Reg. No. : .....

Name : .....

Code No. 8015

For Scheme-I Candidates only

Second Year – 2015
SAY / IMPROVEMENT

Time : 2 Hours
Cool-off time : 15 Minutes

I

PHYSICS

Maximum : 60 Scores

General Instructions to Candidates :

- There is a 'cool-off time' of 15 minutes in addition to the writing time of 2 hrs.
- You are not allowed to write your answers nor to discuss anything with others during the 'cool-off time'.
- Use the 'cool-off time' to get familiar with questions and to plan your answers.
- Read questions carefully before answering.
- All questions are compulsory and only internal choice is allowed.
- When you select a question, all the sub-questions must be answered from the same question itself.
- Calculations, figures and graphs should be shown in the answer sheet itself.
- Malayalam version of the questions is also provided.
- Give equations wherever necessary.
- Electronic devices except non-programmable calculators are not allowed in the Examination Hall.

നിർദ്ദേശങ്ങൾ :

- നിർദ്ദിഷ്ട സമയത്തിന് പുറമെ 15 മിനിറ്റ് 'കൂൾ ഓഫ് ടൈം' ഉണ്ടായിരിക്കും. ഈ സമയത്ത് ചോദ്യങ്ങൾക്ക് ഉത്തരം എഴുതാനോ, മറ്റുള്ളവരുമായി ആശയവിനിമയം നടത്താനോ പാടില്ല.
- ഉത്തരങ്ങൾ എഴുതുന്നതിന് മുമ്പ് ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം എഴുതണം.
- ഒരു ചോദ്യനമ്പർ ഉത്തരമെഴുതാൻ തെരഞ്ഞെടുത്തു കഴിഞ്ഞാൽ ഉപചോദ്യങ്ങളും അതേ ചോദ്യനമ്പരിൽ നിന്ന് തന്നെ തെരഞ്ഞെടുക്കേണ്ടതാണ്.
- കണക്ക് കൂട്ടലുകൾ, ചിത്രങ്ങൾ, ഗ്രാഫുകൾ എന്നിവ ഉത്തരപേപ്പറിൽ തന്നെ ഉണ്ടായിരിക്കണം.
- ചോദ്യങ്ങൾ മലയാളത്തിലും നൽകിയിട്ടുണ്ട്.
- ആവശ്യമുള്ള സ്ഥലത്ത് സമവാക്യങ്ങൾ കൊടുക്കണം.
- പ്രോഗ്രാമുകൾ ചെയ്യാനാകാത്ത കാൽക്കുലേറ്ററുകൾ ഒഴികെയുള്ള ഒരു ഇലക്ട്രോണിക് ഉപകരണവും പരീക്ഷാഹാളിൽ ഉപയോഗിക്കുവാൻ പാടില്ല.

1. There are two basic modes of communication : point to point and broadcasting.

(a) In short wave broadcast service which mode of propagation of radio waves is used ? **(Score : 1)**

(b) Name any other two modes of propagation of radio waves in communication. **(Score : 1)**

(c) Draw the frequency spectrum of amplitude modulated signal. **(Score : 1)**

2. Diode is a semiconducting device made up of p-n junction.

(a) Diode can be used to convert AC into DC. This process is called _____. **(Score : 1)**

(b) Draw the circuit diagram of an AC to DC converter using two diodes. **(Scores : 2)**

3. It was Bohr who suggested the stable structure of atom with the help of quantum hypothesis. According to him,

(a) Where can an electron be observed in an atom ? **(Score : 1)**

(b) What is the angular momentum of an electron ? **(Score : 1)**

(c) How spectral lines are produced ? **(Score : 1)**

The following is a choice question. Answer any **one** :

4. (i) In Young's double slit experiment, the slits are illuminated by blue light to observe interference pattern.

(a) Sketch the interference pattern. **(Score : 1)**

(b) Arrive at the expression for the fringe width. **(Scores : 3)**

OR

(ii) When light passes through a triangular prism, it undergoes deviation.

(a) What do you mean by angle of deviation ? **(Score : 1)**

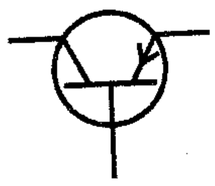
(b) Arrive at the expression :

$$n_{21} = \frac{\sin\left[\frac{A + D_m}{2}\right]}{\sin\frac{A}{2}}$$

(Scores : 3)

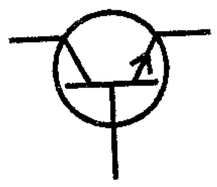
5. There are different types of semiconducting devices such as diode, transistor etc.

