

Reg. No. :

SME-24

Name :

**SECOND YEAR HIGHER SECONDARY MODEL
EXAMINATION, FEBRUARY 2020**

Part – III

Time : 2 Hours

PHYSICS

Cool-off time : 15 Minutes

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-off time' to get familiar with questions and to plan your answers.
- Read questions carefully before answering.
- Read the instructions carefully.
- 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.

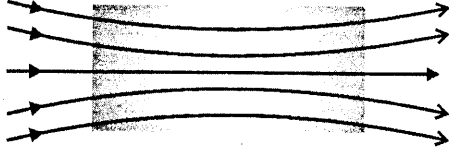
വിദ്യാർത്ഥികൾക്കുള്ള പൊതുനിർദ്ദേശങ്ങൾ :

- നിർദ്ദിഷ്ട സമയത്തിന് പുറമെ 15 മിനിറ്റ് 'കൂൾ ഓഫ് ടൈം' ഉണ്ടായിരിക്കും.
- 'കൂൾ ഓഫ് ടൈം' ചോദ്യങ്ങൾ പരിചയപ്പെടാനും ഉത്തരങ്ങൾ ആസൂത്രണം ചെയ്യാനും ഉപയോഗിക്കുക.
- ഉത്തരങ്ങൾ എഴുതുന്നതിന് മുമ്പ് ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- നിർദ്ദേശങ്ങൾ മുഴുവനും ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- 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.

Question numbers 1 to 6 carry 1 score each. Answer any 5 questions. (5 × 1 = 5)

1. The direction of electric field is always _____ (parallel/perpendicular) to an equipotential surface.
2. To convert a galvanometer into ammeter, you have to connect a
 - (a) low resistance in series
 - (b) high resistance in series
 - (c) low resistance in parallel
 - (d) high resistance in parallel
3. The polarity of induced emf in electro-magnetic induction is given by _____ (Ohm's law, Lenz's law, Gauss' law).
4. When placed inside water the focal length of a spherical mirror
 - (a) increases
 - (b) decreases
 - (c) becomes zero
 - (d) remains unchanged
5. Blue colour of the sky is due to _____.
6. Lyman series in Hydrogen spectrum is in ultraviolet region.
State whether the statement is TRUE or FALSE.

Question numbers 7 to 15 carry 2 score each. Answer any 7 questions. (7 × 2 = 14)

7. An electric dipole is placed in a uniform electric field.
 - (a) Write an expression for torque acting on the dipole. (1)
 - (b) When is the torque maximum? (1)
8. The magnetic field lines through a substance are shown below :

 - (a) Identify the substance. (1)
 - (b) Write two characteristics of the substance. (1)
9.
 - (a) What are the elements of earth's magnetic field? (1)
 - (b) In the magnetic meridian of certain places, the horizontal component of earth's magnetic field is 0.26 G and dip angle is 60° . What is the magnetic field of the earth at this location? (1)

10. When a charged particle moves in a combined electric and magnetic field, it experiences Lorentz force.
- (a) Write equation for Lorentz force. (1)
- (b) Write equation for cyclotron frequency. (1)
11. A convex lens acts as a simple microscope. Draw the ray diagram of a simple microscope.
12. Explain total internal reflection. Write any two applications of total internal reflection.
13. (a) Two nuclei have mass numbers in the ratio 1: 27. What is the ratio of their nuclear radii ? (1)
- (b) Write any two characteristics of nuclear force. (1)
14. (a) Draw the energy band diagram of n-type semiconductor. (1)
- (b) Write the truth table of OR gate. (1)
15. (a) Draw the block diagram of a communication system. (1)
- (b) Write one difference between sky wave and space wave propagation. (1)

Question numbers 16 to 23 carry 3 score each. Answer any 6 questions (6 × 3 = 18)

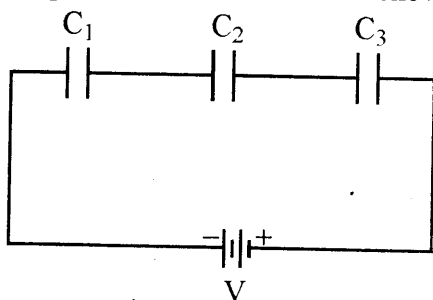
16. Gauss' law gives the relation between electric flux and electric charge.
- (a) Write the mathematical expression for Gauss' law. (1)
- (b) Using Gauss' law derive an expression for electric field due an infinitely long straight uniformly charged wire (2)
17. Wheatstone's bridge is an application of Kirchhoff's rules. Derive the balancing condition for Wheatstone's bridge.
18. With the help of diagram, explain the working principle of AC generator.
19. (a) What do you mean by displacement current ? (1)
- (b) Match the following. (2)

A	B
Microwave	Sterilization
Infrared	Diagnosis
Ultraviolet	Greenhouse effect
X- ray	Radar Communication

20. (a) Derive an expression for angle of deviation for a ray of light when it passes through a prism. (2)
- (b) A thin prism is having an angle of the prism 4° and refractive index 1.5. Find the angle of minimum deviation of the thin prism. (1)
21. (a) Draw the Lyman series and Balmer series of emission line spectra of hydrogen atom. (2)
- (b) The ground state energy of hydrogen atom is -13.6 eV. What are the kinetic and potential energies of electron in this state? (1)
22. State the law of radioactive decay and obtain the equation $N(t) = N_0 e^{-\lambda t}$
23. In our daily life modulation plays an important role :
- (a) What is the need of modulation? (1)
- (b) What is amplitude modulation? (1)
- (c) A message signal of frequency 10 kHz and peak voltage of 20 volts is used to modulate a carrier of frequency 1 MHz and peak voltage of 40 volts. Determine the modulation index. (1)

