RUBRICS: HSSC 1st ANNUAL EXAMINATION 2023

SUBJECT: PHYSICS HSSC-II (Local)

Q.# /Part #	Criteria	Level 1 (Marks)	Level 2 (Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)	
2(i)	Derivation of electric field as potential gradient	Correct derivation involving at least these steps: mentioning i. charge moving against electric field (angle = 180^o) OR correctly labelled figured, ii. calculation of work iii. correctly relating potential difference and electric field (03)	Correctly solving two steps mentioned in level 1 (02)	Correctly solving one step mentioned in level OR correctly labelled figure 1 (01)	Wrong answer (0)		
2(ii)	Definition of electron volt	Correct definition (01)	Partially correct definition (0.5)	Wrong answer (0)			
	Deriving relation between electron volt and joule ($1eV = 1.6 \times 10^{-19}$ J)	Correct proof using $W = q\,\Delta V$ for electron ($q = 1.6 \times 10^{-19}$ C) between two point of ΔV=1V (02)	Partially correct response e.g. correct conversion but wrong conversion of units OR one incorrect step etc. (01)	Only writing the result $1eV = 1.6 \times 10^{-19}$ J (0.5)	Wrong answer (0)		
2(iii)	Description of Rheostat as potential divider	Correct description of Potential divider using Rheostat e.g. mentioning the use of its involved terminals (OR correctly labelled figure), Relation of potential divider and variation of potential with resistance r (03)	Any two correct steps mentioned in level 1 (02)	Any one correct step mentioned in level 1 (01)	Wrong answer (0)		
2(iv)	Calculation of electrical energy supplied to electric heater	Correct calculation and correct answer and unit (03)	Partially correct calculation (02)	One correct mathematical step (01)	Wrong answer (0)		
2(v)	Explanation of "low resistance calling as shunt resistance in ammeter"	Correct response e.g. shunt provides another path for current flow in the combination etc. (01)	Partially correct response (0.5)	Wrong answer (0)			
	Explanation of connecting shunt	Correct explanation e.g. Shunt is low resistance,	Partially correct description (01)	Wrong answer (0)			

	resistance in parallel with ammeter.	when connected in parallel with galvanometer reduces equivalent resistance of combination and increasing the current measuring ability (it can be explained with the help of formula of Rs) etc. (02)					
2(vi)	Explaining the possibility of accelerating neutrons in a cyclotron	Correct Response with correct explanation e.g. neutrons cannot be accelerated in cyclotron, explaining with the help of magnetic force (F = qvB) or cyclotron frequency formulas (03)	Correct response in answer but partially correct or incomplete explanation (02)	Some relevant information (01)	Wrong answer (0)		
2(vii)	Explaining the need of laminated iron cores in transformers	Any three correct advantages of using laminated iron cores e.g. Reduction of eddy current, reducing energy loss, focusing magnetic flux on coils, etc (03)	Any two correct advantages mentioned in level 1 (02)	Any one correct advantage mentioned in level (01)	Wrong answer (0)		
2(viii)	Calculation of coefficient of self-inductance of a coil	Correct calculation and correct answer and unit (03)	Partially correct calculation (02)	One correct mathematical step (01)	Wrong answer (0)		
2(ix)	Reason of production of radiowaves	Correct reason e.g. accelerating charges OR explanation using maxwell equations OR any other correct response etc. (1.5)	Partially correct response (01)	Some relevant information (0.5)	Wrong answer (0)		
	Description of transfer of information using radiowaves	Correctly describing the transmission of information via radiowaves e.g. explaining the production of radiowaves	Partially correct response (01)	Some relevant information (0.5)	Wrong answer (0)		

		in an antenna wire using AC or oscillating charges and conversion into electromagnetic waves etc. (1.5)					
2(x)	Calculation of frequency of AC	Correct calculation and correct answer and unit (03)	Partially correct calculation (02)	One correct mathematical step (01)	Wrong answer (0)		
2(xi)	Explaining the importance of superconductors in MRI	Correct explanation (03)	Partially correct (02)	Some relevant information (01)	Wrong answer (0)		
2(xii)	Differentiate between elastic deformation and plastic deformation	Correctly differentiating between elastic and plastic deformations along with stress strain graph (03)	Partially correct i.e. correct differences OR labelled stress strain graph mentioning elastic and plastic regions, labelled axes etc.(02)	Some relevant information (01)	Wrong answer (0)		
2(xiii)	Explanation of transistor working as open switch	Correct explanation e.g. base current is zero then collector current zero, resistance between C-E terminals is very high, so transistor acts as open switch OR any other correct explanation (1.5)	Partially correct response e.g. any two correct steps mentioned in level 1 (01)	Some relevant information (0.5)	Wrong answer (0)		
	Explanation of transistor working as close switch	Correct explanation e.g. base current is not zero then large collector current is flowing, resistance between C-E terminals is small, so transistor acts as close switch OR any other correct explanation (1.5)	Partially correct response e.g. any two correct steps mentioned in level 1 (01)	Some relevant information (0.5)	Wrong answer (0)		
2(xiv)	Explanation of flow of electrons and holes in a PN junction	Correct explanation of flow of electrons and holes in the formation of PN junction (03)	Partially correct response (02)	Some relevant information (01)	Wrong answer (0)		

