3rd Year Revision

Exam Papers by Topic

(plus definitions & formula)

Biology: 1. Living Things
Exam Questions

1. [2008 OL]
(i) Write the letter T opposite the name of a body tissue in the table on the right.
(ii) Write the letter O beside the name of a body organ in the table on the right.

	Muscle
	Digestive system
	Heart

2. [2009 OL][2007 OL]
Choose one vertebrate and one invertebrate from the list of animals on the right.

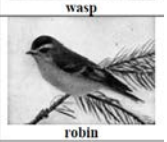
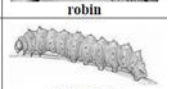
Snail
Frog
Thrush
Earthworm

3. [2009 OL]
(i) Choose the correct temperature range of human body temperature from the list on the right.
(ii) Give one reason for a change in body temperature.

$36 – 37^0$ C
$86 – 87^0$ C

4. [2008 OL]
The table shows a simple key used to identify some common organisms found in a habitat. In the case of any two of the organisms shown on the right, write the letter corresponding to a key feature given in the table above beside the organism which that best describes.

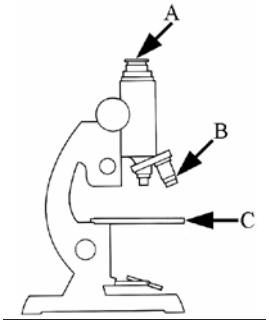
Letter	Key feature of organism
A	Four pairs of legs
B	Segmented body, no legs
C	Three pairs of legs
D	Eight to ten pairs of legs

	 spider
	 wasp
	 robin
	 caterpillar

Biology: 2. Animal and Plant cells

Exam Questions

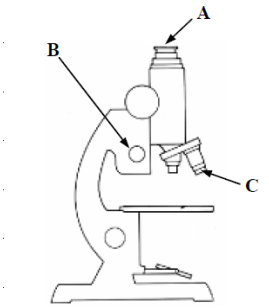
1. [2007 OL]
   The picture shows a piece of laboratory equipment.
(i) Name the piece of equipment.
(ii) Give one use of this piece of equipment.



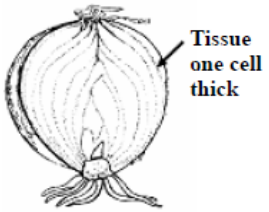
2. [2009]
   The parts labelled A and B in the diagram of the microscope work together to perform a single function.
(i) What is the combined function of A and B?
(ii) Name the part labelled C in the diagram.

3. [2008 OL]
   The diagram shows a microscope.
   Study the diagram and answer the questions below using the table.
(i) In the table write the letter A beside the name of the part labelled A.
(ii) In the table write the letter B beside the name of the part labelled B.
(iii) In the table write the letter C beside the name of the part labelled C.
(iv) In the table write the letter F beside the function of the part labelled B.

	Lens
	Lamp
	Eye piece
	Focus wheel
	Base
	To focus
	To magnify

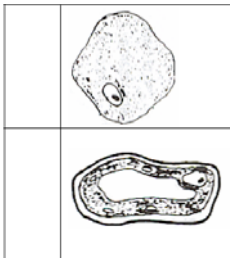


4. [2006]
   The diagram shows a laboratory microscope.
   What are the functions of parts labelled A and B?



5. [2006]
   Onion epidermis is a tissue only one cell thick.
   It is used in school laboratories on microscope slides to investigate plant cell structure using a microscope.
   Describe how to prepare a microscope slide from a plant tissue.

6. [2006]
   Draw a labelled diagram of a plant cell.



7. [2008 OL]
   The diagram shows an animal cell and a plant cell.
(i) Write the letter P beside the plant cell in the table on the right.
(ii) Write the letter A beside the animal cell in the table on the right.

Biology: 3. Food
Exam Questions

1. [2008]
   Give one function for vitamins in our bodies.

2. [2008]
   Give one function for minerals in our bodies.

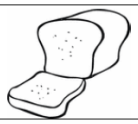
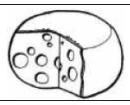
3. [2006 OL]
   Name the mineral needed for healthy growth of teeth.

4. [2007 OL]
   Fibre is a carbohydrate and it is an important part of a balanced diet.
   What is the function of fibre as part of a balanced diet?

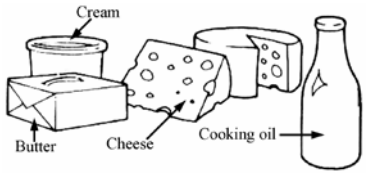
5. [2007 OL]
   Protein and carbohydrate form part of a balanced diet.
(i) In the table on the right write the letter P beside a good source of protein.
(ii) Write the letter C beside a good source of carbohydrate.

	Carrot	
	Cheese	
	Fish	
	Potato	

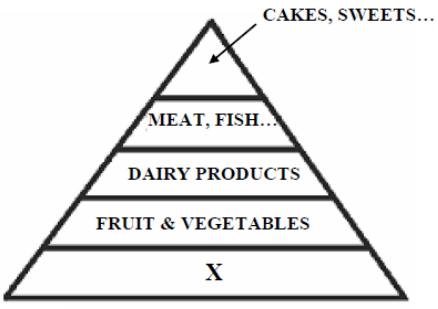
6. [2009 OL]
   Proteins, fats and carbohydrates form part of a balanced diet.
   Answer the following questions about food types.
(i) In the table write the letter F beside a good source of fat.
(ii) Write the letter C beside a good source of carbohydrate.
(iii) Give one function of fibre in the diet.

	Bread	
	Carrots	
	Cheese	
	Burger	

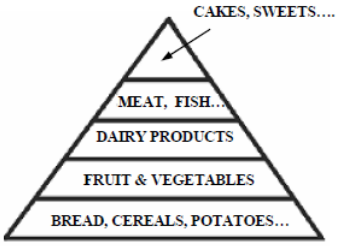
7. [2007]
   Name the principal food type (nutrient), which is present in all of the foods shown.



8. [2006 OL]
   The diagram shows a food pyramid.
(i) Name one item of food that could be found at X in the pyramid.
(ii) Why should only a small amount of the foods at the top of the pyramid be eaten?



9. [2006]
   The diagram shows a food pyramid.
   Explain how to use a food pyramid to plan a healthy diet.



10. [2007]
    Describe a test to show the presence of fat.

11. [2006]
Tests were carried out on three foods by a pupil in a school laboratory.
The results of these tests are given in the table.
A plus (+) sign means a positive result to a test.
A minus (–) sign means a negative result to a test.

Food Tested	Food Tests			
	Starch	Reducing sugar	Protein	Fat
Food A	+	–	–	+
Food B	–	–	+	+
Food C	+	–	+	+

(i) Which one of the foods, A, B or C would most likely be cheese, meat, or fish?
(ii) Which one of the foods, A, B or C would most likely be crisps, or chips?

12. [2008 OL]
The table shows the nutritional information given on the labels on two foods A and B.
(i) Which food, A or B, provides the most energy per 100 g?
(ii) Which food, A or B, is more likely to be cheese?
Give a reason for your answer.

Nutritional information	Food A per 100 g	Food B per 100 g
Energy	1629 kJ	394 kJ
Protein	26 g	5.6 g
Carbohydrate	Trace	20.3 g
Fat	19.5 g	0.6 g

13. [2006]
This nutritional information was given on a packet of wheat bran.
Wheat bran is used with breakfast cereals and is added to brown bread.
Select any two nutrients from the list given and say what role each one has in maintaining health.

Nutritional Information per 100 g	
Energy	872 kJ / 206 kcal
Protein	15 g
Carbohydrate	26.8 g
(of which sugars)	3.8 g
Fat	2.5 g
(of which saturates)	0.5 g
Fibre	36.5 g
Sodium	0.028 g

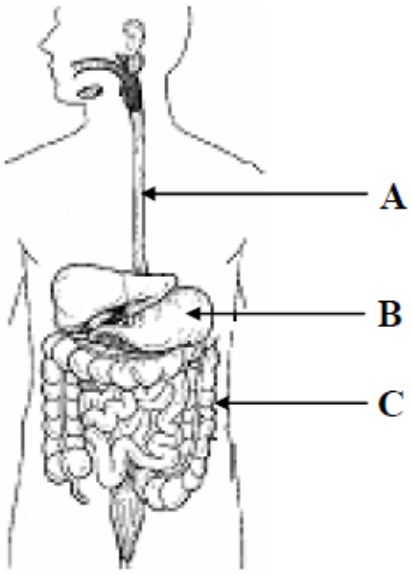
14. [2006 OL]
Describe an experiment you could carry out to show the conversion of chemical energy to heat energy.
Draw a labelled diagram of any equipment used.

15. [2007]
Describe a simple laboratory experiment to show the release of chemical energy from food as heat.

Biology: 4. The Digestive System

Exam Questions

1. [2006 OL]
   Digestion of food is important so that we can obtain energy from our food.
   Name the parts of the digestive system labelled A, B and C in the diagram.

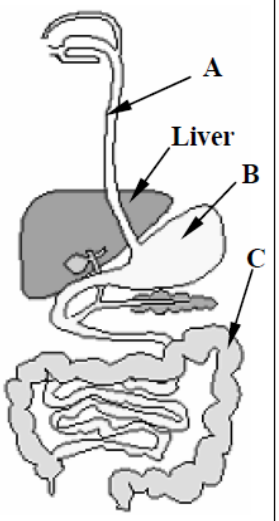


2. [2006 OL]
   Give one function of the stomach.

3. [2007]
   Give a digestive function of the liver.

4. [2007 OL]
   The diagram below shows the human digestive system.
   Examine the diagram and answer the questions that follow.
   (i) In the table write the letter A beside the name of the part labelled A.
   (ii) Write the letter B beside the name of the part labelled B.
   (iii) Write the letter F beside the function of the part labelled B.

	Intestine
	Mouth
	Oesophagus
	Stomach
	Digestion
	Egestion
	Excretion

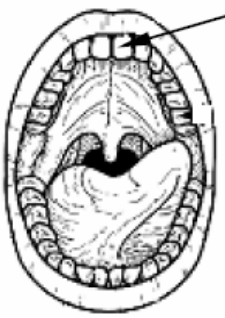


5. [2007 OL]
   The large intestine is labelled C in the diagram.

6. [2007 OL]
   Fibre is a carbohydrate and it is an important part of a balanced diet.
   What is the function of fibre as part of a balanced diet?

7. [2007]
   Give a function of the small intestine other than digestion.

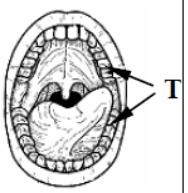
8. [2006 OL]
   Identify the type of tooth labelled X in the diagram on the right.



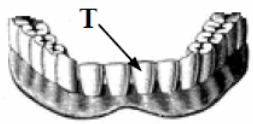
9. [2006 OL]
   Name the mineral needed for healthy growth of teeth.

10. [2007 OL]
    Two teeth are labelled T in the diagram.
    In the table on the right write the letter T beside the type of tooth labelled T.
    Write the letter F beside the function of that type of tooth.

	Canine
	Chewing
	Incisor
	Molar
	Tearing



11. [2009 OL]
A tooth is labelled T in the diagram.
(i) Write the letter T beside the type of tooth labelled T.
(ii) Write the letter F beside the word on the right which describes the function of this type of tooth.



	Canine
	Incisor
	Chewing
	Biting

12. [2006 OL]
Salivary amylase found in the mouth acts on starch in the food we eat.
This action can be investigated in the laboratory.
Name the chemical used to test for the presence of starch at the beginning of the experiment.

13. [2006 OL]
When salivary amylase is added to starch solution and the mixture placed in a water bath at 37 °C for 5 minutes, a new product is formed.
Name the product formed.

14. [2006 OL]
A chemical is used to test for the presence of maltose. This chemical reacts with maltose to produce a brick-red colour when they are heated together in a hot water bath for 5 minutes.
Name this chemical.

15. [2007]
In the small intestine starch is broken down to maltose by amylase.
Identify the enzyme, and the substrate named in this reaction.

16. [2008 OL]
In the table write the letter S beside the name of the solution used to test for the presence of a reducing sugar.

	Biuret
	Benedict's
	Fehling's

17. [2008 OL]
In the table write the letter R beside the name of a reducing sugar.

	Glucose
	Sucrose

18. [2008 OL]
In the table write the letter B beside the colour of the test solution used at the beginning of the experiment.
Write the letter E beside the colour of the test solution that indicates a positive result for the presence of a reducing sugar.

	Brown
	Blue
	Brick Red

19. [2008]
A pupil performed an experiment in a school laboratory to show the action of a digestive enzyme on a food substance.
(i) Name an enzyme suitable for such an experiment.
(ii) Name a food substance on which the enzyme that you have named will act.
(iii) Describe any preparation of the food required before the experiment is performed.
(iv) If no preparation is required state why.
(v) Give the temperature at which the enzyme-food mix should be maintained for the experiment to work.
(vi) How much time is needed for digestion of the food in this experiment?
(vii) Describe a test to confirm that digestion has occurred.

20. [2007]
Describe a simple laboratory experiment to show the release of chemical energy from food as heat.

Biology: 5. Respiration and Breathing
5. Respiration and Breathing: Exam Questions

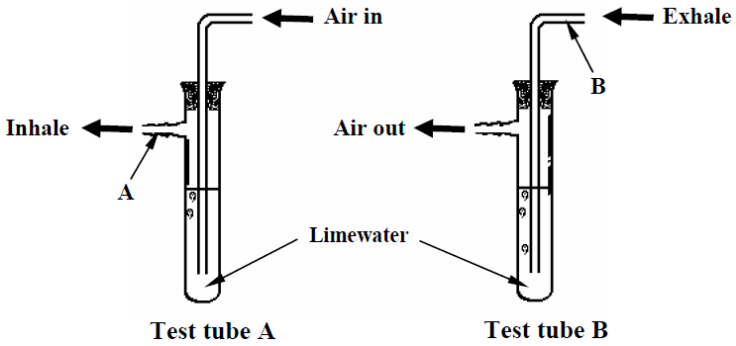
1. [2008 OL]
(i) From the list on the right identify the correct word(s) needed to replace each of the numbers 1 and 2 in the equation below so that the equation describes respiration.
(ii) Glucose + 1 → 2 + Water + Energy

Oxygen
Carbon dioxide

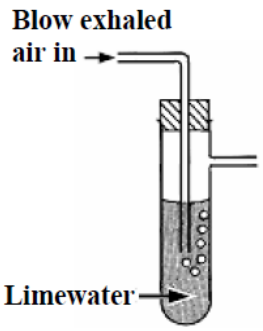
2. [2007]
Complete the following word equation for aerobic respiration.
Glucose (Food) + _____ → Energy + _____ + Water

3. [2007]
State how you would show the presence of one of the products of aerobic respiration by means of a chemical test.

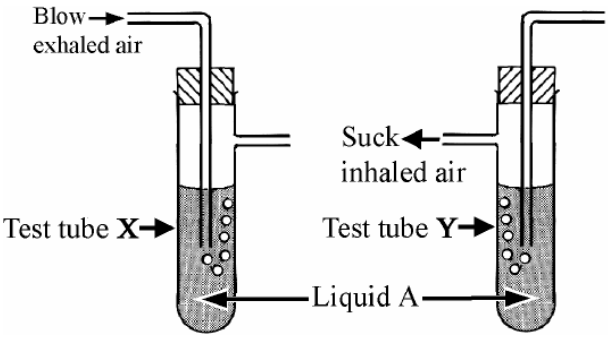
4. [2007 OL]
Limewater was placed in test tube A and in test tube B.
(i) What effect has carbon dioxide on limewater?
The student inhaled through test tube A and exhaled through test tube B twenty times.
The student saw no change in the appearance of the limewater in test tube A. The appearance of the limewater in test tube B had changed.
(ii) What change would you expect the student to have seen in the limewater in test tube B?
(iii) What conclusion should the student have drawn from what he/she saw?



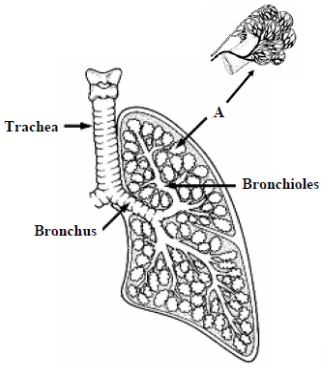
5. [2006]
The diagram is of an apparatus used to show that exhaled air contains carbon dioxide.
When performing this experiment a control is required to show that inhaled air contains less carbon dioxide than exhaled air.
Describe, using a labelled diagram, a suitable control procedure.



6. [2009]
The diagram shows the apparatus used by a pupil when performing an experiment in a school laboratory.
The pupil blew (exhaled) air into test tube X.
The pupil sucked (inhaled) air from test tube Y.
The pupil continued, alternately, blowing and sucking air, as above, until liquid A in one of the test tubes turned milky.
(i) Name liquid A.
(ii) In which test tube, X or Y, did the liquid turn milky?
(iii) Why did liquid A turn milky in one of the test tubes?
(iv) What conclusion can be made from the result of this experiment regarding the difference in composition between exhaled and inhaled air?
(v) Complete the word equation, below, for aerobic respiration.
Food + _____ → _____ + energy + water

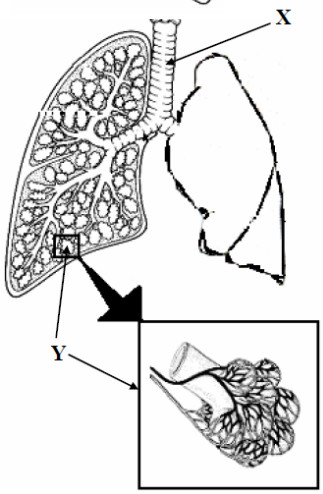


7. [2006]
The diagram shows the structure of a human lung. Air passes in and out of the lungs, via the trachea, bronchi and bronchioles. Gaseous exchange takes place in the structures labelled A.



(i) Name structure A.
(ii) How does gaseous exchange take place in the structures labelled A?

8. [2006 OL]
The heart pumps blood to the lungs and around the body.
The diagram shows part of the breathing system.

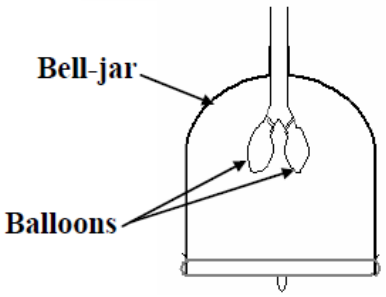


(i) Name the parts of the breathing system labelled X and Y in the diagram.
(ii) Complete the sentence below using a word from the list on the right.
There is more _____ in exhaled air than in inhaled air.

Rib cage
Diaphragm

(iii) A balance of exercise and rest promotes good health.
Name one activity which has a harmful effect on the breathing system.

9. [2009 OL]
The diagram shows a model of the human breathing system.



(i) Name the part of the breathing system represented by the balloons.
(ii) Choose from the list on the right the correct word to complete the sentence below.
The part of the breathing system represented by the bell-jar is the _____.

Other Test Questions

1. Define the term *respiration.*

2. Complete the following word equation for cellular respiration.
Glucose + _____ → Carbon dioxide + _____ + energy

3. When a student exhales into a test-tube surrounded by a freezing mixture of ice and salt a colourless is formed
(i) What is this liquid and describe a test to prove it.
(ii) Why is necessary to put the test-tube in a freezing mixture?

4. Give the word equation for respiration.

5. How would you demonstrate that heat energy is produced during respiration?

6. How would you demonstrate that water is produced during respiration?

7. How would you demonstrate that carbon dioxide is produced during respiration?

8. What is *anaerobic* respiration?

9. Describe with the aid of a diagram how to compare the carbon dioxide levels of inhaled and exhaled air.

10. Describe how oxygen is taken into the bloodstream from the lungs.

11. Describe how carbon dioxide is taken into the lungs from the bloodstream during gaseous exchange.

12. How are these two processes affected by smoking?

13. Draw a labelled diagram of the lungs – include trachea, bronchi, bronchioles and alveoli.

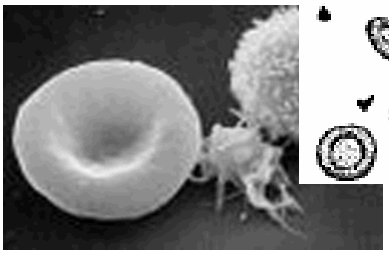
14. Give two effects of smoking on the breathing system.

Biology: 6. The Circulation System

Exam Questions

1. [2006]
Blood is a liquid tissue. The diagram shows blood viewed through a microscope.
Name any two components of blood shown in the diagram.
Give the function of each of the components of blood you have named.

2. [2008]
The photograph shows a red blood cell and a white blood cell taken using an electron microscope.
Give one function for each type blood cell.

