Quantum Physics & Atomic Models Multiple Choice

PSI Physics

1. A Crooke's Tube (a tube containing rarefied gas through which a current is passed between a cathode and an anode) was used in the discovery of the electron by:
   (A) R. A. Millikan (B) J. J. Thomson (C) J. S. Townsend
   (D) M. Planck (E) A. H. Compton

2. The electron charge was measured for the first time in the:
   (A) Cathode ray experiment. (B) Photoelectric effect experiment.
   (C) Oil drop experiment. (D) Electron diffraction from aluminum foil.
   (E) Compton effect experiment.

3. The charge on an electron is represented by "e." Which of the following charges can exist?
   (A) 2.0 e (B) 2.5 e
   (C) 3.6 e (D) 5.2 e
   (E) 5.5 e

4. X-rays are created when:
   (A) protons strike a metal target. (B) neutrons strike a metal target.
   (C) photons are incident on a surface. (D) electrons strike a metal target.
   (E) photons strike electrons.

5. The spontaneous decay of nuclei is called:
   (A) Absorption (B) Ultraviolet Explosion
   (C) Permittivity (D) Photoelectric Effect
   (E) Radiation

6. Which of the following are emitted by the nucleus during radioactive decay?
   (A) Alpha particles (B) Beta particles
   (C) Gamma rays (D) All of the above
   (E) None of the above

7. Which of the following colors is associated with the lowest temperature of a black body radiator?
   (A) Violet (B) Blue (C) Green (D) Yellow (E) Red

8. Classical physics could not explain the behavior of a black body radiator at very short wavelengths. What was this problem called?
   (A) Absorption failure (B) Ultraviolet Explosion
   (C) Wavelength decrease (D) Photoelectric Effect
   (E) Radiation

9. What did Max Planck propose to solve the black body radiator problem?
   (A) Radiation is made up of waves. (B) Light changes its speed in different media.
   (C) Light comes in packets of energy. (D) Light has a continuous energy profile.
   (E) Objects do not radiate energy.

10. Which of the following photons has the greatest energy?
    (A) Infrared (B) Blue light (C) X-ray (D) Gamma ray (E) Ultraviolet

11. The energy of a photon depends on its:
    (A) Amplitude (B) Speed (C) Temperature (D) Pressure (E) Frequency

12. How does the energy of a photon change if the wavelength is doubled?
    (A) Doubles (B) Quadruples (C) Stays the same
    (D) Is cut to one-half (E) Is cut to one-fourth

13. How does the momentum of a photon change if the wavelength is halved?
    (A) Doubles (B) Quadruples (C) Stays the same
    (D) Is cut to one-half (E) Is cut to one-fourth

14. The photoelectric effect was explained by Albert Einstein by assuming that:
    (A) light is a wave. (B) light is a particle.
    (C) an electron behaves as a wave. (D) an electron behaves as a particle.
    (E) light does not interact with matter.

15. The kinetic energy of photoelectrons depends on the:
    (A) speed of light. (B) angle of illumination. (C) intensity of the light.
    (D) number of incident photons. (E) photon frequency.

16. The maximum kinetic energy of photoelectrons depends on which of the following?
    I. The light intensity II. The frequency of the light III. The material of the photoelectric cell

    (A) Only I (B) Only II (C) Only III (D) Only I and II (E) Only II and III

17. Rutherford's Gold Foil experiment caused a modification of which of the following?
    (A) Plum-pudding model of the atom (B) Planetary model of the atom
    (C) de Broglie hypothesis (D) Wave nature of light
    (E) Quantum theory of light

18. In Rutherford's Gold Foil experiment, most of the alpha particles passed through the foil undeflected. Which of the following properties of the atom can be explained from this observation?
    (A) The atom's negative charge is concentrated in the nucleus.
    (B) The nucleus has electrons and protons.
    (C) The atomic mass is distributed evenly throughout the atom.
    (D) The alpha particles can't be deflected by electrons.
    (E) The size of the nucleus is much less than the size of the atom.

