APOLLO

FBISE Physics Class 11
Topical workbook - Volume 3 of 3

124 questions arranged by official framework topic.
National Curriculum 2022-23; supported examinations from 2027.

APOLLO

Waves

Domain D: Waves

First Annual 2026 | Section C Q6 OR | 6 marks

	80cm. Calculate the resistance of the coil.	
OR	Derive f_1, f_2 and f_3 for modes of vibration in a closed organ pipe.	**2+2 +2**

First Annual 2026 | Section B Q2(ix) OR | 3 marks

OR	Write any three characteristics of stationary waves.	**1x3**

First Annual 2026 | Section B Q2(x) | 3 marks

	density and write its formula.	
(x)	What are beats? How are they produced?	1+2

First Annual 2026 | Section B Q2(xii) OR | 3 marks

OR	Explain the use of beats in tuning musical instruments.	03
	The electric field at a point due to a point charge is 36	

First Annual 2026 | Section C Q3 | 6 marks

Q.3	a.	What is meant by polarization.	1+2 +3	OR	a.
	b.	Discuss one application of polarization.			b.
	c.	A polarized light of intensity I_o is passed through another polarizer whose axis makes an angle of $60°$ with the axis of the polaroid filter. What is the intensity of transmitted polarized light from second polaroid filter?			

FBISE model paper | Section A Q1(v) | 1 mark

v.	A stationary wave is formed by waves of frequency 512Hz.The speed of the wave is 65m/s, the distance between two consecutive antinodes is:	0.126m	0.06m	0.03m	0.024

FBISE model paper | Section B Q2(ix) | 3 marks

(ix)	Two tuning forks of frequencies 456 Hz and 452 Hz are sounded together. How many beats are produced over a period of 10 second?	03

FBISE model paper | Section B Q2(viii) OR | 3 marks

(viii)	By using concept of dot product, how can you describe that magnetic flux is scalar product of magnetic flux density (**B**) and	03	**OR**	Is there any transfer of energy through a medium when stationary waves are produced in it? Explain.	03

FBISE model paper | Section B Q2(xiii) | 3 marks

(xiii)	Define constructive and destructive interference.	03

First Annual 2025 | Section B Q2(viii) OR | 3 marks

The deviation of the second order diffracted image formed by an optical grating having 5000 lines per centimeter is $32°$. Calculate the wavelength of the light used.

Modern cars are not rigid but are designed to have

at the upper point.

A source of sound vibrates at 200 Hz and is receding from a stationary observer at $18\ ms^{-1}$. If the speed of sound is $331ms^{-1}$ then what frequency does the observer hear?

by their rectangular components?

What is Doppler effect? Explain it for the cases when:

i) Both listener and source of sound move towards each other.

ii) Both listener and source of sound move away from each other.

A block weighing 4.0 kg extends a spring by 0.16 m

First Annual 2025 | Section C Q6 | 6 marks

Explain Brewster law of polarization with a diagram.	

Second Annual 2025 | Section B Q2(vi) OR | 3 marks

equilibrium.	
The deviation of the second order diffracted image formed by an optical grating having 4000 lines per centimeter is 32°. Calculate the wavelength of light used.	1+2
Briefly explain that increase in entropy means	

Second Annual 2025 | Section B Q2(viii) OR | 3 marks

OR	Briefly describe the terms amplitude, period and frequency.	03
	How a viscous fluid undergoes transition from laminar	

Second Annual 2025 | Section C Q3 OR | 7 marks

OR	Describe Young's double slit experiment. Show how fringe width depends on wavelength and slit separation.	07

Second Annual 2025 | Section C Q5 | 7 marks

Q.5	What is Doppler's Effect? Derive expression for the frequencies heard: a. When the sounding source approaches a stationary listener. b. When sounding source moves away from stationary listener.	1+3 +3

First Annual 2026 | Section B Q2(ix) | 3 marks

If amplitude of a wave is doubled how much energy is increased?	03	OR
An electric field has a strength of 5 N/C. What force is		

First Annual 2026 | Section B Q2(xii) OR | 3 marks

	Wheatstone Bridge.	
OR	The frequency of a certain string is 125 Hz, when it vibrates in 5 segments. Calculate the frequencies when the string is vibrating in 3 and 4 segments. What is the speed of the wave in it, if its length is 0.80m?	
	At what speed would the mass of proton be tripled? The	

First Annual 2026 | Section C Q3 OR | 7 marks

own grid on answer book if required)

OR	a. Describe the Doppler's effect for a moving source and a stationary listener. b. Discuss any two applications of Doppler's effect.	4+3
	State Coulomb's Law. Write its mathematical	

First Annual 2026 | Section B Q2(i) OR | 3 marks

OR	A bus horn produces sound of frequency 200 Hz and is receding from a stationary observer at 18 m/s. if speed of sound is 331 m/s then what frequency does the observer hear?	03
	Briefly explain the working of RADAR.	

