Astronomy 162 *Exam 3*

Name: Answer Key

Student ID: Green Version

Section:

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1. [1pt] The X-rays associated with black holes are thought to be emitted primarily from _____ ?

A) 'hot spots' in an accretion disk inside the Schwarchild radius

B) neutron stars in orbit around the black hole

C) the accretion disk surrounding the black hole

D) the vicinity of the spacetime singularity

E) a region just inside the Schwarzchild radius

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2. [5pt] Match each statement with the appropriate object, and enter the associated letter.

C Distant objects that show very red shifted spectral lines. — A. synchrotron radiation

E Luminous galaxies that have non-thermal spectra. — B. radio galaxies

B Galaxies that emit much of their energy in radiowave photons. — C. quasars

D Spiral galaxies with bright nuclei and regions of gas in turbulent motion. — D. Seyfert galaxies

A Polarized radiation produced when electrons spiral around magnetic field lines. — E. active galaxies

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3. [1pt] The distribution of quasars with redshift indicates that

A) most quasars were formed early in the history of the Universe.

B) quasars are just as numerous now as they were in the early Universe.

C) quasar luminosities have steadily increased with time.

D) quasars have formed only recently, from the interactions between galaxies.

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4. [1pt] The Sun is located in the _____ of the galaxy.

A) spheroidal component

B) halo

C) disk

D) nucleus

E) far outer edge

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5. [1pt] Which statement is true?

A) If the Sun collapsed into a black hole the Earth and all the inner planets would be sucked into it.

B) You can tell what material formed a black hole by studying its surface properties.

C) Gas falling into a black hole gives off X-rays.

D) Light coming from near the event horizon of a black hole would be strongly blue-shifted.

E) All stars that have a mass greater than the Sun will end up as a black hole.

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6. [1pt] The 'event horizon' surrounding a black hole is associated with the _____?

A) Schwarzchild radius

B) spacetime singularity

C) Einstein radius

D) Kerr metric

E) accretion disk

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7. [1pt] The jets seen in some active galaxies are thought to consist of

A) molecular clouds.

B) charged particles moving at close to the speed of light.

C) gravitationally lensed arcs.

D) ejected black holes.

E) stellar coronas.

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8. [1pt] In comparing elliptical galaxies to our own, the part of our own that most resembles the elliptical galaxies is _____?

A) the prominent dust lanes

B) the halo and central bulge

C) the open cluster distribution

D) the disk

E) the spiral arms

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9. [1pt] A Seyfert Galaxy is an example of _____ ?

A) an active galaxy

B) a giant elliptical galaxy

C) an irregular galaxy with radio emission

D) a quasar

E) a normal galaxy

10. [1pt] The primary means of determining the mass of a spiral galaxy uses _____ ?

A) Newton's first law
B) the Wien displacement law
C) the cepheid period-luminosity relation
D) Einsteins theory of special relativity
(E) Kepler's third law

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11. [1pt] The word "quasar" came from the acronym that was used to identify a

A) quantum star.
B) quasi-stellar object.
C) quiet astronomical source.
D) quiet stellar object.
(E) quasi-stellar radio source.

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12. [1pt] The kind of nebula that is illuminated by nearby cool stars is called a (an) _____ nebula?

A) emission
(B) reflection
C) dark
D) absorption
E) spiral

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13. [1pt] The Andromedae Galaxy (M31) is approaching us and does not obey the Hubble Law. Why?

A) The reddening of light by interstellar absorption invalidates the Hubble Law in this case
(B) M31 is too close for the Hubble Law to be applicable.
C) The Hubble Law is valid only for elliptical galaxies.
D) The Hubble Law does not apply to irregular galaxies like Andromedae
E) M31 is too far away for the Hubble Law to be applicable.

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14. [1pt] Galaxies are known with look-back times out to about

A) 4.5 billion years.
(B) 13 billion years.
C) 3000 years.
D) 65 million years.

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15. [1pt] The observation that some quasars vary their light output on timescales as short as days is important because it implies that _____ ?

A) they cannot be stars
B) they must be very close to us
C) they must contain variable stars
D) their redshifts cannot be a gravitational effect
(E) they must have a very compact energy source

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16. [1pt] Most of the mass of the Milky Way Galaxy is detectable

A) in x-rays.
B) in the infrared.
(C) in no part of the electromagnetic spectrum.
D) in visible light.
E) at radio wavelengths.

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17. [1pt] In which of the following parts of the electromagnetic spectrum are we learning the least about the very center of our Galaxy?

A) infrared
B) gamma
C) radio waves
(D) visible light

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18. [1pt] The object at the center of a black hole is called the _____ ?

(A) singularity
B) photon sphere
C) Kerr metric
D) centroid
E) event horizon

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19. [1pt] The youngest stars in the galaxy are found in the _____ ?

A) globular clusters
(B) spiral arms
C) core
D) halo
E) central bulge

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20. [1pt] Matter from a companion star in orbit around a black hole forms a(n)

A) ergosphere.
B) bipolar flow.
C) singularity.
D) event horizon.
(E) accretion disk.

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21. [1pt] Quasars appear to be

(A) a particularly active phase in the history of a galaxy.
B) long-lived objects, unchanged since the beginning of the Universe.
C) all at about the same distance.
D) extremely rare in galaxy clusters.

22. [1pt] The mechanism that may have created the spiral arms of our Galaxy by piling up material to create new stars is called the

A) mass-rotation relation.
B) differential-rotation effect.
C) supernova chain reaction.
D) T Tauri association.
E) density wave.