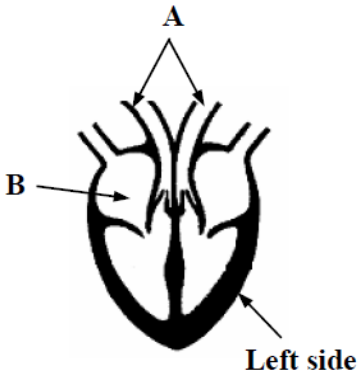


3. [2006 OL]
Blood helps transport food and other materials around the body.
It also helps fight infection.
(i) Name the liquid part of blood that helps transport materials.
(ii) Name the blood cells that help fight infection.

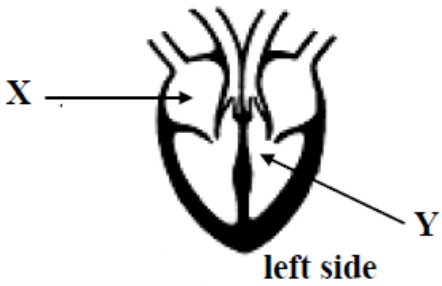
4. [2009 OL]
The heart forms part of the circulatory system.
Answer the following questions on the heart and the circulatory system.

Ventricle
Atrium

(i) The blood vessels labelled A in the diagram carry blood away from the heart.
Name this type of blood vessel.
(ii) Choose from the list on the right, the name of the small chamber of the heart labelled B in the diagram.
(iii) Why is the wall of the left side of the heart thicker than the wall of the right side?



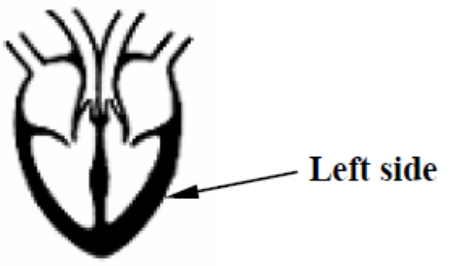
[2006 OL]
Name the chambers of the heart labelled X and Y in the diagram.



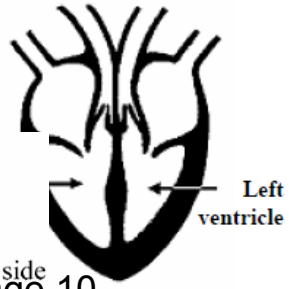
5. [2007 OL]
The diagram shows the human heart.
Blood moves through vessels called arteries and veins.

	Arteries
	Veins

(i) In the table on the right write the letter A beside the name of the blood vessels that carry blood away from the heart.
(ii) Write the letter T beside the name of the blood vessels that carry blood to the heart.
(iii) Why is the wall of the left side of the heart thicker than the wall on the right side?

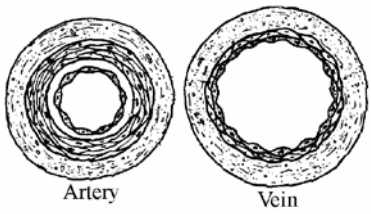


6. [2006]
The diagram shows the human heart.
Why has the left ventricle got a thicker wall than the right ventricle?



7. [2009]
Label clearly the pulmonary artery with an A, and the pulmonary vein with a V in the diagram of the heart.

8. [2008]
   The diagram shows cross sections of an artery and of a vein.
   Why do arteries have much thicker walls than veins?



9. [2008]
   Give one other structural difference between arteries and veins.

10. [2006]
    What causes a person's pulse?

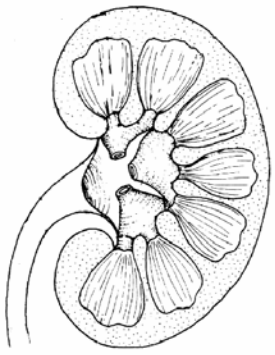
11. [2006]
    The diagram shows a person's pulse rate being taken.
    How is a person's pulse rate measured using this method?

12. [2006]
    An athlete's resting pulse rate is 58. After 10 minutes strenuous exercise their pulse rate was 120. After resting for 5 minutes their pulse rate reduced to 63. Clearly account for the rise and fall in pulse rate experienced by the athlete.

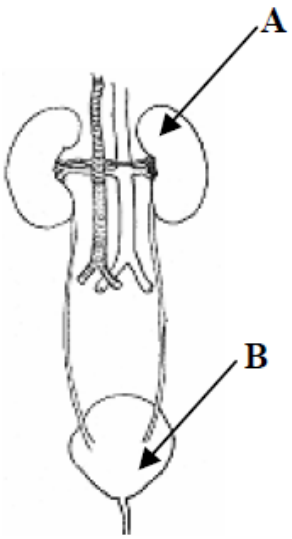
Biology: 7. Excretion
Exam Questions

1. [2007 OL]
Choose the correct part of the human body from the list on the right to complete the following sentence.
The _____ is a human organ of excretion.

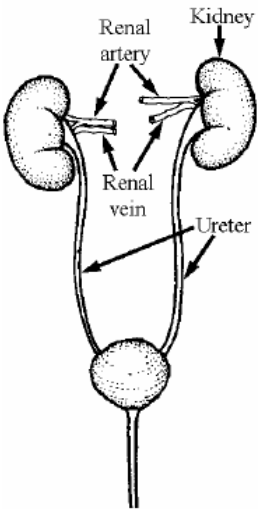
Eye
Joint
Kidney
Muscle



2. [2009]
(i) Name the organ shown in the diagram.
(ii) Give the function of the organ shown.



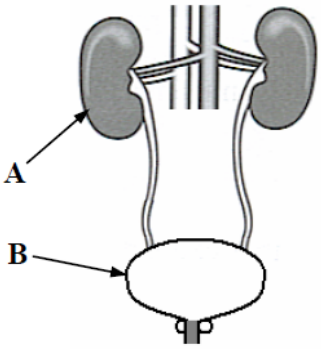
3. [2008 OL]
The diagram shows the human urinary system.
(i) Name the part labelled A in the diagram.
(ii) What is the function of the part labelled B in the diagram?



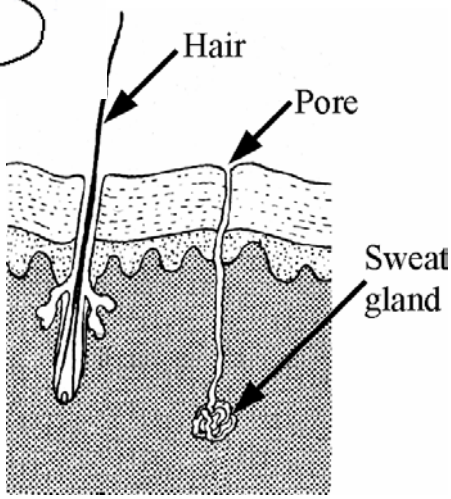
4. [2008]
The diagram shows the human urinary system.
How does the composition of the blood in the renal arteries differ from the composition of the blood in the renal veins? Make reference to waste products in your answer.

5. [2008]
Account for the difference in the composition of the blood entering and leaving the kidneys.

6. [2008]
What is the function of the ureters?

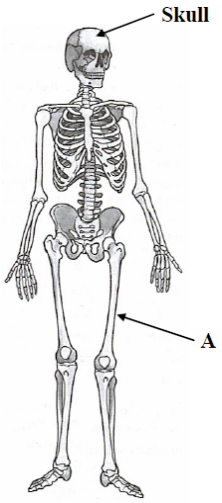


7. [2009 OL]
The diagram shows part of the human urinary system.
Answer the following questions on the urinary system.
(i) Name the parts labelled A and B in the diagram.
(ii) Give one function of part B.
(iii) Name the waste product produced by part A.
(iv) Name one other waste product produced by the human body.



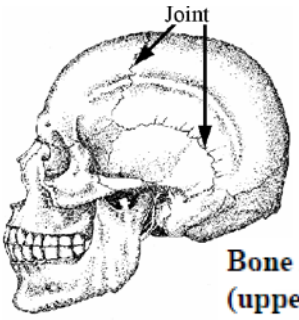
8. [2007]
The diagram shows some of the structures in human skin.
The skin has many functions.
One of them is excretion. Skin excretes sweat.
Name two substances excreted in sweat.

Biology: The Skeleton and Movement

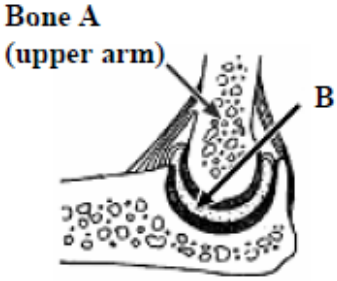


Exam Questions

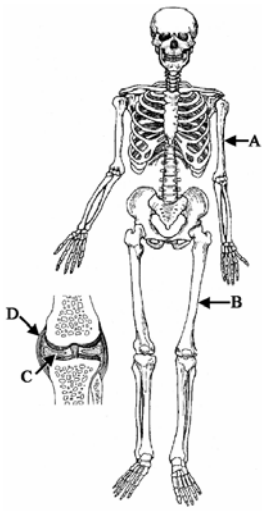
1. [2006 OL]
(i) Name the bone of the human skeleton labelled A in the diagram on the right.
(ii) Name an organ that is protected by the skull.



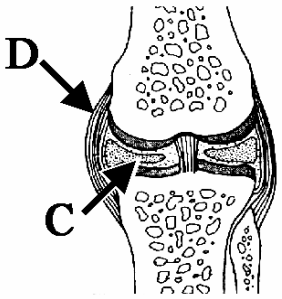
2. [2007]
Different types of joints hold together the bones of our skeleton.
(i) Name the type of joint labelled in the diagram of the human skull.
(ii) How does this type of joint differ from other types of joints found in our bodies?



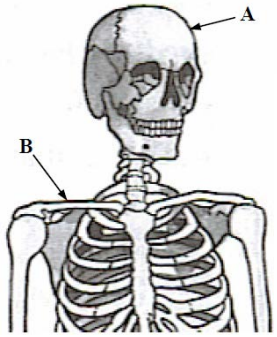
3. [2006]
The diagram shows the structure of an elbow.
(i) Name bone A.
(ii) Identify the type of moveable joint B.



4. [2009]
The diagram shows a detailed drawing of the structure of the knee joint. The kneecap is not shown.
(i) Name the bones labelled A and B.
(ii) What type of joint is the knee?



5. [2009]
C is synovial fluid. D is a ligament.
(i) Give the functions of the parts labelled C and D in the knee.
(ii) Explain the action of antagonistic pairs of muscles in causing the movement of limbs. You may use a labelled diagram in your answer if you wish.



6. [2009 OL]
The diagram shows part of the human skeleton.
Answer the following questions on the human skeleton.
(i) Name the bones of the skeleton labelled A and B in the diagram.
(ii) Give any two functions of the human skeleton.

7. [2007 OL]
(i) In the table below place the letter S beside the name of an organ protected by the skull.
(ii) Write the letter R beside the name of an organ protected by the ribs.

	Brain
	Heart
	Stomach
	Kidney

8. [2008 OL]
One of the functions of the skeleton is to protect the body.
(i) In the table write the letter P beside the organ which is protected by the pelvis.
(ii) In the table write the letter S beside the organ which is protected by the skull.
(iii) In the table write the letter R beside the organ which is protected by the ribs.
(iv) Give one other function of the skeleton, other than protection.

	Lungs
	Brain
	Kidney

9. [2007 OL]
In each case, choose the correct part of the human body from the list on the right to complete the following sentences.

(i) The structure formed where two bones meet is called a _____.

(ii) The tissue that causes movement of joined bones is called _____.

10. Eye
11. Joint
12. Kidney
13. Muscle

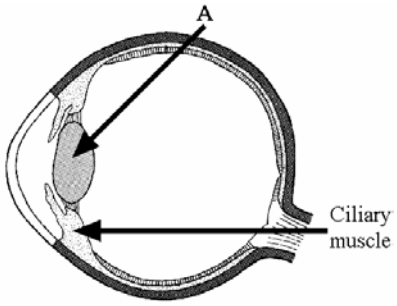
Biology: 9. The Senses and the Nervous System
Exam Questions

1. [2007]
Nerves carry electrical messages around our bodies. Nerves have motor functions and sensory functions.
Explain the underlined terms.

2. [2007 OL]
Choose the correct part of the human body from the list on the right to complete the following sentence.
The _____ detects light.

Eye
Joint
Kidney
Muscle

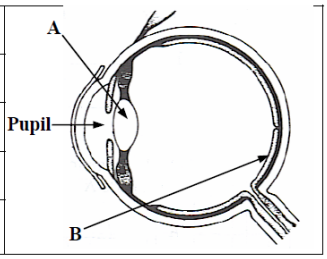
3. [2007]
The diagram is of the human eye.
Name the part labelled A.



4. [2007]
What function has the ciliary muscle?

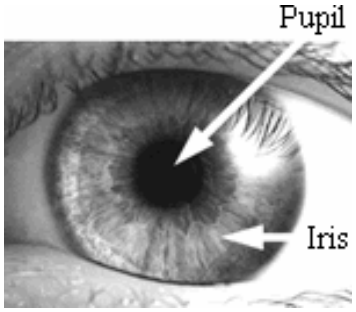
5. [2008 OL]
The diagram shows the human eye. Examine the diagram and answer the questions that follow.
(i) In the table write the letter A beside the name of the part labelled A.
(ii) In the table write the letter B beside the name of the part labelled B.
(iii) In the table write the letter C beside the function of the part labelled A.
(iv) In the table write the letter D beside the function of the pupil.

	Iris
	Retina
	Lens
	Allows light in
	Focuses light



6. [2008]
Give the function of the iris

7. [2008]
Give the function of the pupil.



8. [2008]
The pupil is transparent. Why does the pupil appear to be black in most situations?

9. [2009 OL]
In the table write the letter L beside the name of an organ which detects light.
Write the letter S beside the name of an organ which detects sound.

	Brain
	Eye
	Heart
	Ear

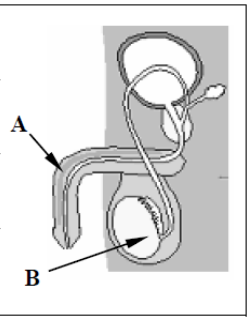
Biology: 10. Human Reproduction

Exam Questions

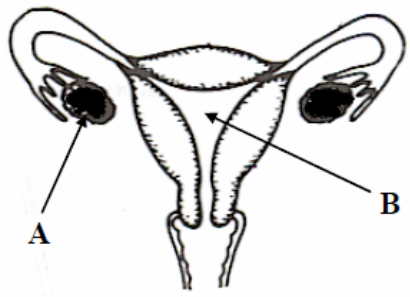
1. [2008]
   Explain the term fertilisation.

2. [2008 OL]
   The diagram shows the male reproductive system.
(i) In the table on the right write the letter A beside the name of the part labelled A.
(ii) Write the letter B beside the name of a substance produced by B.

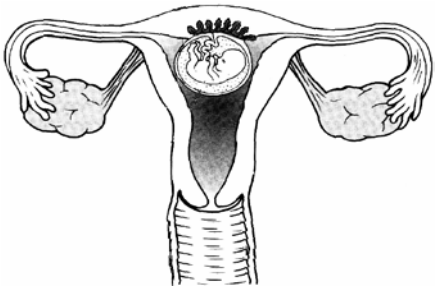
	Egg
	Penis
	Testes
	Sperm



3. [2006 OL]
   Name the parts of the female reproductive system labelled A and B in the diagram on the right.

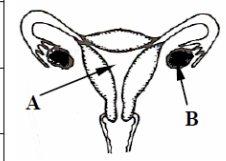


4. [2008]
(i) Mark clearly on the diagram, using an arrow and the label S, where the semen (liquid containing sperm) was released into the female.
(ii) Mark clearly on the diagram, using an arrow and the label F, where fertilization took place.

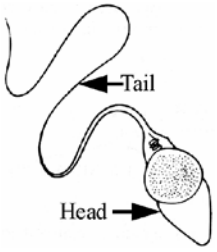


5. [2009 OL]
   The diagram shows the female reproductive system.
(i) In the table write the letter A beside the name of the part labelled A.
(ii) Write the letter B beside the name of the gamete produced by B.

	Egg
	Ovary
	Sperm
	Womb



6. [2009]
   The diagram shows a sperm. The tail enables the sperm to swim.
(i) Why does the sperm need to be able to swim?
(ii) Where does fertilisation occur?



7. [2006]
   What happens in the ovary during the fertile period of the menstrual cycle?

8. [2006]
   What happens to the lining of the uterus during the fertile period of the menstrual cycle?

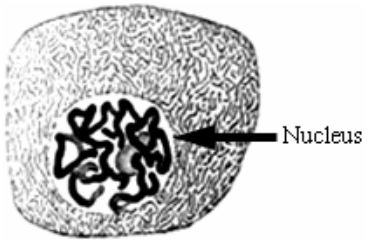
9. [2008]
   State two events that occur in the hours before birth and one event that takes place shortly after the baby is born.

Biology: 11. Genetics

Exam Questions

1. [2007]
(i) Where is DNA located in cells?
(ii) Name a second substance associated with DNA.

2. [2008]
At certain stages in the life of a cell thread-like structures that contain genes can be seen in the nucleus.
(i) What are these thread-like structures called?
(ii) Genes are located on these thread-like structures. Give a role that genes play in life processes.



3. [2006]
Eye colour, hair texture and many other human characteristics are controlled by genes.
(i) Name the structures in the nuclei of our cells where genes are located.
(ii) Name the substance that genes are made of.

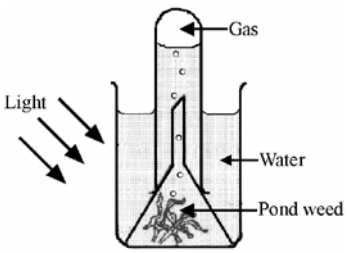
4. [2009 OL]
Inheritable characteristics are controlled by genes.
Write the letter I beside two inheritable characteristics in the table.

	Ability to drive
	Freckled skin
	Tongue rolling
	Ability to knit

Biology: 12. Photosynthesis and Plant Responses - Exam Questions

1. [2009]
   Name two processes that the leaves of green plants carry out.

2. [2007]
   Pondweed is a green plant that lives in water. In the presence of light pondweed undergoes photosynthesis and a gas is produced as one of the products. Name the gas produced.

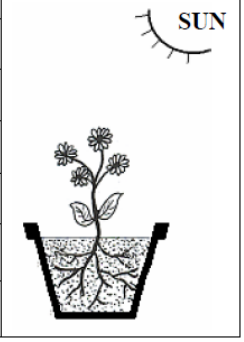


3. [2007]
   Pondweed and all green plants take in and use another gas, from their environment during photosynthesis. Name the gas taken in.

4. [2007]
   How might the rate of production of bubbles, by the pondweed, be increased?

5. [2007 OL]
   The diagram shows a plant that was left in sunlight for a few days.
   A test was carried out in the laboratory on a part of the plant to see if it had made food (starch).
   Answer the following questions using the table.
   (i) Write the letter F beside the name of the process by which plants make food.
   (ii) Write the letter P beside the name of the part of the plant where most of the food (starch) is made.
   (iii) Write the letter C beside the name of the substance which gives plants their green colour.
   (iv) Write the letter S beside the name of the chemical that produced a blue-black colour when it is used to test for starch.

	Chlorophyll
	Flower
	Iodine
	Leaf
	Litmus
	Photosynthesis
	Respiration



6. [2008 OL]
   Plants make their own food using sunlight.
   Choose a word from the list on the right that correctly completes each of the statements below.
   (i) The part of a plant where most food is made is the _____ .
   (ii) The chemical used to test if a plant has made food (starch) is _____ .

Root
Leaf
Iodine
Litmus

7. [2006]
   The plant shown in the diagram was left in total darkness overnight and then exposed to strong sunlight for four hours. The leaf with the foil was removed from the plant and tested for starch.
   Clearly state the result you would expect from this test.
   What conclusion can be drawn?

8. [2009 OL]
   Photosynthesis is a process by which green plants make food (starch).
   Describe an investigation to show that starch is produced by a photosynthesising plant.
   Use the following headings: Equipment, Procedure, Result, Labelled diagram

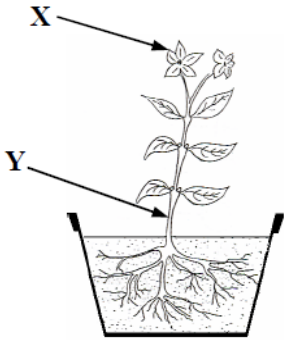
9. [2007 OL]
   How do plants respond to light?

10. [2007 OL]
    Describe, with the help of a labelled diagram, how you could set up an investigation to show how plants respond to light.
    Use the following headings: Equipment: Procedure: Result: Labelled diagram

11. [2009 OL]
    The diagram shows a plant which was left stand inside a window for a long period.
    (i) What caused the plant to grow towards the window?
    (ii) Name this growth response of plants.

Biology: 13. Structure and transport in plants

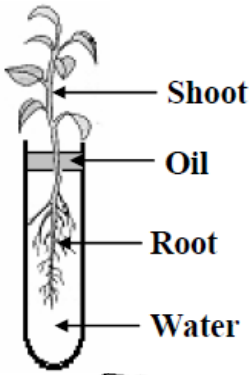
Exam Questions



1. [2008 OL]
   Name the parts of the plant labelled X and Y in the diagram.

