

# PUNJAB PUBLIC SERVICE COMMISSION

## COMBINED COMPETITIVE EXAMINATION FOR RECRUITMENT TO THE POSTS OF PROVINCIAL MANAGEMENT SERVICE, ETC -2022 CASE NO. 2C2023

## SUBJECT: PHYSICS (PAPER-I)

TIME ALL	OWED: THREE HOURS	MAXIMUM MARKS: 100
I. All II. Wr III. No IV. Ext	the parts (if any) of each Question must be attempted a ite Q. No. in the Answer Book in accordance with Q. No. Page/Space be left blank between the answers. All the tra attempt of any question or any part of the question v	t one place instead of at different places. In the Q. Paper. plank pages of Answer Book must be crossed. vill not be considered.
NOTE:	. Attempt any FIVE Questions in All	Attempt in Urdu or English
Q. No.1	a) What are spherical polar coordinates? Define these coordinates. How these are relate with Cartesian coordinates (x, y, z)? Explain direction cosines of a vector.	
	b) Explain vector triple product? Show that	(4+4+4=12 Marks) t
	$\vec{A} \times (\vec{B} \times \vec{C}) = (\vec{A} \cdot \vec{C})\vec{B} - (\vec{A} \cdot \vec{B})\vec{C}$	김 옷을 다 그는 것이야 한다. 것이야.
Q. No.2	(a) Derive the Stokes' theorem from the fu of line and surface integrals. Discuss the theorem holds, and give counterexamples	<b>(8 Marks)</b> Indamental theorem of calculus and the definition assumptions and conditions under which Stokes' to illustrate when the theorem fails.
	(b) How is the curl related to the rotation common properties and identities of the c	and divergence of a vector field? What are some url. (10+10=20 Marks)
Q. No.3	a) Define pressure of a fluid. Derive an point inside a fluid and a point at the atmosphere.	expression for the pressure gradient between a surface. Determine variation in pressure in the <b>(14 Marks)</b>
	<b>b)</b> A bowler swings a ball while bowling t equation.	o a cricketer. Explain this swing using Bernoulli's (6 Marks)
Q. No.4	<ul> <li>a) What are stationary waves? How these and mathematical treatment.</li> </ul>	waves are formed? Describe their characteristics
	b) Calculate formula for power and intens	ity in wave motion.
Q. No.5	(a) Explain the phenomenon of interfere constructive and destructive interference applications.	(10+10=20 Marks) nce of waves. What is the difference between ? Give an example of each and discuss their
	(b) Explain the working principle of a sp distribution of light?	pectrometer. How does it measure the spectral (10+10=20 Marks)
Q. No.6	(a) What is coherence and why is it impo the difference between spatial coherence	ortant in the study of wave phenomena? Explain and temporal coherence.
	(b) What is the resolving power of a diffrac power of a diffraction grating and explain	tion grating? Derive the equation for the resolving the factors affecting it. (10+10=20 Marks)
Q. No.7	(a) What is the difference between reversil How do reversible processes relate to ent	ble and irreversible processes in thermodynamics? ropy and energy conservation? <b>(10 Marks)</b>
	(b) What is enthalpy and how is it related	to internal energy and work? (5 Marks)
	(c) What is Brownian motion and how doe	es it occur? (5 Marks)
Q. No.8	a) What is an ideal gas? Calculate pressur gases. Prove that pressure exerted by id average translational kinetic energy of gas	e of an ideal gas on the basis of kinetic theory of eal gas molecules is directly proportional to the s molecules.
	b) Considering thermodynamic potentials	discuss Maxwell's relations. (12+8=20 Marks)



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SUBJECT: PHYSICS (PAPER-II)

TIME ALLOWED: THREE HOURS

**MAXIMUM MARKS: 100** 

NOTE:		
i. All t II. Writ III. No I IV. Extr	<ul> <li>All the parts (if any) of each Question must be attempted at one place instead of at different places.</li> <li>Write Q. No. in the Answer Book in accordance with Q. No. in the Q. Paper.</li> <li>No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.</li> <li>Extra attempt of any question or any part of the question will not be considered.</li> </ul>	
NOTE: <u>Attempt Five Questions in All. Calculator is allowed (Non-Programmable).</u> <u>Attempt in Urdu or English.</u>		
Q. No. 1:	a) State and explain Ampere's Law of magnetic field on considering a straight current carrying conductor.	
	b) How you can determine the value of magnetic field inside a current carrying Solenoid by employing Ampere's Law? (10+10=20 Marks)	
Q. No. 2:	<ul> <li>a) What is Transient current? Derive its expression for an LR circuit.</li> <li>b) What is Time Constant of an LR circuit?</li> </ul>	
	c) How much percent of maximum current will appear in LR circuit after 5 Time Constants? (10+4+6=20 Marks)	
Q. No. 3:	a) Differentiate between the mechanism of current flow through npn and pnp transistors.	
	<ul> <li>b) What is an amplifier? Describe in detail the transistor as an amplifier using a common-emitter configuration.</li> <li>(6+14 = 20 Marks)</li> </ul>	
Q: No: 4:	a) What is a NAND gate? Write its truth table, logic equation and logic operation. Draw and explain its switch equivalent. Why NAND and NOR gates are called universal gates? Explain with appropriate example.	
	b) What is De Morgan's theorem? Explain its significance. Describe briefly how De Morgan's theorem is applied in the simplification of a Boolean expression. (12+8=20 Marks)	
Q. No. 5:	<ul> <li>a) What is Photoelectric Effect? Explain the experimental results of Photoelectric set-up.</li> <li>b) Describe the followings:         <ol> <li>Threshold frequency</li> <li>Work Function of a metal</li> <li>Einstein's equation of Photoelectric Effect</li> </ol> </li> </ul>	
	iv) Stopping Potential (12+8=20 Marks)	
Q. No. 6;	a) Derive Time dependent and Time Independent Schrodinger's wave equations. What is	
	<ul> <li>b) Solve Schrodinger's wave equation for a particle trapped in one dimensional box.</li> <li>(10+10=20 Marks)</li> </ul>	
Q. No. 7:	a) What do you mean by mass defect and binding energy of a nucleus? How does binding energy per nucleon vary as a function of mass number?	
	<ul> <li>b) State radioactive law. How will you find the mean life time of a radioactive element? Prove that mean life time of a radioactive element is always greater than its half-life. (10+10=20 Marks)</li> </ul>	
Q. No. 8:	a) What do you mean by radioactive decay? Discuss theory of alpha-decay in detail.	
-	b) Define half-life of a radioactive element. Derive an expression to find the half-life of a radioactive element.	
	c) Explain the reason that nuclei with high mass numbers tend to accommodate more neutrons than protons. (8+8+4=20 Marks)	