



ATTEMPT THIS PAPER ON THIS QUESTION SHEET ONLY.

Division of marks is given in front of each question.

This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the right answer cutting and overwriting is not allowed. (10x1=10)

Use Figure 1 (given below) to answer questions A to C. **Figure 1** shows the results of an experiment involving the photoelectric effect. The graph shows the currents observed in the photocell circuit as a function of the potential difference between the plates of the photocell when light beams (A, B, C and D, each with its own wavelength) were each directed at the photocell.

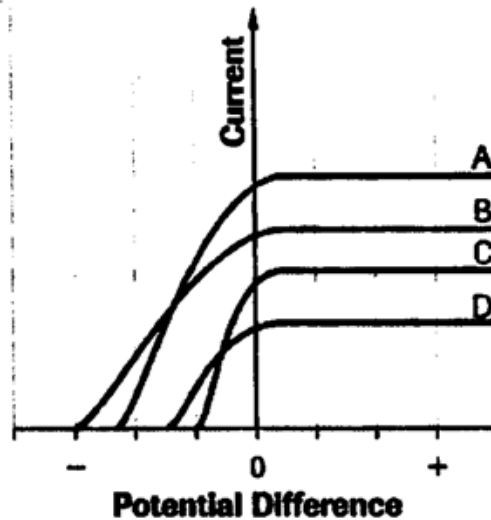


Figure 1. Graph of current versus potential difference for four different beams of light.

A. Which of the beams of light had the highest frequency?

- a) A b) B c) C d) D e) All had same frequency

B. Which of the beams of light had the longest wavelength?

- a) A b) B c) C d) D e) All had same wavelength

C. Which of the beams of light ejected photoelectrons having greatest momentum?

- a) A b) B c) C d) D e) All eject photoelectrons having same momentum

Use **Figure 2** (given below) to answer questions D to E. **Figure 2** shows a Franck–Hertz experiment performed using an accelerating potential of 8.00 V in a tube containing mercury vapors.

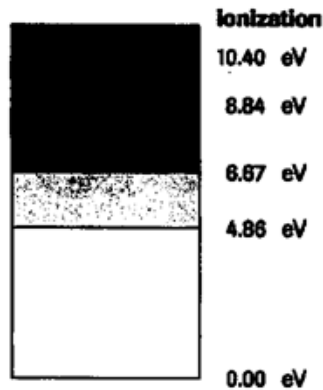


Figure 2. Energy levels for mercury.

- D.** An electron of kinetic energy 9.00 eV collides with a mercury atom that is in the ground state. The mercury atom
- can only be excited to an energy of 8.84 eV
 - can only be excited to an energy of 1.40 eV
 - can only be excited to an energy of 0.16 eV
 - can be excited to any of the 4.86 eV, 6.67 eV or 8.84 eV energy levels
 - cannot be excited by this electron
- E.** A photon of energy 9.00 eV collides with a mercury atom in the ground state. The mercury atom
- can only be excited to an energy of 8.84 eV
 - can only be excited to an energy of 1.40 eV
 - can only be excited to an energy of 0.16 eV
 - can be excited to any of the 4.86 eV, 6.67 eV or 8.84 eV energy levels
 - cannot be excited by this photon
- F.** Which of the following is called as non-mechanical waves?
- Magnetic waves
 - Electromagnetic waves
 - Electrical waves
 - Matter waves
 - none of these
- G.** 1 μC is equals to
- 1.4×10^4 decays/sec
 - 2.5×10^4 decays/sec
 - 3.7×10^4 decays/sec
 - 2.5×10^6 decays/sec
 - 3.7×10^6 decays/sec
- H.** Which of the following nuclear radiation has large ionization power?
- α -radiation
 - β -radiation
 - γ -radiation
 - light radiation
 - none of these
- I.** Electron trapped in 1-D box always
- Form continuous energy spectrum
 - Form discrete energy spectrum
 - Form energy band
 - Form sometimes continuous and sometimes discrete spectrum
 - None of the above
- J.** For hydrogen atom, the energy required for an electron to jump from ground state to first excited state is:
- 13.6 eV
 - 10.2 eV
 - 5.2 eV
 - 3.2 eV



ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q.2. Give short answers to the following. (20)

- a) Explain the concept of *wave-particle* duality by giving at least one example in each case. (3)**
- b) What is Compton Effect? Name physical quantities which conserve during Compton scattering. Also, write down Compton shift equation and explain the terms appearing in it. (3)**
- c) How X-rays can be generated? Differentiate between continuous and characteristic x-rays. (3)**
- d) Explain and differentiate between nuclear fission and nuclear fusion reactions with examples. (3)**
- e) Describe briefly the correspondence principles. (3)**
- f) What is meant by radioactive decay? How nucleus emits alpha, beta and gamma radiations? Explain by writing a general nuclear reaction how atomic number and mass number of an atom is affected with the emission of these radiations. (3)**
- g) What is Moseley's law? Write down its importance in developing periodic table? (2)**

Give long answers to the following. (3x10=30)

- Q.3 What is photoelectric effect? Explain why classical theory failed to explain photoelectric effect. How Einstein photoelectric equation helps to explain photoelectric effect? (3+5+2 = 10)**
- Q.4 Write down de Broglie hypothesis? Explain an experimental method through which later de Broglie hypothesis was tested on material particle. (2+8 =10)**
- Q.5 Write down postulates of Bohr's atomic model. Calculate expressions which show both atomic radius and electronic energy states are discrete. (4+3+3 = 10)**