STAR'S DUST: Using Internet-based resources to learn about the evolution and ecology of the Solar System

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Teacher.pdf

Why didn't the Blonde have any ice cubes for her party?

She lost the recipe.

Lesson Plans

Lesson Plan 1

1. Introduction:

Timeline

- **Scientific vocabulary is not difficult.**
- **Nature's scale.**
- **Safety & glassware**

LEARNING OBJECTIVES

Content

Making conscious of the nature' scale
Understanding the mathematical notation using exponents

Communication

Not being afraid neither of science nor of English. Scientific vocabulary is not difficult.
Filling gaps
Searching Google.
Mixing activities with different level of difficultness
Using comparatives and superlatives
Learning using computer animations and playing games

Cognition

Describing processes: Is there a relationship between atoms and planets? Can atoms be observed?
Analysing: Can young students try to answer the important questions like the scientists?

Culture

Developing of a sensible and conscious awareness of safety in the laboratory.

AIMS

At he end of the lesson , students will be able :

To develop group work strategies
To introduce the strong relationship between the biggest ant the smallest objects.
To use safety equipment, and to avoid accidents.

TASKS PLANNED

Task given will be:

Play a game where users arrange objects according to size, with musical feedback.
The students will be engaged in gathering information on laboratory safety. All students will view a safety video from You tube
Afterwards,, as a extension work, students will get into groups draw a poster to be used for future classes. After there are a quiz and a worksheet questionnaire based on all the knowledge gained.

TIMING : This unit is expected to take approximately 10 hours.

Lesson Plan 2

2. Sustainable Timeline:

- How old is..?
- Popular Misconceptions in Astronomy
- Explore.

LEARNING OBJECTIVES

Content

Downloading geological maps through the Internet
Discovering their main misconceptions about how the Universe works.

Communication

Appreciating the use of foreign language as a means of communication
Understanding technical communication
Understanding and following instructions.

Cognition

Ordering and connecting all the events related to the universe and Solar System evolution.
Predicting what could be the far future of our planet and Solar System

Culture

Being conscious of geological timeline as a first step on the road through evolution of Earth
Helping students think about the evolution of the Universe and where we fit in it.

AIMS

At he end of the lesson , students will be able :
To be conscious of the timeline
To be conscious of some misconceptions about matter and Universe structure
To realize that the evolution of the Universe is the evolution of matter.

TASKS PLANNED

Task given will be:
Use the Internet skills to download geologic maps
Do a brainstorming about the origin and composition of the universe.
Facilitate a class discussion of what's in the universe.
Ask the students to identify the main steps through the evolution
Get the students to spend some time thinking about the relationship between the origin and future of the Universe.

TIMING : This unit is expected to take approximately 10 hours.

Lesson Plan 3

3. Origin and evolution of the Universe:

- **Big Bang/Big Crunch**
- **The matter : Structure and origin.**
- **Laboratory fireworks.**

LEARNING OBJECTIVES

Content

Being able to explain the atom structure to the mates using atoms cards and matching them with the periodic table.
Discovering the relationship between light and matter through easy experiments.
Doing two experiments that make students conscious about the nature of light

Communication

Answering questions : What is everything made of?
Looking for information through the Internet.
Understanding lab procedures
Working safety & Improving lab autonomy
Reading to find answers to questions.

Cognition

Discovering the relationship between the origin of the Universe and the origin of matter analyzing and comparing pictures .
Being aware how we could know the chemical composition of the stars even placed so far.

Culture

Where are we coming from?

AIMS

At he end of the lesson , students will be able :
To analyse information from charts
To develop group work strategies
To learn about the smallest in order to understand the biggest.

TASKS PLANNED

Task given will be:
Review with the students what they have learned about Universe evolution. In the course of discussion, determine how much they know about the structure of matter .
Now it's time to put the concepts into practice. The class will be split into four groups, and the students in each group will be focused on one of practical works in the lab in order to build a pattern that serves to explain the relationship between fireworks and atoms.
Get the students to record their work at the lab

TIMING : This unit is expected to take approximately 10 hours.

Lesson Plan 4

4. Stellar evolution:

- **The life &death of stars.**
- **Energy producers & consumers: nuclear reactions.**
- **Black Holes & supernovas questions.**

LEARNING OBJECTIVES

Content

Making students conscious of how electricity is generated
Describing and comparing the life cycle of a small, medium, or large star using correct vocabulary for the stages in a star's life.

Communication

Arousing students' curiosity
Developing skills for working co-operatively in groups.
Using mind maps
Playing drama

Cognition

Provoking students to ask questions and identify problems.

Culture

Finding out there is something very wrong in the way we deal with materials in our current culture
Discussing about whether we can avoid nuclear waste without switch off the air conditioning

AIMS

At he end of the lesson , students will be able :

To understand energy problems affecting our environment
To understand de differences between fusion an fission power
To analyse pros and cons of using nuclear energies

TASKS PLANNED

Task given will be:

Students use information provided by educator or by themselves to distinguish between Fusion and Fission
The classroom will play the drama" The history of radioactivity" Each student will perform one of the 25 characters. Rehearsals will be considered as a extension activity.
Get the students to link life cycle of stars to atoms formation.
Talk about the life of a star and about the different types of stars found in the universe. Students working in groups of 4 persons will be asked to explain what is happening in the animations and draws they have found through the Internet completing tables and answering questions.

TIMING: This unit is expected to take approximately 10 hours.

Lesson Plan 5

5. The origin of Solar System:

- **Accretion video**
- **Mars**
- **Life in Space**
- **Planets comparative**

LEARNING OBJECTIVES

Content

Introducing students to planetary research and familiarize them with the planets and their features.
Questioning of how life on Earth came to exist –How many planets like ours there may be – whether there has ever been life on Mars.
Observing and interpreting Solar System images.

Communication

Doing a listening activities
Charting the planets

Cognition

Analyzing if life is an exceptional event in our Universe

Culture

Can we afford our dreams of exploring space?

AIMS

At he end of the lesson , students will be able :

To improve English language skills
To Sum up the concepts
To understand the makeup of the solar system and how it was formed.
To give a thorough knowledge of space and the vast emptiness between the planets.
To learn that the sun is the main source of energy for everything on the earth.
To be able to recognize each planet or moon by its unique and identifiable features.

TASKS PLANNED

Task given will be:

As a introduction activity, students will play games about solar system
They will be helped to know more about Solar System doing different kinds of listening activities.
Chart preparation of planets will be part of the homework, then they will be able to discuss and review most of planet features.

TIMING. This unit is expected to take approximately 10 hours.

Lesson Plan 6

http://www.emints.org/ethemes/resources/S00001373.shtml
http://www.uen.org/Lessonplan/preview.cgi?LPid=626

6. History of Earth : Climate change:

- **Geosphere, Atmosphere and Hydrosphere**
- **Earth seasons Practical work**
- **Production of Carbon Dioxide Practical work**

LEARNING OBJECTIVES

Content

Learning about links between main layers of Earth
Explaining the seasons of the year .

Communication

Probing questions challenging misconceptions

Cognition

Developing an integrated understanding of the Earth as a system and the role that humans have played in modifying the dynamics of the system.
Interpreting facts science uncertainties behind global climate change.
Being conscious of greenhouse effect and climate change in the lab

Culture

Making sense of carbon cycle as a way to tackle environmental problems

AIMS

At he end of the lesson , students will be able :

To Get the students to respect and understand each other.
To avoid misconceptions. Students often have many misconceptions about the causes of seasonal changes. Some of these misconceptions come from student misinterpretations of perspective drawings in Earth Science textbooks. For example, a common misconception is that the earth is further from the sun in winter than in summer.

TASKS PLANNED

Task given will be:

Use models to demonstrate revolution and rotation of the planets around the sun.
Students in each group will be focused on practical works in order to build a pattern that serves to explain why the seasons occurred .
To better understand carbon cycle, students will be focused on practical work about how carbon storage and release is affected by acid rain
Students complete a work sheet on the formation of sedimentary rocks to illustrate fossilisation and carbon cycle

TIMING : This unit is expected to take approximately 10 hours.

Lesson Plan 7

7. Origins of Life:

- **Life classification game**
- **Life under extreme conditions. Artemia practical work**

LEARNING OBJECTIVES

Content

Describing and examining facts that led into life.
Facilitating student's learning of the original classification system

Communication

Following written instructions for individual or group activities.

Cognition

Developing an understanding of scientific modes of inquiry.
Distinguishing between necessary and extraneous information.

Culture

Was life on Earth inevitable? What is the nature of life?
Questioning themselves about the ultimate nature of life on Earth.
Imaging how similar or different could be life in some place of our galaxy.

AIMS

At he end of the lesson , students will be able :

To use pictures of familiar animals and classify them using the original classification system.
To learn to navigate around the online dichotomous key.
To learn how to create their own dichotomous key.

TASKS PLANNED

Task given will be:

Students working in groups of 4 persons will be asked to think about causes and consequences.
Working singly, get the students to correctly identify each of the given animals.
Get the students to draw up a list of animals they would like to use for a dichotomous key of their own.
Create an audiovisual message to be sent to Milky Way. The message must outline the main features of our civilization.

TIMING. This unit is expected to take approximately 10 hours

Lesson Plan 8

8. On the origin of Mountains:

- **Topographical maps**
- **Continental drift.**
- **Tectonic plates I/II.**
- **Pyrenees /Himalayan formation.**

LEARNING OBJECTIVES

Content

Developing a conceptual understanding of the nature and process about the origin of mountains
Understanding geochemical cycles and energy in the earth system.

Communication

Interpreting field activities collecting data in order to test hypothesis.
Discussing the relationships of earth crust formation
Sharing with and receiving information from team members
Understanding that interpersonal relationships are important in scientific endeavour

Cognition

Identifying a problem as the result of direct observations or from class work or from special interests of students.
Formulating an hypothesis as a result of reading, discussion, thinking.

Culture

Staging a class forum about the importance of high-quality construction in earthquake zones

AIMS

At he end of the lesson , students will be able :

To learn that tectonic plate movements are caused by convection currents in earth's mantle.
To learn how earth's surface has changed over time.
To identify the connection between volcanoes, earthquakes and tectonic plate theory
To explain the history of the Plate Tectonics theory
To learn appropriate cooperation and interaction skills.

TASKS PLANNED

Task given will be:

http://www.ehow.com/how_2052860_formulate-hypothesis-using-scientific-method.html

Compare the formation of Pyrenees and Himalaya Mountains through tectonic plates.
Get the students to participate more in class, performing a TV debate where students pretend to represent Afghanistan politicians, teachers, construction engineers, and geologists. Students will tackle how to improve the safety of school buildings against future earthquake risk in debate

TIMING. This unit is expected to take approximately 10 hours.