(a) Which of the following symbol represents a p-n-p transistor ?

(i) 

(ii) 

(iii) 

(iv) 

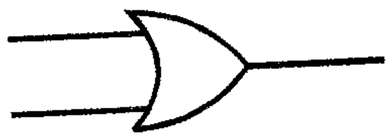
(Score : 1)

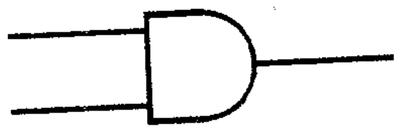
(b) Given below is the truth table of a logic gate :

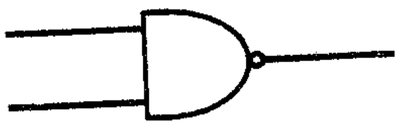
Inputs		Output
A	**B**	**Y**
0	0	1
1	0	1
0	1	1
1	1	0

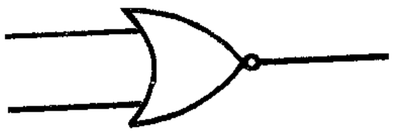
(i) Identify the gate.

(ii) Choose its symbol from the following :

(i) 

(ii) 

(iii) 

(iv) 

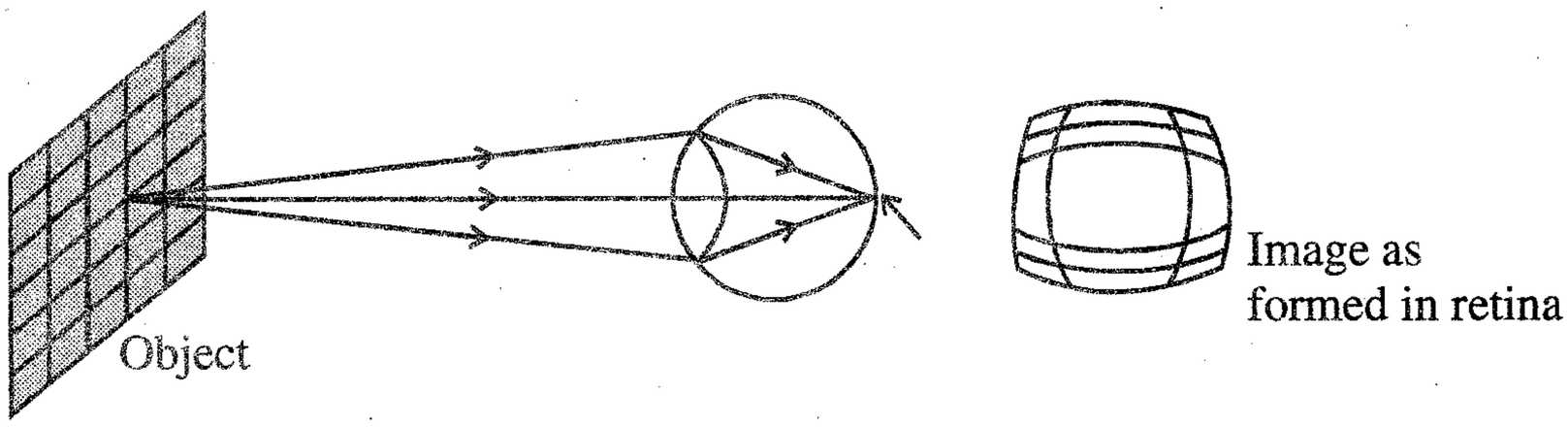
(Score : 1)

6. Radioactivity was discovered by A.H. Becquerel

(a) What do you mean by the term half life period ? **(Score : 1)**

(b) A radioactive sample has initially N_0 number of nuclei. The half life period of this element is 2 years. How much nuclei will be left after 8 years in the sample ? **(Score : 1)**

