FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION-2025 FOR RECRUITMENT
TO POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT
PHYSICS, PAPER-II

TIME ALLOWED: THREE HOURS	**(PART-I MCQs)** **MAXIMUM MARKS: 20**
PART-I (MCQs) : MAXIMUM 30 MINUTES	**(PART-II)** **MAXIMUM MARKS: 80**

NOTE: (i) First attempt **PART-I (MCQs)** on separate **OMR Answer Sheet** which shall be taken back after **30 minutes.**
  (ii) Overwriting/cutting of the options/answers will not be given credit.
  (iii) There is **no negative** marking. All MCQs must be attempted.

PART-I (MCQs)(COMPULSORY)

Q.1. (i) Select the best option/answer and fill in the appropriate Box ■ on the **OMR Answer Sheet.(20x1=20)**
 (ii) Answers given anywhere else, other than OMR Answer Sheet, will not be considered.

1. **A charge moving in a uniform static magnetic field experiences:**
   (A) A force perpendicular to magnetic field and velocity   (B) Increase in momentum
   (C) Decrease in momentum   (D) Decrease in velocity

2. **The same energy alpha particles and electrons associated De Broglie wave lengths are:**
   (A) Equal   (B) Longer than electrons   (C) Smaller electrons   (D) None of these

3. **The mass deficit defines:**
   (A) Nuclear binding energy (B) Nuclear Quadrapole moment (C) Shape of the nucleus (D) None of these

4. **In nuclear physics the magic number defines:**
   (A) Nuclear binding energy (B) Relatively exceptionally stable nuclei (C) Radioactivity (D) None of these

5. **The Zeeman effect is due to the interaction of:**
   (A) External magnetic field and total magnetic field of the specimen
   (B) External electric field and magnetic field of specimen   (C) L, S coupling   (D) None of these

6. **A photon having the same energy as an electron has wavelength _____ as electron's De Broglie wavelength.**
   (A) Shorter   (B) Longer   (C) Same   (D) None of these

7. **In Laurens transformation motion along _____axis's remains zero.**
   (A) One axis   (B) Two axis   (C) Three axis   (D) None of these

8. **Gausses law is applicable on the charges which are:**
   (A) Closely distributed in space   (B) Sparsely distributed in space
   (C) Enclose by a broken surface   (D) Enclose by a close surface

9. **The ratio between the angular momentum and orbital magnetic moment vector of the first orbital electron of Hydrogen Atoms is known as:**
   (A) Total Magnetic Moment   (B) Bohr Magnetron   (C) Magnetic Moment   (D) None of these

10. **The cyclotron is a device which primarily used to:**
    (A) Accelerate sub atomic particles   (B) To generate electrons
    (C) To generate neutrons   (D) To generate protons

11. **The rate of change of current in a coil is proportional to:**
    (A) V   (B) - emf   (C) R   (D) None of these

12. **The charging and discharging behavior of an ideal RLC circuit is:**
    (A) Simple harmonic   (B) Linear   (C) Elliptical   (D) Un predictable

13. **The Lorentz force is given by:**
    (A) $Fq = q (v \times B)$ (B) $\Phi = \delta A / \delta_x + \delta A / \delta_y + \delta A / \delta_z$ (C) $qF = q (v_d \times B)$ (D) None of these

14. **The poynting vector represents:**
    (A) The rate and direction of electromagnetic energy transferred in space.
    (B) The amount of electromagnetic energy transferred in different forms of energy.
    (C) Loss of electromagnetic energy in a medium.   (D)   The flow of thermal energy in a certain direction.

15. **The De Broglie wave particle duality is said to be foundation of uncertainty principle because:**
    (A) The velocities of the particles were very high.   (B) The mass could not attain the velocity of light.
    (C) The mass increases at velocities comparable to the velocity of light increases.
    (D) The uncertainty in position of the moving mass.

16. **The relation between half-life and mean life are:**
    (A) Inversely proportional   (B) Directly proportional   (C) Equal   (D) Half

17. **The concept of mutual frame of reference was used in:**
    (A) Reduced mass correction in spectroscopy   (B) Radioactivity
    (C) Relative nuclear stability.   (D) None of these

18. **The Ultraviolet catastrophe means:**
    (A) The spectral energy concentration towards longer wave length.
    (B) The spectral energy concentration at the middle of the spectrum.
    (C) The spectral energy concentration towards shorter wave side.   (D) None of these

19. **As per quantum physics, the observables 'E' and _____ can not be simultaneously measured with hundred percent accuracy.**
    (A) px   (B) t   (C) x   (D) None of these

20. **The theory of relativity predicts that at velocities comparable to the velocity of light, the moving mass appears to:**
    (A) Increase   (B) Decrease   (C) Remains the same   (D) None of these

PART-II

NOTE:	(i)	Part-II is to be attempted on the separate **Answer Book**.
	(ii)	Attempt **ONLY FOUR** questions from **PART-II. ALL** questions carry **EQUAL** marks.
	(iii)	All the parts (if any) of each Question must be attempted at one place instead of at different places.
	(iv)	Write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.
	(v)	No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
	(vi)	Extra attempt of any question or any part of the question will not be considered.
	(vii)	**Use of calculator is allowed.**

Q. 2. (a) Discuss the spectral properties of perfect black body radiation. Explain the ultra violet catastrophe. **(10)**

     (b) Find the fifth & seventh member of Balmer spectral series. If the third member is 1200 A. **(10)**   **(20)**

Q. 3. (a) In quantum mechanics explain the term commutation between the observables. **(10)**

     (b) Explain how De Broglie wave particle duality laid down the fundamentals of uncertainty principle. **(10)**   **(20)**

Q. 4. (a) In the context of nuclear physics explain the magic numbers. **(10)**

     (b) Explain nuclear Quadruple moment and explain its significance. **(10)**   **(20)**

Q. 5. (a) Derive the expression for electric dipole moment. Discuss two uses in modern science. **(10)**

     (b) Discuss Biot and Savart law and derive its expression, using suitable schematic figure. **(10)**   **(20)**

Q. 6. (a) Explain how Hall's effect could be used to find the sign of charge carriers. **(10)**

     (b) Explain the Hall's effect. How it could calculate the number of charge carriers in material. **(10)**   **(20)**

Q. 7. (a) Explain the construction and working of photo multiplier tube (PMT). **(10)**

     (b) Compare the energies of a proton and electron having same De Broglie wave length of 1A. **(10)**   **(20)**

Q. 8. Write short notes any TWO of the following: **(10 each)**   **(20)**

     (a) Reduced mass correction in spectroscopy

     (b) Electron microscope

     (c) Heisenberg uncertainty principal

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