Introductory Astronomy NAME:

Homework 29: The Large-Scale Structure of the Universe: Homeworks and solutions are posted on the course web site. Homeworks are **NOT** handed in and **NOT** marked. But many homework problems ($\sim$ 50–70 %) will turn up on tests.

---

001 qmult 00007 1 4 1 easy deducto-memory: reading-homework-self-testing done 2

1. Did you complete reading-homework-self-testing for the Introductory Astronomy Lecture (IAL) by the weekly due date?

   a) YYYessss! b) Jawohl! c) Da! d) Sí, sí. e) OMG no!

   SUGGESTED ANSWER: (a),(b),(c),(d)

   Wrong answers:
   e) As Lurch would say AAAARGH.

   Redaction: Jeffery, 2008jan01

---

029 qmult 00120 1 4 2 easy deducto-memory: galaxy groups

Extra keywords: CK-408-key

2. "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

---

029 qmult 00130 1 4 5 easy deducto-memory: Local Group

Extra keywords: CK-407,408-key

3. The Milky Way belongs to a poor irregular cluster called:

   a) the Great Void. b) the Virgo supercluster. c) the Virgo cluster. d) Our Gang.
   e) the Local Group.

   SUGGESTED ANSWER: (e)

   Wrong answers:
   d) Sounds plausible to me.

   Redaction: Jeffery, 2001jan01

---

029 qmult 00150 1 1 4 easy deducto-memory: Virgo cluster

4. 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 and a Norma Cluster, but no Norma galaxy as I know.

   Redaction: Jeffery, 2001jan01

---

029 qmult 00160 2 5 1 moderate thinking: superclusters unbound
Extra keywords: FK-594

5. Superclusters for the most part do not seem to be gravitationally bound systems. If this is so, then their component clusters will:

a) progressively move apart with the expansion of the universe. b) stay close together forever. c) collapse to form supermassive black holes. d) collapse to form a single supermassive black hole. e) empty into the Void.

SUGGESTED ANSWER: (a) See FK-594

Wrong answers:
e) This is something an ancient Greek presocratic philosopher would say.

Redaction: Jeffery, 2001jan01

---

029 qmult 00170 1 4 1 easy deducto-memory: voids
Extra keywords: CK-396,407

6. 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:
c) *Vandals of the Void*: an old scifi book.
e) As Lurch would say: "Aaaarh."

Redaction: Jeffery, 2001jan01

---

029 qmult 00180 1 4 3 easy deducto-memory: large-scale structure web-like or foamy
Extra keywords: CK-396

7. "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) web-like d) creamy e) joky

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

The answer used to be foamy, but increasingly the adjective of choice is web-like and the large-scale structure itself is increasingly called the cosmic web. It's not like a nise spider web though. Spider webs are 2-dimensional and have circular symmetry. The cosmic web is more like a mess of interlocking and jumbled spider webs.

Wrong answers:
e) Oh, c'mon.

Redaction: Jeffery, 2001jan01

---

029 qmult 00330 1 1 2 easy memory: elliptical formation
Extra keywords: FK-602

8. In the formation of elliptical galaxies, the orbits of the stars are randomized (almost always by mergers it seems) and the galaxy becomes quenched (i.e., star formation turns off or nearly off) typically on the time scale of gigayears. Gas in quenched elliptical galaxies:

a) has collapsed to form a supermassive black hole. b) is too hot to form stars. 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