2. [2008]
   Phloem and xylem are plant transport tissues.
   Name a substance, other than water, that is transported in (i) phloem and (ii) xylem.

3. [2008 OL]
   Describe, with the help of a labelled diagram, how you would show the path of water upwards through a plant or a part of a plant.
   Use the following headings: Equipment, Procedure, Result.



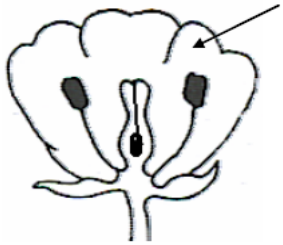
4. [2006 OL]
   The plant in the test tube drawn on the right was allowed stand in the laboratory for a few days to investigate the transport of water in the plant.
   (i) Which part of the plant takes in water?
   (ii) What would you notice about the level of water in the test tube after a few days?
   (iii) Why is it necessary to put oil on the surface of the water in the test tube?

5. [2006]
   Water vapour evaporates from cells in the leaves of plants and exits the leaves by way of tiny pores in their leaves.
   (i) What is this process called?
   (ii) How would you test the drops of liquid inside the plastic bag covering the shoot of the plant shown in the diagram to show that the drops are water?

Biology: 14. Plant Reproduction
Exam Questions

1. [2009]
(i) Name a plant that can reproduce asexually.
(ii) Describe the way the plant that you have named reproduces asexually.

2. [2007 OL]
Name the parts labelled A and B in the diagram of the flower.



3. [2006 OL]
(i) Name the part of the flower labelled A in the diagram.
(ii) Give one reason why insects are attracted to flowers.

4. [2006 OL]
Plants produce a wide variety of seed types which need to be dispersed (scattered) in order to avoid competition.
(i) Identify how the seeds A and B in the diagram are dispersed.
(ii) Name one resource that seeds must compete for with the parent plant.

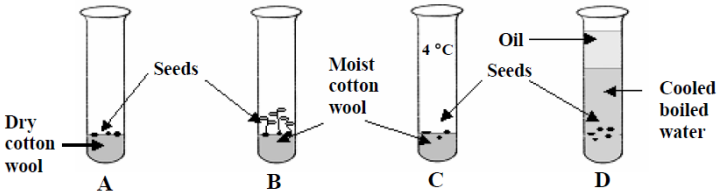
5. [2008 OL]
Seeds are dispersed in different ways.
(i) In the table on the right write the letter W under the seed that is dispersed by wind.
(ii) Write the letter A under the fruit whose seeds are dispersed by animals.

strawberry	dandelion
	

6. [2009]
The child in the photograph is helping a dandelion to disperse its seeds.
(i) Why is seed dispersion important for plants?
(ii) Give a second way, excluding wind, by which plants disperse seeds.

7. [2007]
List three conditions necessary for seeds to germinate.

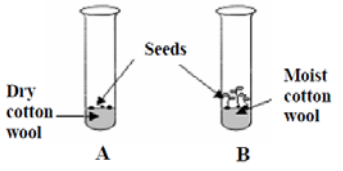
8. [2006 OL]
A number of cress seeds were set up as shown in the diagram and left for a few days to investigate the conditions necessary for germination.
Test tubes A, B and D were kept in the laboratory at room temperature.
Test tube C was placed in the fridge at 4 °C.



(i) Why do only the seeds in test tubes B germinate?
(ii) Why is the water in test tube D boiled before use?
(iii) Explain why the seeds in test tube C failed to germinate.
(iv) Why is this investigation considered to be a "fair test"?

9. [2007 OL]
A number of cress seeds were set up as shown in the diagram and left for a few days at a suitable temperature to investigate one of the conditions necessary for germination.
The seeds in test tube B germinated.
Study the diagram and answer the questions below using the table.

	Air
	Suitable temperature
	Water
	15 °C
	1 °C



(i) Write the letter X in the table beside the condition present in B but not present in A which allowed the seeds in B to germinate.
(ii) At which temperature, 1 °C or 15 °C, would the seeds be most likely to germinate?
Write the letter T in the table beside your choice.

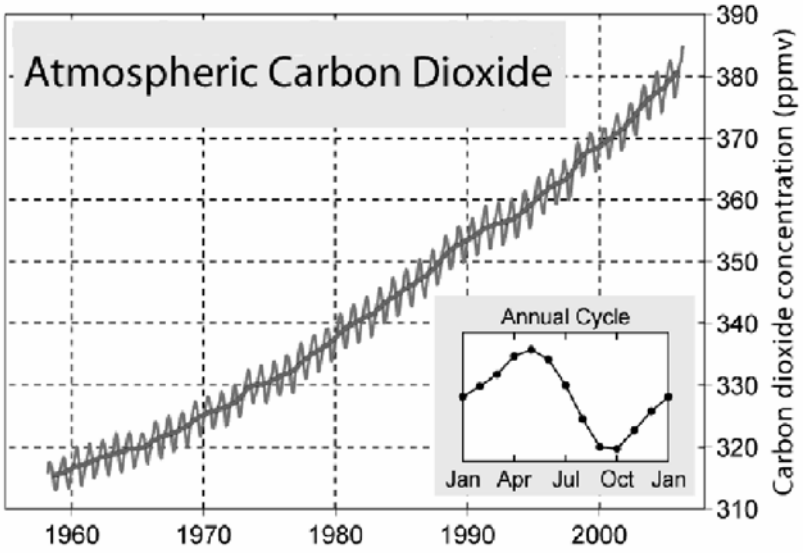
10. [2007]Describe using labelled diagrams an investigation to show that any two of the conditions that you have given are required for seeds to germinate. The investigation must have a suitable control.

Biology: 15. Ecology
Exam Questions

1. [2008]
   The photograph of 'spaceship earth' was taken by a member of the crew of Apollo 17.
   Give two ways in which we can care for our planet.

2. [2006]
   Waste management includes: composting, incineration, landfill and recycling.
   Pick one of the underlined methods of managing waste and say how it works and give one advantage or disadvantage of using the method that you have selected.

3. [2007]
   The increase in carbon dioxide concentration in the Earth's atmosphere is currently causing concern. The use of fossil fuels and deforestation have been identified as major contributors to this increase in carbon dioxide concentration. The graph shows a continual increase in the carbon dioxide concentration for the last fifty years. The data was collected at a site in Europe.



(i) Explain how either the use of fossil fuels or deforestation could have contributed to the increase in atmospheric carbon dioxide.
(ii) Suggest one possible effect of continued increase in carbon dioxide concentration in the Earth's atmosphere.
(iii) Though there is an overall increase in carbon dioxide concentration there is an annual rise and fall in carbon dioxide concentration as shown in the box in the diagram.
Suggest one reason why the carbon dioxide concentration decreases between April and October each year.
(iv) How could the reason that you have given in (iii) be used in a practical way to slow down and even reverse the overall increase in carbon dioxide levels in the atmosphere?

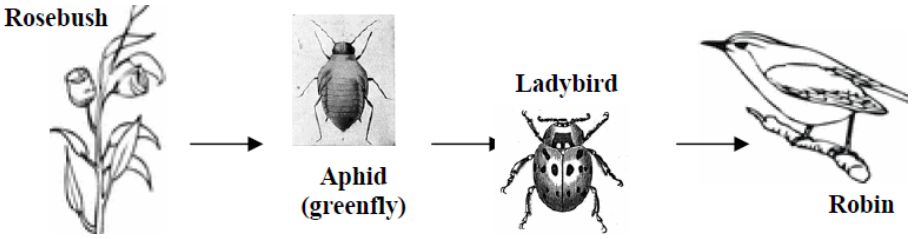
4. [2009]
   Give two reasons why the groups of organisms living together can vary greatly from one part of a habitat to another.

5. [2008]
   The photograph shows Amanita Phalloides, a poisonous fungus, whose common name is 'Death Cap'. Fungi are decomposers.
   Explain the underlined term.

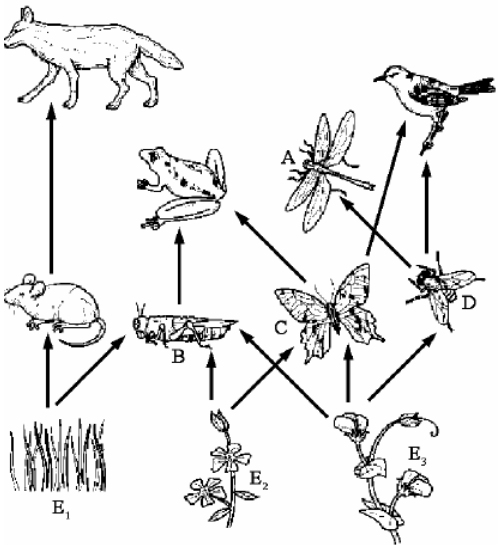
6. [2006]
   Decomposers are living things that release useful materials, from the waste products of plants and animals and from dead plants and animals, for reuse by living organisms. Name two kinds of decomposers found in the soil.

Food Chain / Food Web

7. [2009 OL]
The food chain relates to a garden habitat. Study it and answer the questions that follow.
(i) Name a producer in this food chain.
(ii) Name a consumer in this food chain.
(iii) Explain how the removal of ladybirds would affect the greenfly population in this habitat.

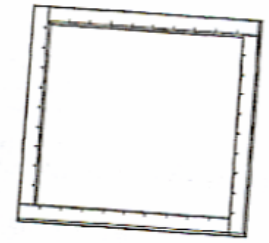


8. [2008]
The diagram shows part of a food web from a mixed habitat with meadows, streams and hedges.
A is a dragonfly, B is a grasshopper, C is a butterfly
D is a house fly, E1, E2 and E3 are plants.
(i) Write down a food chain from the food web shown.
(ii) Select an organism from this habitat or name another organism from a habitat you have studied and state one adaptation that the organism has that makes it suited to its habitat.
(iii) What is meant by competition in a habitat?
(iv) Give an example of interdependence from the food web shown.

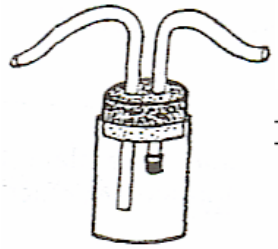


Equipment

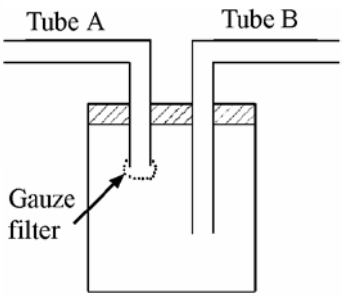
9. [2008 OL]
The piece of equipment drawn on the right is used in ecology.
(i) Name the piece of equipment.
(ii) Give one use for this piece of equipment.



10. [2006 OL]
The piece of equipment drawn on the right is used in ecology.
(i) Name the piece of equipment.
(ii) Give one use of this piece of equipment.



11. [2007]
The diagram shows a pooter. It is used, when studying a habitat to collect small animals e.g. insects, for identification. Describe how to use a pooter.



12. [2009]
The study of a habitat requires the use of sampling instruments, as it is not possible to count every individual organism living there.
The photograph shows a pupil and teacher using a quadrat. The quadrat is placed randomly in a number of sites in the habitat being studied.
(i) How is random sampling achieved when using a quadrat?
(ii) Give two different types of data collected (two different tasks performed) at each site in the habitat when using the quadrat.

13. [2009]
Line transects are also used to sample habitats.
(i) What is a line transect?
(ii) Describe how to sample a habitat using a line transect.

14. [2009]
The photograph shows a pupil with a sweep net.
The sweep net is used to collect small animals e.g. insects from vegetation in a habitat so that they can be identified.

(i) Name a second item of equipment used to collect small animals for identification.

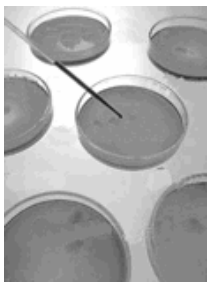
(ii) Draw a labelled diagram, in the box provided, of the item that you have named in (i) above.

(iii) Describe how to use the item that you have named and drawn.

1.

Biology: 16. Micro-organisms
Exam Questions

1. [2009]
One petri dish containing agar was left covered. All of the dishes were kept warm for some days and inspected daily.



(i) What is the function of the agar?
(ii) Why was one petri dish left covered?
(iii) Describe and explain the appearance of the agar in the exposed dishes after some time passed.

2. [2006 OL]
(i) Micro-organisms are used widely in biotechnology. Give one use of biotechnology in industry.
(ii) Micro-organisms can be found growing in a variety of locations.
Describe how the presence of micro-organisms in a sample of soil might be investigated.
Include a diagram of any equipment that might be used.

3. [2007]
The photograph shows a stage in the industrial production of cheese. This is an example of the use of biotechnology in industry.
Give two other examples of the use of biotechnology in industry or medicine.

4. [2008]
The photograph shows Amanita Phalloides, a poisonous fungus, whose common name is 'Death Cap'. Fungi are <u>decomposers</u>.
Explain the underlined term.

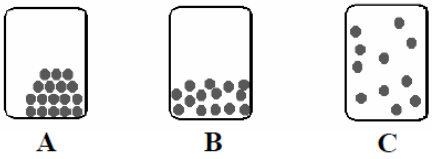
5. [2006]
Decomposers are living things that release useful materials, from the waste products of plants and animals and from dead plants and animals, for reuse by living organisms. Name two kinds of decomposers found in the soil.

6. [2006 OL]
In ecology micro-organisms play a major role in recycling nutrients.
Name one decomposer from a habitat you have studied.

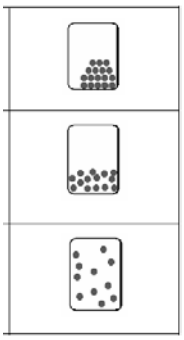
Chemistry: 1. States of Matter

Exam Questions

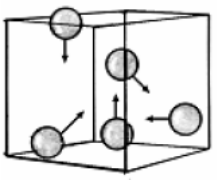
1. [2006 OL]
   The diagrams on the right show the arrangement of particles in a solid, a liquid and a gas.
(i) Which diagram A, B or C shows a gas?
(ii) Name the physical change that takes place when A changes into B.

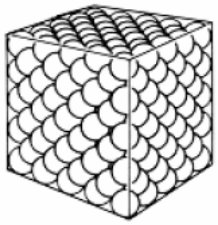


2. [2007 OL]
   The three states of matter are solid, liquid and gas.
   The diagram shows the arrangement of particles in the three states of matter.
(i) In the table write the letter S beside the arrangement of particles in a solid.
(ii) Write the letter G beside the arrangement of particles in a gas.



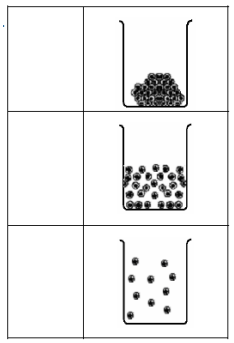
3. [2006]
   Study the diagram carefully. It shows the ways that the particles of gases and solids occupy space.
   The particles of gas have lots of space and move randomly at high speeds in three dimensions and collide with each other and with their container.
   The arrows represent the velocities of the gas particles.
   The particles of a solid are packed closely together and cannot move around but they can vibrate.
   Give one property of a gas and one property of a solid that you have observed and is consistent with (matches) this micro-view of these states of matter.


Particles of a gas


Particles of a solid

4. [2009]
   There are three states of matter: solid, liquid and gas.
(i) Give one property that liquids and gases have in common.
(ii) Give one property in which liquids and gases differ.

5. [2009 OL]
   The three states of matter are solid, liquid and gas.
   The diagram shows the arrangement of particles in the three states of matter.
(i) In the table write the letter L beside the arrangement of particles in a liquid.
(ii) Write the letter G beside the arrangement of particles in a gas.



Chemistry: 2. Elements, Compounds and Mixtures
Exam Questions

1. [2006 OL]
Complete the table below identifying one mixture and one compound from the list on the right.

MIXTURE	COMPOUND

Table Salt
Carbon
Air

2. [2009 OL]
Complete the following sentence using the words from the list on the right.
Water is an example of a _____ and hydrogen is an _____ found in water.

Element
Compound

3. [2007 OL]
Write the name of each of the two elements present in water.

4. [2009 OL]
In each case write the symbol of the metallic element beside its name in the table on the right.

	Aluminium
	Copper

5. [2007]
Marie Curie showed the existence of the element radium and she produced 0.1 g of the compound radium chloride in 1902 by processing tons of pitchblende ore obtained from mines in Bohemia.
Explain the underlined terms.

Exam Solutions

1.

MIXTURE	COMPOUND
Air	Table salt

2. Water is an example of a compound and hydrogen is an element found in water.
3. Hydrogen and oxygen
4.
(i) Al
(ii) Cu
5. Element: An element cannot be broken down into simpler substances.
Compound: A compound is composed of two or more elements chemically combined.

Chemistry: Separating Mixtures

Exam Questions

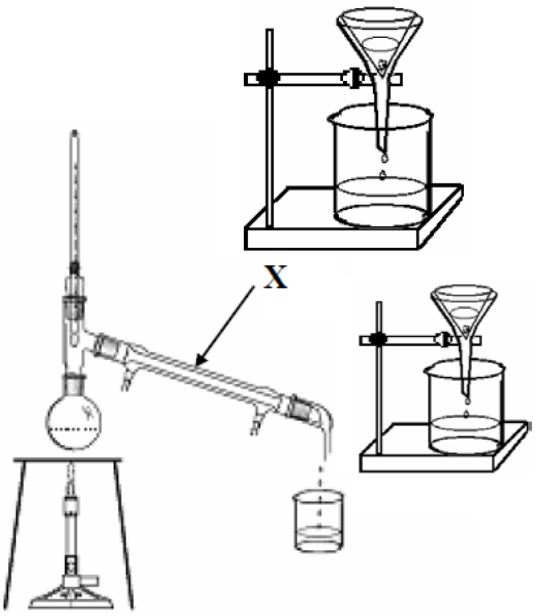
1. [2006]
   How would you show that water contains dissolved solids?

2. [2008 OL]
   Describe, with the aid of a labelled diagram, how you could carry out an experiment to separate soil from a mixture of soil and water.
   Use the headings below.
   Labelled diagram, Equipment, Procedure, Result

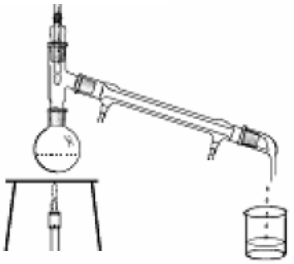
3. [2007 OL]
(i) What is the name given to the separation technique shown in diagram?
(ii) Name two substances which could be separated using this technique.

4. [2009]
   Draw a labelled diagram of an apparatus that could be used to separate an insoluble solid from a liquid.

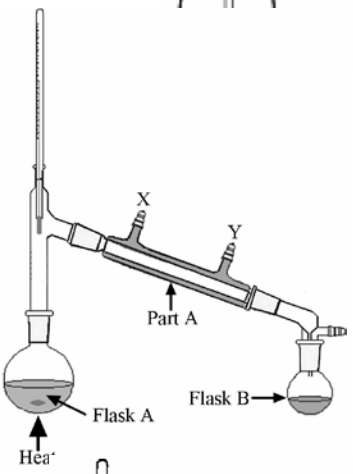
5. [2006 OL]
   Separation techniques are very important in chemistry.
(i) What is the name given to the separation technique shown in the diagram?
(ii) Name two substances which could be separated using this technique?
(iii) Name the part of the apparatus labelled X in the diagram.
(iv) What is the name given to the separation technique shown in the second diagram on the far right?



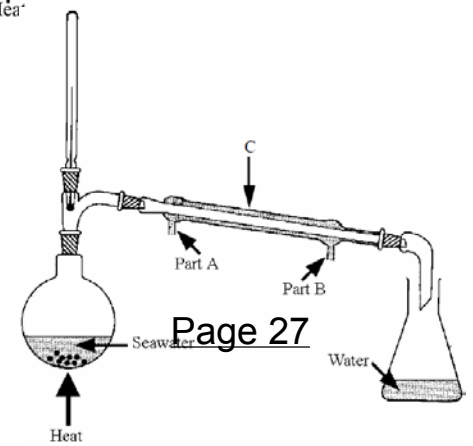
6. [2008 OL]
   Separation techniques are very important in chemistry.
(i) What is the name given to the separation technique shown in the diagram?
(ii) Name two substances which could be separated using this technique.



7. [2007]
   The apparatus shown in the diagram can be used to separate mixtures.
(i) Name part A.
(ii) Which connection, X or Y, is attached to the cold tap?
(iii) Flask A contains seawater. Name the liquid that collects in flask B.
(iv) Name a constituent of seawater that does not move from flask A to flask B.



8. [2009]
(i) Name the separation process shown in the diagram.
(ii) Name the item labelled C in the diagram.
(iii) Identify the part A or B of item C which is connected to the cold tap.
(iv) How could you show that the water collected contains no salt?



9. [2009 OL]
Separation techniques are very important in chemistry. The apparatus in the diagram below was used to separate a mixture of water and a dissolved dye. Study the diagram.

