

# What's Up! December 2021 Challenge **Answers**

by John Rowland

## Scoring System

All questions answered with "Don't know" or "None of the above" score Zero (0).

One point (1) is awarded for each and every **right** answer or **correct** statement **ticked** (✓).

For **Questions 3** and **5**, if any correct statements have been ticked, one **bonus** point (1) is added for each incorrect statement left **unticked**. This is to reward people who ticked only the correct statements.

So there are 4 points up for grabs in questions 1, 2, 4 & 6.

There are 3 correct and 2 incorrect statements in Q3, so the maximum score is 5.

There is 1 correct and 3 incorrect statements in Q5, so the maximum score is 4.

The **maximum** total score is therefore **13**.

## The Questions, Answers and Explanations

### Beginners



1. What is the name of the above object? *[radio buttons]*

- a) The Milky Way - *No. The Milky Way is our own galaxy. This is obviously a separate object.*
- b) **The Andromeda Galaxy** - *Yes!*
- c) The Orion Nebula - *No. The Orion Nebula is a star-forming gas cloud in our own galaxy.*
- d) The Whirlpool Galaxy - *No. But not a bad guess. Here is the [Whirlpool Galaxy](#).*

2. An annular solar eclipse (only one right answer) *[radio buttons]*

- a) Is it an eclipse that happens every year - *No. No eclipses happen every year. Did you mistake the annular for annual?*
- b) **May happen when the Moon comes between the Earth and the Sun** - *Yes! It may happen but not always. Depends on [the distance to the Moon](#).*
- c) May happen when the Earth comes between the Sun and the Moon - *No. That would cause a lunar eclipse.*
- d) Can only happen when the Moon is at its nearest to the Earth - *No. The Moon needs to be somewhere on the part of its orbit that is furthest from the Earth. Then, it's smaller and not big enough to completely hide the Sun, which is seen as a ring or annulus.*

### Intermediate

3. Which of these is/are correct statements? (Could be none, one or more) *[tick boxes]*

- a) **An optical system that uses refraction and reflection is called [catadioptric](#)**. - *Yes! Combined from *dioptric* (refractive) and *catoptric* (reflective)*
- b) **One of the major aberrations of a parabolic mirror is an off-axis coma**. - *Yes! Parabolic mirrors produce comet-like images of stars not on the optical axis. The further off they are, the worse is the [comatic image](#).*

- c) An apochromatic lens brings all wavelengths of light into focus in the same focal plane. - No. Not quite. An [apochromatic lens](#) brings the light of three different wavelengths to the same focus. This produces excellent images but the light of other wavelengths will cause a very small amount of residual chromatic aberration (colour fringing).
- d) A Maksutov-Cassegrain telescope uses a meniscus corrector with a silvered “spot” secondary on the corrector. Yes! See this [Wikipedia entry](#).
- e) A Herschelien telescope has a secondary mirror that reflects light through a hollow declination axis. No. What is described is a [Nasmyth telescope](#). A Herschelien telescope is [described here](#).
4. Venus is at its brightest (only one right answer): [radio buttons]
- a) When it's at its nearest to us. - No. When it's at its nearest, it's between us and the Sun so we only see its unlit side.
- b) When its phase is “full”. - No. When its phase is full, it's on the far side of the Sun and much smaller than when it's nearer to us, and its full-face illumination is not enough to make up for its reduced size.
- c) When it's at greatest elongation (eastern or western). - No. It shows as a “half-moon” shape and is indeed bright at those times but not as bright as when it's nearer to us.
- d) **When the area of its illuminated section is at its greatest.** - Yes! As Venus comes round the Sun as an evening star and starts heading towards us, although its phase shows as an increasingly thin crescent, its size increases markedly and it gets brighter until a point is reached when the crescent thinness decreases so much that the increase in size isn't enough to compensate. <https://shallowsky.com/blog/science/astro/venus-brightest.html> This is the moment of [greatest brightness](#). The reverse happens when Venus becomes a morning star.

## Advanced

5. Which of these are correct statements? (Could be none, one or more.) [tick boxes]
- a) At over 1,000,000°K, the solar corona is the hottest part of the Sun. - No. The [hottest part of the Sun](#) is at its core, where temperatures are thought to be 15,000,000°K.
- b) Globular clusters are found mainly within the densely populated spiral arms of galaxies. - No. They are to be found fairly evenly distributed in a [spherical halo](#) around the galaxy.
- c) **Voyager 1 is now about 1300 light minutes from Earth.** - Yes!. It's got to a [distance of 155.5 AU](#) (23.262 billion Km). and at a speed of 299,792 Km/s, the light would take 1293 minutes to travel that distance.
- d) Spring tides are so-called because, in the northern hemisphere spring, the combined gravitational effects of the Sun and Moon are greater than at any other time of year. - No. [Spring tides](#) occur about once a fortnight when the Sun, Earth and Moon are in line (full moon or new moon). Then, the gravitational effects of the Sun and Moon combine positively. Around the first and last quarter, the Sun and Moon pull at right angles so combine negatively and partly cancel each other out. This produces neap tides (from Old English *nep*, to become lower). The word spring comes from the German word *Springen* (to leap) or the Anglo Saxon word *Springan* (to bulge).
6. The star Vega will be the pole star in about 13,000 years. This is due to (only one right answer): [radio buttons]
- a) **A phenomenon called precession.** - Yes! The axis of the Earth's rotation moves slowly over time rather like the axis of rotation of a spinning top. See [Precession on Wikipedia](#).
- b) A phenomenon called nutation. - No. [Nutation](#) only causes slight and short term wobbling.
- c) A phenomenon called polar motion. - No. [Polar motion](#) is the motion of the Earth's rotation axis relative to its crust. It is partly due to motions in the Earth's core and mantle, and partly to the redistribution of water mass as the Greenland ice sheet melts.

- d) Vega's proper motion of over 14.4 arc seconds northwards per year. - No. [Vega's proper motion](#) is only about 0.33 arc seconds per year and the direction is not northwards. The star with the largest proper motion is Barnard's Star, moving at 10.3 arc seconds per year.

## Analysis of Results

Here are a few findings that may be of interest.

- The average score was 6.2. The maximum possible score was 13.
- All 21 respondents correctly identified the Andromeda Galaxy in Q1.
- 17 people got Q2 right. The answer is b).
- 14 people correctly identified Q3a as true, but 14 got Q3c wrong.
- Only 4 people got Q4 right. That was obviously the trickiest question, as so many of the answers sounded perfectly reasonable.
- Also, 9 people got Q5c right, with 13 getting Q5d wrong.
- 12 people got Q6 right.

*[The online challenge was **opened** on 1/12/2021 and **closed** on 15/12/2021]*

*Ref: <https://yorkastro.org.uk/whats-up/whats-up-december-2021/#Challenge>*