Lesson Plan 9

9. *Origin & evolution of water ecosystems. From protists to fish:*

- **Protists. Ecology practical work**
- **Invertebrate evolution. Video**
- **Jellyfish Bloom**
- **Vertebrates in land : family tree**
- **From stars to Octopus Mind map**

LEARNING OBJECTIVES

Content

By participating in laboratory activities, students will be able to learn the characteristics of freshwater *protists.*
Learning about the diversity of animal life and the interdependence among organisms and habitat

Communication

Developing abilities necessary to do scientific inquiry

Cognition

Recognizing and analyzing alternative scientific explanations and models
Setting up classroom aquariums from rivers and ponds

Culture

Thinking about how to take advantage of freshwater resources without damaging ecosystems

AIMS

At he end of the lesson , students will be able :

To understand the characteristics of protists
To use chemicals and equipment in a safe manner
To construct and defend a scientific viewpoint
To understand the basic concepts of the evolution of species.
To know relationships that exist among organisms in food chains and food webs.
To Know ways in which species interact and depend on one another in an ecosystem
.

TASKS PLANNED

Task given will be:

The student will plan and conduct investigations in which observations of living organisms are recorded in the lab and in the field.
Review with students what they have learned about invertebrates
See how many invertebrates your class can cite as examples.
Give students the following homework assignment: Examine your house, yard, neighbourhood, pond or river for examples of invertebrate forms
Get the students to design their own questionnaires
Get the students to do a mind map through the time following a copper atom

TIMING. This unit is expected to take approximately 10 hours.

Lesson Plan 10

10. Plant Evolution :

- **Investigating the conditions necessary for germination of seeds, practical work**
- **Uptake of oxygen, practical work**

LEARNING OBJECTIVES

Content

Identifying plant parts, where seeds come from and how they grow.
Observing and understanding that green plants need certain chemicals to live and grow and those nutrients do not need to come from the soil.

Communication

Teaching students some lab techniques that they will use in a future experiment.
Listing the important things needed for plant growth.
Demonstrating knowledge and use of words related to seeds and plants.
Describing and recording observations.

Cognition

Working out if carbon dioxide is given off by germinating seeds.
Working out if oxygen is required by germinating seeds

Culture

Helping in the growth of a living organism
Recognizing how plants are a benefit to people and our planet.

AIMS

By the end of the lesson , students will be able :

To germinate seeds on their own
To observe daily change in seed germination and plant growth
To write and draw detailed observations of changes and differences in types of seeds
To provide a springboard for questions in the next lesson.

TASKS PLANNED

Task given will be:

Play Games .Build your own garden or wildlife pond in “Changing Blooms “
This is a simple lab intended to give students an opportunity to observe seed germination day to day, while taking narrative observation notes.
Determine what plants need to survive
Lead a discussion by starting with "What do children need to grow?" Then, ask the students what they think plants might need.
Let the children brainstorm the many 'things' we get from plants.
Discuss what the world would be like without plants.
Create a chart discussing about the benefits of plants in our environment in terms of oxygen, greenhouse effect, food, commodities, medicines.

TIMING. This unit is expected to take approximately 5 hours.

Lesson Plan 11

11. Land ecosystems. From Amphibians to Hominids, 5? million years ago.

- **Family tree practical work**
- **What killed the Dinosaurs ?**
- **Tiger Ecology**
- **Vertebrate Evolution Mind Map**
- **Rainforest story**

LEARNING OBJECTIVES

Content

Introducing into the world of vertebrates
Understanding of the distinguishing factors of various animal types
Learning the characteristics and spatial distribution of ecosystems on Earth's surface

Communication

Knowing what types of information to look for when researching for their work.

Cognition

Investigating the characteristics and evolution of land ecosystems working through tough environmental issues and anthropogenic effects
http://en.wikipedia.org/wiki/List_of_environmental_issues
Unpacking evidences of evolution: embryology, circulatory system,..

Culture

Focusing on the endangered species of the world
Examining how culture and experience influence people's perceptions of nature

AIMS

At he end of the lesson , students will be able :

To develop an understanding of biodiversity and its importance in our environment
To show children the interdependence of animal life with their environment.
To identify and describe food, water and shelter as three essential components of habitat.
To recognize that some fluctuations in wildlife populations are natural as ecological systems undergo a constant change.

TASKS PLANNED

Task given will be:

Bring a plant to school, and tell students to imagine that this is the last existing specimen of this plant on Earth. Ask students for their reactions to your statement, and record their responses on the board.
Watch a video about dinosaurs
Students complete a work sheet based on information from video
Depict one or more classes of animals in ecology context : “The endangered tigers “
The teacher will lead the students into a general discussion about the basic information people must have if they are building up a mind map about vertebrates’ evolution.
Using student ideas, the class will construct a concept map
Class discussion: Students unpack their ideas to conceptualise and make meaning of information obtained from the previous activity

TIMING This unit is expected to take approximately 10 hours

Lesson Plan 12

12. Challenges for the future:

- **Energy: Power Plants**
- **Recycling :Domestic waste SAW project**
- **Water Eutrophication.**
- **Rufea Marsh. Restoration**

LEARNING OBJECTIVES

Content

Learning about human evolution
Dealing with energy issues and sustainable Energy Supply
Visiting a landfill site restoration

Communication

Using the outdoors for observing, discussing processes and presenting reports.
Recording information during local trips , e.g. results of surveys, or notes on observations.
Recording local data for later presentation.

Cognition

Sharpening students' perception and appreciation of changing landscapes.
Providing opportunities to explore a range of alternative cultural and management perspectives first-hand.
Giving students the experience of the pleasure of discovery.

Culture

Developing favourable attitudes towards learning through enjoyable and meaningful outdoor activities.
Making students aware of electricity consumption

AIMS

At he end of the lesson , students will be able :

To develop skills in data collection, recording and analysis.
To understand and acquire habits that reduce water consumption
To develop better understandings of the nature of issues discussed in the classroom and in books.
To enable students to think and acquire knowledge through personal experience.
To understand the relationships between the natural environment and human activities

TASKS PLANNED

Task given will be:

Perform a role play based on non renewable and sustainable energies to better understand how they work.
Study of an environmental theme in class : **Rio Declaration on Environment and Development**
http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=78&ArticleID=1163
Field interpretation of restoration of the Rufea marsh .
Back at school - further interpretation and explanation in class - writing up field report.

TIMING This unit is expected to take approximately 15 hours

Teacher's notes

1. Introduction — Nature scale

2.3. Copy and read aloud , using logarithmic scale, the size of

Blood cell: 10^{-5} m
Atom : 10^{-10} m or 0.1 nanometre
Atomic Nucleus: 10^{-15} m
Seating person: 10^{0} m or 1m

3. Play the game. Arrange the following pictures into size order. Put the biggest at the top of the table.

The smallest thing
http://www.rsc.org/education/teachers/learnnet/contemporary/student/nano_qOne.html

tennis ball,penny,earring,small screw,drop of liquid,pin-tip,mites,cells, DNA

1. Introduction — Safety &glassware

1) Use a converter. How useful it is!
http://www.onlineconversion.com/

1 mile	1609.344	meter
1 Hectare	10 000	square meter
1 meter/metre	1 000 000 000	nanometer
1 millimetre	1 000	micrometer
1 square Kilometer	1 000 000	square meter
1 light second	299 792.458	kilometer
1 astronomical unit	149 597 870.69	Kilometer
1 meter	10 000 000 000	angstrom
Barcelona 12 h	11 h	London
Barcelona 12 h	11 h	GMT
Barcelona 12 h	6 h	New York
1 liter	1	cubic decimeter
1 liter	1 000	cubic centimeter
1 kelvin	-272.15	degree Celsius
25 degree Celsius	77	degree Fahrenheit
1 atomic mass unit [1998]	1.66053873e-24	gram

HOW TO BUY GEOLOGIC MAPS ?

http://www.bgs.ac.uk/ British Geological Survey
BGS Products/Bookshop online
Product catalogues/Geological books &guides
http://www.bgs.ac.uk/contacts/sites/edinburgh/mhhome.html
British Geological Survey. Edinburgh .Murchison House, West Mains Road,

ICC
Frequently Asked Questions (FAQs)
http://www.igc.cat/web/content/ca/common/icc/inici_faq_pro.html#p2
Download maps
http://www.igc.cat/web/gcontent/ca/igc/igc_cataleg.html#geologics

1. Find the geologic map corresponding to Terradets canyon and to Gardeny hill using the following steps :
   - Write the answer

Terradets canyon is …… 75 million…..years old

Gardeny hill is ……25 million…… years old

2. Look at the Internet web page US Geological Survey
http://www.usgs.gov/

Mount Saint Helens pictures

Cartographic data of Mt. Saint Helens after the 1979 eruption. Data supplied by LandSat 7, JPL and USGS.http://www.3dnworld.com/users/1/images/mshcart.jpg
http://www.3dnworld.com/users/1/images/mshphoto.jpg

- Enter Your query and then click search
  a. Place name : Mount Saint Helens
  b. State : Washington
  c. County : Skamania

- Write the answer

The Mount Saint Helens is ……3000 ……years old

Look at the definitions or explanations and choose the correct option:
http://www.astronomy.org/astronomy/misconceptions.html
http://www.astronomy.org/astronomy-survival/misconcp.html
Correct answers

1. The origin of the Universe is studied through:

1a ASTRONOMY
1b ASTROLOGY

ASTROLOGY deals with how the relationships of the sun, moon, planets, and stars influence the attitudes and lives of humans. Astrology began about 3000 years ago in Babylon with what we today call mundane astrology. Predictions were applied to world or national events.
ASTRONOMY is the science which investigates all matter-energy in the universe. It is based upon the scientific method.

2. The Moon has a Hemisphere in Perpetual Darkness called the Dark Side

2a True

2b Nothing could be further from the truth. All places on the moon experience a day and night cycle.

3. The Moon Does Not Rotate

3a. The moon completes exactly one rotation about its axis in the same period of time it takes to make one revolution around the Earth. That is why we always observe the same hemisphere of the moon facing us.

3b. Totally true

4. The Moon has no Gravity

http://www.google.es/search?hl=es&q=the+astronauts++jumps+moon&btnG=Buscar&meta

http://www.crsep.org/PerplexingPairs/May2803WTMPart5.pdf

4a. True. That is the reason why the astronauts were able to jump so high

4b. Any object which possesses mass (matter) has the force of gravity as a condition of its being. That goes for all matter: cars, baseballs, battleships, the moon, sun, planets, and all other objects found everywhere, regardless of whether they are large or small. The moon attracts objects at its surface with a force of 1/6 that of Earth.

5. The Blue Moon is really Blue

5a. The blue moon is not blue at all, since the light which we see reflected from its surface is only sunlight.

5b.True

6. When the Moon is Full, Lunacy Reigns

6a. False. There is no statistical proof from hospital or police records that people are crazier, or that more crimes are committed, or that more babies are born when the moon is full.

6b. True.

7. The Seasons are the Result of the Changing Distance of the Earth from the Sun

7a. People believe this to be true.

7b. The seasons are caused by the 23.5° tilt of the Earth's axis. The axis always points in the same direction. During a year's time the Earth's distance from the sun varies between 91.5 to 94.5 million miles. USA people are actually closest to the sun around January 4th of each year and farthest from the sun around Independence Day, exactly the opposite of what one might expect.

8. The Earth Rotates (Spins) in a Period of One Day

8a. False. The Earth rotates on the average in a period of 23 hours, 56 minutes, sideral day. It takes an extra four minutes the Sun to return from the east to its same noontime position, the solar day which is what we regulate our clocks by.