First Annual 2026 | Section B Q2(ii) OR | 3 marks

	observer hear?	
OR	Briefly explain the working of RADAR.	03

First Annual 2026 | Section B Q2(iii) OR | 3 marks

OR	An oil film spreading over a wet footpath shows colors. How does it happen? Explain.	03

First Annual 2026 | Section C Q4 OR | 6 marks

OR	Keeping in mind the relative velocity of source and observer discuss Doppler effect in detail also compare real and apparent frequencies.	06
	a. What is projectile motion? Give examples. Derive	

APOLLO

Electrostatics

Domain E: Electricity and Magnetism

FBISE model paper | Section A Q29 | 0.5 marks

29.	Unit for the constant of proportionality **k** in Coulomb's law is:	Nm^2C^2	$Nm^{-2}C^{-2}$	Nm^2C^{-2}	$Nm^{-2}C^2$	○ ○ ○ ○

FBISE model paper | Section A Q30 | 0.5 marks

30.	The magnitude of electric field intensity **50 cm** away from a **3μC** charge is:	1.08×10^{7} N/C	1.08×10^{-7} N/C	1.08×10^{-5} N/C	1.08×10^{5} N/C	○ ○ ○ ○

FBISE model paper | Section A Q31 | 0.5 marks

31.	Which one of the following properties must be kept in mind while drawing electric field lines?	Field lines must always be drawn in circles.	Field lines can cross each other if the charges are large.	Field lines must never cross each other.	Field lines always point toward a positive charge.	○ ○ ○ ○

FBISE model paper | Section A Q32 | 0.5 marks

32.	A positive charge enters horizontally in a uniform electric field, directed vertically downward, due to oppositely charged parallel plates. In which direction will the charge be deflected?	Upward, towards the positive plate.	Downward, towards the negative plate.	In a straight line with no deflection.	In a circular path	○ ○ ○ ○

FBISE model paper | Section A Q35 | 0.5 marks

35.	If the distance between two charged parallel plates is doubled while keeping the potential difference constant, the electric field strength will become:	Double of its original value	Half of its original value	Four times of its original value	unchanged	○ ○ ○ ○

FBISE model paper | Section B Q6 | 4 marks

6	A metal mesh enclosure blocks external electric charges from affecting a person inside. What physical principle explains this effect and how?	1+3

First Annual 2025 | Section B Q2(x) | 3 marks

	Explain briefly:	
(x)	What is Faraday's cage? Briefly explain its working.	03

First Annual 2025 | Section B Q2(xii) | 3 marks

(xii)	How will the radius of a flexible ring change if it is given negative charge?	03

First Annual 2025 | Section C Q3 OR | 7 marks

OR	What is meant by electric field strength? Show that: $E = \frac{-\Delta V}{\Delta r}$	07

Second Annual 2025 | Section B Q2(viii) OR | 3 marks

OR	Calculate the electric field intensity at a distance of 0.5 m from a point charge of 2×10^{-6} C in a vacuum.	03

Second Annual 2025 | Section B Q2(x) OR | 3 marks

OR	The electric field at a point due to a point charge is 26 N/C and the electric potential at that point is 13 J/C. Calculate the distance of the point from the charge.	03
OR	Differentiate between conservative and non-	

Second Annual 2025 | Section B Q2(xii) | 3 marks

	projectile.			conservative forces.	
(xii)	An object having a net charge of 24μC is placed in a uniform electric field of 610 N/C directed vertically. What is the mass of this object if it floats in the field?	03	OR	A proton is moving in a circular orbit of radius 12 mm in a uniform 0.30 T magnetic field perpendicular to the velocity of the proton. Find the speed of the proton.	03
	Find the momentum of a positron moving with				

First Annual 2026 | Section B Q2(xiii) OR | 3 marks

03	OR	The electric field at a point due to a point charge is 26 N/C and the electric potential at that point is 13 J/C. Calculate the distance of the point from the charge.	03

FBISE model paper | Section A Q1(xv) | 1 mark

xv.	The region around a charge in which a test charge can feel an electric force is called	Electric intensity	Electric Potential	Electric Field	Electric Energy	○	○	○	○

OR	Show that electric field intensity is equal to negative of potential gradient. Prove that Volt/meter = Newton / Coulomb	04+02

increased?		
An electric field has a strength of 5 N/C. What force is exerted on a charge of 2 C placed in this field?	03	OR
What is meant by the elastic potential energy of a		

