

Team Name: \_\_\_\_\_ Team Number: \_\_\_\_\_

- 1) S (O, P, S, or T) nucleus as seen in the optical
- 2) O (O, P, S, or T) image
- 3)  $1 \times 10^{10}$  (years) 27) Blue knots are blue stars
- 4) Globular Cluster X-ray sources along ring could
- 5) +2.9 to +4.9 be SNR, neutron stars, or black
- 6)  $10^9$  to  $10^{10}$  (years) holes (life time less than 30 Myr)
- 7) O (M, N, O, or T) 28) Object appears to be
- 8) M (M, N, O, or T) galaxy, so X-ray source could
- 9) 1 be AGN
- 10) Higher
- 11) Population 1 formed after 29) 4
- supernovae began occurring 30) 4
- enriching interstellar medium 31) 100
- with heavy elements 32) NGC 604
- 12)  $3.0 \times 10^{11}$  to  $3.2 \times 10^{11}$  (Hz) 33) X-ray
- 13) After gravitational collapse 34) Stellar Nursery
- stars are still surrounded by 35) Powerful stellar wind from
- "shroud" of dust, gas, etc. massive young stars, colliding
- that re-radiate in infrared with gas and dust
- 14) K (A - T) 36)  $3 \times 10^{31}$  (Watts)
- 15) X-ray 37)  $2 \times 10^3$  to  $3 \times 10^3$  (AU)
- 16) 0.15 to 0.25 (AU) 38) 19 to 21 (years)
- 17)  $2.55 \times 10^6$  to  $2.75 \times 10^6$  (years) 39)  $3 \times 10^6$  ( $M_{\odot}$ )
- 18) Gravitational Waves 40)  $10^8$  to  $10^9$  (light years)
- 19) AG (AD, AE, AF, or AG) 41) A (A, B, G, or I)
- 20) ii (i, ii, or iii) 42) I (A, B, G, or I)
- 21) i (i, ii, or iii) 43) 145 to 165 (pcs)
- 22) iii (i, ii, or iii) 44) Z (Z, AA, AB, or AC)
- 23) i (i, ii, or iii) 45) E (C, E, or K)
- 24)  $1.5 \times 10^5$  to  $1.7 \times 10^5$  (ly) 46) C (C, E, or K)
- 25)  $2 \times 10^8$  to  $4 \times 10^8$  (years) 47) 11 to 13 (billions of years)
- 26) No, there is no X-ray source 48) 3500 to 4000 (Mpc)
- corresponding to the galactic 49) M82 (Cigar Galaxy)
- 50) X-ray and Optical
- 51) Starburst Galaxy
- 52) Interaction with M81
- 53) 10 to 20 (km/s)
- 54) 16
- 55) 4
- 56) The luminous matter is not actually concentrated in the center
- 57) Tully fisher assumes a direct relationship between mass and luminosity, which is not the case for dark matter
- 58) Supernovae
- 59) F (F or R)
- 60) R (F or R)
- 61) R (F or R)
- 62) Cepheid
- 63) 2000 to 2300 ( $L_{\odot}$ )
- 64) Helium
- 65) 3 to 4 (Mpc)
- 66) -16.5 to -18.5
- 67) Epsilon Aurigae
- 68) 3
- 69) 27 to 29 (days)
- 70)  $2 \times 10^4$  to  $4 \times 10^4$  (meters)
- 71) M84
- 72) Optical
- 73) Starburst Galaxy
- 74) Jet outbursts from black hole can create "bubbles", excite and suppress star formation
- 75) 8 to 9 (kpc)