

Question 1

A partial energy level diagram for a system is as illustrated. The energies are in units of 10^{-19} J.

$$E_3 = 9.0 \text{ —————}$$

$$E_2 = 5.0 \text{ —————}$$

$$E_1 = 2.0 \text{ —————}$$

Which of the following are possible energies of any single photon that this atom could emit (all in units of 10^{-19} J)? Ignore any other energy levels that the atom may have.

1. Only 2.0
2. Only 3.0
3. Only 4.0
4. Either 3.0 or 4.0
5. Either 3.0 or 4.0 or 7.0
6. Either 2.0 or 5.0 or 9.0

Question 2

A hypothetical molecule has an energy level diagram as illustrated. The energies are in units of 10^{-19} J.

$$E_4 = 9.0 \text{ —————}$$

$$E_3 = 8.0 \text{ —————}$$

$$E_2 = 6.0 \text{ —————}$$

$$E_1 = 1.0 \text{ —————}$$

How many different *possible* energy changes are there for this system?

1. Exactly 1.
2. Exactly 3.
3. Exactly 4.
4. Exactly 6.
5. Exactly 9.

Question 3

A partial energy level diagram for a system is as illustrated. The energies are in units of 10^{-19} J.

$$E_3 = 8.0 \text{ —————}$$

$$E_2 = 4.0 \text{ —————}$$

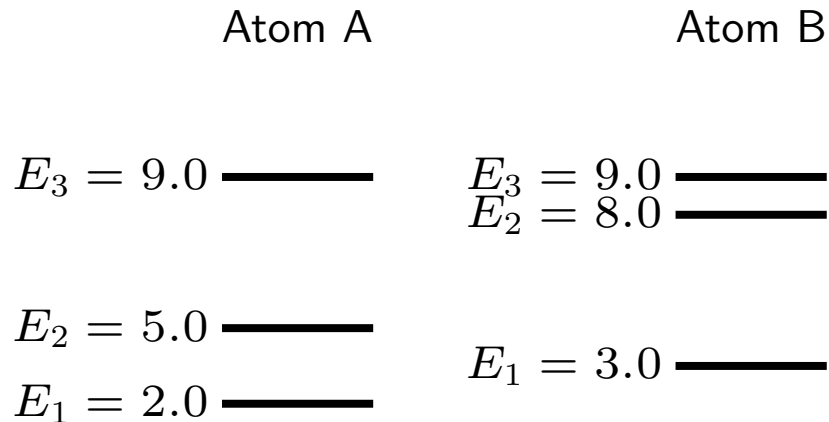
$$E_1 = 2.0 \text{ —————}$$

Which jump results in emission of light with the lowest frequency?

1. $1 \rightarrow 2$
2. $2 \rightarrow 1$
3. $3 \rightarrow 1$
4. $1 \rightarrow 3$
5. $3 \rightarrow 2$

Question 4

Two atoms have the following energy levels:



Consider the spectrum of the light emitted by the atoms. Which of the following is true?

1. The spectrum of A is the same as that of B.
2. There is one spectral line of A which is the same as a line of B.
3. There are no spectral lines of A which are the same as those of B.