1. The most common type of galaxy in the universe is

(elliptical, spiral, irregular). (1pt)

2. The Local Group contains ~25 known member galaxies. The 3 largest galaxies are

(spirals, ellipticals, irregulars), named _The Milky Way_, _Andromeda (M31)_ , _Triangulum (M33)_ (2pts)

3. The total mass of the Milky Way galaxy is estimated to be approximately

(10^6, 10^9, 10^{12}, 10^{15}, 10^{18}) \text{M}_\odot. (1pt)

4. The mass of the black hole that is hypothesised to lie at the center of the nucleus of the Milky Way is

(10^6, 10^9, 10^{12}, 10^{15}, 10^{18}) \text{M}_\odot. (1pt)

5. Match the following galactic components with the correct characteristic: (3pts)

A) Giant Molecular Cloud  __F__ pattern of stars and gas in disks

B) globular cluster  __A__ birth sites for all massive stars

C) galactic halo  __B__ contains a dense group of 10^5-10^6 stars

D) corona  __D__ mostly "dark matter"

E) galactic nucleus  __E__ location of supermassive black hole

F) "bars" and "arms"  __C__ location of most globular clusters
6. The nearest moderately rich cluster of galaxies outside the local group is called the _______ Virgo Cluster ____________, located at a distance of ~ _____18 Mega_________ parsecs. (1pt)

7. The rich cluster of galaxies in the constellation Coma Berenices contains ~ _____10,000_____ galaxies, and is at a distance of _____ ~ 90 Mega_________ parsecs. (1pt)

8. The most distant known quasar is approximately 13 billion light-years away. We are now seeing this object as it was ________13 billion__________ years ago. (1pt)

9. The energy output of a bright quasar is equivalent to that of ( the Milky Way, 100 Suns, a dwarf elliptical, 100 Milky Ways ). (1pts)

10. The Hubble Law links which two characteristics of objects in the universe (1pt)
    A) luminosity and surface temperature
    B) distance and velocity
    C) mass and luminosity
    D) morphology and age

11. The future of the universe, in terms of its ultimate evolution and whether it will expand forever or eventually contract again, is determined by which parameter? (1pt)
    A) the present volume of the universe
    B) the temperature of the gas within it
    C) the intensity of the cosmic microwave background radiation
    D) the average density of matter within it

12. The remnant radiation left over after the Big Bang of the universe and pervading all observable space, has an effective black-body temperature of ~ ( 273, 0, 3, 30 ) degrees K, and emits most strongly at ( visible, infrared, microwave, X-ray ) wavelengths. (1pt)