

15.2 The Bohr Model of Atomic Structure

Name: _____ Class: _____ Date: _____

Total: 9 marks

Objective

Build the skills to answer exam questions on **the Bohr model of atomic structure**.

You must be able to:

- describe the **Bohr model** 玻尔模型 with electrons in discrete, quantized **energy levels** 能级
- explain that an electron absorbs or emits a photon when it changes level
- relate the photon energy to the difference between levels, $E = hf = E_i - E_f$

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ The Bohr model

Electrons occupy only certain **discrete** energy levels —their energy is **quantized**, not continuous.

■ Photons and level changes

An electron **absorbs** a photon to jump up a level and **emits** a photon when it drops down.

■ Photon energy

$E = hf = E_i - E_f$ —the photon carries exactly the energy difference between the two levels.

2 Practice

2.1 State what is meant by quantized energy levels. [1]

2.2 State what happens when an electron drops to a lower energy level. [1]

2.3 An electron falls from a level at -1.5 eV to one at -3.4 eV. Find the energy of the emitted photon. [2]

3 Exam-style questions

3.1 In the Bohr model, the electron energy levels are [1]

- **A** continuous
 - **B** quantized
 - **C** all zero
 - **D** infinite
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3.2 An electron emits a photon when it [1]

- **A** stays in a level
 - **B** moves to a higher level
 - **C** moves to a lower level
 - **D** leaves the atom
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3.3 An electron drops from a level at -0.85 eV to one at -3.4 eV.

(a) Find the energy of the photon, in eV. [2]

(b) State whether the photon is absorbed or emitted. [1]

4 Go further

- work through the **15.2 The Bohr Model of Atomic Structure** lesson on the **Learn** page;
- read the **Modern Physics** section of the AP Physics 2 handout on the **Know** page.

Solutions

2.1 the electron can only have certain allowed energy values, not any value in between.

2.2 it emits a photon carrying the energy difference.

2.3 $E = E_i - E_f = (-1.5) - (-3.4) = 1.9 \text{ eV}$.

3.1 B.

3.2 C.

3.3 (a) $E = (-0.85) - (-3.4) = 2.55 \text{ eV}$. (b) emitted (the electron drops to a lower level).