7. When Deepa consulted an eye specialist, the doctor sketched the following figure to explain her vision problem.



(a) Can you identify Deepa's vision problem ? **(Score : 1)**

(b) What causes such a defect ? **(Score : 1)**

(c) What remedy can you suggest ? **(Score : 1)**

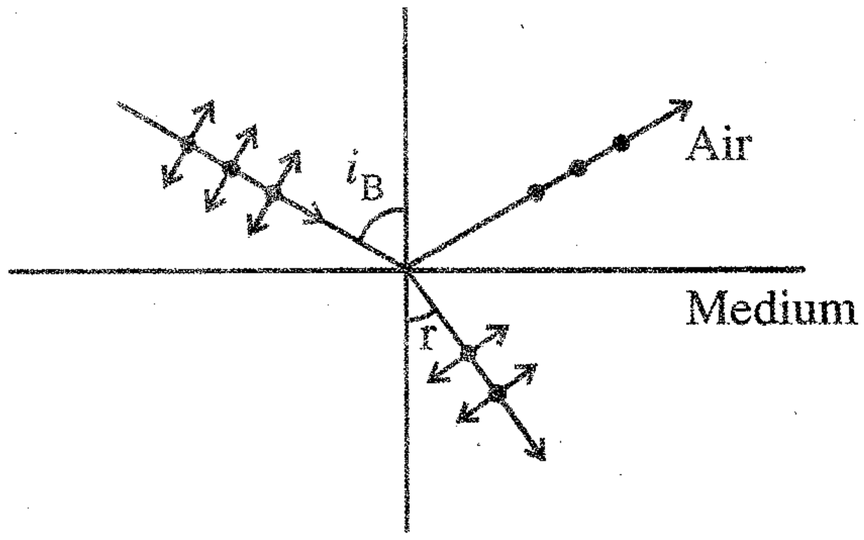
8. Moving charges can produce a magnetic field in the surrounding space

(a) What is a toroid ? **(Score : 1)**

(b) A closely wound solenoid 80 cm long has 5 layers of windings of 400 turns each. The diameter of the solenoid is 1.8 cm. If the current carried is 8 A, calculate the magnitude of field B inside the solenoid near its centre. **(Scores : 2)**

9. Light undergoes different phenomena like interference, diffraction etc.

(a) From the figure given below can you identify the physical phenomenon that light undergoes. **(Score : 1)**



(b) (i) By what name the angle i_B is known ? **(Score : ½)**

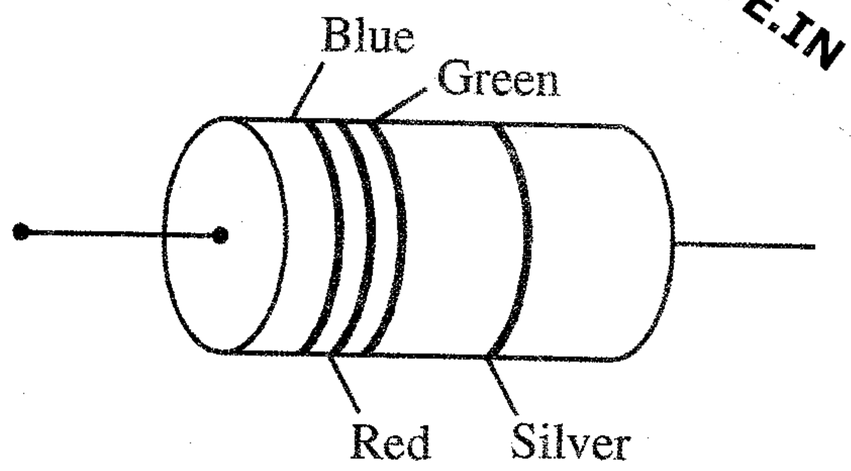
(ii) Modify the Snell's law according to the situation depicted in the figure. **(Scores : 1½)**

10. Match the following suitably :

Microwave	Cellular phone
Infrared	Water purifier
Radio waves	Oven
UV rays	Remote switch

(Scores : 2)

11. The following figure shows a carbon resistor :



(a) Find its value using colour code. **(Score : 1)**

(b) The resistance of a 20 cm long wire is 5 Ω. The wire is stretched to a uniform wire of length 40 cm. The resistance of the wire is

(i) 5 Ω (ii) 10 Ω

(iii) 15 Ω (iv) 20 Ω **(Score : 1)**

(c) Which one of the following materials has more than one value for voltage for the same current ?

(i) Copper (ii) Mercury

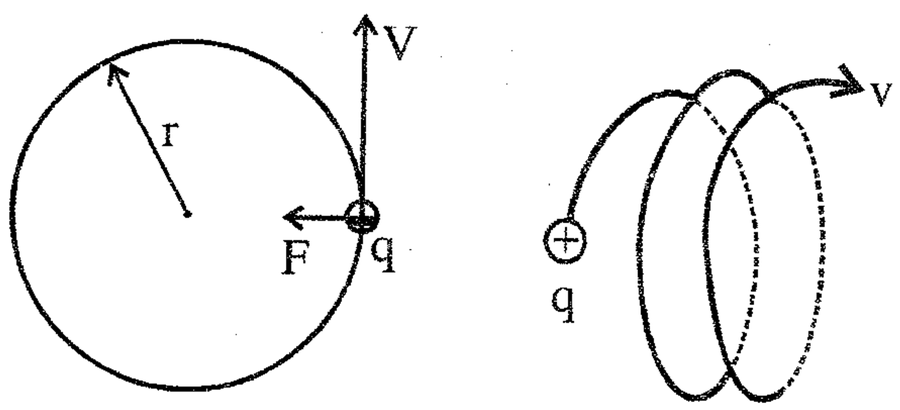
(iii) Gallium Arsenide (iv) Germanium **(Score : 1)**

12. Electrons can undergo diffraction just like waves :

What is the wavelength of an electron accelerating in a potential difference of 54 V ?

