(6 pages)

Reg. No. :

Code No. : 20286 E Sub. Code : SMPH 53

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2021.

Fifth Semester

Physics — Core

ATOMIC PHYSICS

(For those who joined in July 2017-2019)

Time : Three hours

Maximum : 75 marks

PART A — $(10 \times 1 = 10 \text{ marks})$

Answer ALL questions.

Choose the correct answer.

- 1. Wideman and Franz ratio is $\frac{k}{\sigma} =$ _____.
 - (a) $3\left(\frac{k_B}{e}\right)^2 T$ (b) $2\left(\frac{k_B}{e}\right)^2 T$
 - (c) $4\left(\frac{k_B}{e}\right)^2 T$ (d) $\left(\frac{k_B}{e}\right)^2 T$

2. The electrical conductivity $\sigma =$

3.

(a)
$$\frac{ne^2 \lambda v}{2k_B T}$$
 (b) $\frac{ne^2 \lambda v}{4k_B T}$
(c) $\frac{ne^2 \lambda v}{6k_B T}$ (d) $\frac{ne^2 \lambda v}{8k_B T}$
The velocity of the positive rays ranges from

- (a) $10^4 10^5 \text{ ms}^{-1}$ (b) $10^5 10^6 \text{ ms}^{-1}$ (c) $10^{-4} - 10^{-5} \text{ ms}^{-1}$ (d) $10^{-5} - 10^{-6} \text{ ms}^{-1}$
- 4. The pressure of the gas in Thomson's parabola method is about ______ of mercury.
 - (a) 10^4 m (b) 10^5 m
 - (c) 10^{-5} m (d) 10^{-6} m
- 5. Rydberg constant is given as _____.
 - (a) $1.097 \times 10^7 \text{ m}^{-1}$ (b) $1.096 \times 10^7 \text{ m}^{-1}$
 - (c) $1.097 \times 10^{-7} \text{ m}^{-1}$ (d) $1.096 \times 10^{-6} \text{ m}^{-1}$
- 6. The electrons jumping from outer orbits to the second orbit is called ______ series.
 - (a) Pfund series (b) Brackett series
 - (c) Paschen series (d) Balmer series

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7.	The stern and Gerlach experiment is based on the behavior of			
	(a)	Electric dipole	(b)	Magnetic dipole
	(c)	Both (a) and (b)	(d)	None of the above
8.	The frequency of the larmor precession is given by $\omega = $			
	(a)	e/2 m	(b)	B/2 m
	(c)	B/2 me	(d)	Be/2 m
9.	According to Moseley's law the frequency of a spectral line in X-ray spectrum is directly proportional to			
	(a)	Ζ	(b)	\mathbf{Z}^2
	(c)	\mathbb{Z}^3	(d)	\mathbf{Z}^4
10.	The decrease in the intensity of the X-ray is given as dI =			
	(a)	–µI dx	(b)	µI dx
	(c)	$I_0 e^{-\mu x} dx$	(d)	$I_o e^{\mu x} dx$
PART B — $(5 \times 5 = 25 \text{ marks})$				
Answer ALL questions, choosing either (a) or (b).				
Each answer should not exceed 250 words.				
11.	(a) Mention the application of Hall effect.			
Or				

(b) State and Explain Wiedman-Franz's law.

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12. (a) Explain the Thomson's method for positive ray analysis.

Or

- (b) Describe the principle, construction and working of Bainbridge's mass spectrograph.
- 13. (a) Describe Pauli's exclusion principle and its application.

Or

- (b) Explain the different quantum numbers associated with the vector atom model.
- 14. (a) State and Explain about Larmor's theorem with the diagram.

Or

- (b) State and explain Stark effect.
- 15. (a) Explain about the production of X-rays.

Or

(b) Explain about the absorption edges of X-rays.

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[P.T.O.]

PART C — $(5 \times 8 = 40 \text{ marks})$

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) What is Hall Effect? Find an expression for Hall coefficient of a metal and describe the experimental set up to measure it.

Or

- (b) Describe Millikan's method for the determination of electronic charge. Indicate the importance of this measurement.
- 17. (a) Describe the construction, working and theory of a Dempster mass spectrograph.

Or

- (b) With a neat diagram and necessary theory explain how e/m of an electron is obtained by Dunningston's method.
- 18. (a) Describe Rutherford's experiments and its theory on scattering of α particles.

Or

(b) Describe vector atom model. Page 5 Code No. : 20286 E 19. (a) What is Zeeman effect? Discuss the quantum mechanical explanation of the normal Zeeman effect.

Or

- (b) Calculate the magnetic dipole moment of an electron due to orbital and spin motion.
- 20. (a) Explain the continuous and characteristics spectra of X-rays.

Or

(b) Discuss about the absorption of X-rays through experimental study.

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