APOLLO

Electricity

Domain E: Electricity and Magnetism

FBISE model paper | Section A Q33 | 0.5 marks

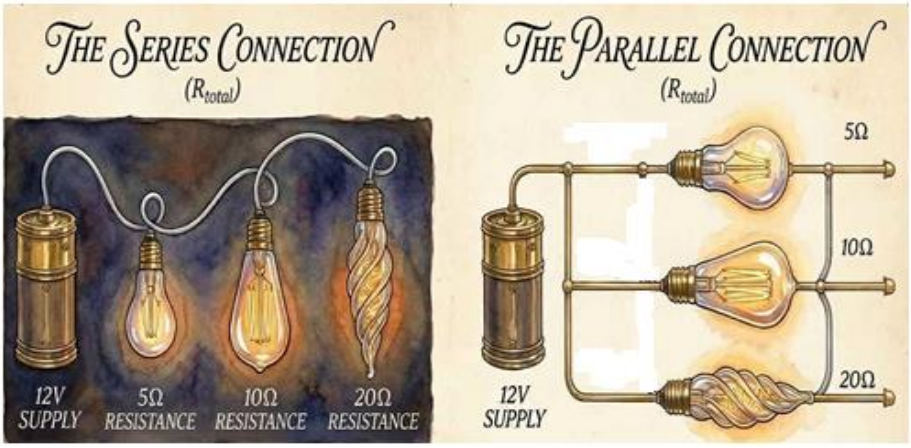
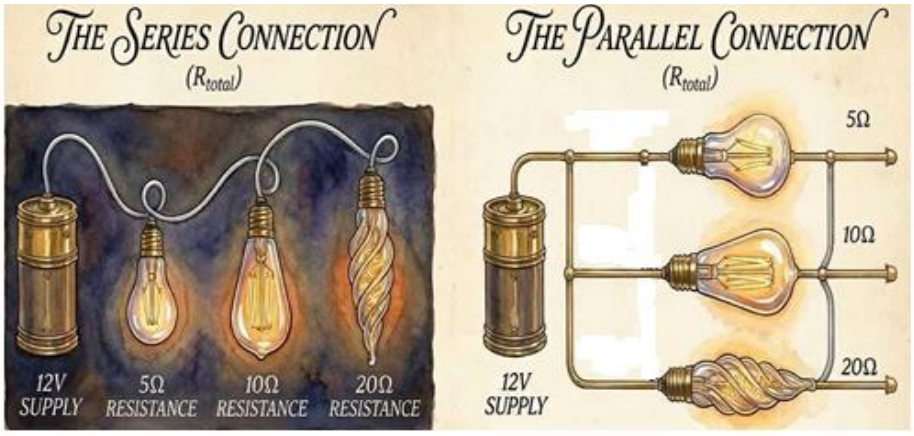
33.	The potential difference between the terminals of a battery is **9V**. How much energy is required to transfer **10 C** of charge across these terminals?	10.9 J	1.9 J	90 J	91 J	○ ○ ○ ○

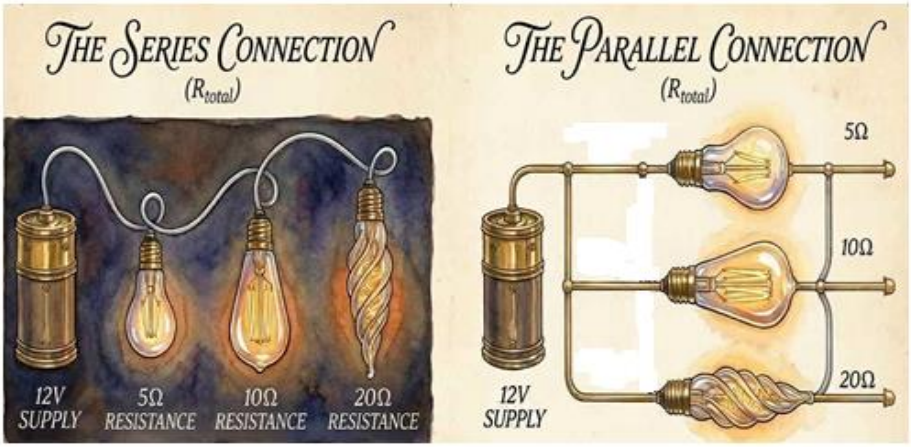
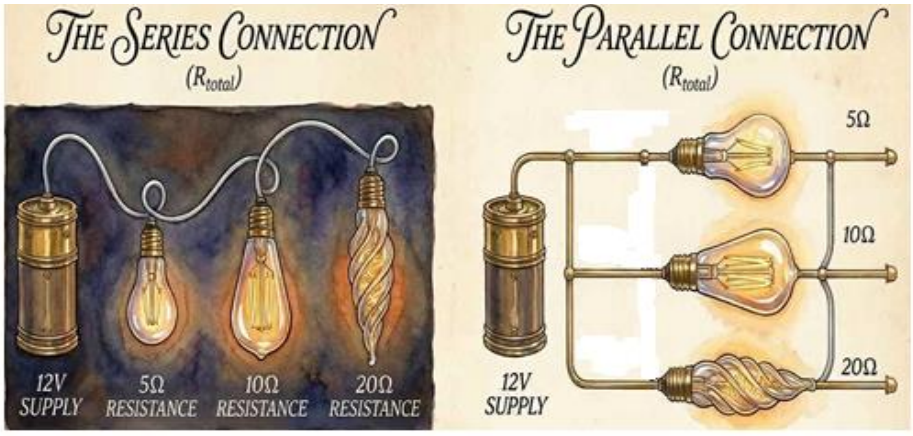
FBISE model paper | Section A Q34 | 0.5 marks

34.	The galvanometer is mainly used in null method because:	It is sensitive to very small currents	It allows large currents to flow	It has negligible internal resistance	It measures high voltages directly	○ ○ ○ ○

FBISE model paper | Section A Q51 | 0.5 marks

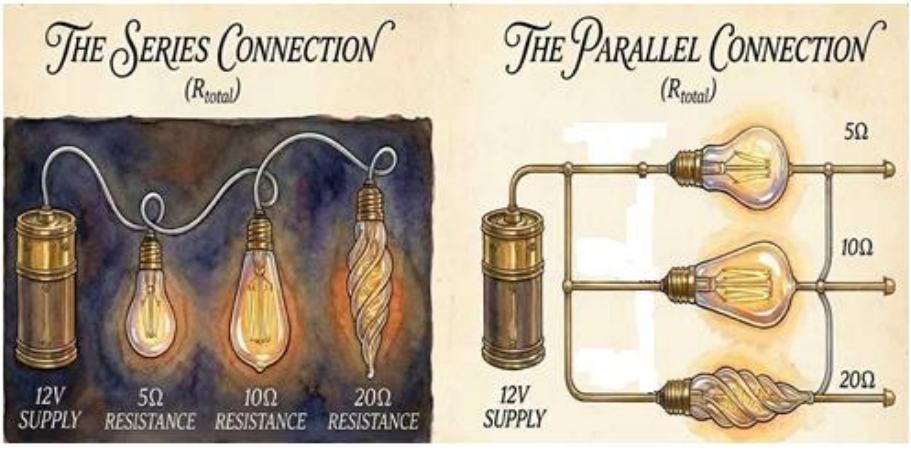
51.	A wire carries **3A** current having cross- sectional area $\mathbf{10^{-6}m^2}$ and number of electrons per cubic meter $\mathbf{5\times10^{28}\ m^{-3}}$. Given that charge on a single electron is $\mathbf{1.6\times10^{-19}C}$, the drift velocity of electrons will be:	3.75×10^{-4} m/s	2.75×10^{-4} m/s	1.75×10^{-4} m/s	0.75×10^{-4} m/s

