(6 Pages)

Reg. No. :

Code No. : 30562 E Sub. Code : SMPH 53

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2020.

Fifth Semester

Physics — Core

## ATOMIC PHYSICS

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

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

## Answer ALL questions.

Choose the correct answer:

- 1. Energy gap in an insulator is
  - (a) large (b) small
  - (c) zero (d) none
- 2. Mobility of electrons is
  - (a) flow of electrons per unit electric field
  - (b) reciprocal of conductivity
  - (c) average electron drift velocity per unit electric field
  - (d) none of the above

- 3. All particles having the same e/m are focused at a single point in
  - (a) Thomson's method
  - (b) Aston's method
  - (c) Bainbridge method
  - (d) Dempster's method
- 4. The velocities of all positive rays is \_\_\_\_\_
  - (a) same
  - (b) not same
  - (c) zero
  - (d) none
- 5. The spin angular momentum of the electrons is given by
  - (a)  $[s(s+1)]^{1/2}\hbar$
  - (b)  $s(s+1)\hbar$
  - (c)  $(s+1)\hbar$
  - (d)  $s(s+1)^{1/2}\hbar$

Page 2 Code No. : 30562 E

- 6. The electronic configuration of magnesium (Z = 12) is
  - (a)  $1s^2, 2s^2, 2p^6, 3d^2$
  - (b)  $1s^2, 2p^6, 3s^2, 3d^2$
  - (c)  $1s^2, 2s^2, 2p^6, 3d^1, 4s^1$
  - (d)  $1s^2, 2s^2, 2p^6, 3s^2$

7. Zeeman effect is a \_\_\_\_\_ phenomenon

- (a) Electro-optic (b) Thermo-electric
- (c) Photo-electric (d) Magneto-optic
- 8. L-S coupling occurs in
  - (a) light atoms under strong magnetic field
  - (b) light atoms with weak magnetic field
  - (c) heaveler atoms with strong magnetic field
  - (d) heaveler atoms with weak magnetic field

## 9. Bragg's law is

- (a)  $2d\sin\theta = n\lambda$  (b)  $d\sin\theta = n\lambda$
- (c)  $n\sin\theta = d\lambda$  (d)  $\lambda\sin\theta = 2d$

Page 3 Code No. : 30562 E

- 10. X-ray absorption coefficient  $(\mu_m)$  varies as the \_\_\_\_\_\_ of the atomic number of the absorber
  - (a) First power (b) Square
  - (c) Cube (d) Fourth power

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) Derive an expression for thermal conductivity of metals.

 $\mathbf{Or}$ 

- (b) State and explain Wiedeman-Franz law.
- 12. (a) Give the properties of positive rays.

Or

- (b) Describe Thomson's parabola method of positive ray analysis.
- 13. (a) State and explain Pauli's exclusion principle.

Or

(b) Give an account of vector atom model.

Page 4 Code No. : 30562 E

[P.T.O]

14. (a) Explain L-S coupling and j-j coupling schemes.

Or

- (b) Explain the experimental study of stark effect.
- 15. (a) Derive Bragg's law.

Or

(b) Explain Laue's method of studying the crystal structure.

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) Explain the classification of solids on the basis of band theory.

Or

- (b) Describe the millikan method for determining the electric charge.
- 17. (a) Describe Bainbridge mass spectrograph and explain how atomic masses are determined?

 $\mathbf{Or}$ 

(b) Describe Dempster's mass spectrograph.

Page 5 Code No. : 30562 E

18. (a) Explain Sommerfield's relativistic atom model in detail.

 $\mathbf{Or}$ 

- (b) Explain Bohr atom model in detail.
- 19. (a) Explain steam-Gerlach experiment.

Or

- (b) Describe an expression for magnetic dipole moment due to
  - (i) Orbital motion of the electron
  - (ii) Spin motion of the electron.
- 20. (a) Describe Bragg's X-ray spectrometer method of determining wave length of X-rays.

 $\mathbf{Or}$ 

(b) Explain in detail the working of semiconductor defectors.

Page 6 Code No. : 30562 E