8b.True

9. The Earth Revolves (Orbits) the Sun in a Period of One Year

9a.True

9b. False.The Earth requires a period of 365.24 days to complete one revolution. We must, therefore, add an extra day to the calendar every four years to bring our planet back into synchronization with its position around the sun.

10. The Aurora is Caused by Reflected Sunlight from the Ice Caps of the Polar Regions

10a. False. The Aurora is an electrical discharge which occurs thousands of miles above the Earth's surface, following lines of magnetic force down into the Earth's atmosphere where they strike gas molecules causing them to glow.

10b. True

11. The Earth was Considered to be Flat During the Time When Columbus Discovered the New World

11a. True

11b. True for the uneducated masses, but not so for anyone who had received a formal education and who could read Greek texts.

12. *Jupiter Will Become a Star One Day*

12a. Jupiter would need to become at the very least 70 times more massive to evolve into a star in order for there to be sufficient material to allow thermonuclear fusion to take place

12b.True

13. The Jovian Planets have Solid Surfaces

13a. True

13b. The Jupiter-like planets, which also include Saturn, Uranus, and Neptune have extensive gaseous atmospheres which eventually become compressed into liquid oceans of primarily hydrogen and helium. As pressures increase, hydrogen is even forced into a metallic state which is the basis for creating the strong magnetic fields which surround all four Jovian worlds.

14. The Telescope was Invented by Galileo

14a. False. The telescope was invented in the year 1608 by the German/Dutch optician Hans Lippershey . Galileo, hearing about the invention through his correspondences with other scientists in Europe, built his first telescope in one night, sometime during the fall of 1609.

14b. True

15. The Sun will Explode at the End of its Lifetime

15a. True

15b. Near the end of its existence, the sun will became a red giant star. The instabilities will eventually cause the sun to shed its outer layers to reveal its inert, hot interior composed primarily of helium. At this point the sun will be called a white dwarf star

16. Polaris. the North Star, is the Brightest Star of the Nighttimes Sky

16 a . True

1 6b. The brightest star of the nighttimes sky is Sirius, the Dog Star. Follow the three stars of Orion's belt downward to this gem of the winter sky.

17. Stars are Burning Hydrogen

17a. True

17b. Nothing could be farther from reality. In the sun four hydrogen protons are fused into one helium nucleus. In the fusion process some mass is converted into energy as helium atoms are created.

18. Isaac Newton Invented Gravity

18b. False. Gravity was always around. It is a condition of any object which possesses mass.

18a. True

19. It is Possible to Travel Faster than the Speed of Light

19a. True

19b. False. For matter, an increase in velocity results in an increase in the amount of mass which an object contains. At the velocity of light, the mass of an object becomes infinite. If all of the matter in this universe were converted into energy, there still would not be enough force created to accelerate the smallest amount of matter to the velocity of light. The mass-energy of this universe is thought to be finite**.**

20. Copernicus was the First Person to Give Us the Concept of a Sun-Centered Universe

20b. False . Actually, it was the Greek, Heracleides (388 BC-315 BC) and later, Aristarchus of Samos (310 BC-230 BC) who first entertained the heliocentric notion that a rotating Earth could be in revolution around the sun.

20a. True

MODELING
http://cfa-www.harvard.edu/seuforum/mtu/MTUmodeling.pdf

3. Origin and evolution of the Universe Big Bang/Big Crunch

Big Bang /Expansion of the Universe /Atom /Nuclear Fusion

4. VIDEO LISTENING ACTIVITY

Big Bang/Crunch

See the video and fill the gaps

Big Bang. The expanding Universe. (9')
http://www.youtube.com/watch?v=QRp_iBYlyEI

transcript
1:10

Perhaps the greatest question facing the human race is to discover where we come from and to find out what is our ultimate fate. Every culture, every age…
And try to answer…
The human mind to find out where we come from, where we are and of course and the end where we are going

Astronomy provides the basic information that each person needs to understand where he or she comes from, where the human race is going.

5. Watch the video **Elements of Physics: The Big Bang Theory.** Complete the scheme drawing the main events and filling the gaps. 3'
http://videos.howstuffworks.com/hsw/10768-elements-of-physics-the-big-bang-theory-video.htm

15.000 my ago
The Universe and all the matter and ..energy… in it was infinitely …dens… and ..hot……
The Universe exploded : BIG BANG

10-43
Universe were formed in this instant along all forms of …matter…., ……energy…..,as well ……space…….and …time…

10-36
The expansion begun:
Matter separated into a type of quark …soup…. Contains elementary particles as a :…quarks……. & …leptons……..& bosons...

10-5
Quarks condensed into ……protons ……and ……neutrons……

1"-3'

Protons and neutrons combined creating the first nuclei of …H….and …He…..

300.000

…Electrons…….. were attracted to the nuclei to form ……atoms…

1 billion . ¿how many ? _____10 ^{9}_____
Clusters of dens masses became …….galaxies…..
……Fusion…. Expontainly begun . …Stars….. were born in this process radiating …light…. In the form of electro magnetic waves. Some stars collapsed under the own .....gravity .....and exploded into ……supernovas……. And the matter spread out into space forming new …atoms….., ……stars..... and ……planets..

THE UNIVERSE CONTINUOUS TO COOL

From BIG BANG to BIG CRUNCH
Frequently Asked Questions in Cosmology
http://www.astro.ucla.edu/~wright/cosmology_faq.html

7. 1. Match the questions to the answers

Correct answers

I 2	II 6	III 4	IV 7	V 5	VI 1	VII 3

1.Q: In the possibility of the event of the Big Crunch. How long in our time would or could it take, and would we notice it beforehand.

A: In order for a big crunch to occur, the universe would have to be contracting, hence we will notice that by seeing all the distant galaxies as blue shifted. In the final stages atoms will no longer exist.

2.Q: How do you describe or define SPACE? How was SPACE created? What is SPACE made of? Does it has a shape, size, limit? I understand matter, mass, stars, etc. but SPACE itself is what I cannot comprehend?

A: Space, and indeed time (or together space-time) was created at the big bang. Space is not made of anything, space-time, if you like, provides the coordinate system in which "events" are occurring. When we describe a particle, for example, we must say where and when this particle is located, we therefore must give its space-time coordinates.

3.Q: On the recent episode of Mysteries of Deep Space, you mentioned the slowing of the expansion of the universe. My question is, if the universe gradually slows down and stops, will it eventually contract and then result in a big bang?

A: At present it seems that the density in the universe is not sufficient to actually stop the universe in its expansion, even though it is slowing down. If the density was enough, then indeed it would have started contracting, and eventually reach a "big crunch."

4.Q: If I understand gravity correctly it is the result of mass and rotation,? yes? More mass, more gravity.My question is...is gravity a entity or the result of other actions. It seemed that what the program was saying was that gravity acts on its own, i.e. light. But it also seemed that gravity is just the result of other actions, mass, rotation, etc.

A: Gravity is indeed one of the four basic interactions (forces) that we see in the universe today. Gravity is the action of mass (nothing to do with rotation). Gravity (which is generated by masses) acts on other masses and on light.

5. Q: I am interested in how many of the scientific community disagree with the "fact" that the universe is expanding. Has anyone considered that this may simply be a misinterpretation of observed data. Are there alternative theories relating the observed red shift to possible influences due to the perceived black matter?

A: There are very few scientists who at this point disagree with the expanding universe. Most of the alternative theories rely on complex plasma physics and electromagnetic effects, which are much less elegant and which encounter serious difficulties sooner or later. There are a few scientists who think that the red shift is not the result of receding motion. Those try to place quasars relatively nearby.

6. Q: After watching a PBS program some years ago entitled 'A Brief History of Time', featuring Steven Hawking, I was amazed that such a respected scientist could admit that he had made mistake about his views on the Big Bang, and the beginning of time. Is this common among cosmologists?

A: The way scientific progress is achieved is by constructing theories which can explain the presently available observations and experiments. When new observations which contradict the existing models are made, the models are modified to be consistent with all the available data.

7. Q: ESA Is the Universe finite or infinite?
http://www.esa.int/esaSC/SEMR53T1VED_index_0_iv.html

A: Joseph Silk: We don't know. The expanding Universe theory says that the Universe could expand forever [that corresponds to a 'flat' Universe]. And that is probably the model of the Universe that we feel closest to now. But it could also be finite, because it could be that the Universe has a very large volume now, but finite, and that that volume will increase, so only in the infinite future will it actually be infinite.

16. Atomic mass unit

http://www.colorado.edu/physics/2000/periodic_table/atomic_mass.html
http://www.sparknotes.com/testprep/books/sat2/physics/chapter19section4.rhtml
http://www.concord.org/~btinker/molo/molo_concept_maps/index.html

Particle	**Mass (kg)**	**Mass (amu)**
Proton	1.6725×10^{-27}	1.0073
Neutron	1.6747×10^{-27}	1.0086
Electron	9.11×10^{-31}	5.4863×10^{-4}

As conclusion

1 Proton is approximately 1 a.m.u.
1 Neutron is approximately 1 a.m.u.
1 Electron is approximately 0.0005 a.m.u.

[How a Star Works](#) / [Black Holes](#)

EVOLUTION OF THE UNIVERSE : From cosmic egg to dead stars

2.2. Fill the mind map with the proper words instead of **(?)**:

Mind Map Solutions

1. **Cosmic egg**
2. **Hidrogen**
3. **Big Bang**
4. **Hidrogen**
5. **Blue star/massive star/Yellow star**
6. **He + He → Be + E**
   Be + Be → O +E
   Be + He → C + E
7. IR(infra-red
8. X- Ray
9. **Ar + O → Fe + E**

   Fe + Cu → Xe +E
10. **Supernova**
11. **Neutron stars**
12. **Pulsar**
13. **Accretion**
14. **Protosol**
15. **Sun**
16. **Satellites**
17. **M,V,E,M**
18. **ASTEROIDS**
19. **OUTER PLANETS**
20. **Europe**
21. **Titan**
22. **Asteroids**
23. **Comets**
24. **Red star**
25. **White dwarf**
26. **Doppler effect**

SUPERNOVAS

1. Match the questions to the answers

CORRECT ANSWERS

1 I	2 IV	3 VI	4 V	5 III	6 II

1. Q: How close must a Star be to affect us in the event that it explodes into Supernovae?

A: Supernovae in our own galaxy can be seen as stars even during daylight. A supernova may have triggered the collapse of the gas cloud which formed the solar system. There is no known massive star that is so near that it will actually destroy the earth as a supernova

2. Q: When ever we see pictures during the programs about novas, supernovas etc. some of the pictures have blue hues and other colours associated with them. Are these colours the result of a radio telescope and computer imaging process or do the images actually emit colour or spectrums of the light they emit?

A: Astronomical images appear sometimes in what is called "true" colors, and sometimes in "false" colors. What is meant by true colors is that the images were taken in several filters, which transmit a certain part of the spectrum which generally corresponds to a given color. Those colors were then combined to form the colors you see in the image.

3. Q: When you look at the fine structure of the spectra of supernovae can you determine the isotopes of the elements in the ejection of the supernovae explosions? If so, can you then determine their relative abundance?

