

**FINAL RUBRICS: HSSC 1<sup>st</sup> ANNUAL EXAMINATION 2023**  
**SUBJECT: PHYSICS HSSC-I (Hard Area)**

Q # (Part #)	Criteria	Level 1 (marks)	Level 2 (marks)	Level 3 (marks)	Level 4 (marks)	Level 5 (Marks)	Level 6 (Marks)
2(i)	Description of Error	Correctly describing error with example of measurements, etc. (1.5)	Partially correct description without correct example (01)	Some relevant example or information (0.5)	Wrong (0)		
	Description of Uncertainty	Correctly describing error with example of measurements, etc. (1.5)	Partially correct description without correct example (01)	Some relevant example or information (0.5)	Wrong (0)		
2(ii)	Calculation of area of mobile phone	Correct calculation, correct answer with unit (01)	Partially correct (0.5)	Wrong (0)			
	Calculation of uncertainty in area of mobile phone	Correct calculation of percentage uncertainties in length, width and area and then writing answer in absolute uncertainty (02)	Partially correct calculation with at least correct calculation of percentage uncertainties (01)	Some relevant steps (0.5)	Wrong (0)		
2(iii)	Magnitude of vector product of two vectors is equal to area of a parallelogram	Correct proof with figure (03)	Correct proof without figure (02)	Partially correct proof OR correct figure (01)	Wrong (0)		
2(iv)	In SHM, velocity is maximum and acceleration is zero at mean position	Correct explanation e.g. mentioning formulae of velocity and acceleration, solving for mean position and discussing results <b>OR</b> any other correct explanation (03)	Partially correct (02)	Some relevant information/ mathematical steps (01)	Wrong (0)		
2(v)	Differences between elastic and inelastic collision	Two correct differences (02)	One correct difference (01)	Some relevant information (0.5)	Wrong (0)		
	Examples of elastic and inelastic collision	Two examples - One Correct example of each type of collision (01)	One correct example of any one type of collision (0.5)	Wrong (0)			
2(vi)	Angle of projection of stone for which its horizontal distance and vertical height are equal	Correct calculation and answer (03)	Partially correct (02)	Some relevant steps (01)	Wrong (0)		

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2(vii)	Escape velocity of a body at Mars	Correct calculation and answer with unit (03)	Partially correct calculation (02)	Correct answer with correct unit (01)	Wrong (0)		
2(viii)	Reason that orbiting satellite does not fall on earth	Correct explanation including discussion on gravitational force as centripetal force, curvature of motion of satellite parallel to curvature of earth surface etc. (03)	Partially correct explanation (02)	Some relevant information (01)	wrong answer (0)		
2(ix)	Calculation of position of first bright fringe	Correct calculation with answer (1.5)	Partially correct (01)	Some relevant steps (0.5)	Wrong (0)		
	Calculation of position of first dark fringe	Correct calculation with answer (1.5)	Partially correct (01)	Some relevant steps (0.5)	Wrong (0)		
2(x)	Selection of wheel of tractor rotating faster	Correct selection of tyre i.e. smaller OR front wheel (01)	Wrong (0)				
	Explanation of the cause of front wheel rotating fast	Correct explanation e.g. small radius OR diameter, small moment of inertia and relating to law of conservation of angular momentum etc. (02)	Partially correct (01)	Some relevant information (0.5)	Wrong (0)		
2(xi)	Dependance of viscous force on shape of object in fluid	Correct explanation (1.5)	Partially correct explanation (01)	Some relevant information (0.5)	Wrong (0)		
	Dependance of viscous force on velocity of object in fluid	Correct explanation e.g. relating with formula of viscous/drag force OR correct theoretical explanation etc. (1.5)	Partially correct explanation (01)	Some relevant information (0.5)	Wrong (0)		
2(xii)	Decrease in cross sectional area of water falling from tap	Correct explanation relating with formula of equation of continuity (03)	Partially correct explanation (02)	Some relevant information (01)	Wrong (0)		
2(xiii)	Calculation of acceleration of simple pendulum	Correct calculation with answer (03)	Partially correct calculation (02)	Any relevant step (01)	Wrong (0)		
2(xiv)	Calculation of frequency of simple pendulum	Correct calculation with answer (03)	Partially correct calculation (02)	Any relevant step (01)	Wrong (0)		

