

Solutions

2.1 B Two successive halvings give one quarter.

Compare the rejected options: $1/2$; $1/8$. Use the stated model and conditions.

2.2 A Donor levels facilitate electron excitation into conducting states.

Compare the rejected options: only photons; no mobile carriers. Use the stated model and conditions.

2.3 16. $2^4=16$.

2.4 False. Energy, momentum and other applicable conservation laws also matter.

3.1 Momentum conservation gives equal and opposite momenta of magnitude p . Non-relativistic energies are $K_1 = p^2/(2m)$ and $K_2 = p^2/(6m)$, hence ratio 3:1. Their sum is Q , so $K_1 = 3Q/4$ and $K_2 = Q/4$. Speeds obey $v_1/v_2 = (p/m)/(p/(3m)) = 3$. Award momentum, energy ratio, partition and speed ratio. Equal momentum does not mean equal energy.