A: Absolutely. The relative abundances of many elements are determined from the spectra of supernovae. Furthermore, it is the presence (or absence) of certain hydrogen, helium and silicon lines that defines the different classes of supernovae.

4. Q: What's the current understanding of the conditions required for a supernovae?

A: Supernovae form either from the cores of massive stars which collapse, when the cores are composed of iron (and reach temperatures of about 10^10 Kelvin), or from white dwarfs which grow in mass beyond the critical limit of 1.4

5. Q: How are elements heavier than iron formed in supernovae? What are some typical reactions?

A: The heavy elements are formed by nuclear reactions under explosive conditions, when neutron captures proceed faster than radioactive beta decays.

6. Q: Any idea where the supernovae was located that supplied the elements for our sun and earth?
A: **We do not know which supernova triggered the formation of the solar system, although some speculations about the Geminga pulsar were made.**

BLACK HOLES

3. Questions and answers
http://www.pbs.org/deepspace/experts/week2a.html

Correct answers

1 II	2 III	3 V	4 X	5 IV	6 VII	7 VI	8 I	9 VIII	10 IX

1.Q: Some time in the future could our sun become a black hole?

A: Our sun will not become a black hole. Only stars more massive than about 30 times the mass of our sun can become black holes. Our sun will eject its outer envelope and leave behind a white dwarf (which is about the size of the earth, but with a mass of almost that of the sun).

2.Q: Does anyone have any theories about what happens to matter when it is sucked into a black hole?

A: Matter no longer exists in the form we know it, because even on the smallest scale particles are torn apart *(split into pieces)*. At the singularity itself even space-time disappears.

3.Q: Black Holes gobble up (*swallow*) everything in sight , including light, where does all of this stuff go once its been caught by this Black Hole? Does it get transported to some distant place in our universe? Does it go forward or back in time?

A: From the point of view of an external observer, matter disappears from view when it gets close to the "event horizon" of the black hole. Hence this matter is essentially lost from our universe. However, the mass of the black hole (and its area) increase, so this is felt through its gravity, and also through the effect on the total entropy (disorder) of the universe.

4.Q: If light is sucked into a black hole because of the intense gravitation, that infers that light has mass. Didn't Einstein say that as something approaches the speed of light it becomes infinitely massive? Seems like paradox to me.

A: The photon has a zero rest mass, and therefore it does not become infinitely massive even though it moves at the speed of light. The correct way to think about it is in General (rather than special) relativity, where what gravity does is it makes the space time curved, and the photons then follow the curved paths, which near a black hole never escape. Indeed, the effect of the gravity on the light is that it becomes less energetic, and therefore of a lower frequency (red shifted).

5.Q: What is at the end of a Black Hole?

A: Black holes evaporate slowly by radiation. This takes very long for solar mass black holes, but for very small black holes it can be very quick.

6.Q: What would happen if a Black Hole swallowed a star?

A: The star will be torn apart by tidal forces, and the gravitational energy will be released as a burst of radiation.

7.Q: If all of our physics become meaningless at the beginning of a black hole, then isn't it somewhat discouraging to scientists who are pursuing an understanding of them?

A: From the point of view of an outside observer, black holes are only seen to their event horizon. All of that is perfectly describable in terms of the physics we know. Only when we look from the inside at the singularity, things become more complicated, but even there, progress is being made.

8.Q: In the program about stars and black holes they mentioned that they believe the matter pulled into a black hole might leave this universe and enter another. If that is so why is there still a gravitational effect from a black hole if the matter is no longer in this universe?

A: From the point of view of an outside observer, the matter that goes in never crosses the event horizon (although it gets nearer and nearer), so the gravitational force always remains.

9.Q: How many sizes of black holes can we find in the space ?

A: Black holes come in all sizes: a) The most common ones, are the remains of supernovas, b) There are super massive black holes that lurk *(hide)* at the centres of galaxies. Created in the early days of the Universe, they have had almost 15

billion years in which to devour anything that has come too close and c) Mini black holes the size of atoms could have formed during the big bang.

10. Q. Is there a mechanism for the formation of miniature black holes?

A: Countless Mini black holes the size of atoms could have formed during the big bang. These holes have been getting steadily smaller. However if they were less massive than about 10^15 grams, they have evaporated already, by Hawking radiation.

11.Q. I was wondering, do you have any ideas on what is on the other side of a black hole? Is a theory that a "white hole" exists on the other side of a black hole. Do you have any idea if that idea is true?

A: General Relativity permits such solutions as White Holes, which can be connected to Black Holes by Worm Holes. However theories about these are, at present, quite speculative, and no known phenomenon requires White Holes as an explanation.

12.Q: Is there anything to lead us to theorize there might be an opposite object? A point expelling matter out into the Universe.

A: "White holes" (which would do what you suggest) are possible solutions of the field equations, however, there is no observational evidence for such objects.

13. Q. Has anyone measured gravity waves yet? How fast do such waves travel in theory?

Gravity waves were not measured yet directly, but observations of many binary systems are fully consistent with the expectations. A project called LIGO will measure them directly in the near future. Gravity waves travel at the speed of light.

5 Origin & evolution Solar System	Accretion video

Earth Origin Planets/Copernicus

Video-Listening exercise.
http://ircamera.as.arizona.edu/NatSci102/text/planetgrowth.htm

1. What does Accretion mean?

Origin of the Solar System, Accreation.

Solution

4	6	5	3	1	2

TRANSCRIPTION

1.Solar system formed from an immense rotating cloud of gas and dust: the Solar Nebula.

2. The Sun's nuclear fires ignited at the dense center of this nebula.

3.The planets were born in the swirling currents of the great cloud.

4.Planets near the Sun: Mercury, Venus, Earth and Mars evolved as globes of rock.

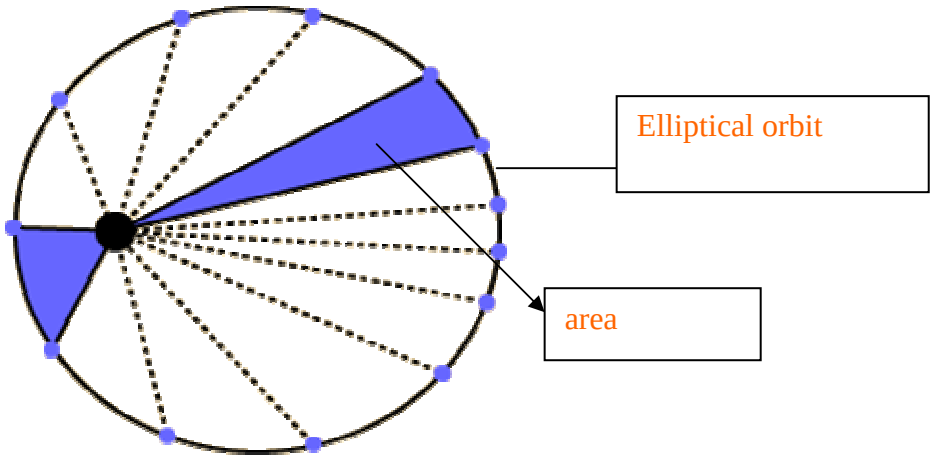
5.There were too small and their gravitational fields too weak to capture and hold the gases from the nebula.

6.But far from the Sun, the massive planets: Jupiter and Saturn with powerful gravitational fields did attract and hold thick gaseous atmospheres of hydrogen and helium.

1.1.Find Kepler's second law and write down it .

Kepler's second law of the undisturbed planetary motion: The line joining the planet to the Sun sweeps out equal areas in equal intervals of time.

1.2.See the animations and explain the drawing
http://www.edumedia-sciences.com/en/a243-kepler-s-laws
http://www.physics.sjsu.edu/tomley/Kepler12.html



1.3.Fill the gaps

When a planet passes closer to the Sun moves …..faster…… in its orbit ; on the other hand when it passes further from the Sun moves more …slowly……..

2. The Law of Titius-Bode

http://www.astro.uu.nl/~strous/AA/en/antwoorden/planeten.html

The following table shows the distances of the planets from the Sun, measured in astronomical units (AU), millions of kilometers (Gm), millions of miles ("Mmi"), and in lightseconds (ls). The number of lightseconds is how many seconds it takes sunlight to reach that planet. The Astronomical Unit is almost exactly equal to the mean average distance between the Sun and the Earth.

Planet	Least				Average				Greatest			
	AU	Gm	Mmi	ls	AU	Gm	Mmi	ls	AU	Gm	Mmi	ls
Mercury	0.306	46	28	153	0.387	58	36	193	0.467	70	43	232
Venus	0.718	106	66	358	0.723	108	67	360	0.728	109	68	363
Earth	0.983	147	91	490	1.000	150	93	499	1.017	152	95	507
Mars	1.381	207	128	689	1.524	228	142	760	1.666	249	155	831
Jupiter	4.951	741	460	2470	5.203	778	484	2596	5.455	816	507	2722
Saturn	9.008	1348	837	4503	9.539	1427	887	4767	10.069	1506	936	5032
Uranus	18.275	2734	1699	9146	19.181	2869	1783	9590	20.088	3005	1867	10034
Neptune	29.800	4458	2770	14890	30.058	4497	2794	15025	30.316	4535	2818	15160
Pluto	29.58	4425	2750	14818	39.44	5900	3666	19732	49.19	7359	4573	24645

There is a pattern to the distances between the Sun some of the planets, which is called the Law of Titius-Bode
The next table shows some numbers:

1) a_n is the distance according to the Law of Titius-Bode.
2) The "(real)" column next to that shows what the real average distance of the planet is (the semimajor axis).

	a_n	(real)
Mercury	0.4	0.39
Venus	0.7	0.72
Earth	1.0	1.00
Mars	1.6	1.52
Asteroids	2.8	
Jupiter	5.2	5.20
Saturn	10.0	9.54
Uranus	19.6	19.18
Neptune		30.06
Pluto	38.8	39.44
	77.2	
	154.0	

4 Planets questionnaire

The sizes, mass, and density of the Sun and the planets are listed in the following table.

