

Code No. : 10036 E Sub. Code : SMPH 53

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL, 2023.

Fifth Semester

Physics — Core

ATOMIC PHYSICS

(For those who joined in July 2017-2019)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL the questions.

Choose the correct answer:

1. The classical expression for the electrical conductivity of a metal in terms of mass of electron, change of electron, concentration of electrons and collision time is given by
- (a)  $mner$  (b)  $m\epsilon\tau/n$   
 (c)  $me^2\tau/m$  (d)  $ne^2\tau^2/m$

2. The value of conductivity of metals  $\sigma$  is

(a)  $\frac{ne^2\lambda V}{4T}$  (b)  $\frac{ne^2\lambda V}{4aT}$   
 (c)  $\frac{na\lambda V}{4e^2T}$  (d)  $\frac{ne^2\lambda VT}{4a}$

3. All particles having the same  $e/m$  are focused at a single point in
- (a) Thompson's method (b) Aston's method  
 (c) Bainbridge method (d) Dempster's method
4. The two isotopes obtained in Thomson parabola method belongs to
- (a) Hydrogen (b) Neon  
 (c) Argon (d) Chlorin
5. Positive rays are also called as
- (a) X-rays (b) Beta rays  
 (c) Canal rays (d) Gamma rays
6. The energy equivalent of a mass unit is
- (a) 1 eV (b) 1 MeV  
 (c) 931 eV (d) 931 MeV

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7. Number of splitting lines in normal Zeeman effect is

(a) 1 (b) 3  
 (c) Above 3 (d) None

8. Mosley law is

(a)  $\gamma \propto z^2$  (b)  $\gamma \propto z$   
 (c)  $\gamma \propto \frac{1}{z}$  (d)  $\gamma \propto \frac{1}{z^2}$

9. In the characteristic spectrum of X-rays

(a)  $K_\alpha < K_\beta$  (b)  $K_\alpha > K_\beta$   
 (c)  $K_\alpha > L_\alpha$  (d)  $K_\alpha = L_\alpha$

10. In Lave method

- (a) X-rays of continuous wavelength are used  
 (b) X-rays of monochromatic wavelength is used  
 (c) X-rays of continuous wavelength and monochromatic wavelength are used  
 (d) Visible light of all wavelengths are used

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PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Derive an expression for thermal conductivity of metals.  
 Or  
 (b) Write a note on Wiedman-Franz's law.
12. (a) What are positive rays? Give its properties.  
 Or  
 (b) What is mass spectrograph? What are its uses?
13. (a) Give an account of vector atom model.  
 Or  
 (b) What are principal quantum number and orbital quantum number? Explain.
14. (a) Explain LS coupling and j-j coupling schemes.  
 Or  
 (b) Distinguish between normal and anomalous Zeeman effect.

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[P.T.O.]

15. (a) Derive Bragg's law.

Or

(b) What is Mosley law? State its importance.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Describe the Millikan method for determining the electric charge.

Or

(b) Discuss in detail Band theory of solids.

17. (a) Describe Thompson's Parabola method and explain how  $e/m$  of the positive ion is calculated.

Or

(b) Describe Bainbridge mass spectrograph and explain how atomic masses are determined.

18. (a) State and explain Pauli's exclusion principle.

Or

(b) Describe how this principle assists in the interpretation of the periodic system of the elements.

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19. (a) Describe Stern-Gerlach experiment. Discuss the importance of the results.

Or

(b) What is Zeeman effect? Discuss the quantum mechanical explanation of normal Zeeman effect.

20. (a) Describe the Powder crystal method of studying crystal structure.

Or

(b) Outline the theory of Compton Scattering and derive an expression for the Compton shift.

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