19. Which of the following statement(s) can be associated with Bohr's theory of the atom?

I. An electron orbiting the nucleus can change its energy continuously.
II. An electron orbiting the nucleus emits energy and falls into the nucleus.
III. An electron orbits the nucleus without radiating energy and can change its energy only by a specific, quantized amount, when it moves between the orbits.
IV. Electrons can only orbit the nucleus in specific circular orbits with fixed angular momentum and energy.

(A) I and II (B) II and IV (C) II and III (D) III and IV (E) I, II, III and IV

20. When an electron falls from an orbit where n = 2 to n = 1:
(A) A photon is emitted. (B) A photon is absorbed. (C) No change in atomic energy.
(D) The atomic energy decreases to zero. (E) The atomic energy increases.

21. When an electron jumps from an orbit where n = 1 to n = 4, its energy in terms of the energy of the ground level (E_1) is:
(A) $E_1/9$ (B) $E_1/16$ (C) $2\ E_1$ (D) $4\ E_1$ (E) $16\ E_1$

22. Which of the following is a limitation of the Bohr Model of the atom?
(A) It does not explain atomic spectra.
(B) It successfully predicts the intensity of the photons emitted when electrons change energy levels.
(C) The model only applies to Hydrogen like atoms.
(D) The model only applies to light atoms.

23. The Compton Effect supports which of the following theories?
(A) Special Theory of Relativity. (B) Light is a wave. (C) Thomson model of the atom.
(D) Light is a particle. (E) The Coulomb force.

24. Neutrons have a:
(A) positive charge and a mass approximately equal to a proton.
(B) positive charge and a mass approximately equal to an electron.
(C) neutral charge and a mass approximately equal to a proton.
(D) neutral charge and a mass approximately equal to an electron.
(E) negative charge and a mass approximately equal to a proton.

25. Which of the following formulas can be used to determine the de Broglie wavelength?
(A) $\lambda = hmv$ (B) $\lambda = h/mv$ (C) $\lambda = mv/h$ (D) $\lambda = hm/c$ (E) $\lambda = mc/h$

26. Which one of the following objects, moving at the same speed, has the greatest de Broglie wavelength?
(A) Neutron (B) Electron (C) Tennis ball (D) Bowling ball (E) Alpha particle

27. Heisenberg's Uncertainty Principle states:
    (A) The more precise a particle's energy can be measured, the less precise its position can be measured.
    (B) A particle's position can be measured exactly.
    (C) A particle's energy can be measured exactly.
    (D) The more precise a particle's momentum can be measured, the less precise its position can be measured.
    (E) The more precise a particle's momentum can be measured, the less precise its energy can be measured.

28. Knowledge of the wave function of a particle enables the probabilities of the particle's position, momentum, energy and other characteristics to be calculated. In classical physics, what is the analogue of the wave function?
    (A) The particle's momentum. (B) The particle's energy. (C) The particle's mass.
    (D) The particle's size. (E) The sum of the forces on the particle.

29. Which theory explains the interaction of photons with matter (electrons)?
    (A) Quantum Chromodynamics. (B) The Standard Model. (C) String Theory.
    (D) The Grand Unified Theory. (E) Quantum Electrodynamics.

30. Which theory explains the attraction between protons and neutrons?
    (A) Quantum Chromodynamics. (B) The Standard Model. (C) String Theory.
    (D) The Grand Unified Theory. (E) Quantum Electrodynamics.

31. Which theory integrates the explanation of the strong nuclear force, the weak nuclear force and electromagnetism?
    (A) Quantum Chromodynamics. (B) The Standard Model. (C) String Theory.
    (D) The Grand Unified Theory. (E) Quantum Electrodynamics.

32. How much of the universe is comprised of matter and energy that is explained by current Physics theory?
    (A) 95% (B) 75% (C) 50%
    (D) 25% (E) 5%.

Answers

1. B
2. C
3. A
4. D
5. E
6. D
7. E
8. B
9. C
10. D
11. E
12. D
13. A
14. B
15. E
16. E
17. A
18. E
19. D
20. A
21. E
22. C
23. D
24. C
25. B
26. B
27. D
28. E
29. E
30. A
31. B
32. E