



## CONSOLIDATION ACTIVITIES

### “SIENCIAS FOR THE CONTEMPORARY WORLD” (1<sup>st</sup> Bachillerato)

#### Unit 1: Our place in the Universe

#### 1.1. Answer these questions:

- Where is dark matter located in this model of a supercluster of galaxies?
- What effects does this dark matter have over the rest of the components of the Universe?
- What role did the dark energy have in the development and evolution of the Universe?
- What percentage of the whole Universe does visible matter represent? What is it made up of?
- What is the cause of the irregular distribution of galaxies in the Universe?

#### 2.1. Relate each concept or discovery with the scientist who proposed it or made it:

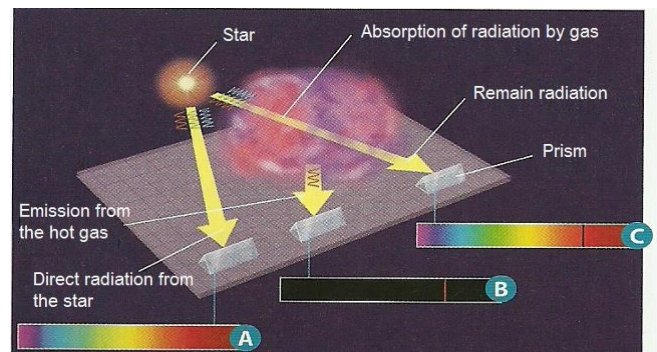
- Epicycles
- Phases of Venus
- First calendars
- The planets move faster when they are near the Sun.
- The existence of life beyond the Earth
- The Earth rotates on its axis each 24 h.
- The Sun is the center of the Universe.
- The skies are neither immutable nor static.
- The way celestial bodies move.
- The Universe of transparent glass spheres.

#### 2.3. Answer:

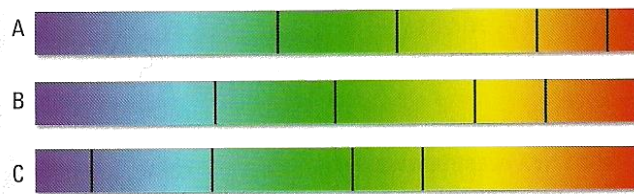
- Why did Einstein introduce the “cosmological constant” in his equations?
- What is the difference between the model of expanding universe and the model of the steady state universe?
- What evidences do exist about that the universe is expanding?

#### 2.4. Observe the diagram. It represents the spectra obtained from the electromagnetic radiation of a star.

- Indicate in each case if it is an absorption spectrum, an emission spectrum or a continuous spectrum.
- Which is the origin of the black line? Why does it appear in “c”? Why is “b” black and the line is coloured?
- How is useful in Astrophysics the study of the electromagnetic spectra?



#### 2.5. Compare the position of the absorption spectral bands of some chemical elements present in galaxies A and B with the spectrum obtained from the same elements in the laboratory (C).



- Which is the origin of the shift of the lines towards the higher wavelengths (red) in A and B?
- Which of both galaxies is farther away from the Earth? Why?
- How can we calculate this distance?

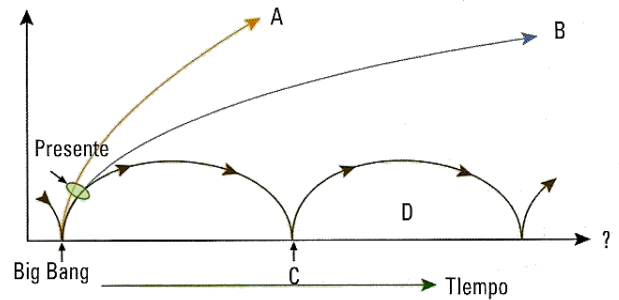
#### 2.6. What is the microwave background radiation? And the red-shift?

**2.7. About the Big Bang theory:**

- How and when did the Universe form according to the Big Bang theory?
- What chemical elements were formed just after the Big Bang?
- When did first atoms appear?
- How was possible the conversion of energy into matter?
- Why has antimatter not detected in the Universe?
- What subatomic particles were formed from the quarks?
- What is the nucleosynthesis? When did it take place?
- What stage of the history of the Universe is known as “dark ages”?

