

**Higher Secondary Model Examination****Part – III****PHYSICS****Max. Score : 60****Max . Time : 2 Hrs.****Cool off Time : 15 Min.****General Instructions :**

- There is a "Cool off time" of 15 minutes in addition to the writing time of 2 Hrs.
- Use the "Cool off time" to get familiar with the questions and do not write the answers or discuss anything with others during "Cool off time" .
- 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.
- Give Equations wherever necessary.

1. Suppose two negative charges '-q' each is placed at a distance 'a' apart in air.
  - (a) draw the electric lines of force surrounding them. (1)
  - (b) Can two electric lines of force intersect? Justify your answer. (2)
2. According to Gauss's Theorem flux is equal to  $q/\epsilon_0$ 
  - (a) What is the electric field intensity at a point inside a uniformly charged rubber balloon? (1)
  - (b) Careful measurement of the electric field at the surface of a black box indicates that the net outward flux through the surface of the box is  $8.0 \times 10 \text{ Nm}^2 / \text{C}$ 
    - 1) What is the net charge inside the box ? (1)
    - 2) If the net outward flux through the surface of the box were zero , does the box contain any charges ? Why or Why not ? (1)
  - (c) Using Gauss' Theorem find the intensity of electric field at a point
    - 1) In the space between two equally and oppositely charged metal plates (1½)
    - 2) On the surface of a spherical metallic shell of radius R (1½)

3. Find the expression for the electric field intensity, and the electric potential, due to a dipole at a point on the equatorial line. (2)

Would the electric field be necessarily zero at a point where the electric potential is zero? Give an example to illustrate your answer. (1 ½)

4. State the laws of electro magnetic induction. Explain eddy current. Discuss its two applications (3)

5. (a) Is the source of magnetic field analogue to the source of electric field? Why? (1)

(b) Can a magnetic field set a resting electron into motion? Explain. (1 ½)

(c) A conductor carries a current of 90 A in the East to West direction. Find the magnetic field due to the current at a point 1.5m below the conductor? (1 ½)

6. (a) Earth's magnetic field does not affect the working of a moving coil galvanometer. Explain. (1 ½)

(b) Can we decrease the range of an ammeter? Explain. (1 ½)

7. Does the speed of light in a medium depend upon the nature of the source? Explain. (1 ½)

8. Why a slight shaking of the picture on the TV screen is observed when a low flying aircraft passes overhead? (1)

9. Can white light produce interference? What is its nature? (1)

10. Work function of Na is 2.3eV. Does sodium show photoelectric emission for light of wavelength 6800 Å? (2)

11. (a) If the intensity of incident radiation on a metal is doubled, what happens to the kinetic energy of electrons emitted? (1)

(b) What is dual nature of matter. (1)

(c) Discuss the experimental set up for the verification of wave nature of matter. Explain how it was verified. (2)

12. (a) Why is a convex mirror used as driver's mirror? (1)

(b) A bird flying high in the air appears to be higher than in reality. Explain why? (1)

13. (a) A coin kept in a vessel and not visible from edge can be viewed by pouring water in to the vessel. Explain why? (1)

(b) An empty test tube is kept in a beaker of water. Its surface inside the water shines like a mirror. Explain why? (1)

14. Derive lens maker's formula for a convex lens. (2)

Sun glasses have no power. Explain why? (1)

15. The refractive index of a prism of angle  $60^\circ$  is 1.62 for sodium light? What is the angle of minimum deviation? (1 ½)

16. State the postulates of Bohr's theory of the hydrogen atom. (1 ½)

Derive an expression for the energy of an electron in any orbit of hydrogen atom. (2 ½)

17. (a) Why a nucleus can eject electrons ( $\beta$  particles) though it contains no electrons? (1)

(b) Derive the relation between half life period and decay constant? (1 ½)

(c) A radio active material is reduced to  $(1/16)$  of its original amount in 4 days. How much material should one begin with so that  $4 \times 10^{-3}$  of the material left after 6 days? (2)

18. With a neat circuit diagram explain the input and output characteristics of an npn transistor in CE configuration. (3)

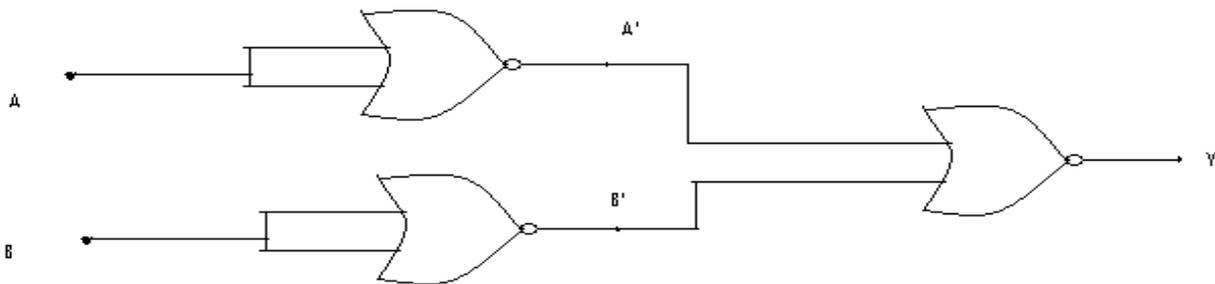
Explain how the transistor can be used as an amplifier. (1 ½)

19. A P – N junction diode can be used to convert ac into dc

(a) Draw the circuit diagram of a full wave rectifier and explain its working? (1 ½)

(b) Is the output of a full wave rectifier pure dc? (1)

20. Inputs A & B are applied to the logic gate setup as shown below. Complete the truth table given below,



A	B	A'	B'	Y
0	0			
0	1			
1	0			
1	1			

and name the equivalent gate formed by this 'set-up'.

(2)

21. Explain amplitude modulation. What are the needs of modulation?

(2)

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