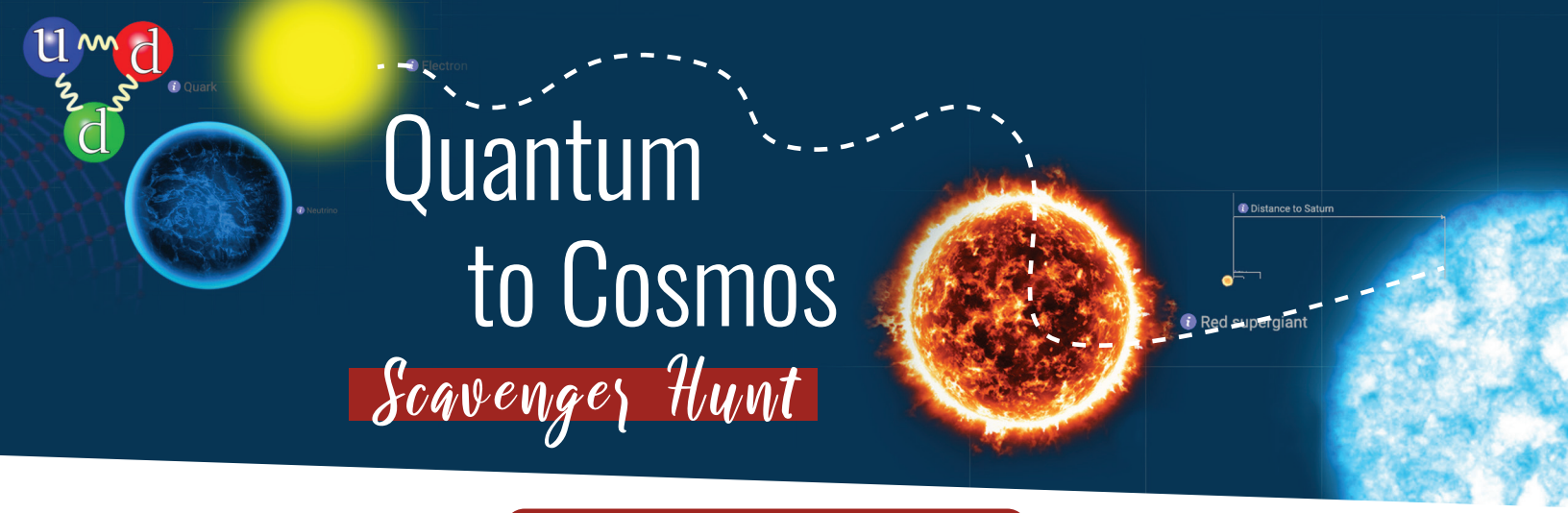

Quantum to Cosmos

Scavenger Hunt

The universe is a vast and wonderous place full of amazing features. Unlock the secret code by answering the questions below about the cosmos.

SECRET CODE (four digits)

0-9	0-9	0-9	0-9

FINAL PUZZLE:

What's the significance of the year in the secret code for physics?

.....

STEP 1: Visit **www.quantumtocosmos.ca** and find the answers to these questions.

1. What are the biggest and smallest human-made objects in the scale? Biggest: ....., Smallest: .....
2. How many times smaller than a grain of sand is a coronavirus particle? Take the size of a grain of sand to be 1.00 millimetres.....
3. What's the name of the experiment designed to take an image of the black hole Sagittarius A*? .....
4. How far away is the object you see when you align the telescopes in the interactive based on the answer to Question 3?
   .... light years.
5. Find the particle that scientists think might make up dark matter and review the expanded information box. What particles are predicted by other theories for dark matter? List them in alphabetical order. .....
6. What's the largest combined mass for two black holes you can create in the *Gravitational Waves* interactive? ..... solar masses
7. In the *Current Limit of the Quantum World* interactive, what are the quantum behaviours (or powers) that affect your particle? List them as they appear from left to right. ..... uncertainty, ..., ...
8. What has the CHIME telescope seen dozens of? .....
9. Which filter in the *Take a Selfie* interactive is a type of light? .....
10. What do physicists speculate that space is like at the Planck scale? .....
11. How many stars (either individual stars or types of stars) are mentioned in the scale? .....
    Note: White dwarfs are stars.
12. What did astronomers infer the existence of when they looked at distant Type 1a supernovas? .....
13. How far away is the Large Magellanic Cloud? .... light years
14. How many times stronger than steel is a carbon nanotube? .....
15. In which year did astronomers first observe the supernova that produced the Crab nebula? .....

STEP 2: Convert your answers as follows: If the answer is a word (or multiple words), convert the **first letter** of *just the first word* to a number using this code:

A = 1	B = 2	C = 3	D = 4	E = 5	F = 6	G = 7	H = 8	I = 9	J = 10	K = 11	L = 12	M = 13
N = 14	O = 15	P = 16	Q = 17	R = 18	S = 19	T = 20	U = 21	V = 22	W = 23	X = 24	Y = 25	Z = 26

If the answer is a number, use the **first three digits** (eg. 10 million = 10 000 000 → 100) or the **entire number** if it has fewer than three digits (eg. 5 → 5).

STEP 3: Add all your numbers together to get the secret four-digit code!

Answers

STEP 1

15. 1054
14. 100 times stronger
13. 163 000 light years
12. dark energy
11. 8 (white dwarfs, Sun, red giant, hypergiant, Betelgeuse, neutron star, Alpha Centauri, red supergiant)
10. granular or grainy
9. UV
8. Fast radio bursts (FRBs)
7. quantum uncertainty, quantum tunneling, and entanglement
6. 100 solar masses
5. Gravitinos, MACHOs, RAMBOS, and Wimpzillas (the subatomic particle is a WIMP)
4. 55 000 000 light years (distance to the black hole M87*)
3. Event Horizon Telescope
2. 8000 times smaller; 8.00 x 103 = (1.00 x 10-3 m)/(1.25 x 10-7 m)
1. Large Hadron Collider (biggest); smallest current transistor gate (smallest)

STEP 2:

12, 800, 5, 550, 7, 100, 17, 6, 21, 7, 8, 4, 163, 100, 105

STEP 3:

1905

FINAL PUZZLE:

The year 1905 was Albert Einstein's *miracle* year. In this period, he discovered special relativity, $E = mc^2$, and models that explained Brownian motion and the photoelectric effect. To find out more about Einstein, visit Inside the Perimeter.