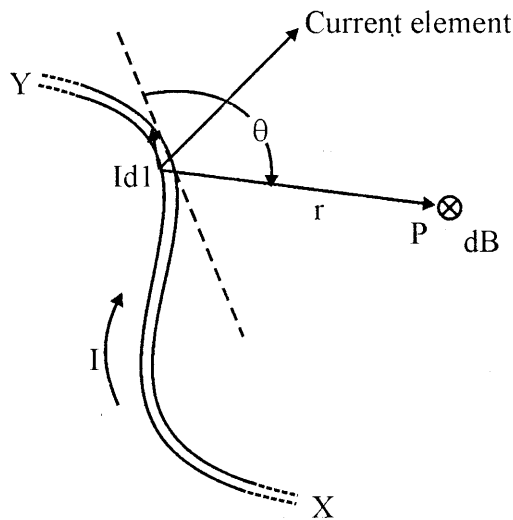
Question number 24 to 26 carry 4 score each. Answer any 2 questions (2 × 4 = 8)

24. Three capacitors are connected as shown below :



- (a) Identify the above combination. (1)
- (b) Obtain an expression for effective capacitance of the above combination. (2)
- (c) If a dielectric medium is placed in between the plates of a capacitor what is the change in its capacitance? (1)
25. (a) Obtain Einstein's photoelectric equation. (2)
- (b) A particle is moving three times as fast as an electron. The ratio of the de Broglie wavelength of the particle to that of the electron is 1.813×10^{-4} . Calculate the mass of the particle. (Mass of electron is 9.11×10^{-31} kg) (2)

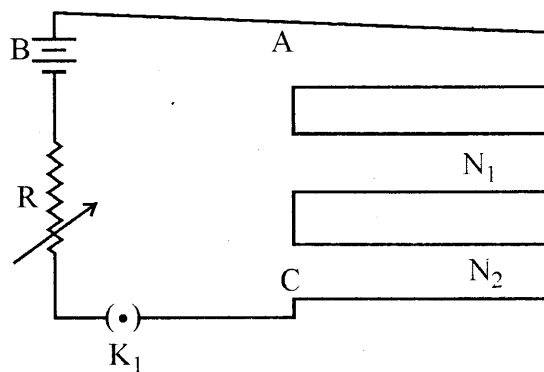
26. Biot-Savart law can be used to find out the magnetic field at a point P, in the following figure



- (a) Write the mathematical expression for Biot-Savart law. (1)
- (b) Derive an expression for magnetic field due to a current carrying circular loop. at a point on its axis. (3)

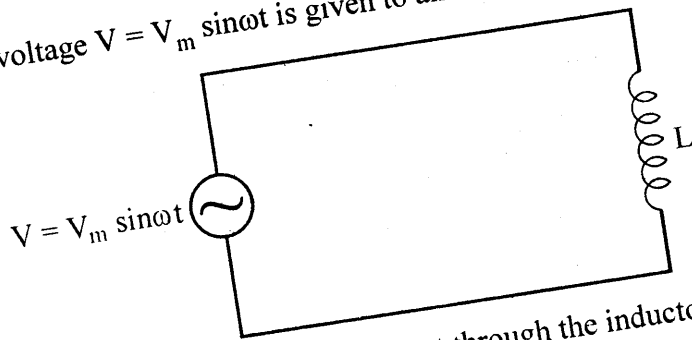
Question number 27 to 30 carry 5 score each. Answer any 3 questions (3 × 5 = 15)

27. Figure shows the incomplete circuit diagram of a potentiometer to measure the internal resistance of a cell.



- (a) What is the principle of potentiometer? (1)
- (b) Complete the above circuit diagram and explain how potentiometer measures the internal resistance of a cell. (3)
- (c) Potentiometer is better than voltmeter for measuring emf of a cell. Give reason. (1)

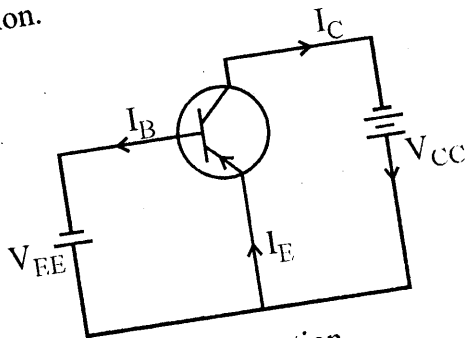
28. An ac voltage $V = V_m \sin \omega t$ is given to an inductor as shown below :



- (a) Obtain an expression for current through the inductor. (2)
- (b) Draw the phasor diagram for the inductor. (1)
- (c) Calculate the resonant frequency of a series LCR circuit with $L = 5\text{H}$, $C = 80 \mu\text{F}$ and $R = 40 \Omega$. (2)

29. For obtaining clear interference pattern two sources must be coherent. (1)
- (a) What are the characteristics of coherent source? (3)
- (b) Derive an expression for bandwidth of interference pattern using Young's Double slit experiment. (1)
- (c) State Brewster's law for polarisation by reflection. (1)

30. Transistors are the building blocks of electronic circuits. Figure below shows the circuit of a transistor configuration.



- (a) Identify the above transistor configuration. (1)
- (b) Draw the input and output characteristics of above transistor configuration. (2)
- (c) For a common emitter transistor amplifier if the collector current is 1 mA and current amplification factor is 100 , calculate the base current of the amplifier. (2)