

APOLLO

Structure of the atom

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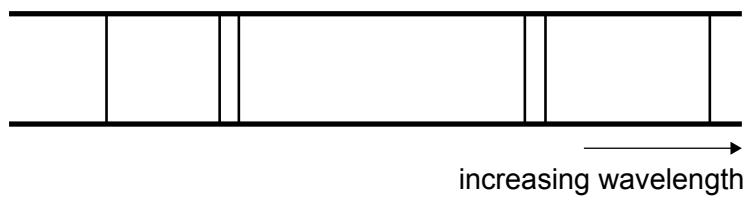
Physics

First assessment 2025

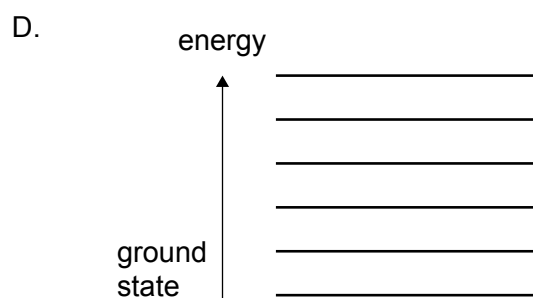
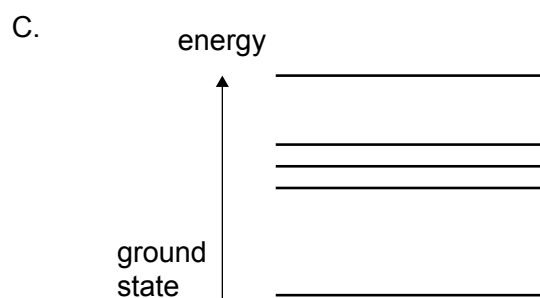
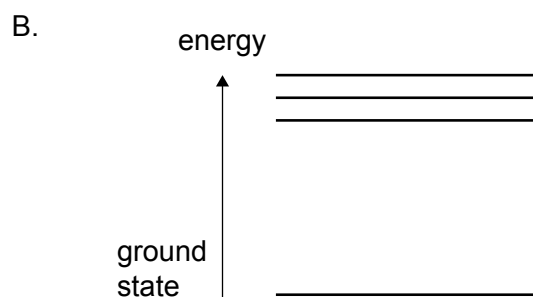
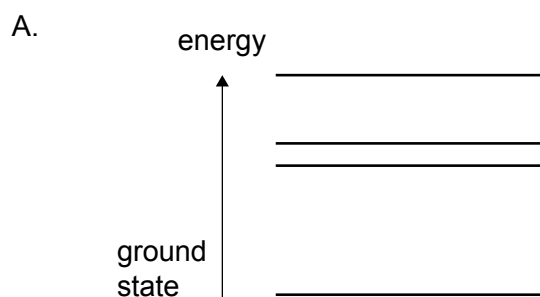
8 questions | questions

21. In this question, all diagrams are drawn to scale.

Part of the emission spectrum of an atom is shown.



Which set of energy levels can give rise to this part of the emission spectrum?



22. An ion X contains the following particles:

- 53 protons
- 89 neutrons
- 54 electrons.

What is the nuclear notation for X?

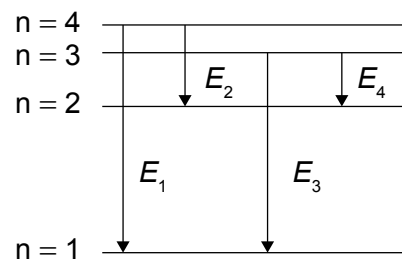
- A. ${}_{53}^{142}\text{X}$
- B. ${}_{53}^{89}\text{X}$
- C. ${}_{54}^{143}\text{X}$
- D. ${}_{54}^{107}\text{X}$

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Turn over

2225-0710

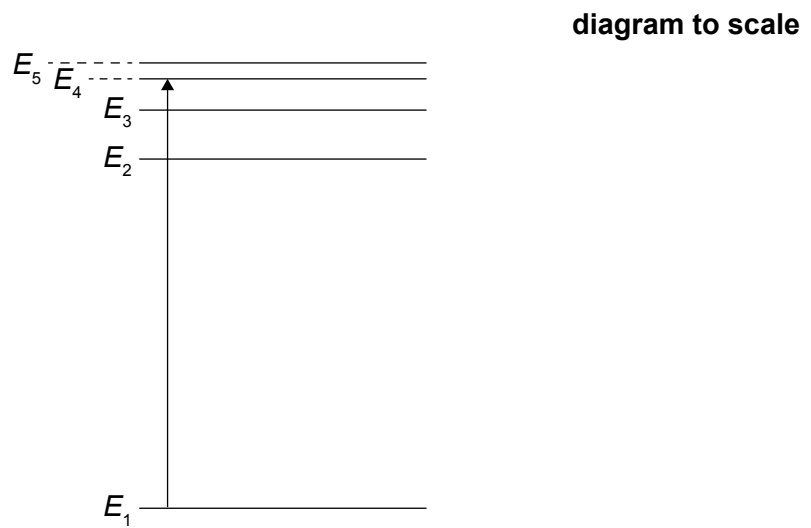
21. Some transitions between the energy states of an atom are shown.



Which transition will emit a photon with the longest wavelength?

- A. E_1
- B. E_2
- C. E_3
- D. E_4

21. The energy levels of an atom in which an electron transitions from E_1 to E_4 are shown. E_1 is the ground state.



How many different wavelengths can be emitted when electrons return to the ground state from E_4 ?

- A. 1
- B. 3
- C. 6
- D. 8

- 21.** Which claim about the structure of the atom is falsified by the results of the Geiger–Marsden–Rutherford experiment?
- A. The nucleus is only made up of positively charged particles.
 - B. The electrons in the atom move in orbits of fixed radius.
 - C. The positive charge occupies all of the atom's volume.
 - D. The electrons in the atom have continuous energy.

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Turn over

0020–0710

21. Three statements are made about emission and absorption spectra.

- I. They provide information on the chemical composition of substances.
- II. They provide evidence for mass-energy equivalence.
- III. They arise from transitioning electrons between energy levels.

Which of the statements are correct?

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

1. The diagram shows the three lowest energy levels of the hydrogen atom. The energy of each level is indicated.

diagram not to scale

–1.51 eV _____

–3.40 eV _____

–13.6 eV _____

- (a) State the number of transitions between these levels that result in the emission of photons.

[1]

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- (b) Calculate the largest photon wavelength for these transitions.

[3]

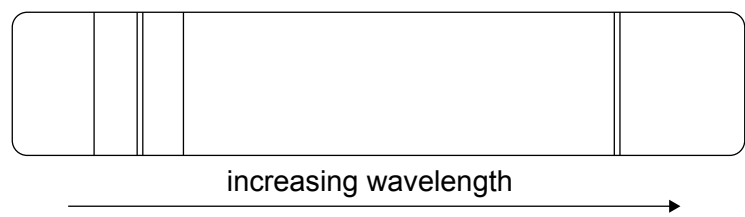
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Turn over
 0020-0747

22. The diagram shows the emission spectrum of an atom.



Which of the following atomic energy level models can produce this spectrum?