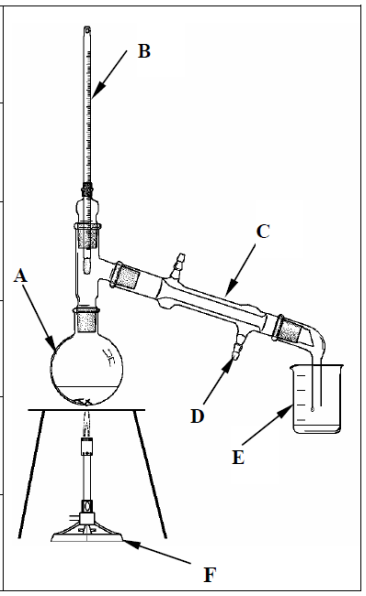
(i) Complete the table correctly matching the labels A – F in the diagram with words/phrases in the table.

(ii) What is the name given to the separation technique shown in the diagram above?

(iii) A colourless liquid was collected in container E during the separation. Name a substance you could use to show that this liquid was water.

(iv) What colour change is observed in this test to show that water is present?

	Bunsen
	Cold water in
	Condenser
	Beaker
	Thermometer
	Round bottomed flask

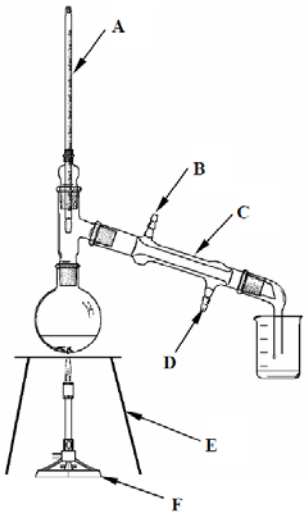


10. [2007 OL]
Separation techniques are very important in chemistry. The apparatus in the diagram was used to separate sea-water. Study the diagram.

(i) Complete the table correctly matching the labels A – F in the diagram with words/phrases in the table.

(ii) What is the name given to the separation technique shown in the diagram?

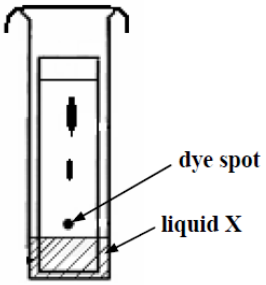
	Bunsen
	Cold water in
	Condenser
	Thermometer
	Tripod stand
	Water out to sink



11. [2008 OL]
A solution of dye can be separated into its constituent colours using the method shown in the diagram.

(i) Identify a liquid X that can be used in this separation.

(ii) What name is given to this type of separation?



12. [2008]

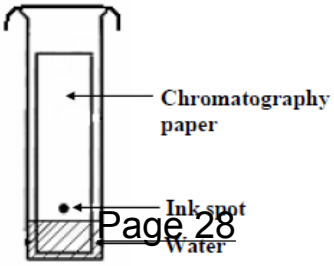
(i) Describe an experiment, using a labelled diagram in the box provided, to investigate the composition of inks in markers containing water-soluble inks, to see if they are a single-colour ink or a mixture of coloured inks.

(ii) On completion of the experiment how is it possible to distinguish between a marker containing a pure single-colour ink and a marker containing mixture of coloured inks.

13. [2006]
A spot of water-soluble ink was put on a piece of chromatography paper and set up as shown in the diagram. The ink used was a mixture of different coloured dyes.

(i) What happens to the ink spot as the water moves up the paper?

(ii) What would happen to a spot of water-soluble ink consisting of a single coloured dye if it were used in the above experiment?



Separating Mixtures

1. Describe briefly with the aid of a diagram how to separate salt from water.

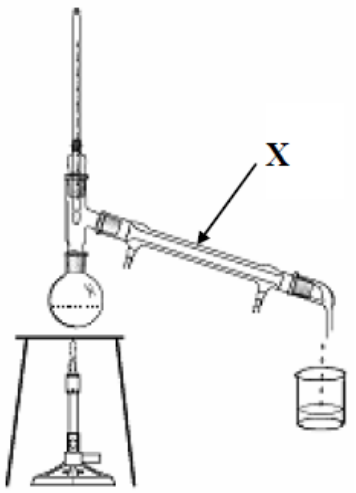
2. Describe briefly with the aid of a diagram how to separate alcohol from water by distillation.

3. Describe briefly with the aid of a diagram how to separate a mixture of inks using paper chromatography.

4. How does filtration work?

5. How does crystallisation work?

6. A student attempts to separate water from a salt water solution using the apparatus shown.



(i) What's left in the round bottomed flask at the end of the experiment?
(ii) Name the part labelled X and explain how it functions.
(iii) Name the method of separation shown in the diagram.
(iv) Identify a mixture that could be separated by using this method.
(v) How does the design of X enable it to carry out its job?

7.
(i) The ink in a biro is an example of a mixture. Explain what is meant by a mixture.
(ii) What technique, in a laboratory, could be used to separate the mixture of pigments in biro ink?

8.
(i) Name the piece of apparatus shown in the diagram.
(ii) Name the separation technique that uses this piece of apparatus.

9. Alcohol and water can be separated by distillation.
(i) What is the difference between the two liquids that allows them to be separated by this technique?
(ii) Which liquid is the distillate?

10.
(i) Give two safety precautions when heating a substance in a test tube.
(ii) Name a solvent and a solute that would dissolve in it.

11. Name a substance, other than water, that forms crystals.
Give one difference between crystalline and non-crystalline solids.

12. Give two methods that a student could use to make dilute copper sulphate solution more concentrated when making copper sulphate crystals.

Chemistry: 4.The Atom

1. [2006 OL]
   Complete the statements below using one of the words from the list on the right in each case.
(i) Protons are _____ charged particles.
(ii) Electrons are _____ charged particles.

Negatively
Positively

2. [2007 OL]
   The sentences below have words omitted.
   Complete the table on the right correctly matching the numbers 1 – 3 with the words in the table.
(i) Neutrons and ____1_____ are located in the nucleus of atoms.
(ii) The ____2_____ move around outside the nucleus of atoms.
(iii) The ____3_____ have no electric charge.

	Electrons
	Neutrons
	Protons

3. [2008 OL]
   Atoms are composed of smaller particles.
   Choose the correct particle from the list on the right to complete each statement below.
(i) The _____ is a particle that has no electric charge.
(ii) The _____ is a particle that has a positive charge.
(iii) The _____ is a particle located outside the nucleus.
(iv) The _____ is a particle that has a relative atomic mass of one unit.

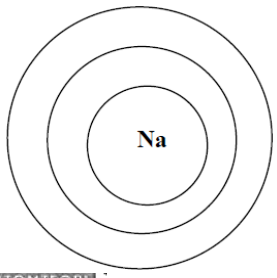
Proton
Neutron
Electron

4. [2009 OL]
   Atoms are composed of tiny particles.
   Choose the correct particles from the list on the right to complete each statement below.
(i) The particles located outside the nucleus are the _____.
(ii) The particles that have no electric charge are the _____.
(iii) The particles that have a positive charge are the _____.
(iv) The particles lost, gained or shared when atoms form bonds are the _____.
(v) Different types of bond can be formed when atoms combine.
(vi) What name is given to the bond that involves an attraction between positive and negative ions?

Protons
Electrons
Neutrons

5. [2008]
   Sir Joseph John Thomson (1856-1940) announced his discovery of the electron in 1897 following extensive experimental work. He was awarded the Nobel Prize in 1906. Compare the charge and the mass of an electron with the charge and the mass of a proton.

6. [2007]
   The diagram represents a sodium atom.
   The circles are electron orbits and the 'Na' represents the nucleus. The atomic number of sodium is 11.
   Using dots or Xs to represent electrons in the orbits give the electronic structure of sodium.



7. [2006]
   Niels Bohr received the Nobel Prize for physics in 1922 for his model of the electronic structure of the atom. Potassium has an atomic number of 19.
   Give the arrangement of the electrons in an atom of potassium.

8. [2009]
   Approximately 98.89% of carbon on the surface of the earth and in the atmosphere is carbon-12. The remaining approximately 1.11% is carbon-13. The numbers 12 and 13 are mass numbers. The atomic number of carbon is 6.
(i) How many neutrons are in the nucleus of a carbon-13 atom?
(ii) Enter the missing word in the following sentence.
   Carbon-12 and carbon-13 are _____ of carbon.

9. [2008]
   Define atomic number.
10. [2006][2008] Define the term 'isotope'.

Chemistry: 5. Solutions and Crystals
Exam Questions

1. [2007]
   Distinguish between a concentrated and a dilute solution?

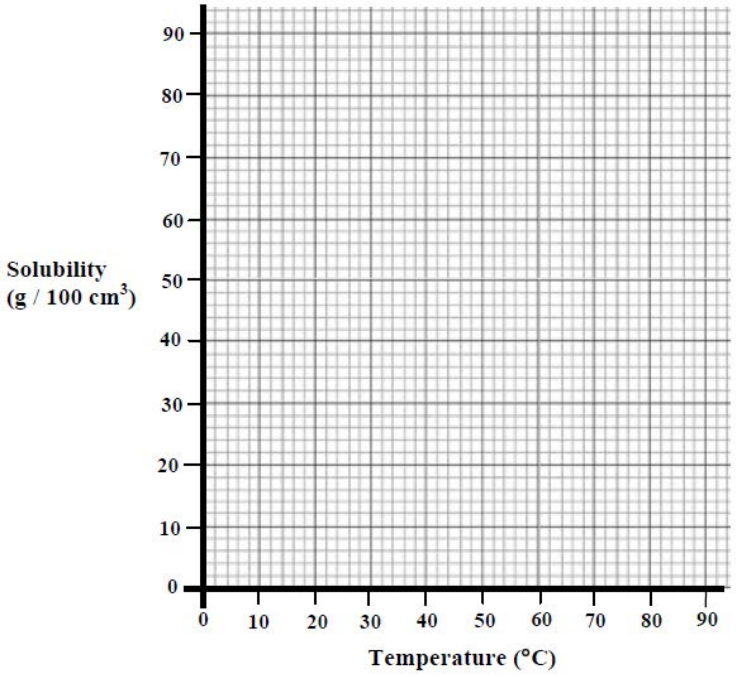
2. [2007]
(i) Name a substance, other than water, that forms crystals.
(ii) Give one difference between crystalline and non-crystalline solids.

3. [2006 OL]
   Describe how you could carry out an experiment to grow crystals using alum or copper sulphate.
   Include a diagram of any equipment used.

4. [2009 OL]
   In a school laboratory, a student investigated the solubility of a salt in water.
   The amount of salt which dissolved in water at different temperatures was measured. The data collected is presented in the table below.

Temperature °C	20	30	40	70	90
Solubility g per 100 cm^3 of water	10	20	30	60	80

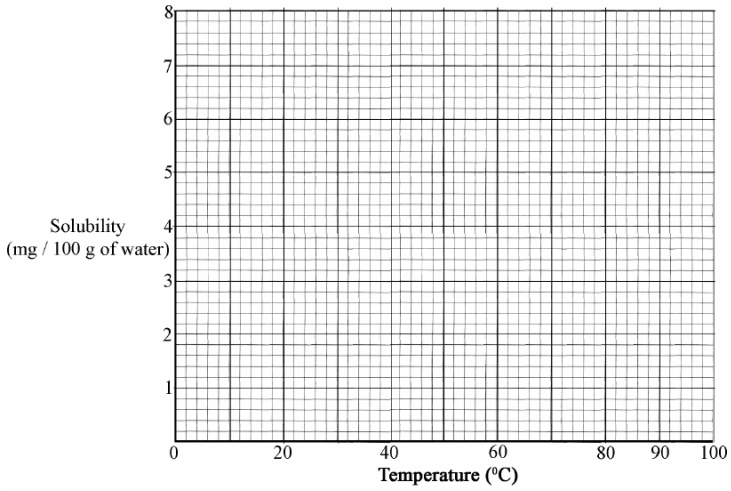
(i) Use this data to draw a graph of solubility (y-axis) against temperature (x-axis) using the grid provided below.
(ii) Use the graph to estimate the solubility at 60 °C.
(iii) What can you conclude about the solubility of the salt in water from the graph?



5. [2007]
A pupil investigated the effect of temperature on the solubility of the salt ammonium chloride in water. She determined the maximum mass, in grams, of the salt that would dissolve in 100 g of water at various temperatures. The data from this experiment are given in the table.

Solubility (g / 100 g water)	29	37	46	55	66	77
Temperature (^{0}C)	0	20	40	60	80	100

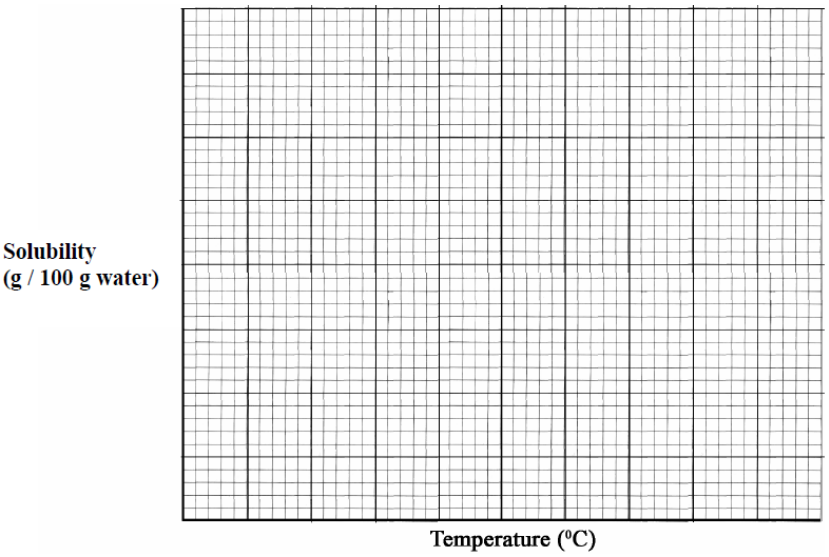
(i) Plot a graph of solubility against temperature.
(ii) Use the graph to estimate the solubility of ammonium chloride at 70 ^{o}C.
(iii) What conclusion about the solubility of ammonium chloride can be drawn from analysis of the graph?



6. [2008]
The limit of solubility (maximum solubility) of oxygen gas (O_2) in water was measured, in mg of oxygen per 100 g of water, at a number of different temperatures. These measurements are given in the table.

Solubility (mg / 100 g water)	7.0	4.3	3.0	2.3	1.4	0.8	0.0
Temperature (^{0}C)	0	20	40	60	80	90	100

(i) Draw a graph of solubility (y-axis) against temperature (x-axis) in the grid provided below.
(ii) Use the graph to estimate the solubility of oxygen at 30 °C.
(iii) What effect has temperature on the solubility of oxygen in water?
(iv) Global warming has many implications. What implication, which could be inferred (concluded) from the information in the graph, might global warming have for animals that live in water e.g. fish?



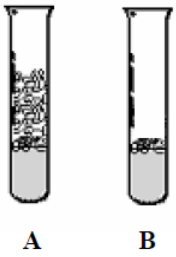
Chemistry: 6. Water
Exam Questions

1. [2006 OL]
Water is essential for life and is composed of two elements.
(i) Name one of the elements that make up water.
(ii) Name a chemical that can be used to test for the presence of water.

	Chlorination
	Fluoridation
	Settling
	Screening

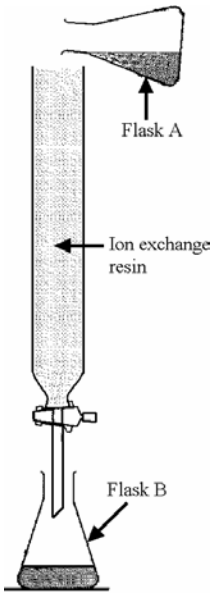
Water Hardness

2. [2008 OL]
The diagram shows an apparatus set up to investigate water hardness.
One test tube has hard water while the other has soft water.
Study the diagram and answer the questions which follow.
(i) Why is it necessary to use the same amount of water in each test tube and to add the same volume of soap solution to each test tube?
(ii) When both tubes were shaken a lather formed in test tube A but not in test tube B.
What does this tell you about the water in test tube A?
(iii) Name an element whose compounds contribute to hardness in water.



3. [2009]
(i) State how to test water to confirm the presence of hardness?
(ii) Name a metallic element some of whose compounds cause hardness in water.
(iii) Give one effect of hard water.

4. [2007]
Flask A contains hard water. Some of this water was poured into the tube containing an ion exchange resin.
The water that passed through the ion exchange resin was collected in flask B.
(i) Describe a test that you could perform on water samples from flask A and from flask B to compare their hardness?
(ii) What result would you expect from this test?
(iii) What causes hardness in water?



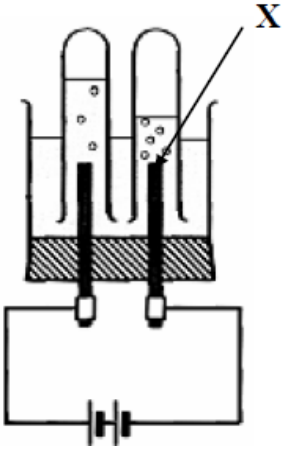
Water Treatment

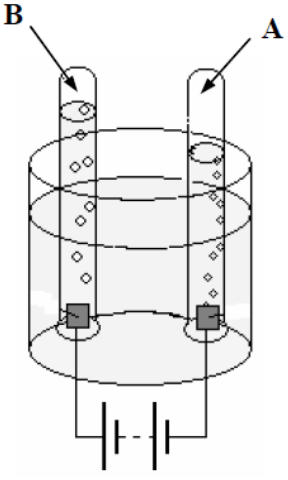
5. [2008 OL]
Water supplied to domestic consumers is treated.
(i) In the table write the letter R beside the name of the treatment used to remove large floating debris from the water.
(ii) In the table write the letter T beside the treatment used to help prevent tooth decay.

6. [2007]
Water supplied to domestic consumers has undergone five or more different processes in a water treatment plant.
Name one of the processes carried out on water in a treatment plant.
Give a reason why the treatment that you have named is carried out.

Electrolysis

7. [2006 OL]
The diagram shows an arrangement of apparatus suitable for the electrolysis of acidified water.
Name the gas produced at the electrode X and state a test for this gas.



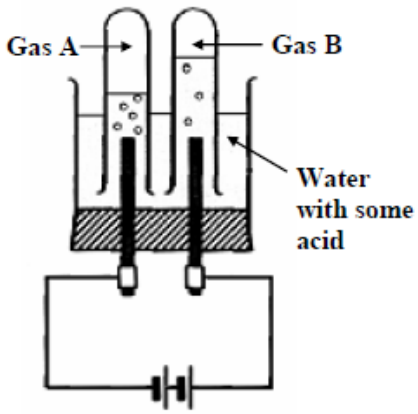


8. [2006]
The diagram shows the electrolysis of water.
(i) Why is some acid added to the water?
(ii) Give a test for gas A.
(iii) The volume of gas A is twice that of gas B.
What does this tell us about the composition of water?

9. [2009 OL]
The apparatus on the right can be used to decompose water by electrolysis. Acid is added to the water to allow an electric current to flow through the water.
Answer the following questions about the electrolysis of water.

(i) Hydrogen gas is collected at A. What test could you carry out in the laboratory to show that this gas is hydrogen?

(ii) Name the gas collected at B.



Chemistry: 7. Ionic and Covalent Bonding
Exam Questions

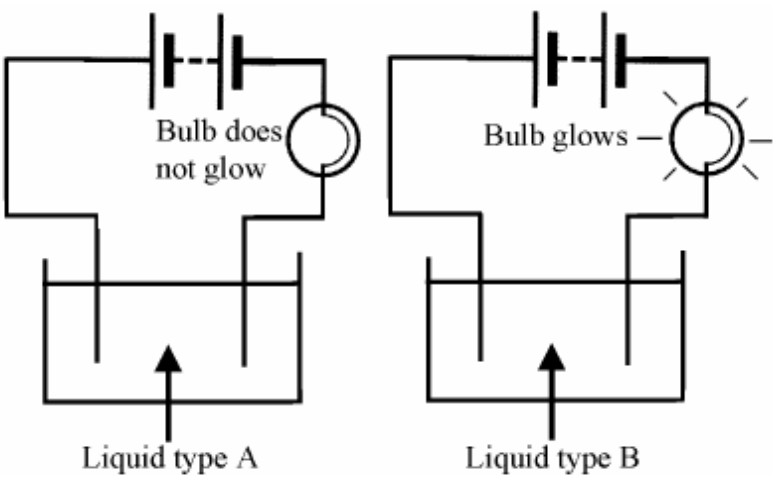
Ionic Bonding

1. [2007 OL]
   Complete the sentence: In _____ bonding positive ions are attracted to negative ions.

2. [2006 OL]
   The bonds in sodium chloride are formed by sodium atoms losing electrons and chlorine atoms gaining electrons.
   Name the type of bond found in a sodium-chloride crystal.

3. [2008]
   Atoms of different elements can form compounds by bonding together.
   What is an ionic bond?