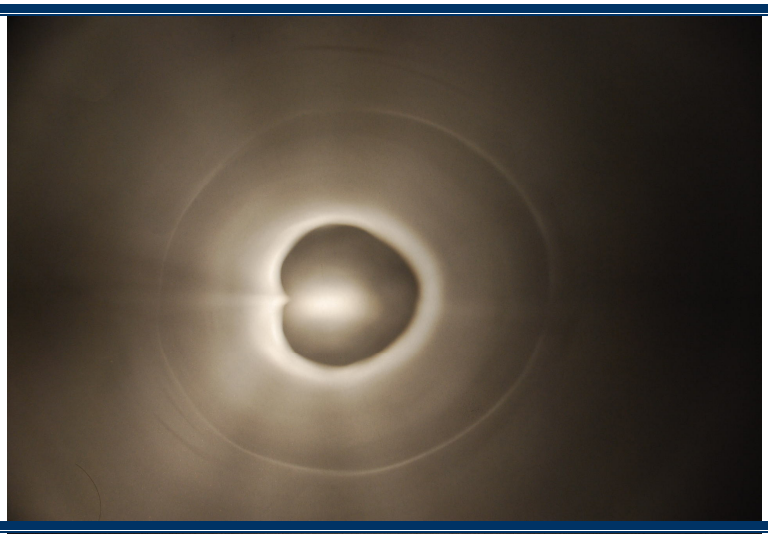
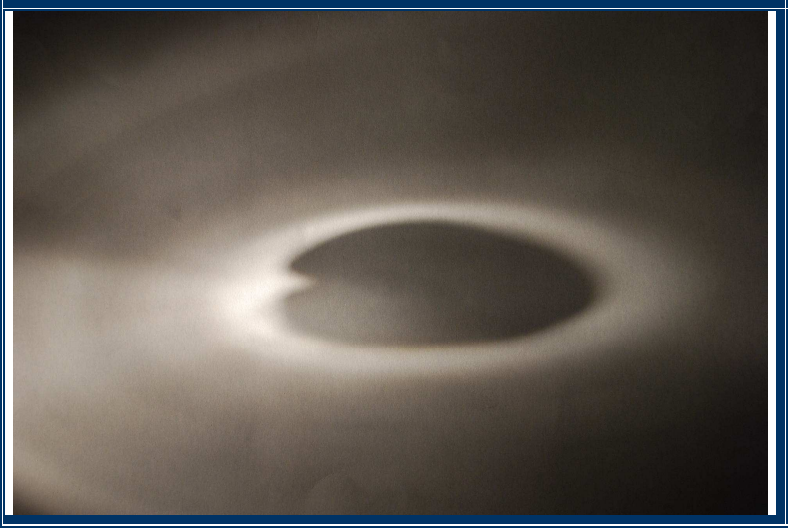
http://www.windows.ucar.edu/tour/link=/our_solar_system/planets_table.html

	Mercury	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune
diameter (Earth=1)	0.382	0.949	1	0.532	11.209	9.44	4.007	3.883
diameter (km)	4,878	12,104	12,756	6,787	142,800	120,000	51,118	49,528
mass	0.055	0.815	1	0.107	318	95	15	17

(Earth=1)								
mean distance from Sun (AU)	0.39	0.72	1	1.52	5.20	9.54	19.18	30.06
orbital period (Earth years)	0.24	0.62	1	1.88	11.86	29.46	84.01	164.8
orbital eccentricity	0.2056	0.0068	0.0167	0.0934	0.0483	0.0560	0.0461	0.0097
mean orbital velocity (km/sec)	47.89	35.03	29.79	24.13	13.06	9.64	6.81	5.43
rotation period (in Earth days)	58.65	-243*	1	1.03	0.41	0.44	-0.72*	0.72
inclination of axis (degrees)	0.0	177.4	23.45	23.98	3.08	26.73	97.92	28.8
mean temperature at surface (C)	-180 to 430	465	-89 to 58	-82 to 0	-150	-170	-200	-210
gravity at equator (Earth=1)	0.38	0.9	1	0.38	2.64	0.93	0.89	1.12
escape velocity (km/sec)	4.25	10.36	11.18	5.02	59.54	35.49	21.29	23.71
mean density (water=1)	5.43	5.25	5.52	3.93	1.33	0.71	1.24	1.67
atmospheric composition	none	CO_2	N_2 + O_2	CO_2	H_2+He	H_2+He	H_2+He	H_2+He
number of moons	0	0	1	2	63	60	27	13
rings?	no	no	no	no	yes	yes	yes	yes

Early Atmosphere /Liquid Water/Weathering of Rock

8. Observe the patch of light projected onto the wall or floor and draw it.

	**SUMMER** Energy is concentrated
	**WINTER** Energy is spread out

http://www.global-greenhouse-warming.com/global-carbon-cycle.html

1. Production of Gas

Materials	**Substitutions**
sodium hydrogencarbonate (3 g)	baking soda
acetic acid 0.80 M	vinegar
125 mL Erlenmeyer flask	small jar
beral pipet	dropper
wood splints	toothpicks

Sodium bicarbonate is the chemical compound with the **formula $NaHCO_3$**. Sodium bicarbonate is a white solid. It has a slight alkaline taste. Since it has long been known and is widely used, the salt has many related names such as **baking soda**, **bread soda**, **cooking soda**, **bicarbonate of soda**. It is found dissolved in many mineral springs. It is also produced artificially.

Reaction

$$NaHCO_3\ (s) + HC_2H_3O_2\ (aq) \rightarrow NaC_2H_3O_2\ (aq) + CO_2\ (g) + H_2O(l)$$

1) General Procedure

Flask 1

- Measure approximately 3 grams (1/2 teaspoon) of baking soda and place it in the flask 1
- Using the pipette, add a few drops of vinegar to the baking soda.
- Make a hole in the stopper and attach a balloon as you can see in the picture below
- **Observe what happens** to the mixture, take a photo and write down your observations in a table

RESULTS

1. **CO_2 Gas bubbles will form.**

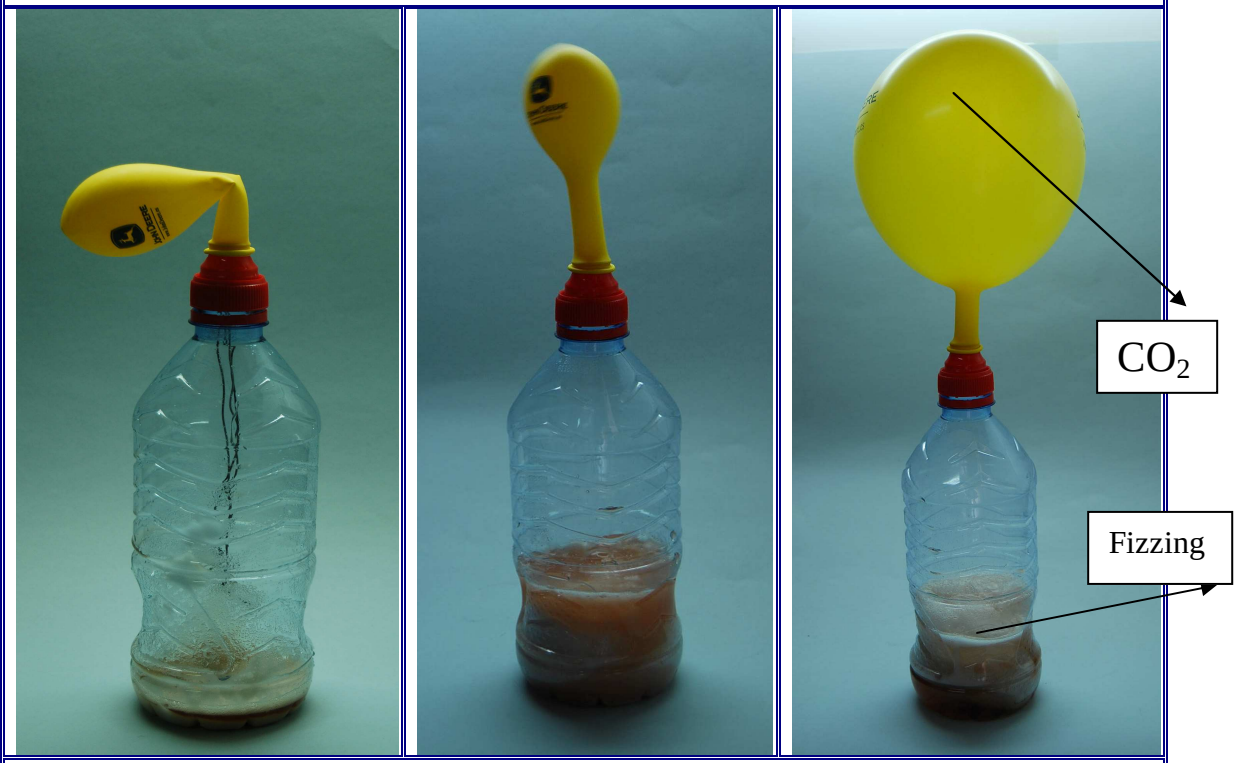
Repeat the experiment , preparing as well :

- Flask 2, control A
- Flask 3, control B
- Flask 4, limestone's dust instead of baking soda
- Flask 5, HCl, instead of vinegar

Draw up a wall chart to plan all the observations

	Reagent 1	Reagent 2	**Results**
Flask 1	Baking soda	Vinegar	fizzing
Flask 2, control A	Baking soda	Distilled water	--------
Flask 3, control B	Distilled water	Vinegar	---------
Flask 4	Limestone's dust	Vinegar	bubbling up
Flask 5	Baking soda	HCl	sparkling

Flask 1



Baking soda + Vinegar release a great amount of CO_2

Flask 2, control A	Flask 3, control B
	
Baking soda + Distilled water don't release CO_2	**Distilled water + Vinegar don't release CO_2**

4. EXTENSION

Which property of carbon dioxide could be tested with a candle?

1. Carbon dioxide does not support combustion. Oxygen is the substance that is necessary for any burning to take place. The splint should be extinguished.
2. The density of carbon dioxide is 1.56 g/mL while that of air is 1.0 g/mL. Since the carbon dioxide is denser than air, it will remain below the air in the container.
3. For the extinguisher, use a plastic drink bottle. Drill a small hole into the screw top and insert a drinking straw. Place a small amount of baking soda in the bottom of a plastic drink bottle. Add a small amount of vinegar to the container. To initiate the extinguisher, tip the bottle to start the reaction, and the carbon dioxide will form

Origin of Life/Energy Crisis Archaebacteria
Photosynthesis .Oxygen Poisoning /Ozone Respiration

1. OSMOSIS. INTRODUCTION ACTIVITY

1) Prepare three slides with different plasma salt concentrations

A: Plant cell + distilled water
B: Plant cell + 5% salt. Control experiment
C :Plant cell +10% salt

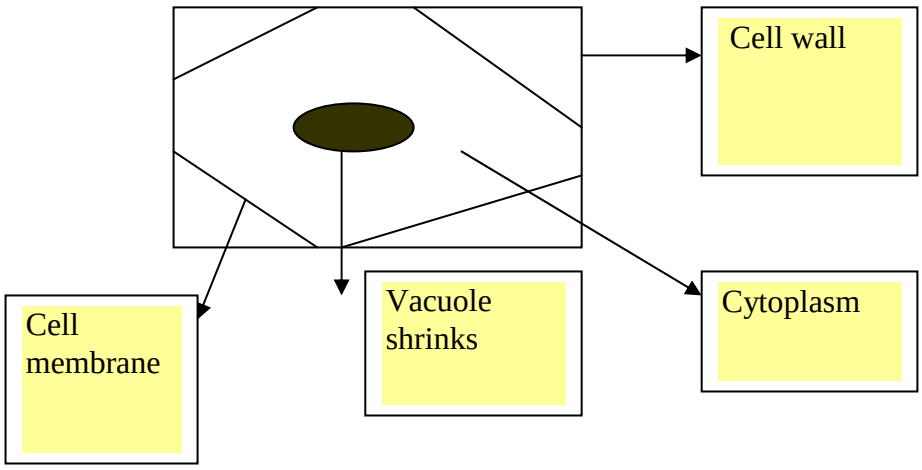
2) Predict the RESULTS, working out what is meant by "osmosis "

Results

	Water in /out	**Vacuole Shrunk/turgid**
A	in	turgid
B	No change	----------
C	out	plasmolysed