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2(xv)	Discussion on stationary waves in stretched string when it is plucked at one quarter of its length	Correctly discussing formation of two loops of stationary waves, its figure, calculation of wavelength and 2 <sup>nd</sup> harmonic frequency of stationary waves (03)	Correctly discussing at least two points mentioned in level 1 (02)	Correctly discussing at least one point mentioned in level 1 (01)	Wrong (0)		
2(xvi)	Path difference in waves w.r.t. interference of waves	Correct explanation e.g. Definition of path difference w.r.t. concept of interference of two waves with correct/suitable figures OR Discussing conditions for maxima and minima in term of path difference or any other correct explanation (03)	Partially correct (02)	Some relevant information (01)	Wrong (0)		
2(xvii)	Proof of Bragg's relation	Correct derivation of path difference with figure, mentioning condition for maxima and final equation (03)	Partially correct derivation at least satisfying two points in level 1 (02)	One correct step mentioned in level 1 (01)	Wrong (0)		
2(xviii)	Explanation on degradation of energy in all natural processes	Correct response and correct explanation (03)	Correct response with partially correct explanation (02)	Some relevant information (01)	Wrong (0)		
2(xix)	Shining one side of a cricket ball by the bowlers (Bernoulli's effect)	Correct explanation (03)	Partially correct explanation (02)	Some relevant information (01)	Wrong (0)		
2 (xx)	Definition of beats	Correct definition (01)	Partially correct definition (0.5)	Wrong (0)			
	Definition of beat frequency	Correct definition OR correct formula (01)	Partially correct definition (0.5)	Wrong (0)			
	Tuning musical instruments using beats	Correct explanation (01)	Partially correct (0.5)	Wrong (0)			
3(a)	Definition of scalar	Correct definition and correct formula	Partially correct (0.5)	Wrong (0)			

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	product and formula	(01)					
	Scalar product of two vectors in term of rectangular components	Correct proof (03)	Partially correct (at least three correct steps) (02)	At least two correct step (01)	Wrong (0)		
	Proof of <b>A.B = B.A</b>	Correct derivation (02)	Partially correct (01)	Wrong (0)			
3(b)	Newtons formula for the speed of sound	Correct formula (01)	Wrong (0)				
	Laplace assumption or his idea about nature of sound waves	Correctly stating assumption e.g. formation of compression and rarefaction of sound waves is a adiabatic processes OR formation of compression and rarefaction of sound waves is adiabatic process OR any other correct statement or correct formula (02)	Partially correct statement (01)	wrong answer (0)			
	Calculation of speed of sound	Correct derivation of Laplace formula and calculation of speed of sound (04)	Correctly deriving Laplace correction to speed of sound (03)	Correctly writing at least half of mathematical steps (02)	Some relevant steps (01)	Wrong (0)	
4(a)	Calculation of potential at a point	Complete derivation with figure (05)	Correct derivation without figure (04)	Partially correct derivation with figure (03)	Partially correct derivation (02)	Some relevant information (01)	Wrong (0)
4 (b)	Calculation of speed of hoop (ring) at bottom of speed of sound	Correct calculation of speed of ring (03)	At least three correct steps (02)	At least two correct steps (01)	Wrong (0)		
	Calculation of speed of disc (cylinder) at bottom of speed of sound	Correct calculation of speed of ring (03)	At least three correct steps (02)	At least two correct steps (01)	Wrong (0)		
	Comparison of speed of hoop and disc	Correct calculations by ratio or some other method and correct result (02)	Partially correct calculation (01)	Only correct result (0.5)	Wrong (0)		
5(a)	Differentiate between	Any one correct difference (02)	Partially correct (01)	Wrong answer (0)			

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	molar specific heats at constant pressure and at constant volume						
	$C_p > C_v$	Correct reason (02)	Partially correct (01)	Some relevant information (0.5)	Wrong answer (0)		
	Proof of $C_p - C_v = R$	Correct proof involving calculation internal energy, first law of thermodynamics, general gas equation etc. (04)	Partially correct with at least two correct calculations mentioned in level 1 (03)	One correct calculation mentioned in level 1 (02)	Some relevant steps (01)	Wrong (0)	
5(b)	data	Correct data (01)	Incomplete data(0.5)	Wrong (0)			
	Calculation	Correct calculation with answer (04)	Correct calculation with wrong answer (03)	Some correct relevant steps (02)	Any one relevant step (01)	Wrong (0)	

**Note: All the markers must know the solutions of all the question items of the question paper before starting marking.**