	SPECTRA PRACTICE PAPER 2024-25 SUBJECT- PHYSICS (042)	
	Time-3 hrs. M.M-70	
	General Instructions:	
	(1) All questions are compulsory. There are 33 questions in all.	
	(2) This question paper has five sections: Section A, Section B, Section C,	
	Section Dand Section E.	
	<ul> <li>Section A contains twelve very short answer questions and four assertion reasoning MCQs of 1 mark each.</li> <li>Section B contains five short answer questions of 2 marks each.</li> </ul>	
	<ul> <li>Section C contains seven short answer questions of 3 marks each.</li> <li>Section D contains two case-based questions of 4 marks each.</li> </ul>	
	<ul> <li>Section E contains three long answer questions of 5 marks each.</li> </ul>	
	(3) There is no overall choice. However internal choice is provided. You must attempt only one of the choices in such questions.	
	Section – A	
Q1	Which molecule has zero dipole moment?	1
	(i) CO <sub>2</sub> (ii) NH <sub>4</sub> (iii) SF <sub>3</sub> (iv) H <sub>2</sub> O	
Q2	A steady current flows in a metallic conductor of non- uniform cross-section. Which of	1
	these quantities is constant along the conductor	
	(i) current (ii) current density (iii) drift speed (iv) electric field	
Q3	What will be the readings of the voltmeter shown in the figure given below? (i)2 V (ii) 1V (iii) 0V (iv) 4V	1
Q4	Which of the following is called heat radiation?	1
• -	(i) X rays (ii) Y rays (iii) infrared radiation (iv) microwave	
Q5	A current of <b>10 A</b> is passing through a long wire which has semicircular loop of the radius <b>20 cm</b> as shown in the figure. Magnetic field produced at the centre of the loop is (i) $10\pi \mu T$ (ii) $5\pi \mu T$	1
	(iii) $4\pi \mu T$ (iv) $2\pi \mu T$	

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Q6	The focal length of a biconvex lens of radii of each surface 50 cm and refractive index 1.5, is	1
	(i) 40.4 cm (ii) 75 cm (iii) 50 cm (iv) 80 cm	
Q7	Choose the correct plot of potential energy between a pair of nucleons as a function of their separation.	1
	$(a) \bigoplus_{PE} (MeV) (meV)$	
Q8	Bohr's atomic model can not be extended to atoms having more that one electron due to	1
	(i) gravitational force of attraction (ii) centripetal force	
	(iii) electrical force of attraction (iv) nuclear forces	
Q9	The refractive index of the material of an equilateral prism is $\sqrt{3}$ . What is the angle of	1
	minimum deviation? (i) $45^{\circ}$ (ii) $60^{\circ}$ (iii) $37^{\circ}$ (iv) $30^{\circ}$	
Q10	Which of the following electromagnetic rays has <b>maximum</b> wavelength?	1
	(i) Radio waves (ii) X-rays (iii) Infrared rays (iv) Ultraviolet rays	
Q11	Lenz's law is the consequence of the law of conservation of:	1
	(i) energy (ii) charge (iii) mass (iv) momentum	
Q12	The ratio between Bohr radii is	1
	(i) 1:2:3 (ii) 2:4:16 (iii) 1:4:9 (iv) 1:3:5	
	Directions: Each of these questions contain two statements, Assertion and Reason. Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below. (a) Assertion is correct, reason is correct; reason is a correct explanation for assertion. (b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion (c) Assertion is correct, reason is incorrect (d) If both assertion and reason is incorrect	1
Q13	<b>Assertion</b> : Total energy of revolving electron in any stationary orbit is negative. <b>Reason</b> : Energy is a scalar quantity. It can have only positive values.	1
Q14	Assertion: A lens has two principal focal lengths which may differ.	1
	Reason: Light can fall on either surface of the lens. The two principal focal lengths differ when	
	medium on the two sides of lens has different refractive indices.	
Q15	Assertion: A photon has no rest mass, yet it carries some momentum.	1
	<b>Reason</b> : Momentum of photon is due to its energy and equivalent mass.	