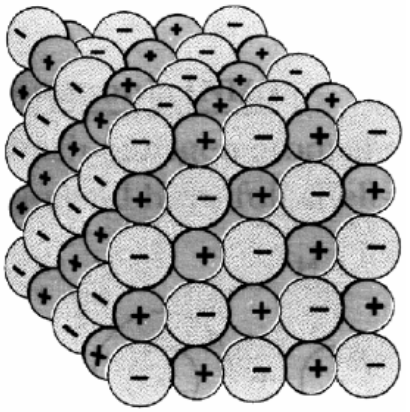
4. [2008]
   A pupil investigated the ability of covalent and ionic substances to conduct electricity. Four substances were selected. One was a liquid. The other three substances were solids and these were dissolved in pure water before testing.
   The apparatus used in the investigation is drawn below. When the liquids were tested the bulb did not glow in some cases (Liquid type A) and the bulb glowed in other cases (Liquid type B).
   The results of the investigation are given in the table.



Liquid	Cooking oil	Table salt	Table sugar	Copper sulphate
Liquid type	A	B	A	B

(i) Name the ionic substances in the table. Give a reason for your answer.
(ii) Three of the substances tested are solid at room temperature. Why were these substances dissolved in water before the investigation?

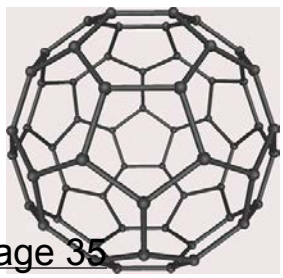
5. [2009]
   The diagram shows sodium ions (+) and chloride ions (-) in part of a crystal of table salt, sodium chloride.
(i) How are sodium ions and chloride ions formed from their atoms?
(ii) What force holds the ions together in sodium chloride?
(iii) Name one other compound that is composed of ions.



Covalent Bonding

6. [2007 OL]
   Complete the sentence: In _____ bonding pairs of electrons are shared.

7. [2007]
   The diagram shows a molecule of C60. It has 60 carbon atoms <u>covalently bonded</u> together.
   This molecule is nick-named the 'Buckey Ball'.
   Explain the underlined term.

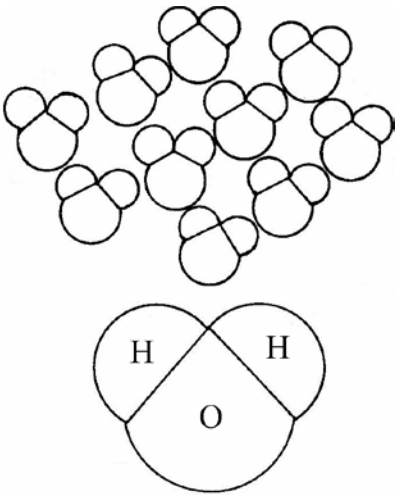


8. [2006 OL]
   The bond in a molecule of hydrogen gas is formed by a shared pair of electrons.

Name the type of bond found in hydrogen gas.

9. [2008]
   Some atoms join together by sharing pairs of electrons. This is called covalent bonding.
   Draw a diagram showing the covalent bonding in a molecule of water.
10. [2009]
    The diagram shows a group of water molecules with one enlarged below with its constituent atoms identified by their atomic symbols. Water molecules are very tiny, one teaspoon of water contains approximately 2×10^{23} molecules.

(i) Name the type of bonding in the water molecule.
(ii) Describe this type of bond.
(iii) Name one other compound with this type of bonding.



Chemistry: 8. The alkali and alkaline earth metals
Exam Questions

1. [2007 OL]
Complete the following sentence below inserting the correct words from the list on the right.
All the known _____ are listed in the _____.

Atoms
Elements
Compounds
Periodic table

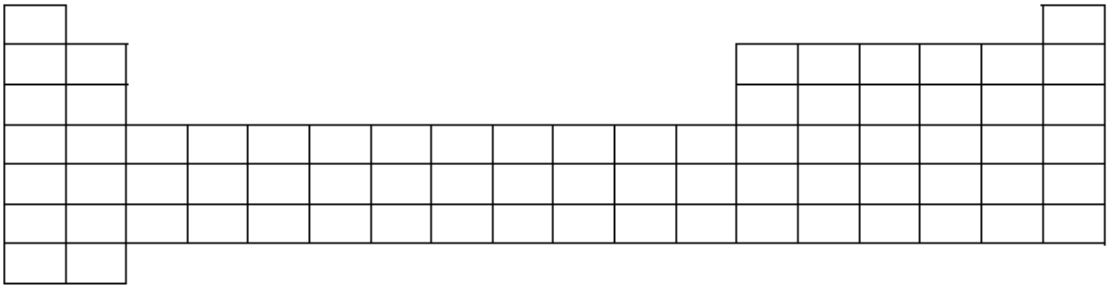
2. [2007]
Give two properties of alkali metals.

3. [2008]
The diagram shows the first twenty elements in their positions in the periodic table. The number given with each element is the atomic number of that element.

1	2										3	4	5	6	7	8/0
^{1}H																^{2}He
^{3}Li	^{4}Be										^{5}B	^{6}C	^{7}N	^{8}O	^{9}F	^{10}Ne
^{11}Na	^{12}Mg										^{13}Al	^{14}Si	^{15}P	^{16}S	^{17}Cl	^{18}Ar
^{19}K	^{20}Ca															

(i) By what name are group two metals known?
(ii) Why are the noble gases, group 8/0, very chemically unreactive?

4. [2006]



(i) Show, clearly using shading and labelling, the location of the alkaline earth metals on the blank periodic table given.
(ii) Name an alkaline earth metal.

Chemistry: 9. Acids and Bases
Exam Questions

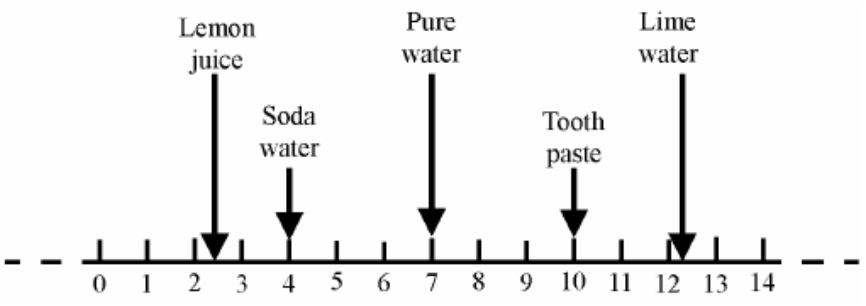
1. [2006 OL] [2008 OL]
Many substances found in the home are acids or bases. Complete the table below identifying one acid and one base from the list on the right.

Acid	Base

Vinegar
Water
Oven Cleaner

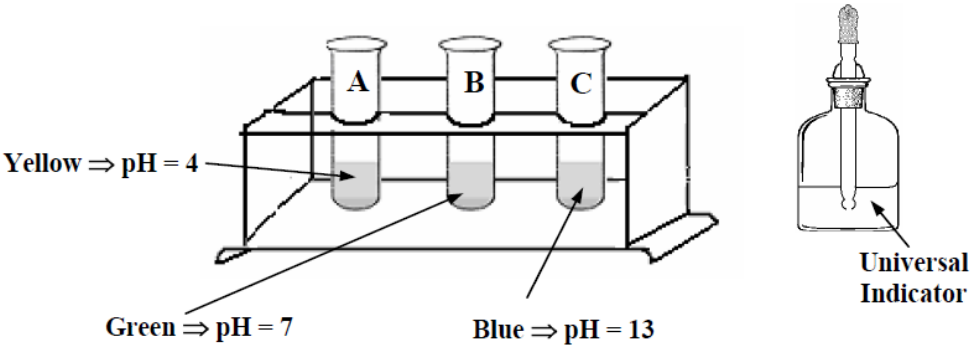
2. [2007]
Name an everyday substance with a pH of less than 7.

3. [2008]
The diagram shows the positions of some common substances on the pH scale.
Classify the substances shown as acidic, basic or neutral.



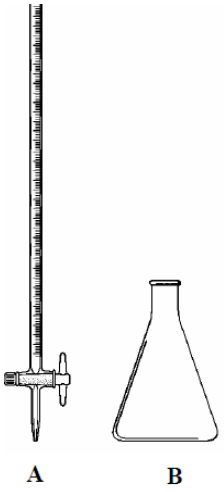
4. [2007 OL][2007]
Describe, with the help of a labelled diagram, how you could investigate simple household substances to see if they were acidic, basic or neutral.
Use the following headings: Equipment and chemicals, Procedure, Result, Labelled diagram

5. [2009 OL]
The diagram shows the apparatus set up by a student to investigate the pH of three different liquids A, B and C.
A few drops of universal indicator were added to each liquid in a test tube.
Study the diagram and the results given. Then answer the questions below.



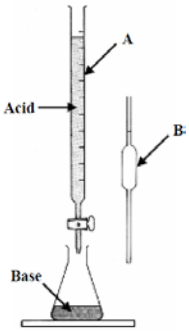
(i) Which test tube, A, B or C, contained distilled water? _____
(ii) Which test tube, A, B or C, contained an acid? _____
Give a reason for your answer.

6. [2006 OL] [2008 OL]
When hydrochloric acid reacts with sodium hydroxide to neutralise each other, a salt and water are formed. Some of the pieces of equipment used in this experiment are shown in the diagram.



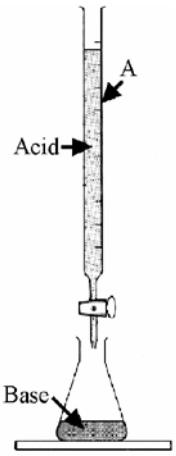
(i) Name the piece of equipment labelled A.
(ii) Name the salt formed when sodium hydroxide is neutralised by hydrochloric acid?
(iii) Which piece of equipment A or B is usually used to measure the hydrochloric acid during this experiment?
(iv) How can you tell by using an indicator that enough hydrochloric acid has been added to neutralise the sodium hydroxide?

7. [2006]
The pieces of laboratory equipment shown, together with some other items, were used to prepare a sample of sodium chloride.



(i) Name item A or item B
(ii) There were 25 cm^3 volumes of base used in this experiment.
Describe how the piece of equipment A was used to measure the volume of acid required to neutralise this amount of base.
(iii) Name a suitable acid and name a suitable base for the preparation of sodium chloride by this method.
(iv) Write a chemical equation for the reaction between the acid and the base that you have named.

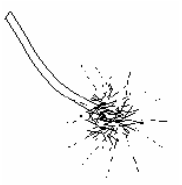
8. [2009]
(i) What is item A used for in the titration of an acid with a base?
(ii) What happens when an acid reacts with a base?



9. [2007]
Give the formula of a common base.

10. [2007]
Alkalis are water-soluble bases. Name a substance, which is alkaline.

11. [2008 OL]
The diagram shows a piece of magnesium being burned in air.
Magnesium oxide is formed.
When magnesium oxide is tested with moist red litmus indicator it changes colour to blue. What does this tell us about magnesium oxide?

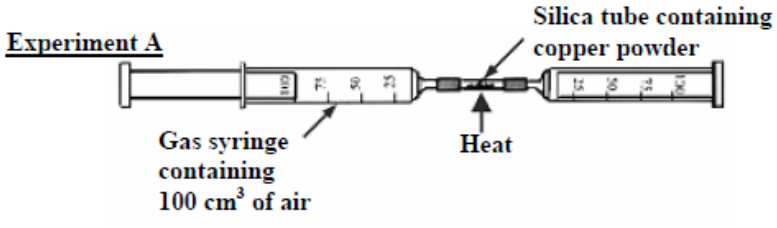


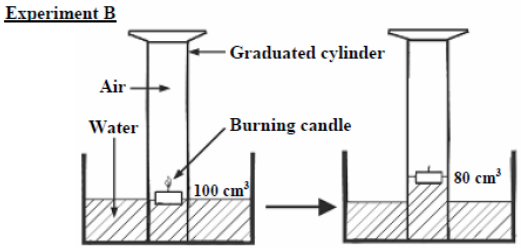
Chemistry: 10. Air and Oxygen

Exam Questions

1. [2008 OL][2009 OL]
   Name any three gases normally found in clean air.

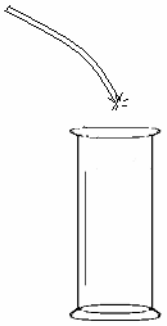
2. [2006]
   The composition of air can be investigated in different ways.
   Two experiments are shown in the diagram.





   In Experiment A the air was pushed repeatedly over the heated copper powder and only 79 cm^3 of gas remained at the end of the experiment.

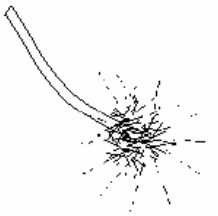
(i) Why is it necessary to let the apparatus cool down before measuring the volume of the remaining gas?
(ii) Why did the volume of gas decrease and then remain steady?
(iii) What is the remaining gas mainly composed of?
(iv) Experiment B is less accurate than Experiment A.
   Give a reason why this is so.



3. [2006 OL]

(i) What happens when a "glowing splint" (very hot piece of wood) is placed in a gas jar of oxygen?
(ii) Give one property of oxygen that this demonstrates.

4. [2008 OL]
   The diagram shows a piece of magnesium being burned in air.
   Magnesium oxide is formed.
   When magnesium oxide is tested with moist red litmus indicator it changes colour to blue.
   What does this tell us about magnesium oxide?

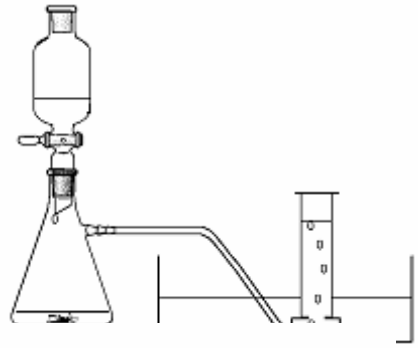


5. [2008]
   Magnesium was burned in oxygen as shown in the diagram.

(i) What colour was the flame?
(ii) Pieces of moist blue and red litmus paper were mixed with the product of the combustion.
   What result was seen?
(iii) What conclusion can be made from the result of the litmus test?

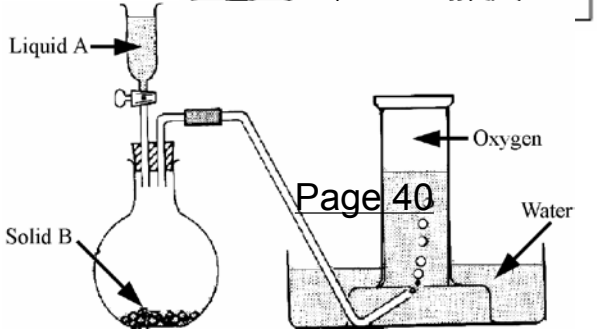
6. [2006]
   In 1774 Joseph Priestley, an English chemist, discovered oxygen.

(i) Name the two chemicals that you reacted together to prepare oxygen in the school laboratory.
(ii) One of the chemicals acted as a catalyst.
   Which one of the two chemicals used was the catalyst?



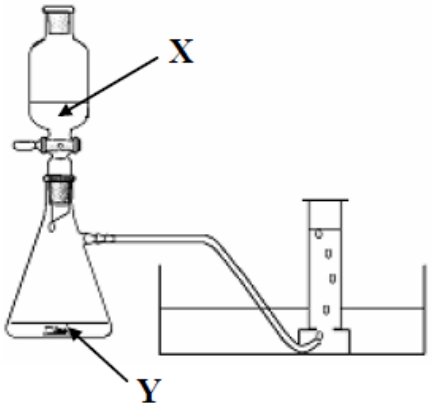
7. [2009]
   Oxygen can be prepared by decomposing liquid A using solid B as a catalyst.
   This preparation is shown in the diagram.

(i) Name liquid A.



(ii) Name solid B.
(iii) What is a catalyst?

8. [2006 OL]
Oxygen gas can be prepared in a school laboratory using the apparatus drawn on the right.



(i) Identify a liquid X and a solid Y that can be used in this preparation.
(ii) Solid Y speeds up the breakdown of liquid X. What name is given to this type of chemical?

Fossil fuels and acid rain

9. [2007 OL]
Fossil fuels are sources of hydrocarbons.
(i) Name one element found in all hydrocarbons.
(ii) The burning of fossil fuels can give rise to acid rain.
Give one harmful effect of acid rain.
(iii) Natural gas is mainly composed of one particular hydrocarbon.
What is the name of this gas?

10. [2006 OL]
(i) Natural gas is mainly methane (CH_4).
Name one of the two elements found in methane.
(ii) Name one gas produced when methane is burned in air.

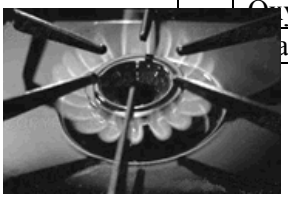
11. [2008 OL]
(i) Choose two fossil fuels from the list on the right.
(ii) Name two products formed when a fossil fuel is burned in air.

Coal
Nuclear
Oil
Tidal

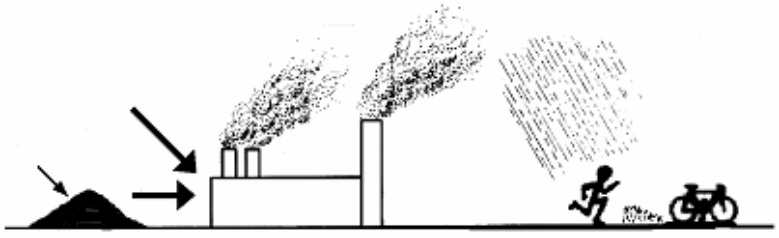
12. [2009 OL]
(i) Write the letter F beside the name of a fossil fuel in the table.
(ii) Write the letter P beside a product formed when a fossil fuel is burned.

	Coal
	Nuclear
	Oxygen
	ater

13. [2008]
(i) Natural gas is a fossil fuel. What is a fossil fuel?
(ii) Name the main constituent of natural gas.



14. [2006]
(i) Fossil fuels are burnt to provide energy to generate electricity.
Give the name or formula of a compound of sulfur formed when a sulphur containing fossil fuel burns in air.
(ii) Acid rain is formed when this sulfur compound dissolves in and reacts with water in the atmosphere.
Describe the effect of acid rain on limestone.



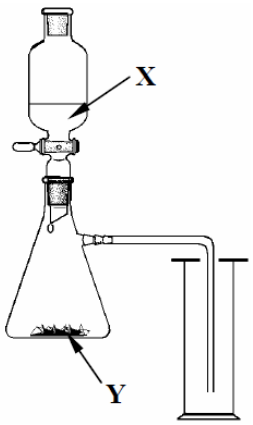
15. [2009]
The photograph shows the emissions from a coal burning electricity generating station.
Name a pollutant present in the emissions and describe its effect on the environment.

16. [2006]
In Ireland 90% of electricity is generated by burning fossil fuels compared to other European countries who have an average of 50% use of fossil fuels and a 30% use of fossil fuels in the USA.
List two disadvantages, excluding acid rain, of this heavy reliance on fossil fuels for the production of electricity.

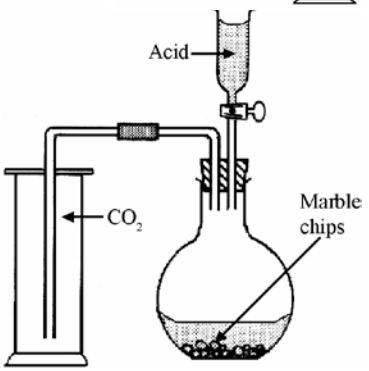
Chemistry: 11. Carbon Dioxide
Exam Questions

1. [2007]
   Give the chemical name for marble.

2. [2009 OL] [2007 OL]
   The diagram shows an arrangement of apparatus suitable for the preparation of carbon dioxide gas in a school laboratory.
   Name suitable substances X and Y from which carbon dioxide can be made.

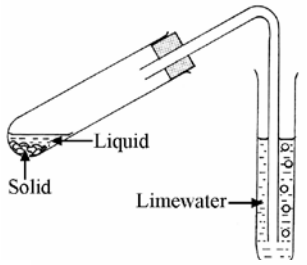


3. [2007]
(i) The diagram shows an apparatus that can be used for the preparation and collection of carbon dioxide.
   Give the formula of a suitable acid.
(ii) What physical property of carbon dioxide allows the gas to be collected in the manner shown in the diagram?

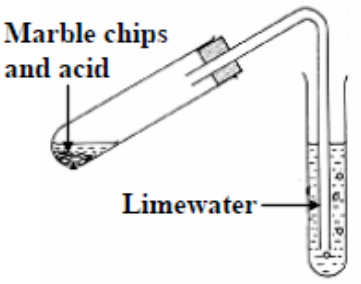


4. [2006 OL]
   Name the chemical that turns milky white if carbon dioxide is bubbled through it.

5. [2008]
   The liquid and solid shown in the diagram react together to produce a gas that turns limewater milky. Name a liquid and a solid that react together in this way.