Scenario for MCQs # 73 to 76	**An electrician designs a lighting circuit using three lamps with resistances 5 Ω, 10 Ω, and 20 Ω connected to a 12 V supply. He compares properties of series and parallel connections.** 					
Scenario for MCQs # 73 to 76						
73.	In the series connection, if the current drawn is **0.34A,** what is the voltage drop across the **10 Ω** lamp?	34 V	29.4 V	3.4 V	2.94 V	○ ○ ○ ○

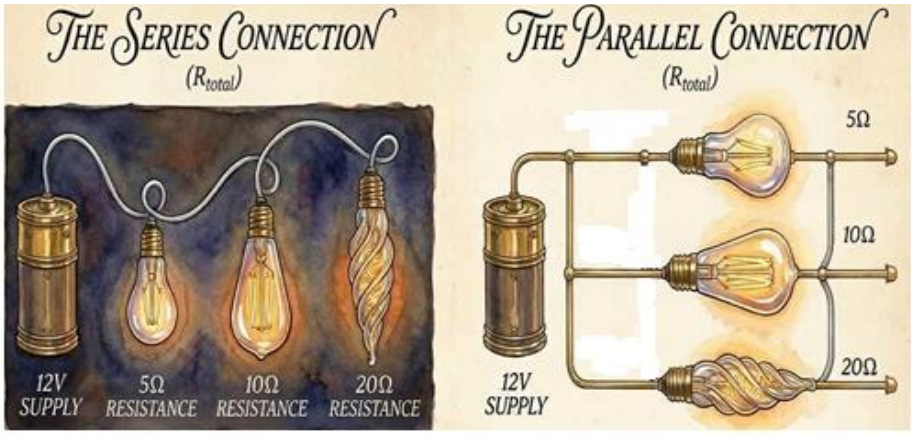
Scenario for MCQs # 73 to 76	**An electrician designs a lighting circuit using three lamps with resistances 5 Ω, 10 Ω, and 20 Ω connected to a 12 V supply. He compares properties of series and parallel connections.** 					
Scenario for MCQs # 73 to 76						
73.	In the series connection, if the current drawn is **0.34A,** what is the voltage drop across the **10 Ω** lamp?	34 V	29.4 V	3.4 V	2.94 V	○ ○ ○ ○
74.	Which lamp will be the brightest in the parallel connection?	The 5 Ω lamp	The 10 Ω lamp	The 20 Ω lamp	All lamps will have the exact same brightness.	○ ○ ○ ○

Scenario for MCQs # 73 to 76

An electrician designs a lighting circuit using three lamps with resistances 5 Ω, 10 Ω, and 20 Ω connected to a 12 V supply. He compares properties of series and parallel connections.

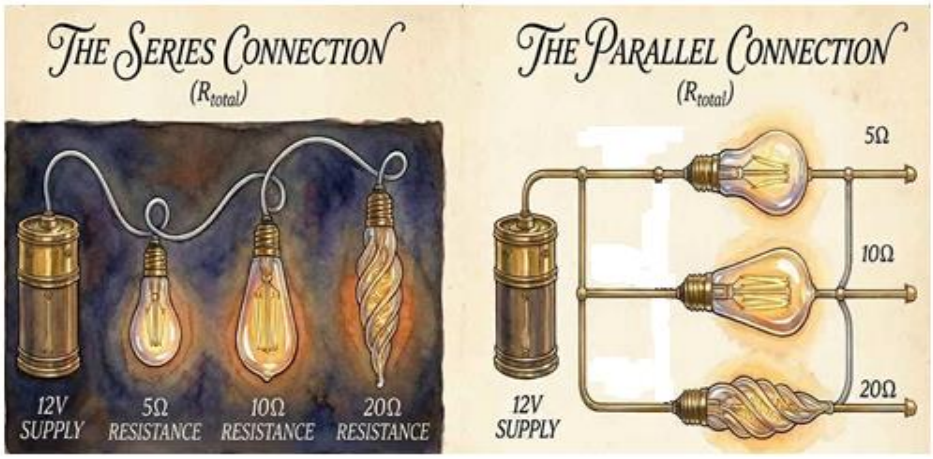


Scenario for MCQs # 73 to 76



73.	In the series connection, if the current drawn is **0.34A,** what is the voltage drop across the **10 Ω** lamp?	34 V	29.4 V	3.4 V	2.94 V	○ ○ ○ ○
74.	Which lamp will be the brightest in the parallel connection?	The 5 Ω lamp	The 10 Ω lamp	The 20 Ω lamp	All lamps will have the exact same brightness.	○ ○ ○ ○
75.	What is the total resistance of the series connection?	30 Ω	15 Ω	20 Ω	35 Ω	○ ○ ○ ○

FBISE model paper | Section A Q76 | 0.5 marks

Scenario for MCQs # 73 to 76	**An electrician designs a lighting circuit using three lamps with resistances 5 Ω, 10 Ω, and 20 Ω connected to a 12 V supply. He compares properties of series and parallel connections.** 

76.	After comparison, he prefers the Parallel connection over Series combination of bulbs. This is because in parallel circuit,	He uses less number of wires.	each lamp operates independently and receives full voltage.	the total current is reduced	the bulbs are safe from ever burning out.

