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Q62

Consider the following statements: 1. Light is affected by gravity. 2. The Universe is constantly expanding. 3. Matter warps its surrounding space-time. Which of the above is/are the prediction/predictions of Albert Einstein's General Theory of Relativity, often discussed in media? (a) 1 and 2 only (b) 3 only (c) 1 and 3 only (d) 1, 2 and 3 Official key: D.

UPSC Civil Services Prelims 2018 · General Studies · 2 marks · Science and Technology
Science, technology, space, defence, IT - Prelims GS Paper I.

Explanation**(a)**

(a) 1 and 2 only. Light bending in a gravitational field and an expanding cosmos are GR-related, but statement 3-matter warping spacetime-is the core of the theory and cannot be dropped. This option is not the key.

(b)

(b) 3 only. Curved spacetime is Einstein's geometry of gravity, yet gravitational effect on light and cosmic expansion from the field equations are also GR predictions discussed in media. This option is not the key.

(c)

(c) 1 and 3 only. Light deflection and spacetime curvature are textbook GR, but Friedmann expansion of the universe also follows from Einstein's equations (with suitable sources). Omitting 2 is therefore wrong for this question. This option is not the key.

(d) Official key

(d) 1, 2 and 3. General Relativity says mass-energy curves spacetime, so light follows that curvature; the same equations admit an expanding universe. All three statements are GR predictions in the sense UPSC asked. This option is the official key.

Summary

Official key is (d) 1, 2 and 3. Einstein's field equations identify gravity with spacetime curvature caused by matter-energy, which implies that light is deflected and that cosmological solutions can expand. Hubble's observation fitted that GR framework. None of the three listed claims lies outside that theory as the question frames it. Partial options that drop any statement therefore fail.

Related possible facts

These can be asked in a future Prelims paper.

1919 eclipse

Eddington's test of starlight deflection

Gravitational lensing

Modern confirmation that light follows curved spacetime

Friedmann equations

GR cosmology; expanding or contracting universes

Gravitational waves

LIGO 2015 detection; another GR prediction

Equivalence principle

Local equivalence of gravity and acceleration

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