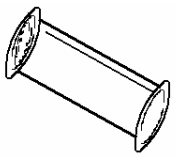


6. [2006]
   Carbon dioxide turns limewater milky.
   Complete the chemical equation for the reaction of carbon dioxide with limewater.
   $Ca(OH)_2 + CO_2 \rightarrow$



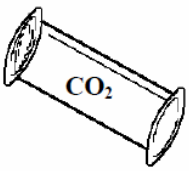
7. [2007]
   If a strip of moist blue litmus paper and a strip of moist red litmus paper are put into a jar of carbon dioxide what effect, if any, does the gas have on them?

8. [2009]
   Carbon was burned in oxygen and the products tested with pieces of moist red and blue litmus paper.
   Give the result of the litmus test described above and make a conclusion based on this result.



9. [2006 OL]
   The diagram shows a gas jar of carbon dioxide gas being poured onto a lighting candle.
(i) What happens to the lighting candle when the carbon dioxide gas is poured over it?
(ii) What does this tell us about carbon dioxide gas?

10. [2007 OL]
    The diagram shows a gas jar of carbon dioxide gas being poured onto a lighting candle. The candle quenches (goes out). This test demonstrates two properties of carbon dioxide gas.
    State these two properties.



11. [2007][2009]
    Give two uses of carbon dioxide.

Chemistry: 12. Metals and Non-metals

Exam Questions

1. [2008 OL]
Solids can be metals or non-metals.
Identify two non-metals from the elements whose symbols are shown on the right.

Cu **S**

N **Ag**

2. [2008 OL]
Metals have certain characteristics.
In the table, write M beside each of two characteristics of metals.

	Dull
	Can be stretched
	Shiny

3. [2009]
Metals are malleable and ductile. Explain the underlined terms.

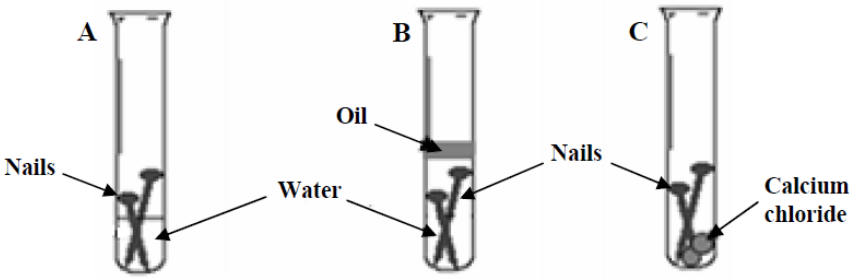
4. [2009]
The photograph shows a statue that was cast in the alloy bronze.
(i) What is an alloy?
(ii) Name an alloy, other than bronze, and give one use for it.

5. [2007 OL]
In the table on the right write the letter A beside the name of each of the two alloys listed.

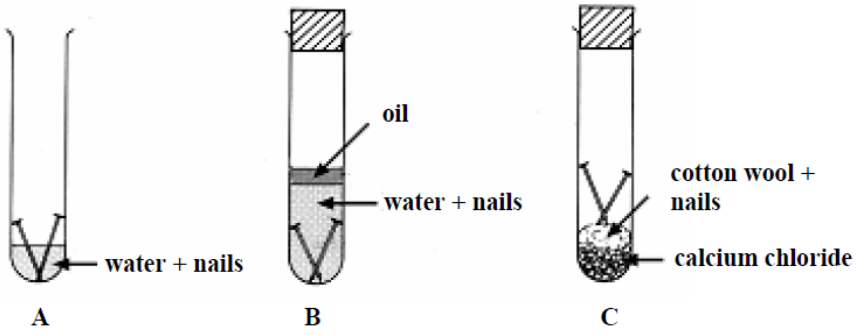
	Aluminium
	Brass
	Diamond
	Iron
	solder

Corrosion

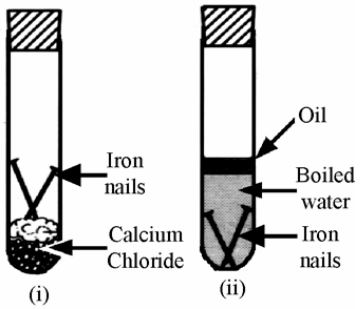
6. [2006 OL] [2007 OL]
The diagram shows three experiments which were set up to investigate rusting.
Study the diagram and answer the questions below.
(i) In which test tube A, B, or C will the nail rust?
(ii) Why is the water in test-tube B boiled and cooled and then covered with a layer of oil?
(iii) What is the function of the calcium chloride in test tube C?



7. [2008 OL]
The diagram shows an apparatus set up by a student to investigate the rusting of iron nails.
Study the diagram and answer the questions that follow.
(i) Why did the nails in test tube A rust?
(ii) Why did the nails in B not rust?
(iii) Name one method that can be used to prevent the rusting of iron.



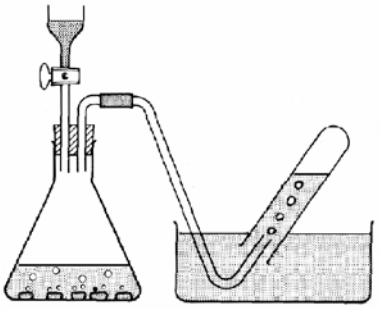
8. [2006]
Oxygen and water together are necessary for the corrosion of iron or steel.
Describe, with the aid of labelled diagrams, experiments to show that:
(i) Oxygen alone, will not lead to the corrosion of iron (or steel)
(ii) Water alone will not lead to the corrosion of iron (or steel).



9. [2006]
The millennium spire, in Dublin, is made from steel.
Iron and steel show visible signs of corrosion.
Give one visible sign of corrosion.

10. [2008]
(i) Name a method of treating iron that helps prevent rusting.
(ii) How does the method that you have named work?

The activity Series

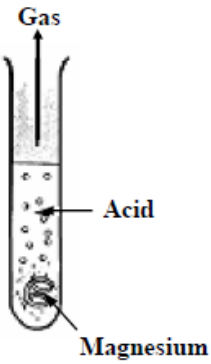


11. [2009]
The apparatus shown in the diagram was used to investigate the reaction of zinc with hydrochloric acid.
Hydrogen gas is produced.
(i) Describe a test for hydrogen.
(ii) Write a chemical equation for the reaction of zinc with hydrochloric acid.

12. [2008]
The following metals were reacted with dilute acid: copper, magnesium, calcium and zinc.
The reactivity of each metal was noted. List these metals in order of decreasing reactivity.

13. [2006]
List the four metals in order of reactivity with the acid, starting with the most reactive.

14. [2006]
Reactivity tests were carried out on calcium, copper, magnesium and zinc in four test tubes containing an acid.
The test carried out using magnesium is shown.
State one thing you would do to make the tests fair.



Chemistry: 13. Plastics
Exam Questions

1. [2006 OL][2007 OL][2009 OL][2007]
   The picture shows a plastic crate.
   Name the raw material used in the making of plastics.

2. [2006 OL][2007]
   Most plastics are non-biodegradable. Explain what is meant by the term non-biodegradable.

3. [2009 OL]
   Plastics can be non-biodegradable i.e. they do not decompose.
   Give one reason why this affects the environment.

4. [2007 OL]
   Plastics are widely used to make bottles, lunchboxes etc.
   Give one reason why plastics are suitable for the uses above.

5. [2006]
   Different plastics have different properties.
   The dust pan and brush set shown is made from two different plastics.
   The bristles are made of type A and the other parts are made of type B plastic.
   Give one property of type A and one property of type B plastic that that make them suitable for their use in this product.

Physics: 1. Measurement, equipment and units
Exam Solutions

1. $6 \times 4 = 24$ cm^2
2.
(i) Graduated cylinder
(ii) To find volume of liquids / measure (amount of) liquids
3.
(i) Item shown: Graduated cylinder
(ii) Second item: burette/ pipette
4.
(i) Graduated cylinder
(ii) $90 - 75 = 15$ cm^3
(iii) 15 cm^3
5. Thermometer; it is used to measure temperature
6.
(i) Tripod
(ii) To hold (support) objects (when heating)
7.
(i) Wearing goggles/ looking through wall (side) of test tube/ tube in holder/ apparatus in centre of bench
(ii) Point tube away/ add boiling chips to a liquid/ use small amounts/ lab coat/ heat gently/ screen/ gloves/ tie hair back…
8. Bunsen burner/ tripod/ pipe clay triangle/ crucible/ tubing/ evaporating dish

Physics: 2. Density

Mass, Volume and Density: Exam questions

1. [2008 OL]

(i) Complete the equation in the box below using the words on the right.
Density =

MASS
VOLUME

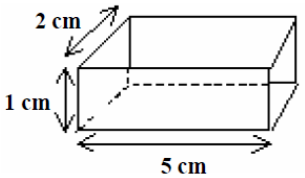
(ii) If the mass of a stone is 20 g and the volume of the stone is 10 cm^3, find the density of the stone.

2. [2007 OL]

A block of metal has the measurements shown on the right.
The mass of the metal block is 21 g.

(i) Write the letter V beside the value of the volume of the block.
(ii) Write the letter D beside the value of the density of the block.

	8 cm^3
	10 cm^3
	2.1 g cm^{-3}
	210 g cm^{-3}

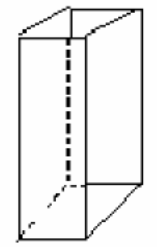


3. [2009 OL]

The mass of a metal block is 14.7 g. It has a volume of 7 cm^3.

(i) Name the instrument you would use in the laboratory to find the mass of the block.
(ii) Write the letter D beside the value of of the density of the block.
(iii) Write the letter U beside the unit used to measure the density.

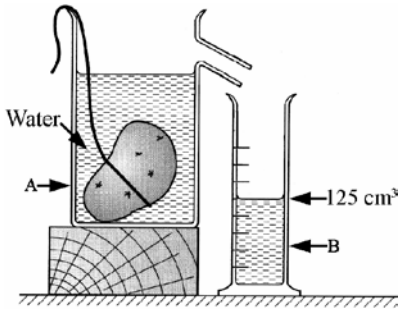
	2.1
	102.9
	cm^3
	g/cm^3



4. [2009]

A pupil measured the volume of a potato using the items of laboratory equipment, labelled A and B as shown in the diagram.

(i) Name the items labelled A and B.
(ii) The potato had mass 175 g and volume 125 cm^3.
Calculate the density of the potato.
Give the units of density with your answer.
(iii) Why did the potato sink in the water?



5. [2007]

Ice floats on water but ice sinks in ethanol (an alcohol).
Use this information to compare the *density* of *ice* with

(i) the *density* of *water*;
(ii) the *density* of *ethanol*.

Physics: 3. Velocity & Acceleration

Exam Questions

1. **[2009]**
   Define velocity.

2. **[2007 OL]**
   The speed of a car is 15 m s^{-1}.
(i) In the table write the letter D beside the distance the car will travel in 5 seconds.
(ii) Write the letter F beside the word that describes what happens when the speed of a car increases.

	3 m
	75 m
	Acceleration
	Force

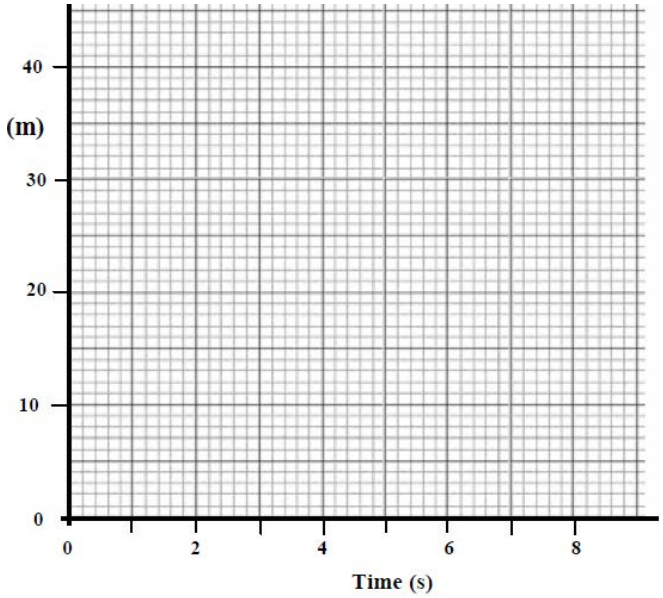
3. **[2009 OL]**
(i) A cyclist moves 20 metres along a track in 4 seconds.
In the table write the letter S beside the speed of the cyclist.
(ii) Write the letter D beside the distance the cyclist will travel in 2 seconds.

	5 m/s
	80 m/s
	10 m
	40 m

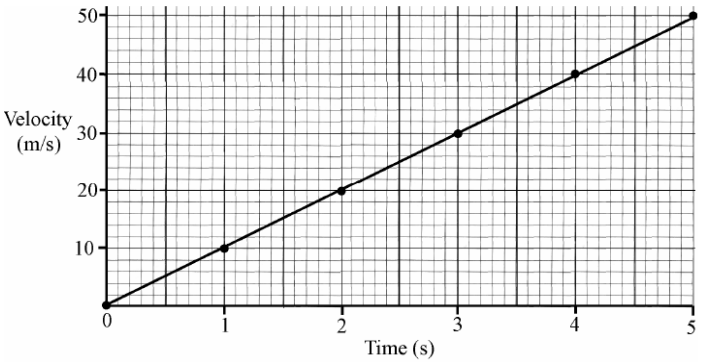
4. **[2008 OL]**
   A cyclist moved along a track.
   The distance travelled by the cyclist was measured every 2 seconds.
   The data collected is presented in the table below.

Distance travelled (m)	0	10	20	30	40
Time (s)	0	2	4	6	8

(i) Use this data to draw a graph of distance travelled (y-axis) against time (x-axis) using the grid provided below.
(ii) Use the graph to estimate the distance travelled by the cyclist in 5 seconds.
(iii) Calculate the speed of the cyclist in m s^{-1} (m/s).



[2009]
A stone was dropped from the top of a tall cliff. The stones approximate velocity was measured each second as it fell. The data collected during this experiment is given in the graph.
Use data from the graph to estimate the acceleration of the stone as it fell. Give the units of acceleration with your answer.



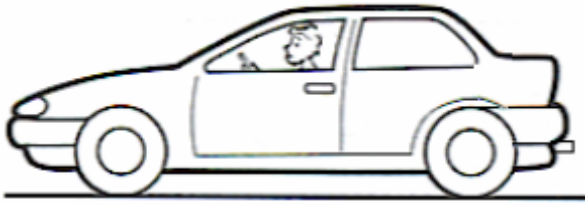
Physics: 4. Force

Exam questions

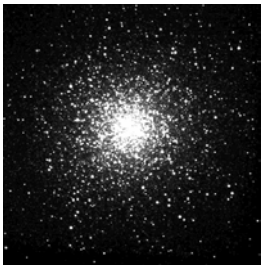
1. [2007 OL]
   Different units are used to measure different physical quantities.
(i) In the table on the right write the letter L beside the unit of length.
(ii) Write the letter W beside the unit of weight.

	Metre
	Newton
	Joule

2. [2009 OL]
   Friction can be useful when driving a car.
(i) Name one way in which friction is useful when driving a car.
(ii) Name one possible way to reduce friction.



3. [2006 OL]
   Friction is an example of a force.
(i) Give another example of a force.
(ii) Give one way to reduce friction.
(iii) After what scientist is the unit of force named?



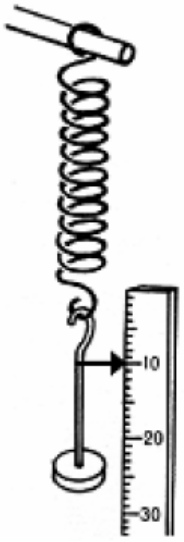
4. [2008]
   The globular cluster shown is a group of stars (like a small galaxy).
   Gravity is the force that holds the stars together in this formation.
   Give two effects that gravity has on your everyday life.

5. [2009]
(i) A stone was dropped from the top of a tall cliff. Name the force that causes the stone to fall downwards.
(ii) The stone had a mass of 2 kg. What was the weight of the stone on earth? Give the unit.

6. [2006]
   A pupil measured the *weight* of an apple of *mass* 0.2 kg using a spring balance and got a reading of 2 N. Distinguish between *weight* and *mass*.

7. [2006]
   State Hooke's law. {This isn't on the syllabus and shouldn't have got asked, so presumably won't appear again – but you never know}
   Robert Hooke (1635-1703) made a number of discoveries including the effect of force on elastic bodies now known as Hooke's law.

8. [2006 OL]
A student carried out an investigation to examine the relationship between the extension (increase in length) of a spring and the force applied to it.
The diagram shows the apparatus used.
The table shows the data collected by the student.

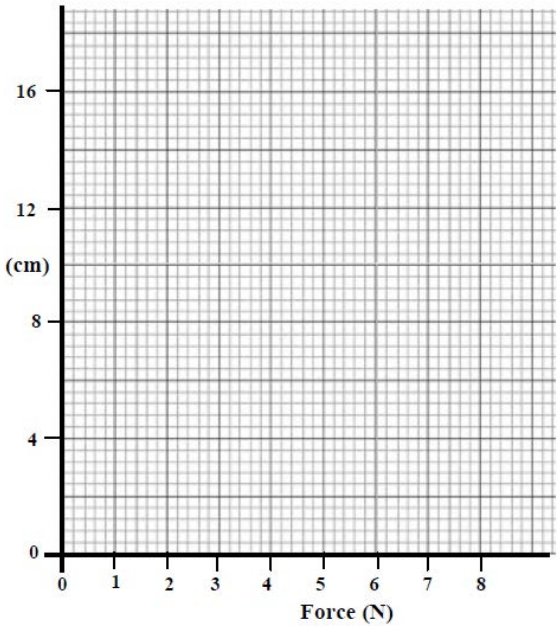


Force (N)	0	2	4	6	8
Extension (cm)	0	4	8	12	16

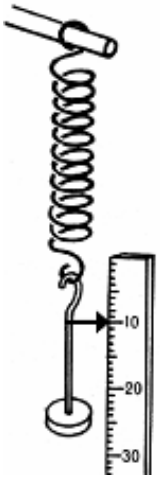
(i) Describe how the student could have taken any one of these measurements.

(ii) Draw a graph of the extension (y-axis) against the force in the grid provided on the right.

(iii) What force results in a 6 cm extension of the spring?



9. 2006]
A student was given a box of identical springs and asked to analyse them so that they could be used as newton meters. The student performed an experiment, using the apparatus shown in the diagram, on one of the springs.
In the experiment the student measured the increase in length of the spring caused by a number of weights. The spring was tested to destruction (that is weights were added until the spring was damaged).
The data from the experiment is given in the table.

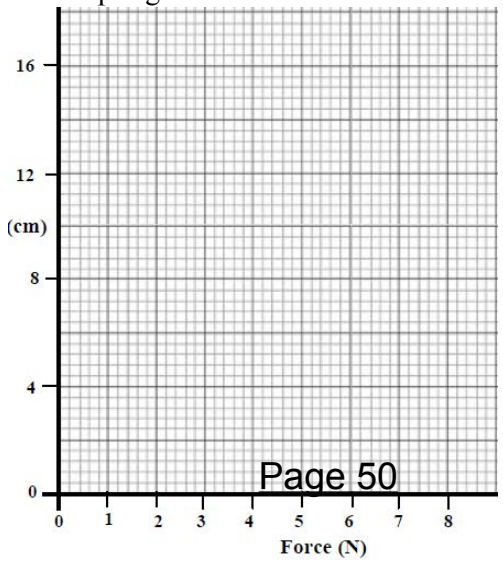


Weight (N)	0.0	0.4	0.8	1.2	1.6	2.0	2.4
Extension (cm)	0.0	2.0	4.0	6.0	8.0	8.5	8.6

(i) Plot a *graph of extension* (increase in length – y-axis) *against weight* (*x*-axis) in the grid provided.

(ii) Use the graph to find the *weight* that would produce an *extension* of 5 cm in the spring.

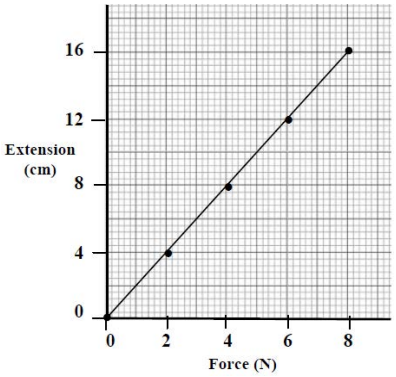
(iii) Study your graph carefully.
The spring obeys Hooke's law for the earlier extensions and then when the spring becomes damaged it does not appear to do so.
Estimate, from your graph, *the weight after the addition of which the law seems no longer to apply.*



10. [2009 OL]
A student investigated the relationship between the extension of a spring and the force applied to it.
The equipment shown in the diagram was used.
The data collected is shown in the table.

Force (N)	0	2	4	6	1	8
Extension (cm)	0	4	8	12	2	16

The student then drew the graph shown below.



Answer the questions that follow about this investigation.

(i) Name an instrument used to measure the force in this investigation.