2(xv)	Explaining "the rest mass of photon is zero"	Correct response with correct reason e.g. proving it with relativistic mass equation or any other correct reason (03)	Correct response in answer but partially correct or incomplete explanation (02)	Some relevant information (01)	Wrong answer (0)		
2(xvi)	Explanation of unified mass scale	Correct explanation e.g. definition, its relation with mass of C-12 atom i.e. 1u = mC-12/12 and its value in kg etc. (1.5)	Partially correct (01)	Some relevant information (0.5)	Wrong answer (0)		
	Explanation of mass defect	Correct explanation e.g. discussing sum of masses of nucleons and resultant nucleus OR definition of mass defect, equation OR any other correct explanation (1.5)	Partially correct (01)	Some relevant information (0.5)	Wrong answer (0)		
2(xvii)	Differentiating between excitation potential and ionization energy	Any three correct differences (03)	Any two correct differences (2)	Any one correct difference (1)	Wrong answer (0)		
2(xviii)	Differentiating between Characteristic X-rays and visible light	Any three correct differences on the basis of energy, frequency, wavelength, penetration power etc. (03)	Any two correct differences (2)	Any one correct difference (1)	Wrong answer (0)		
2(xix)	Description of any two basic forces of nature	Correctly describing any two basic forces of nature with at least three characteristics of each force (03)	Partially correct response of both forces with at least two correct characteristics (02)	Describing correctly any one force with three characteristics OR describing two forces with one correct characteristic of each force (1.5)	Some relevant information (01)	Wrong answer (0)	

2(xx)	Explanation of release of more energy per nucleon in fusion reaction than fission reaction	Correct explanation (03)	Partially correct (02)	Some relevant information (01)	Wrong answer (0)		
3(a)	Derivation of energy stored in capacitor-first formula ($U = ½ CV^2$)	Correct derivation involving average voltage, energy basic formula $W = qV$ and putting value of q ($q = CV$), average voltage and final result (05)	Derivation having three correct steps mentioned in level 1 (04)	Derivation having two correct steps mentioned in level 1 (03)	Derivation having one correct step mentioned in level 1 (02)	Some relevant information (01)	Wrong answer (0)
	Derivation of energy stored in capacitor-second formula ($U = ½ \varepsilon_o \varepsilon_r E^2 Ad$)	Correct derivation by putting values of capacitance and voltage and calculating the final formula (03)	Derivation having two correct steps mentioned in level 1 (02)	Derivation having one correct step mentioned in level 1 (01)	Wrong answer (0)		
3(b)	Explaining the conversion of galvanometer into ammeter	Correctly describing that shunt resistance is connected in parallel with galvanometer OR correctly drawing labelled figure (01)	Partially correct (0.5)	Wrong answer (0)			
	Calculation of shunt resistance	Correct calculation and correct answer and unit (04)	Partially correct calculation OR correct calculation with wrong answer (03)	One correct mathematical step (02)	Any relevant step (01)	Wrong answer (0)	
4(a)	Definition of motional emf	Correct definition (02)	Partially correct (01)	Wrong answer (0)			
	Derivation of formula of motional emf	Correct derivation with correct labelled figure (05)	Correct derivation without figure (04)	Partially correct derivation with three mathematical steps (03)	Two correct mathematical steps (02)	One correct mathematical step (01)	Wrong answer (0)

4 (b)	(i) Calculation of current	Correct calculation with correct answer (02)	Partially correct (01)	Wrong answer (0)			
	(ii) Calculation of power consumed	Correct calculation with correct answer (02)	Partially correct (01)	Wrong answer (0)			
	(iii) Writing equation of voltage	Correct equation in correct format ($V = V_m \sin\theta$) (02)	Partially correct (01)	Wrong answer (0)			
5 (a)	Explanation of de-Broglie hypothesis	Correct explanation of hypothesis along with derivation of de-Broglie wavelength (03)	Partially correct e.g. correct hypothesis statement with incomplete derivation (02)	Some correct relevant information (01)	Wrong answer (0)		
	Description of experiment to show particles can have wave characteristics	Correct description of experiment e.g. Davisson Germer experiment with labelled figures and mathematical steps or explaining on the basis of Bragg's relation etc (05)	Correct description and correct mathematical steps without figure including (04)	Partially correct description with at least $2/3^{rd}$ of the correct description (03)	Partially correct with $1/3^{rd}$ of the correct description (01)	Some relevant information (01)	Wrong answer (0)
5 (b)	Calculation of wavelength of electron in 3rd orbit of hydrogen atom	Correctly calculating energy of electron in 3rd orbit and then calculating wavelength of electron using de-Broglie hypothesis (05)	Correct calculation of energy and wavelength with wrong answer (04)	Correct calculation of energy but wrong calculation of wavelength (03)	Partially correct (02)	One relevant correct mathematical step (01)	Wrong answer (0)

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