**2.8. The graph on the left represents the possible futures of our universe.**

- Identify each one.
- Which of them seems to be the most probable according to the recent discoveries about dark energy?
- Which of them is related to the Pulsating Universe hypothesis?

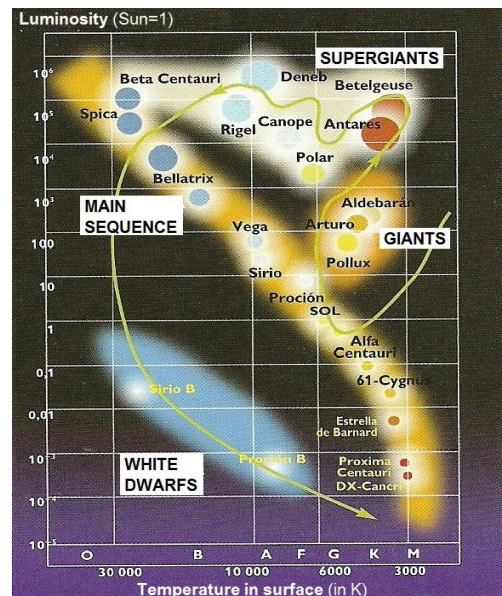


**3.1. Answer these questions:**

- Which are the components of a galaxy?
- What criterion is used to classify galaxies?
- What is the difference between a spiral galaxy and a barred spiral galaxy?

**3.2. In the Hertzsprung-Russell diagram (or H-R diagram) has been represented the evolution of a star similar in mass to the Sun, since it was born until it die.**

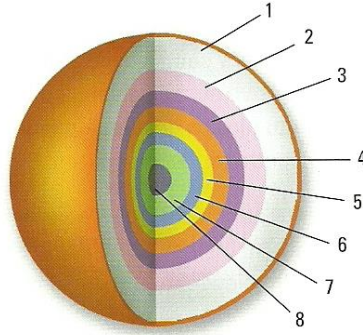
- What is the luminosity (or brightness) of a star?
- What is the difference between the apparent magnitude of a star and its absolute magnitude?
- The brightest stars in the diagram, will be the brightest ones seen from the Earth? Explain your answer.
- Why do they have different colours?
- What is the reason of their different sizes?
- During its life the star displaces trough the diagram in the direction that the arrow indicates. How is this explained?
- How does temperature vary along the star life?
- How will change the temperature and brightness of the Sun until its death?



**3.3. What influence has the mass of a star in its evolution?**

**3.4. The picture represents a red supergiant star just before to become a supernova.**

- Indicate which chemical element is synthesising in each layer.
- How does temperature vary as depth increases?
- How is the end of this kind of stars?
- Which are the oldest chemical elements? When were formed the iron and the carbon? Were gold or uranium formed during the Big Bang?
- The sentence "*We are star dust*" belongs to the famous astronomer and science communicator Carl Sagan. What do you think it is referred to?



**3.5. Answer the questions:**

- Why are some nebulae called "stellar nurseries"?
- Explain which difference exists among absorption, emission and reflexion nebulae.

**3.6. Answer the questions:**

- Why is almost impossible to know how many stars are really in the Milky Way?
- What galaxies form part of the Local Group?
- Which parts can be distinguished in the Milky Way?

**3.7. To measure distances in the space we need bigger units than those used in the Earth.**

- Which unit is used to measure distances within the Solar System? Which one will we use to measure distances between stars? Indicate the equivalence of both in kilometres.
- Andromeda galaxy is 2.5 million light-years from the Earth. How much time would it take us to arrive there if we could travel at the speed of light?
- If our spacecraft could only reach 40,000 Km/h, how long does the journey be? Express the result in years.

**4.1. Answer these questions:**

- What are the differences between an asteroid and a comet?
- Explain what the *accretion of planetesimals* is.
- What is the "*iron catastrophe*"?
- How was formed the Moon?