Astronomy 162 *Exam 3*

Name: Answer Key

Student ID: White Version

Section:

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

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

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2. [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) gamma-ray
E) radio frequency

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3. [1pt] The fact that we do not see blue shifted quasars _____ .

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

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4. [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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5. [1pt] The hydrogen in an H I region is predominantly

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

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6. [1pt] The observation that some quasars vary their light output on timescales as short as days is important because it implies that _____ ?

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

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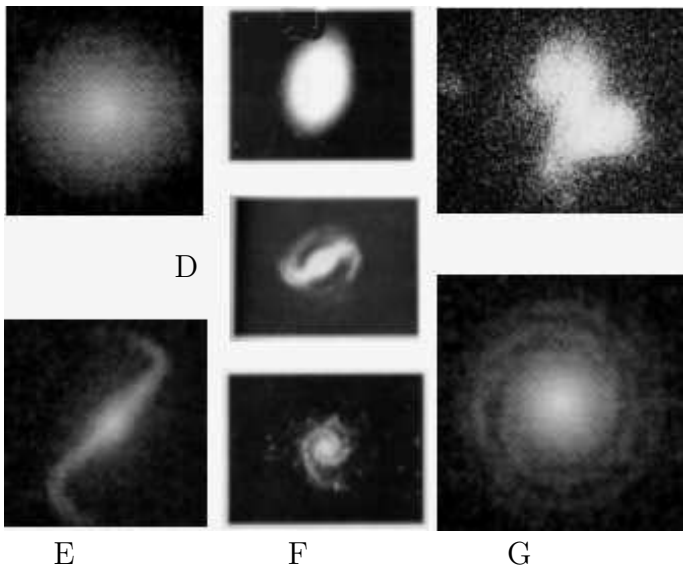
7. [1pt] Match the Hubble classification of the galaxy with the picture. (For each type below, enter the letter for the corresponding picture.)



D SBa

A E0

B E3

G Sa

C Irregular

E SBc

F Sc

8. [1pt] The 'event horizon' surrounding a black hole is associated with the _____?

(A) Schwarzchild radius
B) spacetime singularity
C) accretion disk
D) Kerr metric
E) Einstein radius

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9. [1pt] In comparing elliptical galaxies to our own, the part of our own that most resembles the elliptical galaxies is _____?

(A) the halo and central bulge
B) the spiral arms
C) the disk
D) the open cluster distribution
E) the prominent dust lanes

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10. [1pt] The fact that the Universe is expanding is stated in quantitative form by the _____ ?

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

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11. [1pt] The object at the center of a black hole is called the _____ ?

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

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12. [1pt] If enough mass is present in a small enough volume at the center of a galaxy, it implies the presence of

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

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13. [1pt] The region around a black hole from which energy can theoretically be extracted is the

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

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14. [1pt] Which statement is true?

A) Light coming from near the event horizon of a black hole would be strongly blue-shifted.
B) If the Sun collapsed into a black hole the Earth and all the inner planets would be sucked into it.
(C) Gas falling into a black hole gives off X-rays.
D) You can tell what material formed a black hole by studying its surface properties.
E) All stars that have a mass greater than the Sun will end up as a black hole.

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15. [1pt] The kind of nebula that is illuminated by nearby cool stars is called a (an) _____ nebula?

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

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16. [1pt] Supermassive black holes probably exist in

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

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17. [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) Messier
B) Hubble
C) Halley
D) New Galactic
E) New General

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18. [1pt] The X-rays associated with black holes are thought to be emitted primarily from _____ ?

A) a region just inside the Schwarzchild radius
B) neutron stars in orbit around the black hole
C) 'hot spots' in an accretion disk inside the Schwarchild radius
(D) the accretion disk surrounding the black hole
E) the vicinity of the spacetime singularity

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19. [1pt] Quasars appear to be

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

20. [1pt] Why is Jupiter not a black hole?