(Scores : 2)

13. The following figures represent the path of motion of a charged particle in a uniform magnetic field.



(1) (2)

(a) What will be the direction of magnetic field with respect to the velocity of the charged particle ?

(i) In figure (1)

(ii) In figure (2)

(Scores : 2)

(b) With the help of figure 2 explain the term pitch. **(Score : 1)**

(c) Which of the following is a suitable material for making electromagnet ?

(i) Tungsten (ii) Bismuth

(iii) Copper (iv) Soft iron **(Score : 1)**

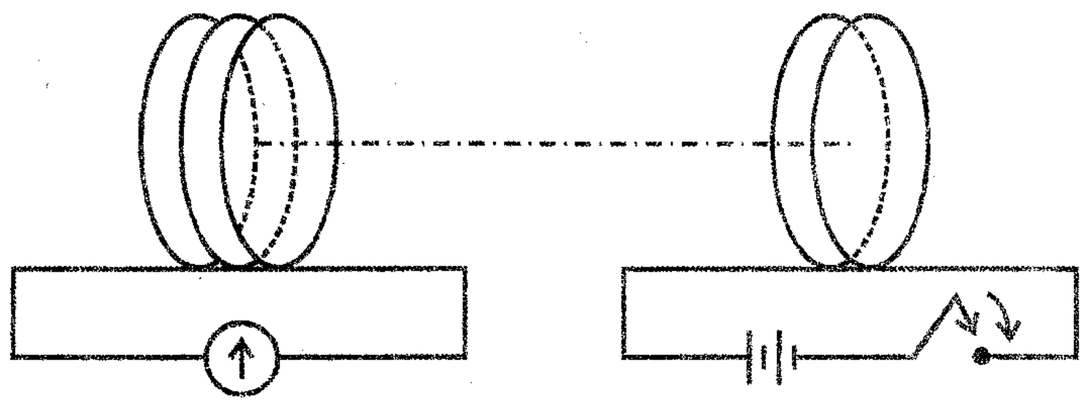
(d) The phenomenon of perfect diamagnetism in super conductors is called _____.

(i) Dynamo effect (ii) Hysteresis

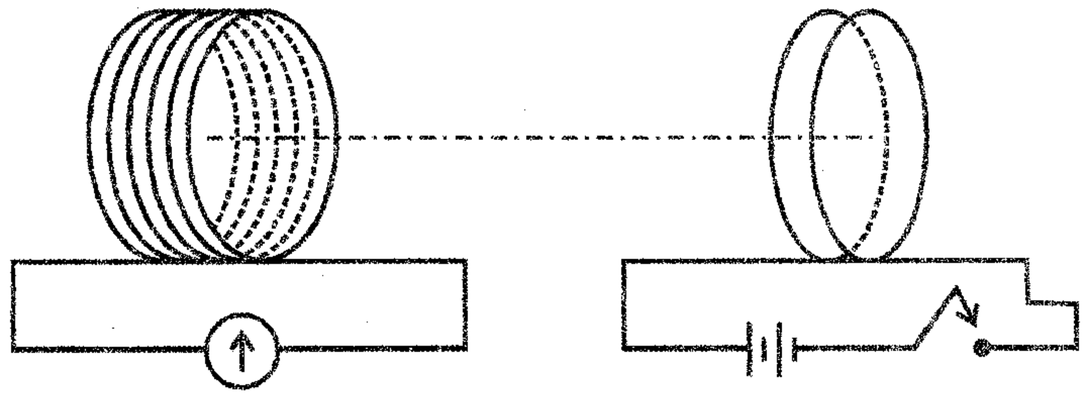
(iii) Meissner effect (iv) Faraday effect **(Score : 1)**

14. An electric current can be induced in a coil by changing the magnetic flux through the coil.

(a) Which of the following galvanometer shows larger deflection when the tapping key is pressed suddenly ? **(Score : 1)**



(a)



(b)

(b) Using suitable equation justify your answer. **(Scores : 2)**

The following is a choice question. Answer any **one** :

15. (i) Meter bridge is a practical application of Wheatstone's bridge.