Q16	Assertion: Conductivity of a semiconductor increases on doping with	1
	pentavalent atoms.	
	<b>Reason</b> : Pentavalent atoms can easily donate electrons due to their less ionisation	
	energy.	
	Section: B	
Q17	Briefly explain the formation of <b>p-n junction</b> diode.	2
Q18	A proton and an electron have same kinetic energy. Which one has smaller de Broglie wavelength and why?	2
Q19	As shown in the figure, <b>PQ</b> is the ray incident on a prism ABC.	2
	Show the corresponding refracted and emergent rays.	
	The critical angle for the material of the prism is <b>45</b> °.	
	Also find the refractive index of the material of the prism.	
Q20	Two wires of equal length, one of copper and the other of manganin have the same	2
	resistance. Which wire is thicker?	
Q21	Find a relation between critical angle and refractive index.	2
	UR Name the phonomenon which is based on total internal reflection and write the	
	necessary conditions for this phenomenon to occur	
	Section C	
Q22	How is the radius of a nucleus related to its mass number? Show that the nuclear	3
	matter density is independent of atomic mass number.	
Q23	Four charges +q, -q, +q and -q are to be arranged respectively at the four corners of	3
	a square ABCD of side a.	
	(i) Find the work required to put together this arrangement.	
	(ii) A charge $q_0$ is bought to the centre of the square, the four charges being held	
	fixed. How much extra work is needed to do this?	
024	The could shall an annual of the hundred on share in 12.0 eV	2
QZ4	(i) What is the kinetic energy of the hydrogen atom is <b>-13.6 ev</b>	5
	(ii) What is the notential energy of electron in the <b>3<sup>rd</sup> excited</b> state?	
	(iii) If electron jumps to the ground state from the <b>3<sup>rd</sup> excited</b> state, calculate the	
	wavelength of the photon emitted.	
Q25	State Kirchhoff's laws of an electrical network. using it, calculate the potential	3
	difference across the 8Ω resistor.	

	$ \begin{array}{c} 2\Omega\\ B\\ 4 \\ 4 \\ 0 \\ 4 \\ 0 \\ 4 \\ 0 \\ 4 \\ 0 \\ 4 \\ 0 \\ 4 \\ 0 \\ 4 \\ 0 \\ 4 \\ 0 \\ 1 \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	
Q26	<ul> <li>(i)Two identical circular wires P and Q each of radius R and carrying current I are kept in perpendicular planes such that they have a common centre as shown in the figure. Find the magnitude and direction of the net magnetic field at the common centre of the two coils.</li> <li>(ii) Write Ampere's circuital law.</li> </ul>	3
Q27	An electromagnetic wave travelling through a medium has electric field vector $E_y$ = 4x10 <sup>5</sup> cos (3.14x10 <sup>8</sup> t-1.57x) N/C. Here x is in m and t in s. Then find (i) Wavelength (ii) Frequency (iii) expression for magnetic field vector.	3
Q28	(a)State the Faraday's law of electromagnetic inductions. (b)Kamla peddles a stationary bicycle the pedals of the bicycle are attached to a <b>100</b> -turn coil of area <b>0.10</b> m <sup>2</sup> . The coil rotates at <b>half a revolution</b> per second and it is placed in a uniform magnetic field of <b>0.01</b> T perpendicular to the axis of rotation of the coil. What is the maximum voltage generated in the coil? OR A bar magnet M is dropped so that it falls vertically through the coil C. The graph obtained for voltage produced across the coil Vs time is shown in figure (b). Explain (i) the shape of the graph (ii) Why is the negative peak is longer than positive peak? <b>Section: D (Case study-based questions)</b>	3
020	Junction diada	1
Q29	A p-n junction diode is the key to all semiconductor devices. When such a junction is made, a depletion layer is formed consisting of immobile ion-cores devoid of their electrons or holes. This is responsible for a junction potential barrier. By changing the external applied voltage, junction barrier can be changed. In forward bias, the barrier is decreased while the barrier increases in reverse bias. Hence, forward bias current is more (mA) while it is very small ( $\mu$ A) in reverse biased junction diode. The given figure shows a germanium semiconductor device.	4

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