Section: A  Answer all the questions  
1. The elliptical orbits of electron in the atom was proposed by  
   a) J.J.Thomson  
   b) Bohr  
   c) Sommerfeld  
   d) de Broglie  

2. A Coolidge tube operates at 6200 V. The maximum frequency of the X-rays emitted from the tube is  
   a) 1.5 X 10^{18} Hz  
   b) 3 X 10^{18} Hz  
   c) 1.5 X 10^{3} Hz  
   d) 3 X 10^{6} Hz  

3. At the threshold frequency, the velocity of electrons is  
   a) Zero  
   b) maximum  
   c) minimum  
   d) infinite  

4. According to relativity, the length of the rod in motion  
   a) is the same as its rest length  
   b) is more than its rest length  
   c) is less than its rest length  
   d) zero  

5. The mass defect of a certain nucleus is found to be 0.003 amu. Its binding energy is  
   a) 27.93 eV  
   b) 27.93 MeV  
   c) 2.793 eV  
   d) 2.793 MeV  

6. The radio isotope used in agriculture is  
   a) \(^{31}\)P  
   b) \(^{32}\)P  
   c) \(^{23}\)Na  
   d) \(^{24}\)Na  

7. The Colour of the light emitted by a LED depends on  
   a) its reverse bias  
   b) its forward bias  
   c) the amount of forward bias current  
   d) the type of the semiconductor material  

8. Improper biasing of a transistor circuit produces  
   a) heavy loading of emitter current  
   b) distortion in the output signal  
   c) excessive heat at the collector terminal  
   d) faulty location of load line  

9. The Rf channel in a radio transmitter produces  
   a) audio signals  
   b) high frequency carrier waves  
   c) both audio and high frequency carrier waves  
   d) low frequency carrier waves  

10. In phase modulation  
    a) only the phase of the carrier wave varies  
    b) only the frequency of the carrier wave varies  
    c) both the phase and the frequency of the carrier wave vary  
    d) there is no change in the phase and frequency of the carrier.  

Section: B  Answer any TEN questions  

11. Define modulation factor.  
12. What is phase modulation.  
13. What are the different types of wire and cable used for telecommunication?  
14. What is zener breakdown?  
15. Define bandwidth of the amplifier.  
16. Give the Barkhausen criteria for oscillations.  
17. Calculate the radius of the \(^{27}\)Al nucleus.  
18. Define 1 amu.  
19. State any two Soddy - Fajan’s radioactive displacement law.  
20. What is threshold frequency?  
21. What are matter waves?  
22. At what speed is a particle moving if the mass is equal to three times its rest mass?  
23. What are cathode rays?  
25. Calculate the mass of the electron from the known values of the specific charge and the charge of electron.  

Section: C  Answer any THREE questions  

26. Explain the various spectral series of hydrogen.  
27. Explain Hallwachs experiment on photo electric effect.  
28. Calculate the energy released in the reaction: \(^{13}\)Al \(^{27}\) + \(^{1}\)H \(^{2}\) \rightarrow \(^{12}\)Mg \(^{25}\) + \(^{2}\)He \(^{4}\)  
   Mass of \(^{13}\)Al \(^{27}\) = 26.981535 amu; \n   Mass of \(^{1}\)H \(^{2}\) = 2.014102 amu; \n   Mass of \(^{12}\)Mg \(^{25}\) = 24.98584 amu; \n   Mass of \(^{2}\)He \(^{4}\) = 4.002604 amu. \n
The decay constant of a radio-active element is 0.000231 per day. Calculate the half life and the mean life.  
29. Explain the function of OR and NAND gates.  
30. Explain the principle of MODEM.  

Section: D  Answer any TWO questions  

31. Derive an expression for the energy of an electron in the n\(^{th}\) orbit of hydrogen atom.  
32. Derive \(N = N_0 e^{-\lambda t}\).  
33. Explain the action of Colpitt’s Oscillator.  
34. Explain the action of vidicon camera tube.  

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