**Scrambled Science: Dark Matter**

Why do physicists think that 80% of the matter in our universe is dark matter – a new form of matter - that has never been detected directly?

The following statements are all true. Group the statements by which ones describe the **problem** and which describe the **various solutions**. Use these ideas to write an answer in fewer than 50 words.

A: The mass from orbital measurements is 5 times more than from brightness measurements.

B: 99% of the mass in our solar system is found in the Sun.

C: The speed of an orbiting star can determine the force acting on it.

D: Planets are hard to see, but can be found by micro-lensing, wobble, transits

E: The mass of the stars in a galaxy can be found by the galaxy’s type and brightness.

F: Black holes do not emit light.

G: Black holes can be observed indirectly by micro-lensing and orbits, total mass is too small

H: Our present theory for gravity is well supported by all other observations.

I: Neutrinos are very hard but possible to detect (Canada got a Nobel Prize for this)

J: Astronomers can measure mass by how much it bends light.

K: Neutrinos have mass and there are lots of them.

L: Our present theory for gravity is different from 100 years ago.

M: If the unseen matter were from neutrinos it would prevent galaxy formation.

N: The mass of all black holes is not enough (measured by materials ejected during formation)

O: Mass of neutrinos is too small.

Q: Mass estimates from lensing and orbital motion agree.

R: Big Bang nucleosynthesis gives the same ordinary mass as the brightness method.

S: New physical laws could alter the orbital measurement but not lensing.

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