Red-shift and the Big Bang

Name _____ Class _____ Date _____

Light from distant galaxies gives evidence that the universe is expanding, and that it began with the Big Bang.

KEY IDEAS

- **Red-shift**: an observed increase in the wavelength of light from most distant galaxies.
- The further away a galaxy, the faster it is moving away and the bigger its red-shift.
- Big Bang theory: the universe began from a very small region that was extremely hot and dense. Dark mass and dark energy are still not understood.

Section A · Recall

Grade 4–5

1 What is red-shift? [2]

An observed increase in the wavelength of light from most distant galaxies (shifted towards the red end of the spectrum).

2 What does red-shift tell us about how distant galaxies are moving? [1]

They are moving away from us.

3 State what the Big Bang theory says about how the universe began. [2]

The universe began from a very small region that was extremely hot and dense.

Section B · Explain

Grade 5–6

4 Galaxy A shows a larger red-shift than galaxy B. Compare the two galaxies. [2]

Galaxy A is moving away faster, and is further away.

5 Explain how red-shift provides evidence that the universe is expanding. [3]

Light from nearly all distant galaxies is red-shifted, so they are moving away.

More distant galaxies show more red-shift, so they are moving away faster.

This means the universe is expanding (and so began from one small region).

Section C · Stretch

Grade 7+

6 Since 1998, observations of supernovae suggest that distant galaxies are moving away faster and faster. Explain why this is an unanswered question for scientists. [3]

It can't be explained by the matter and energy we can observe.

Scientists have suggested dark energy (and dark mass),

but nobody knows what these are, so there is still a lot we don't understand.

Exam-style question

AQA style

7 Astronomers compare the spectrum of light from a distant galaxy with the spectrum from a source in a laboratory.

a Describe how the dark lines in the galaxy's spectrum would be different. [2]

They would be shifted towards the red end,

to longer wavelengths.

b Explain why scientists accept the Big Bang theory even though nobody was there to see it. [2]

It explains the observed evidence (red-shift showing the universe is expanding);

theories are accepted when they fit the evidence, and can change if new evidence is found.

c Name one thing about the universe that scientists do not yet understand. [1]

Dark mass / dark energy

Total: _____ / 18

How confident am I?	Not yet	Nearly	Got it
I can explain what red-shift is	☐	☐	☐
I can explain how red-shift supports the Big Bang	☐	☐	☐
I can describe unanswered questions about the universe	☐	☐	☐