3) Match the drawing with the proper slide

SOLUTION : slide C



8. On the origin of Mountains.	Continental Drift

Continental Drift Movie

9 Water ecosystems evolution	Protists . Ecology practical work

Algae Eukaryotes/
Jellyfish/Arthropods /Mollusc/Insects
Vertebrates

1. Look at this video and Complete the sentences.

http://es.youtube.com/watch?v=SCfg3sywC7k&feature=related

Trnscript

Protists are abundant in water and in land.
Most , like this *Ameba* , are single cell. Its false feeds or pseudopodia are used for feeding or locomotion.
Volvox is a colony of single cell organisms. Special reproductive cells give rise to new individuals.
Paramecium is covered in tiny hairs called cilia that beat in time to produce movement and uses structures called vacuoles to engulf and digest food.

http://ebiomedia.com/prod/ProtistsVideoDVD.html
http://bcs.whfreeman.com/thelifewire/content/chp00/00020.html

The great plant escape ** http://www.urbanext.uiuc.edu/gpe/index.html
Earth 350 my ago Ferns /Seed Plants /Moss

1. INVESTIGATING THE CONDITIONS NECESSARY FOR GERMINATION OF SEEDS

Rules when performing a biological investigation:

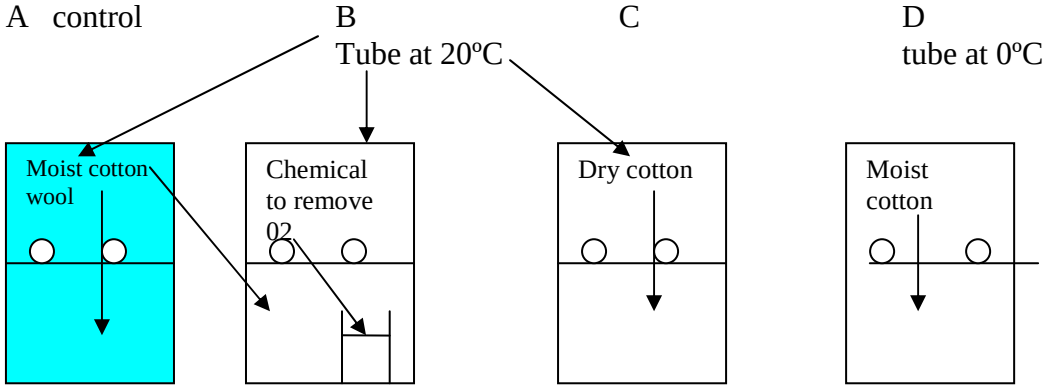
In biology the results of an investigation are valid if:

1. At each stage only one variable factor is studied at a time because if several are involved, then it is impossible to know which is responsible for the results.
2. Many organisms are used because if only a few are used, then perhaps these were unusual and not typical of the species in general
3. The experiment can be successfully repeated many times because if not, then perhaps the outcome just happened to result from a lucky chance.

To satisfy the above rule, the investigation is set up as shown in two experiments below

Procedure

1. Tubes B, C and D each differ from tube A by only one factor.
2. The same large number of cress seeds is used in each tube to allow for a few seeds being unusual or dead.
3. The whole experiment is repeated by several groups of pupils

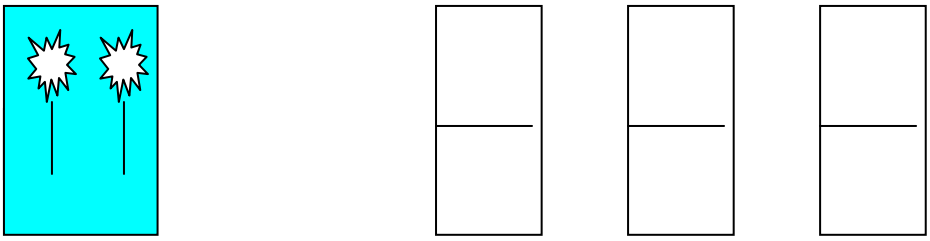


O2/water /warmth water/warmth O2/warmth O2/water

RESULTS

4 DAYS LATER

Germination _____ no germination _____



5) Conclusions

5.1. The results show that seeds need:

- oxygen,
- water
- and warmth for germination.

5.2. Germinating seeds need:

- oxygen for respiration to give energy for growth,
- water to allow chemical called enzymes to digest stored food for the growing embryo
- warmth to give a suitable temperature for enzymes to act.

10. Plant evolution Uptake of oxygen

1. Uptake of oxygen . Practical work

1) Procedure

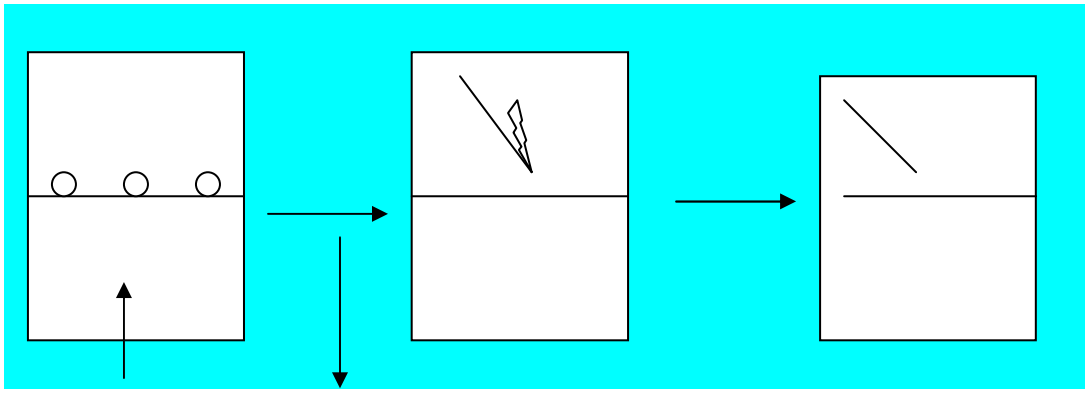
- Place live germinating peas in a damp cotton wool into a jar A
- Place dead peas in a damp cotton wool into a jar B
- After three days plunge a burning splint into each jar

1) Predict

The burning splint will ……go out immediately**……. in jar A**

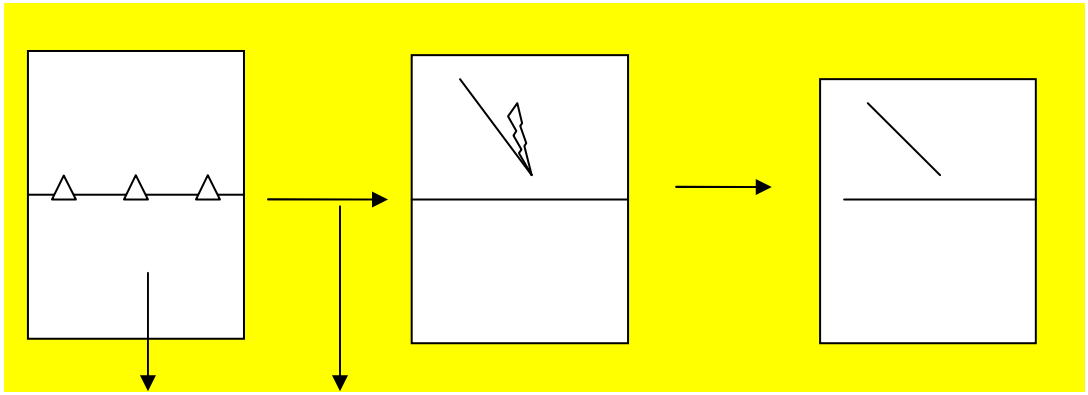
The burning splint will …… burn for a few seconds… **in jar B**

A
Live germinating peas



Damp cotton wool after 3 days lighted splint goes out at once

B
Dead (boiled + cooled) peas



Damp cotton wool after 3 days

Conclusions

Fill in the gaps:

It goes out immediately in gas jar ……A… but continues to ……in jar B…….. for a few seconds in B, showing that A contains ……less oxygen ……. than B.

It is therefore concluded that germinating seeds have taken in ……oxygen…….

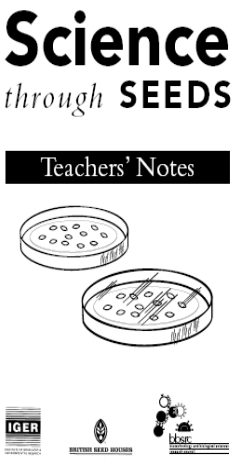
3.GENERAL CONCLUSION

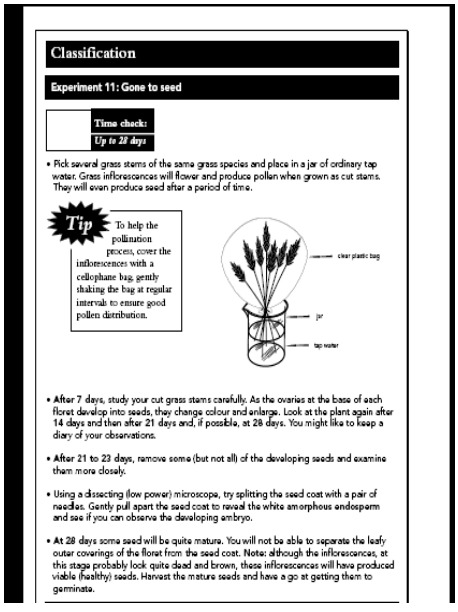
http://www.livinghistoryfarm.org/farminginthe40s/lrScience03.html

Green plants can manufacture their own food from CO2 and H2O, but like all living things, need certain chemicals to live and grow. Normally plants obtain these chemicals from the soil.
Organic matter in the soil is decomposed into basic nutrient salts providing plant food. Rain helps to dissolve the salts, making them available to plants through absorption by the roots
The primary nutrient Nitrogen is necessary for the formation of proteins and chlorophyll. Phosphorus provides energy production for root growth and flower production. Potassium is associated with movement of water, nutrients, and carbohydrates in plant tissue.

Science through seeds

http://www.bbsrc.ac.uk/society/schools/secondary/science_through_seeds/index.html




Classification

Experiment 11: Gone to seed

Time check:
Up to 28 days

• Pick several grass stems of the same grass species and place in a jar of ordinary tap water. Grass inflorescences will flower and produce pollen when grown as cut stems. They will even produce seed after a period of time.

Tip
To help the pollination process, cover the inflorescences with a cellophane bag, gently shaking the bag at regular intervals to ensure good pollen distribution.

clear plastic bag
jar
tap water

• After 7 days, study your cut grass stems carefully. As the ovaries at the base of each floret develop into seeds, they change colour and enlarge. Look at the plant again after 14 days and then after 21 days and, if possible, at 28 days. You might like to keep a diary of your observations.

• After 21 to 23 days, remove some (but not all) of the developing seeds and examine them more closely.

• Using a dissecting (low power) microscope, try splitting the seed coat with a pair of needles. Gently pull apart the seed coat to reveal the white amorphous endosperm and see if you can observe the developing embryo.

• At 28 days some seed will be quite mature. You will not be able to separate the leafy outer coverings of the floret from the seed coat. Note: although the inflorescences, at this stage probably look quite dead and brown, these inflorescences will have produced viable (healthy) seeds. Harvest the mature seeds and have a go at getting them to germinate.