A) Jupiter has a core composed of metallic hydrogen, which is known not to form black holes, though we don't know why.

B) Jupiter has insufficient mass to form a black hole.

C) Planets cannot form black holes because their event horizons would be too small.

D) Jupiter's mass is not squeezed into a small enough volume.

E) Only stars can form black holes.

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21. [1pt] The Andromedae Galaxy (M31) is approaching us and does not obey the Hubble Law. Why?

A) The Hubble Law is valid only for elliptical galaxies.

B) The reddening of light by interstellar absorption invalidates the Hubble Law in this case

C) The Hubble Law does not apply to irregular galaxies like Andromedae

D) M31 is too far away for the Hubble Law to be applicable.

E) M31 is too close for the Hubble Law to be applicable.

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22. [1pt] The youngest stars in the galaxy are found in the _____ ?

A) spiral arms

B) core

C) globular clusters

D) central bulge

E) halo

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23. [1pt] Matter from a companion star in orbit around a black hole forms a(n)

A) singularity.

B) accretion disk.

C) ergosphere.

D) event horizon.

E) bipolar flow.

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24. [1pt] The largest nearby cluster of galaxies is the

A) Coma cluster.

B) Perseus cluster.

C) Vega cluster.

D) Virgo cluster.

E) Large Magellanic cluster.

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25. [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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26. [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) density wave.

B) mass-rotation relation.

C) differential-rotation effect.

D) supernova chain reaction.

E) T Tauri association.

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27. [1pt] Galaxies are known with look-back times out to about

A) 4.5 billion years.

B) 13 billion years.

C) 65 million years.

D) 3000 years.

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28. [5pt] Match each statement with the appropriate object, and enter the associated letter.

E	Galaxies that emit much of their energy in radiowave photons.	A. Seyfert galaxies
C	Distant objects that show very red shifted spectral lines.	B. active galaxies
A	Spiral galaxies with bright nuclei and regions of gas in turbulent motion.	C. quasars
B	Luminous galaxies that have non-thermal spectra.	D. synchrotron radiation
D	Polarized radiation produced when electrons spiral around magnetic field lines.	E. radio galaxies

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29. [1pt] Presently the most plausible explanation for the energy sources in the centers of active galaxies is _____ ?

A) very dense clusters of O and B stars

B) rapid and sequential nova explosions

C) large clusters of rapidly spinning neutron stars

D) chain reaction supernova explosions

E) a supermassive black hole

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30. [1pt] The 21-cm line, widely used by radio astronomers, comes from

A) synchrotron radiation.

B) neutrino production.

C) the hydrogen (H) spin-flip transition.

D) ammonia (NH3) molecules.

E) hydroxyl (OH) molecules.

31. [1pt] The fact that circular velocity does not decrease at galactic radii greater than that of the Sun indicates that our Galaxy

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

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32. [1pt] The Sun is located in the _____ of the galaxy.

A) spheroidal component
B) nucleus
C) far outer edge
D) disk
E) halo

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33. [1pt] An early candidate object possibly containing a black hole was

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

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34. [1pt] The jets seen in some active galaxies are thought to consist of

A) molecular clouds.
B) gravitationally lensed arcs.
C) charged particles moving at close to the speed of light.
D) stellar coronas.
E) ejected black holes.

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35. [1pt] Most of the mass of the Milky Way Galaxy is detectable

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

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36. [1pt] The word "quasar" came from the acronym that was used to identify a

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

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37. [1pt] An explanation for the quasars found nearby is that they are being fueled by

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

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38. [1pt] A Seyfert Galaxy is an example of _____ ?

A) an irregular galaxy with radio emission
B) an active galaxy
C) a quasar
D) a normal galaxy
E) a giant elliptical galaxy

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39. [1pt] Lacertids, or BL Lac objects, are probably

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

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40. [1pt] The primary means of determining the mass of a spiral galaxy uses _____ ?

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