Introductory Astronomy

Homework 28: Galaxies Not to be handed in. Homework solutions are posted already.

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046 qmult 00100 1 1 1 easy memory: galaxy nearest neighbor distance

1. A typical nearest neighbor distance between galaxies is of order:

   a) 1 Mpc. b) 1 kpc. c) 1 pc. d) 1 cm. e) 4220 Mpc.

   SUGGESTED ANSWER: (a) See CK-397 and FK-593, but no one is very explicit on this fine point.

   Wrong answers:
   d) A bit small.
   e) This is the Hubble length for Hubble constant 71 (km/s)/Mpc (FK-653). The Hubble length is a characteristic size scale for the observable universe (CL-45–47).

   Redaction: Jeffery, 2001jan01

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046 qmult 00210 1 4 3 easy deducto-memory: Hubble tuning fork diagram
Extra keywords: CK-394

2. Hubble galaxy types are conveniently displayed by a:

   a) Hubble spoon diagram. b) Hertzsprung-Russell (HR) diagram. c) Hubble tuning fork diagram. d) Hertzsprung-Hubble spoon diagram. e) Hertzsprung-Russell knife diagram.

   SUGGESTED ANSWER: (c)

   Wrong answers:
   b) This is a luminosity versus temperature plot for stars.
   e) As Lurch would say: "Aaaarh."

   Redaction: Jeffery, 2001jan01

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046 qmult 00230 2 4 2 moderate deducto-memory: barred spiral subtypes
Extra keywords: CK-394 FK-585

3. "Let's play *Jeopardy*! For $100, the answer is: They are the subtypes of the Hubble type barred spiral."

   What are _____, Alex?

   a) Sa, Sb, and Sc b) SBa, SBb, and SBc c) E0, E1, E2, E3, E4, E5, E6, and E7 d) SO and SBO e) Irr I and Irr II

   SUGGESTED ANSWER: (b)

   Wrong answers:
   a) These are the spiral (or ordinary) spiral subtypes.
   c) These are the elliptical subtypes.
   d) These are the lenticular subtypes.
   e) These are the irregular subtypes.

   Redaction: Jeffery, 2001jan01

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046 qmult 00300 1 4 5 easy deducto-memory: ellipticals
Extra keywords: CK-393,395,407

4. "Let's play *Jeopardy*! For $100, the answer is: Galaxies of this Hubble type range in size from about $10^5\,M_\odot$ (small dwarfs) to $10^{13}\,M_\odot$ (large giants), consist mainly of Population II and old Population I stars, and have relatively little dust and gas."

   What is _____, Alex?

   a) irregular b) lenticular c) spiral d) barred spiral e) elliptical.

   SUGGESTED ANSWER: (e) See CK-395 and FK-582

   Wrong answers:
   a) No.

   Redaction: Jeffery, 2001jan01

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046 qmult 00400 1 4 2 easy deducto-memory: lenticular galaxies
Extra keywords: CK-394,407

5. Lenticular (SO and SBO) galaxies have:

   a) spiral arms, but no disks. b) disks, but no spiral arms. c) bulges, but no disks. d) no bulges, disks, spiral arms, or halos. e) no size whatsoever.

   SUGGESTED ANSWER: (b)

   Wrong answers:
   a) Exactly wrong.
   e) As Lurch would say: "Aaaarh." "Whatsoever" is the intensive form of "whatever" (Ba-1387).

   Redaction: Jeffery, 2001jan01

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046 qmult 00500 1 4 4 easy deducto-memory: spirals and barred spirals
Extra keywords: CK-388,392,407

6. Spiral galaxies are divided into ordinary spirals (or just spirals without qualification) and:

   a) bulgeless spirals. b) haloed spirals. c) disked spirals. d) barred spirals. e) unbarred spirals.

   SUGGESTED ANSWER: (d) The terminology is a bit ambiguous because spiral can mean ordinary spiral or ordinary and barred spiral collectively. But it seems overly pedantic to try to remove the ambiguity. Context must decide what spiral sans qualification means.

   Wrong answers:
   e) This is just another name for ordinary spirals.

   Redaction: Jeffery, 2001jan01

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046 qmult 00520 1 1 2 easy memory: trailing spiral arms

7. The spiral arms rotate in the same sense as the disk stars around the center of the galaxy. The arms, however, rotate more slowly than the stars and gas. The ends of the spiral arms:

   a) point in the direction of rotation. b) point opposite the direction of rotation: i.e., the arms are trailing. c) point exactly radially. d) curl back and point toward the galaxy center. e) are knotted together.

   SUGGESTED ANSWER: (b) See FK-569.

   Wrong answers:

a) Somewhere I think I've read that there is one known galaxy with leading arms: NGC 4622 (CK-393).
e) As Lurch would say: "Aaaarh."

Redaction: Jeffery, 2001jan01

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046 qmult 00530 1 4 1 easy deducto-memory: edge-on, face-on

8. To see a spiral or lenticular galaxy parallel to the disk is to see it _____ and to see it perpendicular to the disk is to see it _____.

a) edge-on; face-on b) face-on; edge-on c) edge-on; obliquely d) face-on; obliquely e) obliquely; opaquely

SUGGESTED ANSWER: (a)

Wrong answers:
b) Exactly wrong.
e) As Lurch would say: "Aaaarh."

Redaction: Jeffery, 2001jan01

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046 qmult 00540 1 4 4 easy deducto-memory: spiral subtype from bulge
Extra keywords: CK-388

9. One can usually tell the subtype of a spiral or barred spiral seen **EDGE-ON** because a subtype indication is provided by:

a) the tightness of the winding of the spiral arms. b) the darkness of the disk dust lane. c) the relative size of the halo. d) the relative size of the bulge. e) the galaxy brightness on the sky.

