Your notes

GCSE Physics: revision notes

Orbits, red-shift and the Big Bang

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Red-shift

- When a light source moves away from us, the light we see has a longer wavelength: it is shifted towards the red end of the spectrum. This is **red-shift**.
- Light from most distant galaxies shows **red-shift**, so they are moving away from us.
- The further away the galaxies are, the faster they are moving away and the bigger the **red-shift**.

The expanding universe

- **Red-shift** is evidence that the universe is expanding: all the distant galaxies are moving away from each other.
- It supports the **Big Bang theory**: the universe began from a very small region that was extremely hot and dense, and has been expanding ever since.
- **Cosmic microwave background** radiation, left over from the early universe, is further evidence for the Big Bang.
- (Edexcel) The Steady State theory said the universe has always existed, with new matter made as it expands. It cannot explain the **cosmic microwave background** radiation, so the **Big Bang theory** is the accepted one.

What we don't yet know

- Since 1998, observations of supernovae suggest that distant galaxies are moving away faster and faster: the expansion of the universe is accelerating.
- Scientists think this is caused by **dark energy**. Galaxies also seem to contain far more mass than we can see, called **dark matter**.
- There is still much about the universe that is not understood. Scientists develop new theories as new evidence is found.

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Key terms

Red-shift	The increase in the wavelength of light from a galaxy moving away from us.
Big Bang theory	The theory that the universe began from a very small, extremely hot and dense region and has been expanding since.
Expanding universe	The idea that galaxies are moving further apart over time.
Cosmic microwave background	Microwave radiation coming from all directions, left over from the early universe.
Dark energy	An unknown cause of the accelerating expansion of the universe.
Dark matter	Mass that can't be seen but whose gravity affects galaxies.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. What is red-shift?
2. What does red-shift tell us about distant galaxies?
3. How does red-shift change with distance?
4. What theory does red-shift support?
5. What does the Big Bang theory say?
6. What did observations of supernovae since 1998 suggest?
7. What is dark matter?
8. What other evidence supports the Big Bang?

Answers

1. An increase in the wavelength of light from a source moving away
2. They are moving away from us
3. More distant galaxies have a bigger red-shift
4. The Big Bang theory
5. The universe began from a very small, extremely hot and dense region
6. The expansion of the universe is accelerating
7. Mass that can't be seen but whose gravity affects galaxies
8. The cosmic microwave background radiation

What to do next

Practise 11 questions on this topic

Try 7 exam questions, with mark schemes

Read the lesson, one step at a time

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