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23. [1pt] Supermassive black holes probably exist in

A) pulsars.
B) the centers of most galaxies.
C) the outer solar system.
D) the halo of the Milky Way Galaxy.
E) novae.

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24. [1pt] If enough mass is present in a small enough volume at the center of a galaxy, it implies the presence of

A) a star cloud.
B) star formation.
C) a white dwarf.
D) dust and gas.
E) a black hole.

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25. [1pt] The region around a black hole from which energy can theoretically be extracted is the

A) event horizon.
B) Schwarzschild radius.
C) exit cone.
D) ergosphere.
E) photon sphere.

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26. [1pt] Presently the most plausible explanation for the energy sources in the centers of active galaxies is _____ ?

A) large clusters of rapidly spinning neutron stars
B) a supermassive black hole
C) rapid and sequential nova explosions
D) very dense clusters of O and B stars
E) chain reaction supernova explosions

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27. [1pt] The 21-cm line, widely used by radio astronomers, comes from

A) hydroxyl (OH) molecules.
B) the hydrogen (H) spin-flip transition.
C) neutrino production.
D) synchrotron radiation.
E) ammonia (NH3) molecules.

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28. [1pt] The location of clouds of neutral hydrogen in the galaxy can be mapped using the 21 centimeter line of hydrogen which comes in the _____ region of the spectrum?

A) x-ray
B) ultraviolet
C) infra-red
D) radio frequency
E) gamma-ray

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29. [1pt] The fact that circular velocity does not decrease at galactic radii greater than that of the Sun indicates that our Galaxy

A) is rotating faster than previously believed.
B) is more massive than previously believed.
C) is rotating more slowly than previously believed.
D) is less massive than previously believed.

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30. [1pt] Why is Jupiter not a black hole?

A) Jupiter has insufficient mass to form a black hole.
B) Jupiter's mass is not squeezed into a small enough volume.
C) Only stars can form black holes.
D) Planets cannot form black holes because their event horizons would be too small.
E) Jupiter has a core composed of metallic hydrogen, which is known not to form black holes, though we don't know why.

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31. [1pt] The fact that we do not see blue shifted quasars _____ .

A) is a result of gravitational lensing
B) proves that the Universe will never collapse
C) disproves Hubble's law
D) proves that the Universe is almost all hydrogen
E) is evidence against the hypothesis that quasars are locally ejected objects

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32. [1pt] An early candidate object possibly containing a black hole was

A) Barnard's star.
B) Subaru.
C) Cygnus X-1.
D) Polaris.
E) Sirius.

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33. [1pt] The largest nearby cluster of galaxies is the

A) Large Magellanic cluster.
B) Vega cluster.
C) Virgo cluster.
D) Perseus cluster.
E) Coma cluster.

34. [1pt] An explanation for the quasars found nearby is that they are being fueled by

A) collapsing galaxies.
B) gas from another, interacting galaxy.
C) nucleosynthesis.
D) black holes.
E) clusters interacting.

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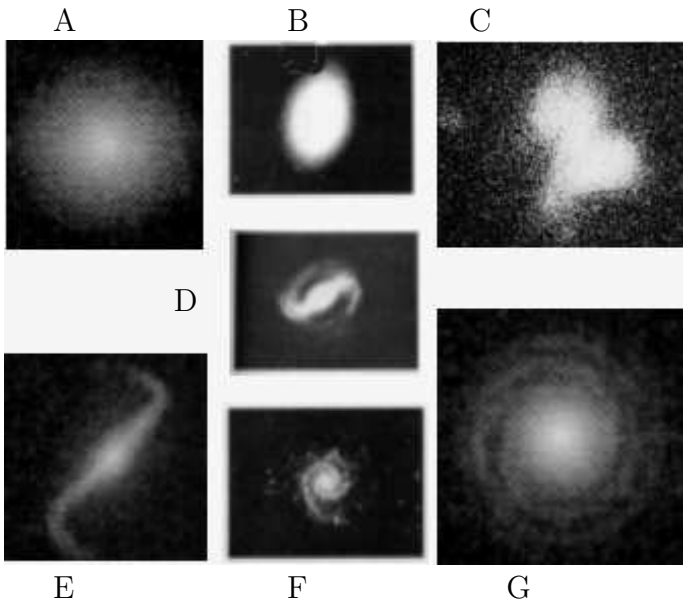
35. [1pt] Match the Hubble classification of the galaxy with the picture. (For each type below, enter the letter for the corresponding picture.)



D SBa

F Sc

B E3

G Sa

E SBc

C Irregular

A E0

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36. [1pt] Lacertids, or BL Lac objects, are probably

A) galaxies with strong radio emission.
B) spiral galaxies at very high redshifts.
C) stars with no or very few emission and absorption lines.
D) highly active galactic nuclei with their jets pointed at us.

37. [1pt] The _____ Catalog of objects in the sky grew from a compilation of 'fuzzy' objects designed to keep comet watchers from mistaking these objects for comets.

A) Halley
B) New General
C) Hubble
D) New Galactic
E) Messier

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38. [1pt] Why must a star that produces an H II region be a hot star?

A) Hot stars emit strongly in the UV
B) Hot stars emit copious quantities of radio waves
C) Only hot stars eject matter at sufficiently high rates
D) Only hot stars emit H II
E) Only hot stars have strong emission at large wavelengths

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39. [1pt] The fact that the Universe is expanding is stated in quantitative form by the _____ ?

A) Hubble Law
B) Slipher Law
C) Inverse Square Law
D) Third Law of Kepler
E) Maxwell-Boltzmann Law

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40. [1pt] The hydrogen in an H I region is predominantly

A) within compounds.
B) neutral.
C) molecular.
D) ionized.