H curve of a ferromagnetic material is as shown in figure :



- What do you mean by ferromagnetic material ? Write any two properties of it.
- Identify the value of retentivity and coercivity from the figure.
- A solenoid has a core of a material with relative permeability 400. The windings of the solenoid are insulated from the core and carry a current of 2A. If the number of turns is 1000 per metre, calculate magnetic intensity (H) and magnetic field (B).
(Scores : 1+1+2)

- Derive an expression for self inductance of a solenoid.
- What do you mean by eddy current ? Write any two applications of it. (Scores : 2 + 2)

20. The given graph shows the variation of KE with frequency of incident radiations for two surfaces A and B.



- Which of the two metals has greater work function ? For which of the metals will stopping potential be more for the same frequency of incident radiation ?
- The work function of caesium metal is 2.14 eV. When light of frequency 6×10^{14} Hz incident on the metal surface, what is the maximum KE of the photoelectrons and stopping potential ?
(Scores : 1 + 3)

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21. (a) Name different series of lines observed in hydrogen spectrum.

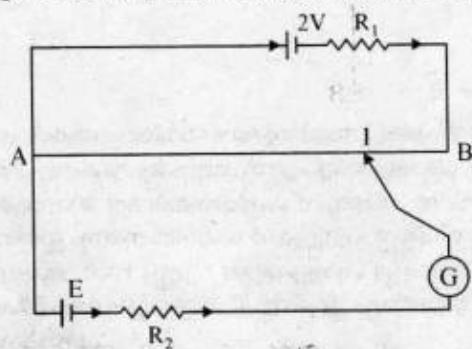
(b) Draw energy level diagram of hydrogen atom.

(Scores : 2 + 2)

Answer any three questions from question number 22 to 25. Each question carries 5 Scores.

(Scores : $3 \times 5 = 15$)

22. The circuit diagram of a potentiometer for determining the emf 'E' of a cell of negligible internal resistance is as shown in figure :

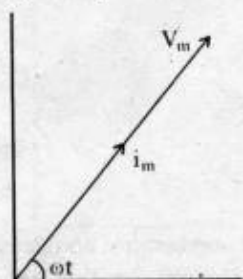


(a) State the principle of working of a potentiometer.

(b) How the balancing length AJ changes when the value of R_1 decreases ?

(c) Derive an expression to find out internal resistance of a cell. (Scores : 1+1+3)

23. The phasor diagram of the alternating voltage across an unknown device X and current flowing through it are shown below.



(a) Identify the device X.

(b) Draw the graphical variation of current and voltage with ωt through this device.

(c) Draw the phasor diagram which shows the relation among V_R , V_L , V_C and I in a series LCR circuit.

(Scores : 1 + 2 + 2)