(a) With the help of a neat circuit diagram, derive an expression for finding an unknown resistance R. **(Scores : 2)**

(b) When a resistance of 10 Ω is connected in series with the unknown resistance R, the balancing length is found to be 50 cm. When 10 Ω is removed the balancing length is shifted to 40 cm. What will be the value of unknown resistance R ? **(Scores : 2)**

(ii) Like resistors, cells can be combined together in an electrical circuit and can also be replaced by an equivalent cell.

(a) Derive an expression to find the effective emf of two cells connected in parallel. **(Scores : 2)**

(b) The potential difference across the terminals of a battery is 8.5 V, when a current of 5 A flows through it from the negative terminal to the positive terminal. When a current of 4A flows through it in the opposite direction, the terminal potential difference of the battery is 10 V. Find the emf and the internal resistance of the battery. **(Scores : 2)**

16. Power developed in an ac circuit can be expressed as $P = VI \cos \phi$. In certain circuits no power is developed even though current flows through it.

(a) Identify such a circuit from the following :

(i) purely inductive circuit

(ii) purely resistive circuit

(iii) inductive and resistive circuits

(iv) resistive and capacitive circuits **(Score : 1)**

(b) Which of the following circuit can be used to produce oscillations ?

(i) L-R Circuit (ii) LCR Circuit

(iii) LC Circuit (iv) RC Circuit **(Score : 1)**

(c) Explain how oscillations are produced in the chosen circuit. **(Scores : 2)**

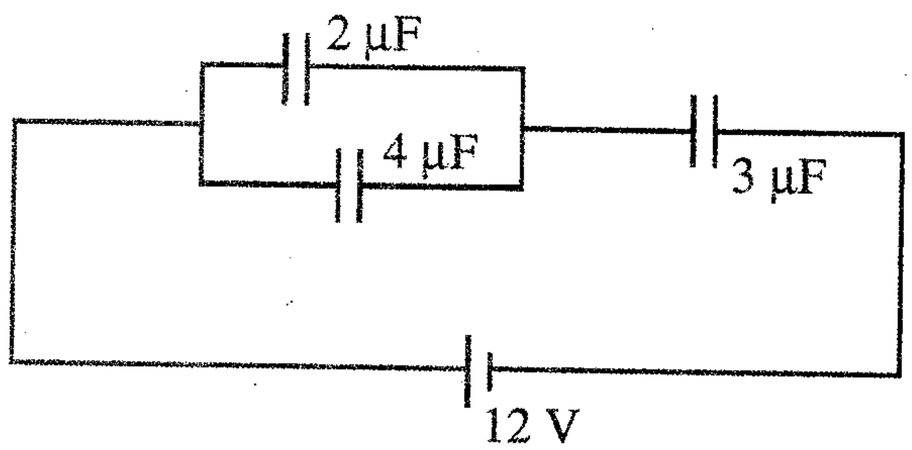
17. A capacitor is an electronic component having two conductors separated by an insulator.

(a) An insulated capacitor with air between its plates has a potential difference of V_0 and a charge Q_0. When the space between the plates is filled with oil, the potential difference becomes V and charge becomes Q. Which of the following relation is correct ?

(i) $Q = Q_0$ $V > V_0$ (ii) $Q = Q_0$ $V < V_0$

(iii) $Q > Q_0$ $V = V_0$ (iv) $Q < Q_0$ $V = V_0$ **(Score : 1)**

(b) Three capacitors are connected to a 12 V battery as shown in figure :



(i) What is the effective capacitance of the combination ? **(Score : ½)**

(ii) What is the potential difference across the 2 μF capacitor ? **(Score : 1½)**

18. In symmetric charge configurations, the electric field can be easily calculated using Gauss's law. According to Gauss's law,

(a) The electric flux through any closed spherical surface enclosing a charge q is given by

(i) $q\varepsilon_0$ (ii) q/ε_0

(iii) $\frac{1\ q}{4\pi\varepsilon_0 r}$ (iv) $4\pi\varepsilon_0 qr$ **(Score : 1)**

(b) Obtain an expression for electric field at a point P due to a thin shell of radius R, when the point is at a distance r from the centre of the shell. **(Scores : 2)**

(c) A sphere of radius 'a' is made of insulating material and has a charge distributed uniformly throughout its volume. Let the charge density be ρ. Find the field due to the charge for $r \leq a$. **(Scores : 2)**

19. When light falls on certain metals photo electrons are generated.

(a) Express the phenomenon in terms of an equation. **(Score : 1)**

(b) Explain the terms used. **(Scores : 2)**