2 mark questions

22. Calculate the wavelength associated with each of the following.

(i) A ball of mass 200 g moving with a velocity of 100 ms^{-1}.

(ii) An electron moving with a velocity of 100 ms^{-1}.

(i) $\lambda = \frac{h}{mv}$, $\quad m = 200\ g = \frac{200}{1000} = 0.2\ kg$

$$\therefore \lambda = \frac{6.6 \times 10^{-34}}{0.2 \times 100} = 3.3 \times 10^{-35}\ m$$

(ii) Mass of electron $= 9.1 \times 10^{-31}$ kg

$$\therefore \lambda = \frac{h}{mv} = \frac{6.6 \times 10^{-34}}{9.1 \times 10^{-31} \times 100} = 7.25 \times 10^{-6}\ m.$$

4 mark questions

23. When the teacher asked to write the electronic configuration and box diagram of two elements

with atomic numbers 24 and 29 respectively, a student wrote the answer as follows.

Z = 24 $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^6$

Z = 29 $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^9\ 4s^2$

(a) If there is any mistake in the answer, correct it and draw the box diagram of the two elements.

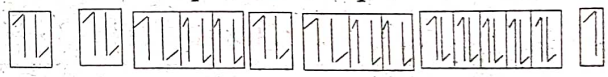
(b) Substantiate your answer.

(c) What are the rules you must obey while filling electrons in various orbitals.

(a) Yes, there is a mistake in the given answer. The correct configuration is.

Z = 24 $1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^5$ $4s^1$

Z = 29 $1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^{10}$ $4s^1$



(b) The above configuration is correct because fully filled and half filled orbitals have extra stability.

(c) The filling of electrons into different orbital is based on some well established principles.