(ii) Describe how the student could have measured the extension of the spring.

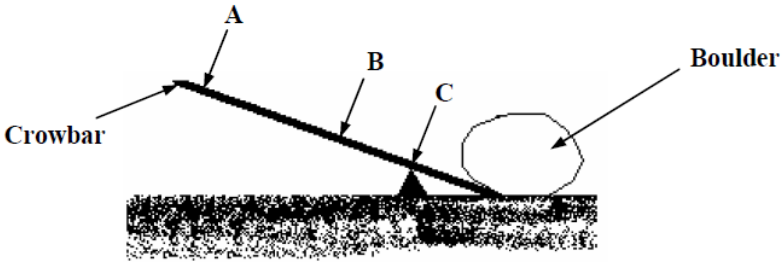
(iii) What conclusion would you draw from this investigation?

Physics: 5. Moments

Exam Questions

1. [2007]
   Give an everyday example of an application of the lever, using a labelled diagram, showing the fulcrum and at least one force acting on the lever.

2. [2008 OL]
   The crowbar in the diagram acts as a lever and applies a turning force on the boulder (large rock).
   Answer the questions which follow with reference to the points A, B and C in the diagram.



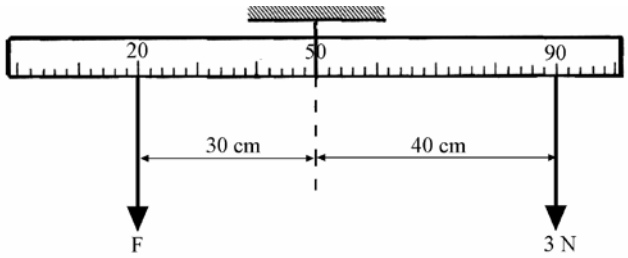
(i) Which of the three points, A, B or C, is the fulcrum (the point about which the turning force acts)?

(ii) At which of the three points, A, B or C, will the least force be needed to move the boulder? Give a reason for your answer.

3. [2008]
   State the law of the lever.

4. [2007]
   Define moment of a force.

5. [2007]
   The diagram shows a metre stick suspended from its centre of gravity.
   A force of 3 N acts on the stick at the 90 cm mark and a force of F newtons acts on the stick at the 20 cm mark. The metre stick is balanced horizontally.
   Calculate force F.



Physics: 6. Centre of Gravity

Test Questions

1. Define the term ‘Centre of Gravity’.
2. When is an object in stable equilibrium?
3. Give two ways in which an object can be made stable.
4. What factor determines whether an object which has been tilted will fall over?
5. Describe briefly how to find the exact centre gravity of an irregular-shaped piece of cardboard (make sure you include a diagram in your answer).
6. Explain why the centre of gravity of a double-decker bus should be as low as possible.

Physics: Pressure

Exam Questions

1. [2006 OL]

(i) Complete the equation in the box using the words on the right.

(ii) Name the piece of equipment used to measure pressure.

Pressure = _____

Area
Force

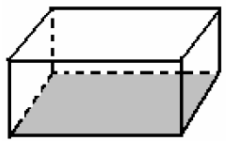
2. [2009 OL]

Answer the following questions about pressure.

(i) Complete the equation in the box below using the words on the right.

Pressure =

Area
Force

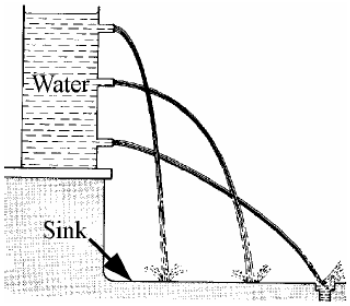


(ii) If a metal block applies a force of 20 N on an area of 5 cm^2, find the pressure being applied by the block.

3. [2009 OL]

The diagram shows a container with three spouts. The container is filled with water. Jets of water pour out of the spouts.

Why does the jet of water from the bottom spout travel the furthest out from the container?

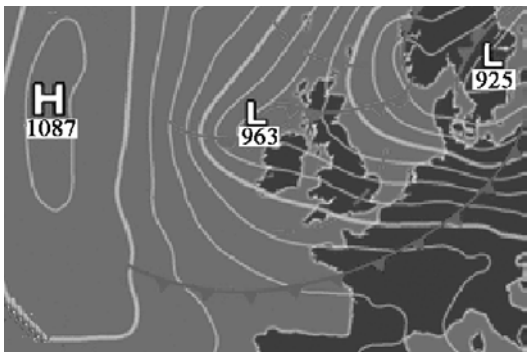


4. [2007]

The diagram is an Atlantic weather chart.

(i) Use the chart to predict two *weather conditions* that you might expect for Ireland.

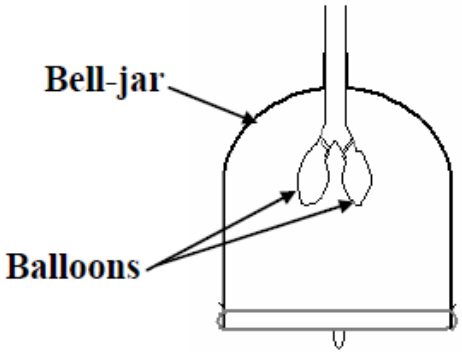
(ii) Explain why low atmospheric pressure *causes* one of the weather conditions that you have given.



5. [2009]

The diagram shows a model of the human breathing system.

Rib cage
Diaphragm



(i) Name the part of the breathing system represented by the balloons.

(ii) Choose from the list on the right the correct word to complete the sentence below.

The part of the breathing system represented by the bell-jar is the _____ .

Physics: 8. Work, Energy and Power

Exam questions

1. [2006 OL]
Energy cannot be created or destroyed but it can be changed from one form to another e.g. chemical energy can be converted into heat energy.
Describe an experiment you could carry out to show the conversion of chemical energy to heat energy.
Draw a labelled diagram of any equipment used.

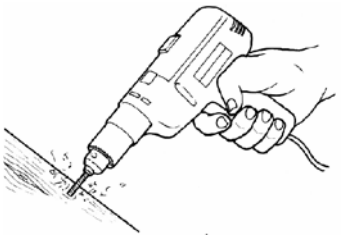
2. [2008 OL]
The diagram shows a common light bulb.
Complete the table below by writing the letter B beside the two main energy changes that take place when the bulb is in use.

	Electrical to light
	Electrical to sound
	Electrical to heat
	Chemical to heat
	Heat to light

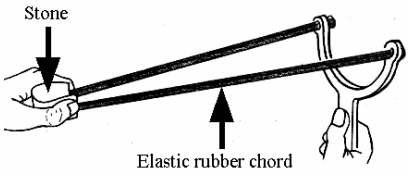
bulb

3. [2006 OL]
Give an example from everyday life where electrical energy is converted to kinetic energy.

4. [2009]
Give two useful energy conversions that occur when the drill shown in the diagram is being used.



5. [2008]
Fill in the missing words in both sentences.
(i) The stretched rubber chord has _____ energy.
(ii) If the stone is released it will have _____ energy.



6. [2007]
When work is done energy is converted from one form to another.
Identify one energy conversion that occurred when a car brakes.

7. [2008 OL]
In the table write the letter R beside two forms of renewable energy.

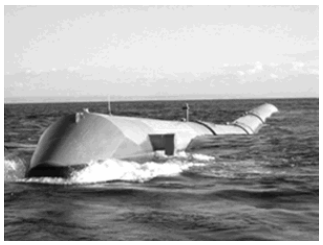
	Oil
	Wind
	Solar
	Coal
	Wave

8. [2009 OL]
In the table write the letter N beside two forms of non-renewable energy.

	Coal
	Oil
	Solar
	Tidal

9. [2007 OL] [2007]
Nuclear energy could be used to solve Ireland's energy shortage.
Give one advantage and one disadvantage of using nuclear energy to generate electricity.

10. [2008]
The Pelamis, shown in the photograph, converts the energy of waves in seas into electrical energy.
Give one advantage and one disadvantage of generating electrical power in this way.



11. [2009]
Give one advantage or one disadvantage of fitting solar panels to your home?

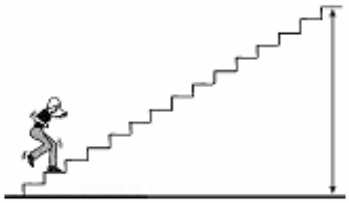
12. [2006]
Suggest two alternative sources of energy (instead of fossil fuels) for the generation of electricity in Ireland.

13. [2008]
(i) Name the energy from the sun that the solar panel changes into electricity.
(ii) The electrical energy is then changed into a form of energy that can be stored in a battery Name the form of energy that can be stored in a battery.
(iii) In winter it may be dark when the pupils are going to or coming from school.

Give two energy conversions that occur to produce the flashes of light warning motorists approaching the school on dark mornings.

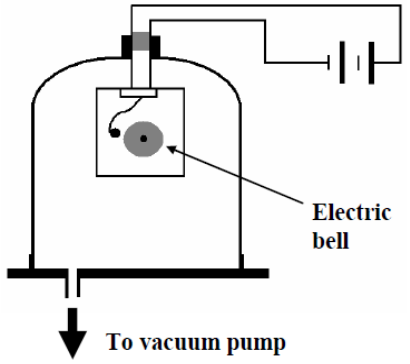
14. [2007]
The driver of a moving car applied the brakes.
The brakes produced an average stopping force of 8 kN (8000 N) and the car stopped having travelled 20 m after the brakes were applied.
Calculate the work done in stopping the car.

15. [2006]
A girl of mass 60 kg (weight 600 N) climbed a 6 m high stairs in 15 seconds.
Calculate the work she did and the average power she developed while climbing the stairs.



Physics: 9. Sound
Exam Questions

1. [2007 OL][2009 OL]
A student set up the following experiment to investigate how sound travels through air.
An electric bell was placed inside a bell-jar as shown in the diagram.
The bell rang and it could be heard clearly.
When the pump was switched on it started to pump the air out of the bell-jar and a vacuum was created.
At that stage the bell could no longer be heard but it could still be seen ringing.



(i) What conclusion could be drawn from this investigation?
(ii) When the air was pumped out, the bell could still be seen even though it could not be heard. What difference between light and sound does this show?
(iii) During an electric storm lightning is usually seen before thunder is heard.
What does this tell us about light and sound?

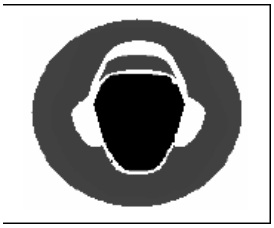
2. [2007]
Describe, using a labelled diagram in the box, an investigation you could carry out to show that *sound requires a medium* in which to travel.

3. [2007][2008 OL]
The picture shows a flash of lightning.

(i) Which is detected first, the flash of lightning or the clap of thunder?
(ii) What does this tell us about the speed of light?

4. [2006] [2009]
How are *echoes* produced?

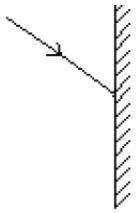
5. [2009 OL]



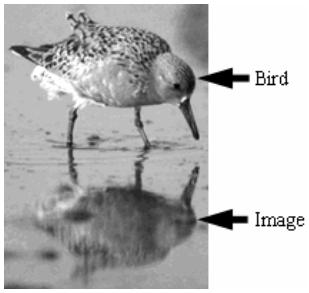
(i) The soldier in the diagram has safety goggles on his hat.
Give one reason why safety goggles should be used in the laboratory.
(ii) The sign on the right is found displayed at shooting ranges and in many factories. What instruction does this sign give?
(iii) Why is it important to obey the instruction given by this sign?

Physics: 10. Light
Exam questions

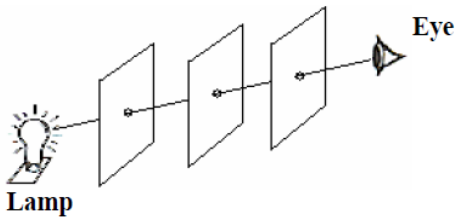
1. [2008 OL]
The diagram shows a ray of light striking a plane mirror.
(i) Complete the path taken by the ray in the diagram.
(ii) Name the property of light shown.



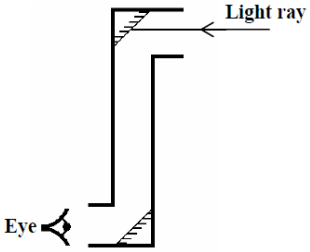
2. [2008]
The photograph shows a wader i.e. a bird that feeds in shallow water.
(i) Is the image of the bird produced by reflection or by refraction?
(ii) Give a reason for your answer.



3. [2006 OL]
The equipment shown in the diagram was set up and used in an experiment on light.
(i) What would the eye on the right see if the middle card was moved slightly?
(ii) What does this experiment tell us about light?

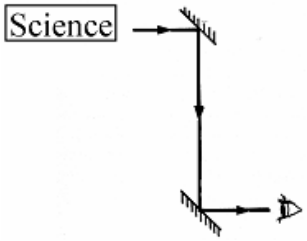


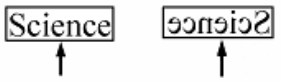
4. [2007 OL]
Describe, with the help of a labelled diagram, how you could carry out an experiment to show that light travels in straight lines.
Use the following headings: Equipment: Result: Labelled diagram



5. [2007 OL]
The diagram shows a ray of light shining onto a plane mirror in a periscope.
Complete the path taken by the ray in the diagram.

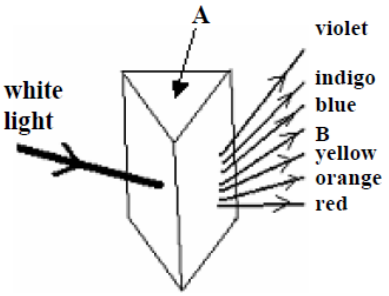
6. [2006]
A pupil made a *simple periscope* using two plane (flat) mirrors.
The mirrors were arranged as shown in the diagram. The pupil looked through the periscope at the word 'Science' written on a card pinned to the laboratory wall.
Did the pupil see first image or the second image when she looked through the periscope?
Give a *reason* for your answer.





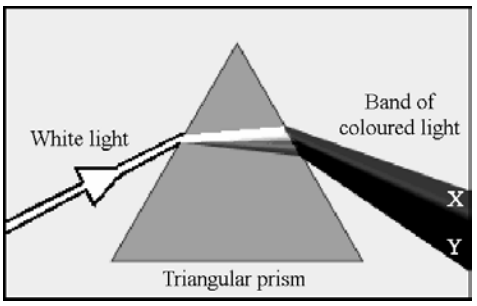
7. [2006]
Why is the word Ambulance painted in reverse on the front of many ambulances?

8. [2008 OL]
The equipment shown in the diagram was set up and used in an experiment on light.
(i) Name the piece of equipment labelled A.
(ii) Name the colour labelled B.



9. [2008]
The photograph shows narrow beams of light (rays) passing through a lens-shaped piece of transparent material. Parallel rays of light enter the material from the left and when they leave the material they converge and pass through a common point, before moving apart.
Give a use for a lens having this effect on light.

10. [2008]
The diagram shows a ray of white light entering a triangular glass prism. The light passes through the prism and emerges as a band of coloured light.
What does this experiment show about the composition of white light?
(i) What is this separation of white light into different colours called?
(ii) What name is given to the band of coloured light produced?
(iii) State the *colour of the light labelled* X and the *colour of the light labelled* Y at the extreme ends of the band of light illustrated in the diagram.



11. [2008 OL]
The picture shows a flash of lightning.
(i) Which is detected first, the flash of lightning or the clap of thunder?
(ii) What does this tell us about the speed of light?

12. [2007]
Thunder and lightning occur during electric storms.
Explain why we *see* the lightning *before* we *hear* the thunder.

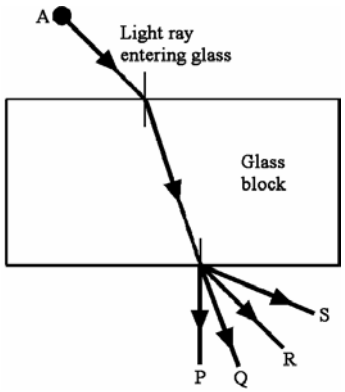
13. [2006][2007]
What is refraction of light?

14. [2007]
Give an everyday example of an effect caused by refraction.

15. [2007]
Name another way in which the direction of a light ray can be changed apart from refraction.

16. [2007]
Give an application of this bending of light.

17. [2007]
A glass block like the one shown in the diagram was used in an experiment in which a narrow beam (ray) of light was shone through it. The light passed from air to glass, on entry, and glass to air, on exit.
The path of this light ray is shown in the second diagram.
The light ray from A bends both on entering and on leaving the glass block.
Pick, from '*rays*' P, Q, R or S the path taken by the light ray leaving the glass.

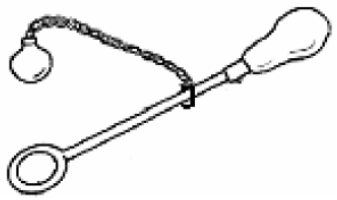


Exam Questions

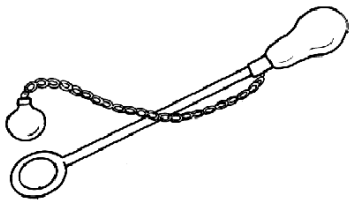
1. [2006]
   Define temperature and give a unit used to express temperature

2. [2008]
   Give two differences between heat and temperature.

3. [2007 OL]
   The apparatus drawn consists of a ball and ring.
   When the ball and the ring are cold the ball just fits through the ring.
   When the ball is heated the ball does not pass through the cold ring.
   (i) What conclusion would you draw from this experiment?
   (ii) What would you expect to happen if the ball was cooled down again?



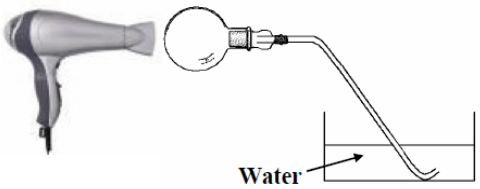
4. [2007]
   The diagram shows a "ball and ring" apparatus.
   When the ball and ring are both cold the ball just passes through the ring.
   How would you use this apparatus to show
   (i) the expansion of a solid on heating
   (ii) the contraction of a solid on cooling?



5. [2009 OL]
   Describe, with the help of a labelled diagram, how you could carry out an experiment to show that metals expand when heated.
   Use the following headings: Labelled diagram, Equipment, Procedure, Result.

6. [2008 OL]
   The diagram shows a round-bottomed flask full of coloured water.
   (i) What would you expect to notice if the flask is heated gently?
   (ii) Give a reason why this should happen.
   (iii) Why is coloured water used during this investigation?

7. [2007 OL]
   In an investigation to see the effect heating had on gases, a student heated a round-bottomed flask containing air using a hairdryer as shown in the diagram.
   (i) What would you expect the student to have seen when the flask was heated?
   (ii) What conclusion can you draw from this investigation?



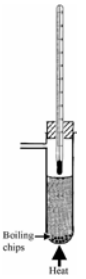
8. [2006 OL]
   Heat may be transferred from hot to cold places by the three methods listed on the right.
   Choose the method of heat transfer that occurs in each of the following.

CONDUCTION CONVECTION RADIATION

   (i) The boiling of water in a kettle.
   _____
   (ii) The heating of the Earth by the Sun.
   _____

9. [2006]
   Describe an experiment to show the expansion of water when it freezes.
   You may include a labelled diagram if you wish.

10. [2009]
The boiling point of water can be determined using the apparatus shown in the diagram.



(i) Why are boiling (anti-bumping) chips added to the water?
(ii) At what temperature does water boil, at standard (normal) atmospheric pressure?
(iii) What effect does the raising of pressure have on the boiling point of water?
(iv) What effect does the lowering of pressure have on the boiling point of water?

Conduction, Convection and Radiation

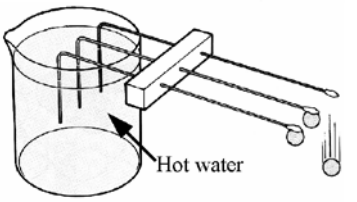
11. [2007 OL]
Heat is transferred in different ways.
In each case use a word from the list on the right to correctly complete each sentence below.

Conduction
Convection
Radiation

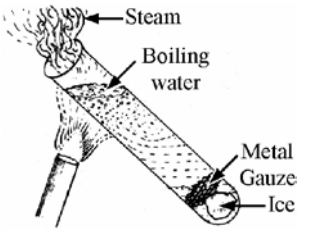
(i) Heat travels through solids by _____.
(ii) Heat travels through liquids and gases by _____.
(iii) Heat travels from the Sun to the Earth by _____.

12. [2006]
Name the mode of heat transfer from the hot liquid, through the spoon, to the hand.

13. [2009]
Copper, aluminium and iron rods are set-up as shown in the diagram. A metal ball is attached by wax to the end of each rod. Hot water is poured into the beaker. The ball falls from the copper rod first. What conclusion can be drawn from this observation?