11. Land ecosystems Amphibians to Homo	Mind map

Preserving Biodiversity Lesson Plans
http://www.nationalgeographic.com/xpeditions/lessons/06/gk2/molson.html

Amphibians/Invertebrates onto Land/Reptiles/Mammals
Earth 200 my ago/Meteorite/Primates /Spread of mammals
Homo Erectus /Fire/Neanderthals/Recent Ice Age

12. Challenges for the future /Energy	Power Plant

Climate Threats/Pollution/Future of Medicine /Future of Energy.
Future of Climate/Future of Humanity
Future of Earth/Future of the Sun /Future of GalaxyFuture of Universe

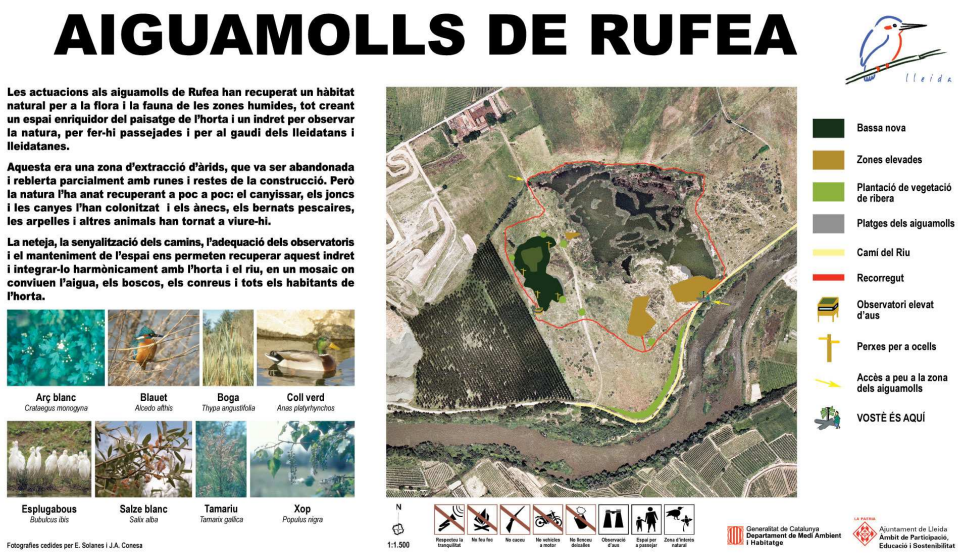
1) Match the two columns.

Solution

1d	2e	3h	4c	5f	6b	7g	8a	9j	10i

1.SO2 & NOx	a. Is measured using a scale called "pH."
2.CO2	b.Caused by acid rain
3.NOx	c.Caused by global warming
4..High T	d.Primary causes of acid rain
5. CO2 & SO2 emissions	e.Gas which causes global warming
6.Damaged trees &dead fish	f. Occurs naturally in gases from volcanoes
7.Fossil fuels	g.Are burned in power stations to make energy
8. Acid rain	h. HNO3 is formed when it reacts with water in the atmosphere
9.CO2 & SO2	i. It dissolves calcium carbonate
10.Acid rain	j.Gases released when fossil fuels are burned

Objectives of Teaching and Learning outside the Classroom



http://www.ens.gu.edu.au/ciree/LSE/MOD8.HTM#oht14

Planning Learning Experiences Outside the Classroom: Teacher Preparation

1. Organise the following:
   - Consent form for parents
   - Permission to visit the site
   - Finance
   - Transportation
   - Toilet facilities
   - Clothing and equipment
   - Departure and arrival times
2. Pre-visit the site(s).
3. Decide how much time is required for the tasks and for travel to and from the site.
4. Identify all possible risks and manage them appropriately.
5. Identify appropriate student/adult ratio.
6. Be aware of any possible distractions to students at the site.
7. Plan pre-field study learning experiences and prepare students to see fieldwork as active learning.
8. Prepare fieldwork activities and resources.

Materials

- Computer connected to the Internet.
- Student worksheets and questionnaires
- Lab instruments & reagents
- Puzzle maker http://www.puzzle-maker.com/

Assessment

Students' EVALUATION

Total points: 10

- Up to four points: worksheet completed; diagrams carefully prepared; labels clear and correct; diagrams accurately illustrate.
- Up to four points: Practical wok and report.
- Up to three points: Listening and writing accuracy.
- Up to one point : Participation

Tasks' EVALUATION
Feedback. Improve materials in order to give more confidence and avoid mechanical work.

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CLASSIC GEOLOGY IN EUROPE
http://www.nhbs.com/classic_geology_in_europe_tefno_113606.html

ECOLOGICAL http://www.amazon.co.uk/s/ref=nb_ss_w_h_/202-4581145-7371037?url=search-alias%3Daps&field-keywords=rivers+ponds+lakes+&x=13&y=20

FRESHWATER PROTOZOA
http://www.amazon.co.uk/s/ref=nb_ss_b/202-4581145-7371037?url=search-alias%3Dstripbooks&field-keywords=freshwater+protozoa

GEOLOGY OF ENGLAND AND WALES
http://www.amazon.co.uk/s/ref=nb_ss_w_h_/026-6890540-1754825?url=search-alias%3Daps&field-keywords=geology+of+England+and+Wales

GEOLOGY OF EUROPE
http://www.amazon.co.uk/s/ref=nb_ss_w_h_/202-4798728-0884609?url=search-alias%3Daps&field-keywords=The+geology+of+Europe&Go.x=17&Go.y=11

GEOLOGY NORTHERN IRELAND.

Geological Survey.**The Explore series.** A series of touring cards detailing scenic drives that explore the geology and natural history of Ireland's 12 northern counties./**The Walk series.** A series of packages for walkers that explore scenic areas of Ireland's 12 northern counties. Each pack details 10 circular walks of varying difficulty with information about geology, archeology and folklore.
http://www.bgs.ac.uk/gsni/shop/landscapes%20from%20stone/home.htm

GEOLOGY OF SCOTLAND
http://www.amazon.co.uk/geology-scotland/s/ref=sr_pg_1?ie=UTF8&rs=&keywords=The%20geology%20of%20Scotland&rh=i%3Aaps%2Ck%3AThe%20geology%20of%20Scotland&page=1

GRAND CANYON GEOLOGY.
http://www.amazon.co.uk/s/ref=nb_ss_w_h_/202-1668751-8006237?url=search-alias%3Daps&field-keywords=grand+canyon+geology

GUIDE GEOLOGY SCOTLAND
http://www.amazon.co.uk/s/ref=nb_ss_w_h_/202-1668751-8006237?url=search-alias%3Daps&field-keywords=guide+geology++Scotland&Go.x=7&Go.y=12

SCOTLAND NATURE
http://www.amazon.co.uk/s/ref=nb_ss_w_h_/202-1668751-8006237?url=search-alias%3Daps&field-keywords=Natural+History+orkney

EDITORIALS & PUBLISHERS

1. http://nora.nerc.ac.uk/1582/

2. http://www.amazon.co.uk/
3. http://www.geologists.org.uk/publicationsales.html Geologists' association. Guides. Publications.
4. http://www.harpercollins.co.uk/Search/Default.aspx. The New Naturalist series Harper Collins.
5. http://www.hoddereducation.co.uk/TitlesList/8536/Biology.htm
6. http://www.nhbs.com/ NHBS. Environment Bookstore, serving conservationists, scientists, wildlife enthusiasts and libraries since 1985.
7. http://www.swt-fife.org.uk/book.htm
8. http://www.timetabler.com/textbooks.html#3
9. http://www.yorksgeolsoc.org.uk/Publications/publications.html. Yorkshire Geological Society's Occasional Publications and Guides
10. www.academicpress.com
11. www.bh.com
12. www.brookscole.com
13. www.collins.co.uk
14. www.defra.gov.uk.
15. www.dk.com
16. www.elsevier.com
17. www.studymates.co.uk
18. www.thomsonrights.com
19. British Geological Survey /Edinburgh Geological Society: EGS Publications. Sales Officer/Murchison House/West Mains Road/Edinburgh EH9 3LA/ tel 0131 445 2921

Vocabulary

CLASS INSTRUCTIONS

School rules
http://www.saraswatimodernschool.com/schooldiary.html

How do you do your homework?

http://news.bbc.co.uk/cbbcnews/hi/newsid_3970000/newsid_3979400/3979487.stm

Get Homework Done
http://www.school-for-champions.com/grades/getitdone.htm

Some practical advice for homework
http://www.kes.bham.sch.uk/letters/hw.pdf

Why read aloud?

Teachers have read aloud to young children for centuries. We know that time spent reading aloud is valuable to them. We have watched pre-readers listen to a story, then capture the book itself to look at again and again. Sometimes they memorized the story, shared it with their friends, and at times even slept with the book.

http://www.education-world.com/a_curr/curr081.shtml

1. A blank page.
2. A bundle/pile of examination papers.
3. A few times a week.
4. A rule of thumb
5. A sitting plan
6. A warning
7. Absolutely no excuses
8. Again people talking and not listening
9. All at once
10. All students sitting an exam in May 2009 are required to go to 1 study period per week
11. Applying your knowledge.
12. Are you feeling better?
13. Are you in a hurry to leave?
14. Are you listening to me?
15. Are you trying to concentrate?
16. As simple as that
17. Ask for help
18. Ask your teacher or phone a classmate if you are not sure.
19. At the front, please
20. Back to work
21. Be careful = pay attention = take care
22. Be on time, Don't be late

23. Be quiet
24. Be with you in a minute
25. Before leaving the examination room you must give this book to the invigilator. If you do not, you may lose all the mark for this paper.
26. Bring me your sheet please
27. Bring your books with you
28. Budding Einsteins/ *Einsteins en potència*
29. By no means /definitely not
30. By the way
31. By yourself = on your own = alone
32. Can I help you at all?
33. Can I help you?
34. Can you finish, please
35. Can you go on?
36. Can you speak a bit more quietly?
37. Can you start off?
38. Check the answer = find out = discover = look it up
39. Close the door
40. Come here!
41. Come this way
42. Come to the blackboard
43. Come what may.
44. Core subject /*Comuns*
45. Correct = revise
46. Could you come here, please
47. Could you do me a favour?
48. Could you give me your essays /assignments, formal*?*
49. Could you move in separated seats to listen?
50. Could you speak a bit louder*?*
51. Could you speak more quietly?
52. Cover up the English version of each word and translate the Spanish and then vice versa.
53. Cross this word out.
54. Cut round
55. Delete what does not apply. Cross out.
56. Did I give you any homework the last day?
57. Did you hear that he won the Nobel Prize?
58. Did you hear the news?
59. Do calculations
60. Do the register. Call out your name.
61. Do you have a list of?
62. Do you mind closing the window?
63. Do you realise that you can already recognise many Spanish words you have never meet before?
64. Do you understand what I am asking you?
65. Do you understand what is supposed to be doing?
66. Do you want me to help you?
67. Does it make sense to you?
68. Doesn't make any sense
69. Doing just now with no argument and no talking.