FBISE model paper | Section B Q2 OR | 4 marks

OR	Explain how inspectors can easily check the reliability of a concrete bridge with carbon fibers?	04

FBISE model paper | Section B Q4 | 4 marks

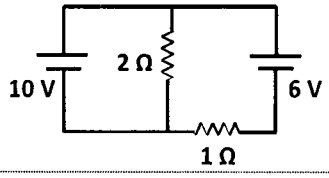
4	A device draws a current of **4A** when connected to a **12V** battery. Calculate the: a) power consumed by the device. b) resistance of the device.	2+2

First Annual 2025 | Section B Q2(vi) | 3 marks

(vi)	Calculate KE in electron volt and joules gained by an electron moving through a potential difference of 2 volts.	**03**
(vii)	Why does the resistance of LDR decrease with increase	

First Annual 2025 | Section B Q2(vii) | 3 marks

(vii)	Why does the resistance of LDR decrease with increase in intensity of light on it?	03

Find the current flowing through each resistor of the circuit.  	06

First Annual 2025 | Section B Q2(ix) | 3 marks

What is meant by null method of measurement? Enlist two applications.	03

First Annual 2025 | Section B Q2(xiv) | 3 marks

(xiv)	Under what conditions can the terminal potential differences of a battery exceed its emf?	03

Second Annual 2025 | Section B Q2(ix) | 3 marks

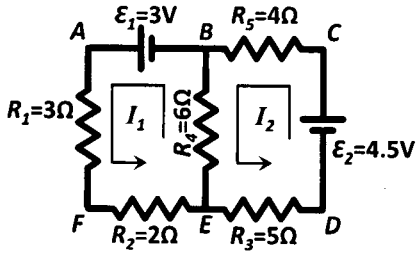
	deformation.	
(ix)	A current of 2 A is flowing in a copper conductor with a cross-section of 1 mm^2. Find the drift velocity of the electrons. (For copper, n=8.5 x 10^{28} per m^3)	

Second Annual 2025 | Section B Q2(xiv) OR | 3 marks

OR	Calculate the resistance of wire 15 m long that has a diameter of 1.5 mm and resistivity of 2.63x10^{-2} Ω m.	1+2

mathematical form. Draw its sketch.

Q.6 Find Current flowing through each resistor, using Kirchhoff's law, in the given circuit. **06**



1HA-II

$g = 9.8ms^{-2}$ • $V = Er$ • $P = \vec{F}.\vec{v}$ • $qE = mg$ • A_1v

$x = v_i \times t$ • $F_e = F_g$ • $eBr = vm_p$ • $I = nAvQ$ • v_f =

First Annual 2026 | Section B Q2(ix) | 3 marks

(ix)	Briefly explain light dependent resistor (LDR). Give one application of LDR.	2+1	OR	The front wheel of a tractor travels 700 revolutions while the rear wheel 280 in a time interval of 40 seconds. Find their angular velocities.	03

First Annual 2026 | Section B Q2(xi) OR | 3 marks

1.5 + 1.5	OR	acceleration. What is meant by potential gradient? Derive its formula. What is meant by superfluid? How is superfluid made?	03

First Annual 2026 | Section C Q5 OR | 6 marks

	discuss the direction of that force.	
OR	**a.** State Kirchoff's laws for current and voltage. **b.** There is a copper coil having 2000 turns with $0.8mm^2$ cross-section area, the length per turn is 80cm. Calculate the resistance of the coil.	
	Derive f_1, f_2 and f_3 for modes of vibration in a closed	

First Annual 2026 | Section B Q2(xii) | 3 marks

	b. Crystal lattice	
(xii)	What is a light dependent resistor (LDR)? Why is LDR useful in automatic circuits?	1+2
(xiii)	The orbit of an electron revolving around	

FBISE model paper | Section A Q1(viii) | 1 mark

viii.	The best instrument for accurate measurement of emf of a cell is:	Voltmeter	Potentiometer	Ammeter	Ohmmeter

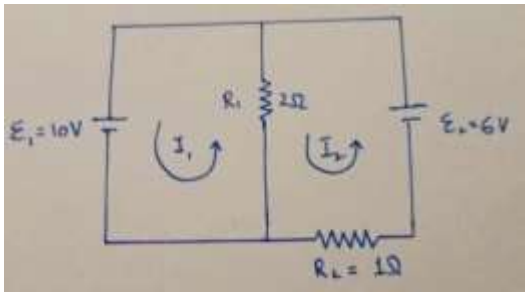
FBISE model paper | Section B Q2(v) | 3 marks