SUGGESTED ANSWER: (d)

Wrong answers:
a) This is exactly what you cannot see when the galaxy is viewed edge-on.

Redaction: Jeffery, 2001jan01

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046 qmult 00800 2 4 3 moderate deducto-memory: irregular galaxy LMC

10. A well known example of an irregular galaxy (of subtype Irr I) is the:

a) Whirlpool Galaxy (M51). b) Sombrero Galaxy (M104). c) Large Magellanic Cloud (LMC). d) Milk Way (i.e., the Galaxy). e) Andromeda Galaxy (M31).

SUGGESTED ANSWER: (c)

Wrong answers:
a) Does "whirlpool" sound like it could be anything other than a spiral galaxy.

Redaction: Jeffery, 2001jan01

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046 qmult 00910 1 1 1 easy memory: star formation in spiral density waves
Extra keywords: CK-408-key

11. The compression of gas and dust in the spiral density wave spiral arms leads directly to these observationally obvious spiral arm features:

a) star formation, hot young, blue stars (i.e., OB stars), and H II regions. b) white dwarfs, neutron stars, and black holes. c) brown dwarfs and planets. d) Venus and Mars. e) the Moon and Mercury.

SUGGESTED ANSWER: (a)

Wrong answers:
b) These always ultimately result from star formation, but they are not observationally obvious spiral arm features.
c) These always ultimately result from star formation, but they are not observationally obvious spiral arm features.
e) As Lurch would say: "Aaaarh."

Redaction: Jeffery, 2001jan01

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046 qmult 01000 1 4 2 easy deducto-memory: galaxy groups
Extra keywords: CK-408-key

12. "Let's play *Jeopardy*! For $100, the answer is: These objects are themselves grouped into larger structures: clusters (poor and rich), superclusters, filaments, sheets and, in a zero or near-zero population sense, voids."

What are _____, Alex?

a) spiral arms b) galaxies c) H II regions d) black holes e) bulges

SUGGESTED ANSWER: (b) See CK-396 and FK-592 and especially FK-596 for sheets and voids.

Wrong answers:
e) Well bulges go with some galaxies, but this is hardly a best answer.

Redaction: Jeffery, 2001jan01

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046 qmult 01012 1 4 2 easy deducto-memory: undiscovered LG galaxies
Extra keywords: CK-408-6

13. Some galaxies in the local group may be undiscovered because:

a) they are too large. b) they are hidden by the Galaxy dusty disk. c) located in the southern hemisphere of the celestial sphere. d) emit only **RED** light. e) emit only **GREEN** light.

SUGGESTED ANSWER: (b)

Wrong answers:
e) As Lurch would say: "Aaaarh."

Redaction: Jeffery, 2001jan01

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046 qmult 01020 1 1 4 easy deducto-memory: Virgo cluster

14. The nearest rich cluster contains over 2000 galaxies, covers about $10^\circ \times 12^\circ$ on the sky in the constellation Virgo, is about 15 Mpc away, and has a diameter of about 3 Mpc. It is an irregular cluster. It is called the:

a) Local Group. b) solar system. c) Coma cluster. d) Virgo cluster. e) Norma cluster.

SUGGESTED ANSWER: (d)

Wrong answers:
e) Now would the Virgo cluster be in the constellation Norma? There is a Norma arm, but no Norma galaxy or cluster as far as I know.

Redaction: Jeffery, 2001jan01

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046 qmult 01050 1 4 1 easy deducto-memory: voids
Extra keywords: CK-396,407

15. These structures, which are roughly spherical, are of order 30 Mpc to 120 Mpc in diameter. They are rather empty, but may contain hydrogen gas and strings of dim galaxies. They are called:

a) voids. b) vaults. c) vandals. d) vents. e) vultures.

SUGGESTED ANSWER: (a) See CK-396 and FK-596

Wrong answers:
e) As Lurch would say: "Aaaarh."

Redaction: Jeffery, 2001jan01

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046 qmult 01060 1 4 3 easy deducto-memory: large scale structure sudsy
Extra keywords: CK-396

16. "Let's play *Jeopardy*! For $100, the answer is: The large-scale structure of galaxy groupings is often described by this adjective."

What is _____, Alex?

a) snowy b) solid c) sudsy d) creamy e) joky

SUGGESTED ANSWER: (c) See CK-396 and FK-596.

Wrong answers:
a) Contact force: no way.

Redaction: Jeffery, 2001jan01

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046 qmult 01110 1 1 2 easy memory: elliptical formation
Extra keywords: FK-602

17. In formation of elliptical galaxies most of the star formation must have occurred and exhausted the gas before the gas could collapse to a disk **OR** a disk formed, but the disk and gas:

a) collapsed to form a supermassive black hole. b) were eliminated by collisions and mergers in galaxy rich environments. c) vanished into thin air. d) mutually annihilated. e) dissolved into helium.

SUGGESTED ANSWER: (b)

Wrong answers:
e) As Lurch would say: "Aaaarh."

Redaction: Jeffery, 2001jan01

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046 qmult 02000 1 4 5 easy deducto-memory: unaided eye galaxies
Extra keywords: CK-409-7

18. The Andromeda galaxy (M31), the Large Magellanic Cloud (LMC), and the Small Magellanic Cloud (SMC) are all:

a) elliptical galaxies. b) dwarf elliptical galaxies. c) irregular galaxies. d) spiral galaxies.
e) unaided-eye objects: i.e., they can all be seen by the unaided eye.

SUGGESTED ANSWER: (e)

Wrong answers:
b) As Lurch would say: "Aaaarh."

Redaction: Jeffery, 2001jan01