2017 Ph H1 Q20

Section: Our Dynamic Universe
Topic: The Expanding Universe

Given:

- Apparent brightness $F = 4.4 \times 10^{-10}\ \mathrm{W/m^2}$
- Luminosity $L = 6.1 \times 10^{30}\ \mathrm{W}$

Use:

$$F = \frac{L}{4\pi d^2} \Rightarrow d = \sqrt{\frac{L}{4\pi F}}$$

Calculation:

$$d = \sqrt{\frac{6.1 \times 10^{30}}{4\pi \cdot 4.4 \times 10^{-10}}} = \sqrt{1.10 \times 10^{39}} \approx 3.32 \times 10^{19}\ \mathrm{m}$$

Final Answer:
A

Revision Tips:

- Use the inverse square law for **luminosity and apparent brightness**
- Always check for correct unit consistency
- Brightness F decreases with distance squared