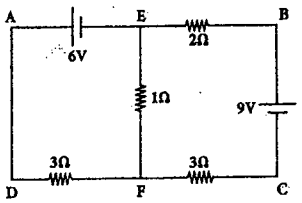
(v)	What is effect of radius of cross section of conductor on its resistance?	03

FBISE model paper | Section B Q2(x) | 3 marks

(x)	Why does the resistance of LDR decrease with increase in intensity of light on it?	03

(xi)	If 280 J of work is done in carrying a charge from a place where potential is -12V to another place where potential is V volt. Calculate the value of V.	03

Q.6	Find current flowing through each resistor, using Kirchhoff's law in the given circuit. 	06

	Calculate the distance between the charges.	
OR	a. Derive the formula for combined resistance of two or more resistors in series. b. Calculate the current that flows in the 1Ω resistor in the following circuit. 	3+4
OR	How is artificial gravity created to counter weightlessness. Determine linear velocity angular velocity, time period and frequency of artificial satellite.	2+4

)ld 2022) ——

$10^{-19} J$ ∘ $\overline{A}.\overline{B} = AB\,\mathrm{Cos}\,\theta$ ∘ $A = \pi r^2$ ∘ $E = \frac{F}{q}$

APOLLO

Electromagnetism

Domain E: Electricity and Magnetism

FBISE model paper | Section A Q36 | 0.5 marks

36.	The working principle of a seismometer is based on:	electro statics	electro magnetic induction	magnetic attraction	electrical resistance	○ ○ ○ ○

FBISE model paper | Section A Q37 | 0.5 marks

37.	A square metallic plate of sides **10m** is kept in a magnetic field which is making angle of **30^o** with the normal. The magnetic flux associated with it is **200Wb**. What will be the intensity of magnetic field at the plate?	2.2 T	3.21 T	2.31 T	1.32 T	○ ○ ○ ○

FBISE model paper | Section A Q52 | 0.5 marks

52.	A coil of **20** turns experiences a change in magnetic flux from **0.01 Wb** to **0.05 Wb** in **2s**. The induced emf in the coil is:	0.2V	0.4V	0.1V	0.5V

OR	A straight wire of length **0.75m** carries a current of **8A**. It is placed in a uniform magnetic field of **0.2T** such that it makes an angle of **45º** with the magnetic field lines. **(a)** Determine the magnitude of the magnetic force on the wire. **(b)** What would be the force if the wire were placed parallel to the magnetic field?	3+1

9	State why the magnetic field due to a current- carrying solenoid is increased when a ferrous core (iron) is inserted into it? Explain the significance of relative permeability of iron core in this regard?	4+2	**OR**

First Annual 2025 | Section B Q2(ix) | 3 marks

	depend on the resistance of the circuit? Justify.	
(ix)	The Kinetic energy of a charged particle moving in a uniform magnetic field does not change. Why? Explain briefly.	03
(x)	What is Faraday's cage? Briefly explain its working.	

First Annual 2025 | Section B Q2(vii) OR | 3 marks

	speed of light? Justify.	
OR	State Faraday's law of electromagnetic induction. Give its mathematical form.	2+1
	At what speed would the mass of proton be	

First Annual 2025 | Section B Q2(viii) | 3 marks

(viii)	Does the induced emf in a circuit depend on the resistance of the circuit? Does the induced current depend on the resistance of the circuit? Justify.	1.5 + 1.5	OR	At what speed would the mass of proton be doubled? The rest mass of proton is $1.673\times10^{-27}\ kg$.	03

First Annual 2025 | Section B Q2(x) OR | 3 marks

03	OR	What is meant by magnetic flux linkage? Explain briefly.

First Annual 2025 | Section C Q6 | 6 marks

	pipe.	
Q.6	Discuss and derive an expression for magnetic force acting per unit length of conductor, when current is passing through two parallel straight conductors in upward direction.	**06**

Second Annual 2025 | Section B Q2(xii) OR | 3 marks

	conservative forces.
OR	A proton is moving in a circular orbit of radius 12 mm in a uniform 0.30 T magnetic field perpendicular to the velocity of the proton. Find the speed of the proton.

	angular momentum of a rigid body.	
Q.4	Explain the origin of the forces between current-carrying conductors and determine the direction of the forces.	**4+2**

First Annual 2026 | Section C Q4 OR | 6 marks

		kg.	
1+3 +2	OR	Derive an expression for a magnetic force experienced by a moving charge in a uniform magnetic field. Also discuss the direction of that force.	4+2
		a. State Kirchoff's laws for current and voltage	

First Annual 2026 | Section B Q2(iii) OR | 3 marks

		which is responsible for the particle's mass.	
03	OR	How a seismometer uses electromagnetic induction to detect earthquakes? Explain briefly.	03

First Annual 2026 | Section B Q2(ix) | 3 marks

(ix)	What is magnetic flux? Also describe magnetic flux density and write its formula.	1+2
(x)	What are beats? How are they produced?	