70. Don’t answer back!
71. Don’t be snotty/ insolent
72. Don’t butt in /Don't interrupt
73. Don’t chat please
74. Don’t complicate English, plain E., not long winded /Prolix
75. Don’t make (any)mistakes
76. Don’t pressure, the answer will be given right now.
77. Don’t rub out the board
78. Don’t rub the writing off the board
79. Don’t shout out.
80. Don’t take it for granted
81. Don’t talk if I am not asking you a question
82. Don’t utter a word/ Don't say a word.
83. Draft copy.
84. Draw symbols for the vocabulary or phrases and practise saying them out loud.
85. End of question paper.
86. Every student should bring the diary to school daily
87. Everyone who is under 5 needs to look over the vocabulary.
88. Everyone will get a chance
89. Everything I am saying is absolutely true.
90. Excesses won’t be tolerated
91. Excuse-me I am speaking
92. Expelled ! (*forever).*
93. Expelled from school for playing truant / for skiving off school/ for dogging it
94. Explanations.
95. Extra work/ advanced work
96. Fairly urgent
97. Fill in.
98. Filling blanks
99. Final copy
100. Fold over
101. Follow the text.
102. For your sake
103. From what you know, what ..
104. Get rid of your chewing gum
105. Get well soon.
106. Give back
107. Give out = distribute = hand out
108. Go on. Don’t stop.
109. Go through different stages
110. Guess
111. Has your mind gone blank?
112. Have a look your book notes
113. Having a break already?
114. He is glad to hearing from you
115. He is not well
116. Headmaster office.
117. Here is a tongue twister for you to practise.
118. Here you are.

119. Hide them.
120. Highlight /Underline the key word
121. How are you doing? /How are you feeling? /How are you keeping?
122. How long will you be in ….Spain?
123. I am not interested in any excuses
124. I can't hear you very well.
125. I don’t mind/It doesn’t matter
126. I have called for quiet!
127. I set you two exercises for today (give). To give /set homework
128. I want to boost the moral
129. I want to talk to you, now
130. I will let you away with it, but I can’t allow this kind of behaviour
131. I’m going to ticking off your names on the register
132. I’m sorry to keep you waiting
133. If I am not happy, you will get in trouble
134. If need be.
135. If that is you want, that’s fine
136. If there’s any little thing you need to know , just ask
137. If you need help, put your hand up and I’ll come to you
138. If you want to sharpen your pencils, do it now.
139. In the correct order
140. Is anything that you don’t understand?
141. Is there not a mistake?
142. It is a cinch/very easy
143. It is not expected that you talk
144. It is not working as good as he should
145. It takes three quarters of an hour.
146. It was very good of you to help me
147. It was worth a try
148. It’s an easy instruction: Don’t talk
149. It’s frowned upon/*No està ben vist*
150. It’s getting late
151. It’s great that you could come.
152. It’s just no worth
153. It’s the final check
154. Jean is going to be here with us until May/for a several days
155. Just in case
156. Keep on trying
157. Keep up to date/Get up to date.
158. Later on we are going to the computers
159. Learn by heart
160. Let me have a look
161. Let’s go to study immediately
162. Listen for your name. Registration.
163. Listen to the cassette and repeat
164. Listen to the words again and repeat them after the cassette
165. Listen very carefully
166. Little by little.
167. Look at this
168. Look for the page 40 everyone.

169. Look out / watch out (*danger)*
170. Look over the vocabulary silently/ Revise
171. Look up the following words at the dictionary. Write down their meanings.
172. Luckily, today it's not raining
173. Make graphs
174. Make sure that you have the correct answer
175. Make sure that you have your homework done
176. Make sure you understand what you are being asked to do.
177. Mark them up. Put the results on the board. Write them on the board.
178. Match up .
179. Michael join Paul, please. Sit with him, please. Sit next to/beside him, please
180. Mind your language! Don't swear
181. Mind your own business! MYOB, more polite I'd rather not say.
182. Needless to say
183. Next
184. No way/ That's impossible
185. Nothing could be further from the truth.
186. On this course I expect you to work hard / you have to work hard on this course.
187. Other words in Spanish are similar to ours because both languages have common roots because they come from the Latin.
188. Over and over.
189. Pass books to the front, please.
190. Pay no attention to Peter
191. Peter, do you want to move beside Paul?
192. Please, keep this part of the desk, clear
193. Prepare this dialogue with your partner
194. Put in detention after school
195. Put the eraser, ruler, pencil and biro on the table
196. Put the mobile away.
197. Put the rubbish out. Take out the rubbish.
198. Put up your hand
199. Put your chewing gum in the bin
200. Put your hand down
201. Read aloud .Read it out loud. Read it aloud,
202. Read it in silence.
203. Read it quietly
204. Reading again for yourself
205. Ready, set ,go
206. Remove= quite away
207. Repeat
208. Rights and duties
209. Rub this word out/rub it out
210. Science notebook
211. Score this word out
212. Show your working out. Use mathematics and show your working out to explain your thinking *Ensenya'm el plantejament.*.
213. Shut up, will you = stop talking

214. Sit down
215. Sit on the chair
216. Some teachers don't treat students as a adults
217. Speak up
218. Sport pitch. Football pitch. Basketball court
219. Stand up
220. Start off Anne
221. Stood still
222. Students can speak openly with their classmates/school chums
223. Students have enough time to study on their own
224. Students have generally a good behaviour
225. Swot/*Empollon*
226. Take notes
227. Take out your exercise book
228. Take roll / Take attendance/Do the registration/I am going to call /do the register.
229. Take turns to practise with your partner
230. Take your earphones out.
231. Take your jacket off
232. Take your jotter ready for inspection
233. Take your seat.
234. Tap on the door /*trucar amb delicadesa*
235. Teachers and students respect each other
236. Tell off
237. Testing your knowledge
238. Thank you for coming/for joining us (at he end)
239. Thank you for helping me so much
240. That is not acceptable and you know perfectly well
241. That would mean
242. The activity consist of
243. The choice is yours
244. The good things/The bad things.
245. The homework should be handed in on Wednesday
246. The odd one out /*L'intrús.*
247. The result will be
248. The school has (at one's disposal) good educational materials such as computers, library ,videos,..
249. The student did a really good job of his work/essay about viruses
250. The teacher asks the students to outline one chapter
251. There are a great variety of extracurricular activities such as ..
252. There are enough clubs and social activities where students and teachers can meet
253. There are many people chatting
254. There is a good level of friendship between students and teachers
255. There shouldn't be a sound
256. They've done a whale of a job renovating the building.
257. This doesn't make (any)sense to me
258. This is your seat for ever
259. This should be looked up on the Internet / you should look it up /for it on The Internet.

260. Throw out your chewing gum
261. Throw the chewing-gum in the bin.
262. Tick (√) the correct box below
263. TIME, TIDE AND EXAMS WAIT FOR NO MAN
264. Time's up
265. Timetable
266. To encourage yourself
267. To show respect towards her teachers and classmates.
268. TO WANT TO IS TO BE ABLE /WHERE THERE IS A WILL, THERE IS A WAY
269. Troublemakers will be expelled
270. Try to catch your partner out.
271. Turn over for question 12 on page six.
272. Turn over the other side
273. Turn your papers over, now
274. Underline the words you don't understand. Look them up in a dictionary.
275. Use a pencil to shade
276. Use an eraser to rub off the writing
277. Watch what you say
278. We are lucky to have Jean here with us. Thank you for coming in. (at the beginning)
279. We do a lot of cultural visits
280. We go on a field trip at least once a year.
281. We will carry out a survey
282. We will do the survey
283. Well done
284. What am I asking you?
285. What are acting like this with him for
286. What are they saying?
287. What do all these words have in common?
288. What do you need to do is ?
289. What do you think of it?
290. What do you think you're doing?
291. What does "lapis mean in English?
292. What happens to you, is..
293. What is supposed to happen when you…(land on)?
294. What is that?
295. What is the best way of learning them?
296. What other techniques can you think of? Try them out and see which work best for you.
297. What time do the classes start (at)?
298. What was your homework for today?"
299. What we are going to do today is ..
300. What will we do now?
301. What you should know
302. What's the result /outcome, *formal*
303. What's the Spanish for "ruler"?
304. What's wrong with?
305. When they felt like it

306. Which words in the first three units did you recognise without any need for explanation?
307. Who asked me for a jotter?
308. Who is absent?
309. Who is Peter?
310. Who needs to borrow a pencil?
311. Who wants to read next?
312. Who wants to read their it?"
313. Who wants to read their writing?
314. Will see what happens
315. Will you finish
316. Will you start off
317. With more confidence = more confidently, please.
318. With your partner test each other, one of you draws a symbol and the other has to work out how to say it in Spanish
319. Without warning
320. Word in bold
321. Work on
322. Work out a problem
323. Work through workbook to page 35
324. Working day
325. Would it bother you to close the window?
326. Would you like me to buy?
327. Would you outline the important points of the speech
328. Would you start off
329. Write out a list of ten new Spanish words with the English translation alongside
330. Write a heading
331. You are asked to complete
332. You are going to learn the alphabet.
333. You are not allowed to leave the examination room until the end of the test.
334. You can now say words that you haven't met before
335. You can't complain. It's your own fault, isn't it?
336. You could either do maths or you couldn't
337. You have to make clear.
338. You have to make sure
339. You have to mention
340. YOU HAVE YOUR HEAD IN THE CLOUDS
341. You know what he's like
342. You must find the way that suits you best
343. You must leave the class = get out!
344. You need to hand in the homework next Tuesday
345. You need to listen to the teacher.
346. You need to look at he board when the teacher is explaining the grammar
347. You should learn all the key words by the end of each unit
348. You should work day after day /day in day out /every day
349. You will be asked to complete
350. You will see
351. You're always interrupting

352. You're asking for trouble = you'll get into trouble
353. You're late.
354. You've done a whale of a job/ party /story /*Un gran treball*
355. *3* cautions = 1 expulsion

STATIONERY ITEMS

1. (Cello) Tape/tape dispenser
2. (Permanent)Marker
3. (Ruled) Note pad /
4. Address label sheets A4 size
5. Ball Pen red
6. Binder clips
7. Binder
8. Blank CDs
9. Board pin/Drawing pin
10. Calculator
11. Chalk + Chalk board duster
12. Colour pencil set
13. Coloured Card A3 size
14. Coloured paper A4 size
15. Correcting fluid
16. Correcting Tape
17. Crayon
18. Cutter knife
19. Diary/*agenda*
20. Envelop/stamp
21. Eraser
22. Exercise book/jotter
23. File tray
24. Flip chart + char paper
25. Folder
26. Folder
27. Glue stick /glue gum
28. Highlighter
29. Lead pencil/*mina*
30. Ledger
31. Paper punch single/double
32. Paper shredder
33. Paper trimmer /*guillotina*
34. Pen Blue/black
35. Pen drive/stick USB
36. Pencil
37. Post-it/Self-stick notes
38. Refill

39. Ring file
40. Ruler
41. Scissor
42. Sharpener
43. Sheet protector/Clear plastic punched pocket
44. Sketch book
45. Slide binder + Report cover/document easy case
46. Stamp +stamp pad
47. Staple
48. Stapler remover
49. Stapler
50. Tag

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