FBISE model paper | Section A Q1(vii) | 1 mark

vii.	Cyclotron frequency of a charged particle moving in a magnetic field B is independent of:	Magnetic flux density	Charge on a particle	Velocity of particle	Mass of particle

FBISE model paper | Section A Q1(xiii) | 1 mark

xiii.	Which of the following moving particle is not deflected by magnetic field?	Neutron	Proton	Electron	Positron	○ ○ ○ ○

FBISE model paper | Section B Q2(iii) OR | 3 marks

(iii)	Write the characteristics of scalar product.	03	**OR**	Define the principle used in seismometer.	03

FBISE model paper | Section B Q2(viii) | 3 marks

(viii)	By using concept of dot product, how can you describe that magnetic flux is scalar product of magnetic flux density (**B**) and vector area (**A)**?	03

FBISE model paper | Section B Q2(xii) OR | 3 marks

OR	Hydrogen has three isotopes. How can you use magnetic field to separate them?	03

First Annual 2026 | Section B Q2(ix) OR | 3 marks

How is magnetic field created around a straight current carrying conductor? How its direction is determined?	2+1
Prove that $E = -\frac{\Delta V}{\Delta r}$	

First Annual 2026 | Section C Q4 | 6 marks

				b. Discuss any two applications of Doppler's effect.	
Q.4	Explain how electric and magnetic fields can be used in velocity selection. Make diagram as well.	4+2	OR	State Coulomb's Law. Write its mathematical expression. Two point charges $q_1 = 4\mu C$ and $q_2 = 2\mu C$, exert a repulsive force of 36N on each other.	1+1 +4

APOLLO

Relativity

Domain F: Modern Physics

FBISE model paper | Section A Q39 | 0.5 marks

39.	A rod has a proper length of **10m.** As it moves past a stationary observer at a speed of **0.6c,** its length is measured to be **8m** by the observer. Why there is a change in the observed length?	The proper length is invariant	The atoms of rod physically shrink	Moving objects appear shorter in relative motion	Moving objects appear stretched in relative motion	○ ○ ○ ○

FBISE model paper | Section A Q44 | 0.5 marks

44.	As an object's velocity approaches speed of light **c**, the relativistic mass will:	decrease	remain constant	increase	become zero	○ ○ ○ ○

FBISE model paper | Section A Q47 | 0.5 marks

47.	The speed of light in vacuum is:	Variable with observer's speed	Constant for all inertial frames	Greater for moving observer	Zero in non-inertial frames	○ ○ ○ ○

FBISE model paper | Section A Q48 | 0.5 marks

48.	Two events occur simultaneously at different locations in a stationary reference frame. According to special relativity, a moving observer will perceive them as:	occurring at the same time and same location	occurring at different times	occurring at the same time but at different locations	merging into a single event	○ ○ ○ ○

FBISE model paper | Section A Q53 | 0.5 marks

53.	If the speed of light **c** is the only absolute quantity in universe then space and time must;	entirely disappear	also be absolute	be finite	depend on observer's frame of reference

FBISE model paper | Section A Q54 | 0.5 marks

54.	Which real-world phenomenon provides evidence for time dilation?	Expansion of metals when heated	Life spans of cosmic-ray muons reaching the earth's surface	Sound echoes in valleys	Red shift of distant galaxies

FBISE model paper | Section B Q1 OR | 4 marks

OR	Distinguish between inertial and non-inertial frames of reference Providing at least one example for each.	3+1

First Annual 2025 | Section B Q2(vi) OR | 3 marks

What happens to the density of an object as it moves in a direction with very high speed relative to speed of light? Justify.	03

First Annual 2025 | Section B Q2(xii) OR | 3 marks

OR	What is the difference between inertial and non-inertial frame of reference?	03

First Annual 2025 | Section C Q6 OR | 6 marks

OR	Discuss the following consequences of special theory of relativity: i) Time dilation ii) Length contraction iii) Mass increase	2x3

Second Annual 2025 | Section B Q2(xiii) | 3 marks

	What is the mass of this object if it floats in the field?			velocity of the proton. Find the speed of the proton.	
(xiii)	Find the momentum of a positron, moving with relativistic speed. The energy of the positron is 0.47 MeV.	03	OR	According to which principle ships float on water? Explain briefly.	03

Second Annual 2025 | Section C Q6 OR | 6 marks

	particle.	
OR	What is special theory of relativity? Describe the following consequences of special theory of relativity: **a.** Mass variation **b.** Length contraction **c.** Time dilation	2+2 +2

First Annual 2026 | Section C Q6 OR | 6 marks

			Also calculate the force of friction.	
a. What is meant by term protentional gradient? Derive its formula. b. Show that $\frac{volt}{meter} = \frac{newton}{columb}$	3+3	OR	a. State postulates of special theory of relativity. b. Briefly discuss length contraction as a consequence of special relativity. c. The length of spaceship is 100m long. What will be its length if the spaceship moves with a speed of 0.99c?	2+1 +3

1HA-L26004-(D)

FBISE model paper | Section A Q1(x) | 1 mark

x.	Theory of relativity was formulated by.	Isaac Newton	Rutherford	Plank	Albert Einstein

02+ 04	**OR**	Describe the following consequences of special theory of relativity A: Mass variation B: Length contraction C: Time dilation	02+02 +02

APOLLO

Particle Physics

Domain F: Modern Physics

FBISE model paper | Section A Q40 | 0.5 marks

40.	During β^- decay, a neutron within a nucleus transforms into which of the following sets of particles?	Proton + electron + anti-neutrino	Proton + positron + neutrino	Electron + gamma rays	Neutron + proton	○ ○ ○ ○

FBISE model paper | Section A Q41 | 0.5 marks

41.	Which statement best compares a quark and an anti-quark of the same flavor?	Both have same electric charge but opposite masses	Both have opposite electric charges but same mass	Both have same charge and mass but different colors	They are identical in every way	○ ○ ○ ○

FBISE model paper | Section A Q42 | 0.5 marks

42.	Which elementary particle serves as the force carrier for the electromagnetic interactions?	Gluon	Photon	Z-Boson	W-boson	○ ○ ○ ○

FBISE model paper | Section A Q43 | 0.5 marks

43.	Alpha particles are emitted with discrete energies, whereas beta particles are emitted with a continuous range of energies because:	neutrino shares the energy in alpha decay	neutrino/anti-neutrino shares the energy in beta decay	anti-neutrino shares the energy in alpha decay	alpha particles are bosons	○ ○ ○ ○

FBISE model paper | Section A Q45 | 0.5 marks

45.	In electron- positron annihilation, why are at least two photons produced instead of just one?	To conserve electric charge	To conserve mass	To conserve linear momentum	To conserve lepton number	○ ○ ○ ○

FBISE model paper | Section A Q46 | 0.5 marks

46.	Both electrons and neutrinos are classified as leptons; because	They experience strong nuclear force	They do not experience strong nuclear force	They are made up of quarks	They are made up of anti-quarks	○ ○ ○ ○

FBISE model paper | Section A Q77 | 0.5 marks

Scenario for MCQs # 77 to 80

Inside a "high-velocity" research chamber, physicists observe two different subatomic interactions. They note the following:

System	Interaction Mechanism
Quarks bound inside a proton	Exchange of gluons
Electrons in the beam	Exchange of photons

		Electrons in the beam			Exchange of photons	
77.	Which fundamental force is responsible for the exchange of gluons between quarks?	Electro-magnetic force	Weak nuclear force	Strong force	Gravitational force	○ ○ ○ ○

FBISE model paper | Section A Q78 | 0.5 marks

Scenario for MCQs # 77 to 80

Inside a "high-velocity" research chamber, physicists observe two different subatomic interactions. They note the following:

System	Interaction Mechanism
Quarks bound inside a proton	Exchange of gluons
Electrons in the beam	Exchange of photons

		Electrons in the beam			Exchange of photons	
77.	Which fundamental force is responsible for the exchange of gluons between quarks?	Electro-magnetic force	Weak nuclear force	Strong force	Gravitational force	○ ○ ○ ○
78.	The exchange of photons between electrons mediates which type of interaction?	Strong interaction	Electromagnetic interaction	Gravitational interaction	Beta decay interaction	○ ○ ○ ○

FBISE model paper | Section A Q79 | 0.5 marks

Scenario for MCQs # 77 to 80

Inside a "high-velocity" research chamber, physicists observe two different subatomic interactions. They note the following:

System	Interaction Mechanism
Quarks bound inside a proton	Exchange of gluons
Electrons in the beam	Exchange of photons

		Electrons in the beam			Exchange of photons	
77.	Which fundamental force is responsible for the exchange of gluons between quarks?	Electro-magnetic force	Weak nuclear force	Strong force	Gravitational force	○ ○ ○ ○
78.	The exchange of photons between electrons mediates which type of interaction?	Strong interaction	Electromagnetic interaction	Gravitational interaction	Beta decay interaction	○ ○ ○ ○
79.	In particle physics, gluons and photons both are called force-carrying particles. They are generally categorized as:	Leptons	Hadrons	Gauge-Bosons	Fermions	○ ○ ○ ○

FBISE model paper | Section A Q80 | 0.5 marks

Scenario for MCQs # 77 to 80	**Inside a "high-velocity" research chamber, physicists observe two different subatomic interactions. They note the following:** **System** — **Interaction Mechanism** **Quarks bound inside a proton** — **Exchange of gluons** **Electrons in the beam** — **Exchange of photons**

80.	Why do quarks exchange gluons whereas electrons do not?	electrons are negatively charged particles and repel gluons	Gluons only interact with particles having color and quarks possess color charge	Gluons decay before reaching electrons	Gluons only interact with leptons	○ ○ ○ ○

FBISE model paper | Section B Q7 | 4 marks

7	Define baryons and mesons. Give two examples of each.	2+2

First Annual 2025 | Section B Q2(ix) OR | 3 marks

OR	If $^{233}_{92}U$ decays twice by alpha particle emission, what is the resulting isotope? Show by equation.	03

First Annual 2025 | Section B Q2(x) OR | 3 marks

OR	Compare gluons and photons.	03

First Annual 2025 | Section B Q2(xi) | 3 marks

(xi)	What is meant by annihilation? Give one annihilation reaction.	03

First Annual 2025 | Section C Q4 OR | 6 marks

OR	What is meant by quark? Explain the quark family of particles.	2+4

First Annual 2026 | Section B Q2(ii) | 3 marks

(ii)	Describe photon as a force carrier.

First Annual 2026 | Section B Q2(ii) OR | 3 marks

Give Comparison of amorphous and polymeric solids. (Three points)	1x3	OR	State the Higgs Boson as a fundamental particle which is responsible for the particle' s mass.	03
The magnitudes of dot and cross product of two			How a seismometer uses electromagnetic induction	

FBISE model paper | Section A Q1(xii) | 1 mark

xii.	Lepton number for muon particle is:	-1	+1	+1/2	0

FBISE model paper | Section B Q2(ii) OR | 3 marks

(ii)	Define crystalline and amorphous solid.	03	**OR**	What are the differences between gluons and photons?	03

FBISE model paper | Section C Q5 | 6 marks

Q.5	What is meant by quark? Explain the quark family of particle.	02+ 04	**OR**