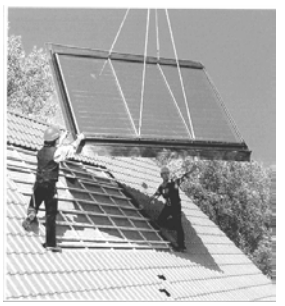


14. [2007]
(i) What does the experiment shown in the diagram tell us about the transfer of heat energy in water?
(ii) If you wanted to warm all of the water why would the bottom of the test tube be the best place to heat with the Bunsen flame?



15. [2006]
Heat moves in liquids by convection. Give one *difference* between convection and conduction.

16. [2009]
The photograph shows a solar panel being installed. Water passing through the panel is heated by the sun.
(i) How does heat from the sun travel, through the vacuum of space, to the earth?
(ii) Give one advantage or one disadvantage of fitting solar panels to your home?



Latent Heat

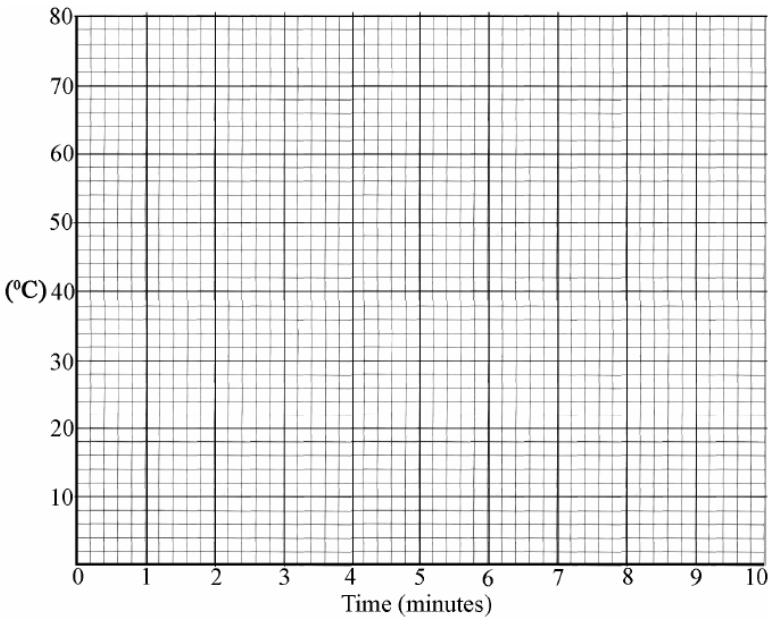
17. [2008]
A pupil heated some lauric acid, which is a solid at room temperature, until it turned into a liquid.
The lauric acid was then allowed to cool at a uniform rate. The temperature of the lauric acid was taken every minute.
The data from this experiment is given in the table.

Temp (0C)	75	64	54	43	43	43	43	43	32	22	10
Time (min)	0	1	2	3	4	5	6	7	8	9	10

(i) Draw a *graph*, using this data, of *temperature against time (x-axis)* in the grid provided below.

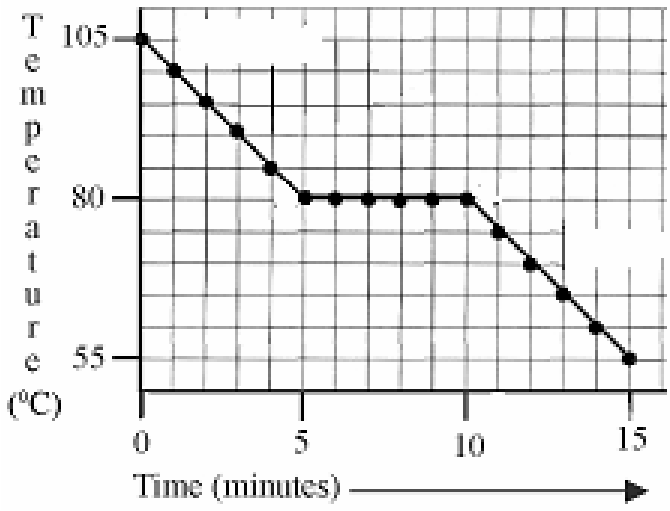
(ii) Explain the *shape of the graph* that you obtain.

(iii) Use the graph to estimate the melting point of lauric acid.



18. [2006]
The graph is a cooling curve. The substance used in this experiment was naphthalene. Naphthalene has a melting point of 80 ^{0}C.
The rate of heat loss was constant throughout the experiment.

(i) What is happening to the naphthalene between points A and B on the graph?
(ii) What is the *heat loss*, between points A and B, on the curve called?



19. [2009 OL]
The diagram shows two metal cans equal in size and filled with the same amount of water at 100 °C. Can A is wrapped in cotton wool and can B has no wrapping.

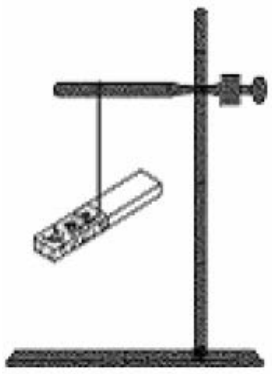
(i) After 15 minutes, which can, A or B, would you expect to have the higher temperature?
(ii) Give a reason for your answer.

Physics: Magnetism

Exam Questions

1. [2007 OL]
The diagram shows a magnet freely suspended from a wooden stand. Complete the statements below using the correct word from the list on the right in each case.

Repel
Attract



(i) When the north pole of another magnet is brought close to the north pole of the hanging magnet they will _____ each other.

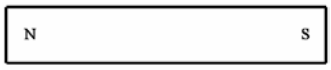
(ii) When the south pole of another magnet is brought close to the north pole of the hanging magnet they would _____ each other.

2. [2006 OL][2009 OL]
The diagram shows a bar magnet.

(i) Draw the pattern made if iron filings or plotting compasses were placed around the bar magnet.

(ii) Give one use of a magnet.

3. [2007]
The diagram shows the outline of a bar magnet.



(i) Draw two *magnetic field lines* one on each side of the bar magnet.

(ii) What are the *parts* labelled N and S in the diagram called?

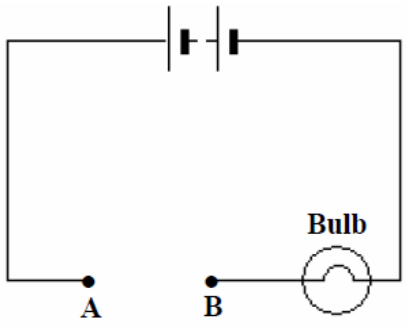
4. [2008 OL]
Describe, with the help of a labelled diagram, how you could carry out an experiment to plot the magnetic field of a bar magnet.
Use the following headings: Labelled diagram, Equipment, Procedure, Result.

1.

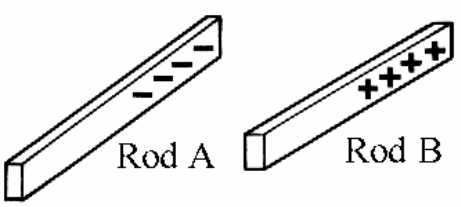
Physics: 13. Static Electricity

Exam Questions

1. [2006 OL]
   A student set up the circuit drawn on the right to investigate different materials to see which were electrical conductors and which were electrical insulators.
(i) What would you expect to observe when an electrical conductor is connected between the contact points A and B? Give a reason for your answer.
(ii) What would you expect to observe when an electrical insulator is connected between the contact points A and B? Give a reason for your answer.



2. [2008]
   Two rods A and B, made from different plastics, were given the static electrical charges shown in the diagram.
   How could you have charged the rods as shown?



3. [2008]
   Describe with the help of a labelled diagram how the force between the two charged rods A and B could be investigated.
   What result would you expect from this investigation?

4. [2008]
   In dry weather you can sometimes get an electric shock from a supermarket trolley.
   This is caused by the build-up of static electricity on the trolley.
   Explain clearly why this only happens in dry weather.
   Answer
   In wet weather moisture allows electric charge to escape.

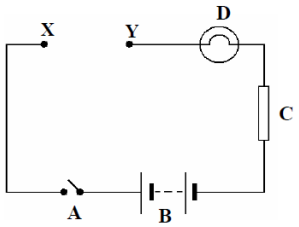
5. [2009]
   A plastic pen when rubbed with a dry cloth can attract small pieces of paper which 'stick' to it.
(i) Why does this happen?
(ii) Explain why the pieces of paper fall from the pen after some time.

6. [2006 OL]
   The picture shows a flash of lightning.
(i) What type of energy generates lightning?
(ii) The flash of lightning is seen before the thunder is heard.
   What does this tell us about the speed of light?

Physics: 14. Current Electricity

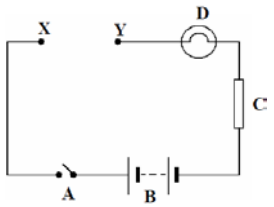
Exam questions

1. [2008 OL]
The diagram shows a simple electrical circuit.
Complete the table below correctly matching each of the names of the components in the circuit with one of the labels A, B, C or D.

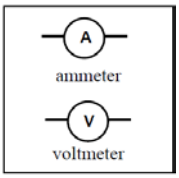


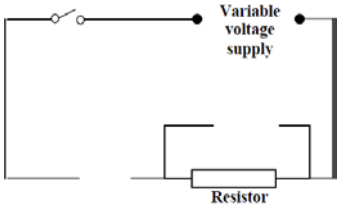
Label	Circuit component
	Bulb
	Power supply
	Resistor
	Switch

2. [2008 OL]
You are given a piece of copper metal and a piece of timber.
Which piece, metal or wood, should you connect between X and Y in order that the bulb would light when the switch is closed? Give a reason for your choice.

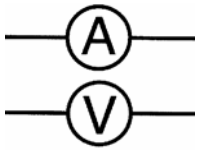


3. [2007 OL]
A student set up the circuit shown to investigate the relationship between the potential difference (voltage), the current and the resistance of a wire conductor.
Gaps are left in the diagram in the places where the ammeter and voltmeter should be placed. The symbols for these devices are given on the right.
Complete the circuit inserting the symbols for the ammeter and the voltmeter in their correct positions.





4. [2007]
The symbols for two electrical meters are given in the diagram.
The symbol  is for a meter that measures potential difference, often called 'voltage'.
What electrical quantity can be measured using the meter with the symbol  ?



5. [2006]
Components, e.g. bulbs, in electrical circuits can be connected in series or in parallel.
It is noticed that, when one headlight fails (blows) in a car, the second remains lighting.
(i) State the way the headlights are connected and give a reason why this mode of connection is used.
(ii) All of the bulbs go out in an old set of Christmas tree lights, when one of bulbs fails (blows).
In what way are the bulbs connected in this set of lights?
(iii) Explain why, when one bulb blows, they all go out.

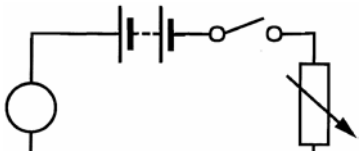
6. [2006]
Calculate the resistance of the filament of a car headlamp when 12 V produces a current of 5 A in it.
In what unit is resistance measured?

7. [2007 OL]
The student used the variable voltage supply to apply different voltages across the resistor. She measured the voltage across the resistor and the current passing through it several times. She collected the following data.

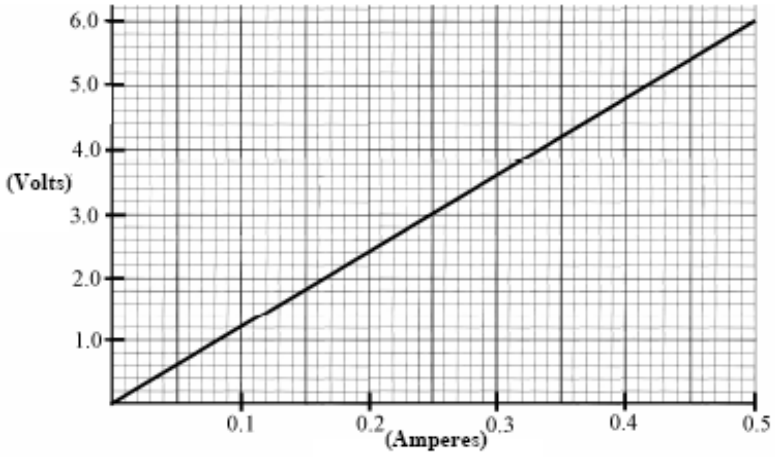
(i) Draw a graph of the voltage (y-axis) against the current (x-axis).
(ii) What conclusion can you draw from the graph about the relationship between the potential difference (voltage) and the current passing through the wire conductor?

Voltage (V)	0	2	4	6	8
Current (A)	0	0.5	1.0	1.5	2.0

8. [2007]
Meters (V) and (A) are used in the circuit shown.
Enter 'A' into the appropriate circle of one of the meter symbols in the circuit diagram so as to clearly identify its correct position.



9. [2007]
A pupil used the circuit above to get a set of readings from both meters for different values and then plotted this data in the graph shown.
Use this graph to calculate the resistance of resistor R shown in the diagram. Give the unit of resistance with your answer.



10. [2007]
Give one application of the magnetic effect and one application of the chemical effect of electric current.

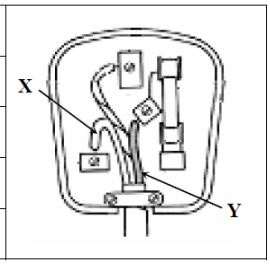
11. [2008]
Distinguish between alternating and direct current.

12. [2008]
What is the average voltage of domestic alternating current in Ireland?

13. [2006]
Explain, clearly, the safety role of fuses in household electrical circuits.

14. [2007 OL]
The diagram shows a three-pin plug with the back removed.
(i) In the table below write the letter X beside the name of the wire labelled X in the diagram.
(ii) Write the letter C beside the colour of the insulating on the wire labelled Y.

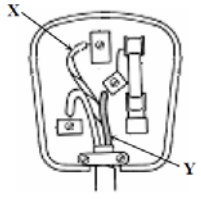
	Earth
	Live
	Neutral
	Brown
	Blue



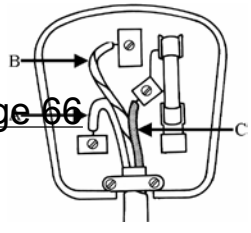
15. [2008 OL]
The diagram shows a three-pin plug with the back removed.
Answer the questions below using the table.
(i) In the table write the letter X opposite the name of the green and yellow wire.
(ii) Write the letter Y opposite the name of the wire to which the fuse is connected.
(iii) Write the letter Z opposite the function of the fuse in a plug.

	Live
	Neutral
	Earth
	Insulation
	Safety

16. [2006 OL]
The diagram shows a three-pin plug with the back removed.
(i) What is the correct names for the cables labelled X and Y.
(ii) Give one reason why the back covering (casing) of a plug is made from plastic.



17. [2008]
Wiring a plug correctly is most important.
Give the colour/s of any two of the plastic insulations on the wires labelled A, B and C.



18. [2008 0L]
(i) Write the letter C beside the unit of electric current.
(ii) Write the letter E beside the unit of electricity used by the ESB for costing.

	Volt
	Ampere
	Kilowatt Hour

19. [2006 OL]
Appliances vary in the amount of electricity they use depending on their power rating.
A tumble drier has a high power rating of 2.5 kW.
(i) Name another appliance found in the home that has a high power rating.
(ii) Name an appliance found in the home that has a low power rating.

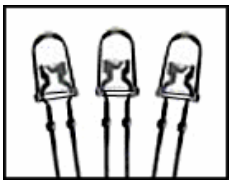
20. [2007 OL]
An electric cooker has four hot plates.The total power rating of the four hot plates is 7 kW.
All four are used for a total of 2 hours each day.
(i) How many units of electricity (kWh) are used in 1 week?
(ii) If electricity costs 11 cent per unit how much does this cost?

21. [2006 OL]
The ESB charges for electricity at a rate of 12 cent per kW h.
A tumble drier of power rating 2.5 kW is used for 2 hours each week for 4 weeks.
(i) How many units of electricity are used?
(ii) What is the cost, in cent, of using the tumble drier?

Physics: 15. Electronics

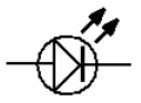
Exam questions

Diodes and Light Emitting Diodes

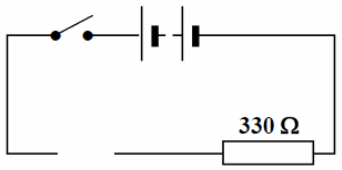


1. [2008]
   Identify the devices shown in the diagram.

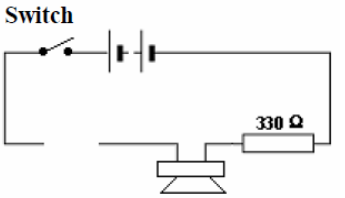
2. [2008]
   Leds are often used instead of bulbs. Give a reason for this wide application.



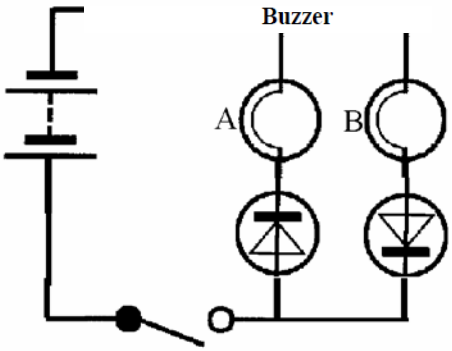
3. [2006 OL]
   The diagram shows the symbol of a LED.
(i) Complete the circuit on the right by drawing in the LED so that the LED will light when the switch is closed.
(ii) Why is there a resistor connected in series with the LED?



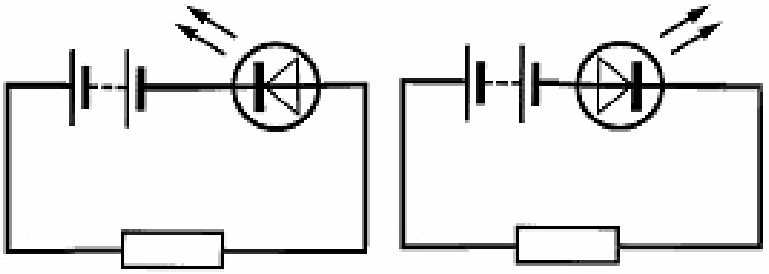
4. [2007 OL]
(i) Identify device labelled A on the right.
(ii) Complete the circuit inserting the symbol for the device A so that the buzzer would sound if the switch were closed.



5. [2007]
(i) Look carefully at the circuit diagram and then state which bulb/s, if any, light when the switch is closed.
(ii) Give a reason for your answer.

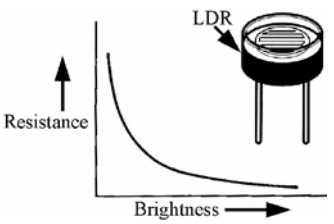


6. [2006]
   A pupil carried out an investigation into the effect of a diode on d.c. and on a.c. circuits using an LED.
   The following circuits were initially set up.
(i) What is observed in circuit A (the first circuit) and in circuit B (the second circuit)?
(ii) When the batteries in circuits A and B were replaced by 6 V a.c. supplies the LEDs glowed dimly in both circuits. Explain this observation.



Light Dependent Resistors

7. [2009]
(i) The diagram shows a light dependent resistor (LDR) and a graph of the resistance of the LDR against the brightness of light falling on it.
   Give an everyday use for an LDR.
(ii) Describe an experiment to measure the resistance of an LDR under varying degrees of brightness of light.
(iii) Draw the circuit diagram in the box provided.
(iv) Explain how you would vary the brightness of the light.
   You do not have to state how the brightness of the light was measured.



PHYSICS

A

Acceleration: Acceleration is the rate of change of velocity.

Formula: a= change in velocity / time taken

Units: m/s^2 or ms^{-2}

Alternating current: Current that travels in one direction for one hundredth of a second but the opposite direction for the next hundredth of a second.

Amplitude: The amplitude of a wave is the height of the crest above the average position.

Area: Area is the amount of surface enclosed within the boundary lines.

B

Biomass: This is the chemical energy stored in fast growing plants.

C

Centre of gravity: The centre of gravity of an object is the point through which all the weight appears to act.

Compass: A magnet, which is free to rotate and indicate direction.

Concave lens: A concave lens is a lens that spreads out light rays (diverging lens).

Condensation: This is the changing of a gas to a liquid state.

Conduction: This is the transfer of heat through a solid, without the movement of the solid.

Convection: This is the transfer of heat through a liquid or a gas when molecules of the liquid or gas move and carry the heat.

Convex lens: A convex lens is a lens that brings light rays together (converging lens).

Current: Current is a flow of charge.
Unit: Ampere (A)

D

Density: Density is the mass per unit volume of the substance.

Formula: $\text{Density} = \frac{\text{Mass}}{\text{Volume}}$

Units: g/cm^3 or $g\ cm^{-3}$

Direct Current: Current that travels in one direction only (i.e. from the positive terminal to the negative terminal).

Dispersion: This is the splitting up of white light into separate colours. It can be done by passing white light through a prism.

E

Energy: Energy is the ability to do work.

Equilibrium: An object that is balanced is said to be in equilibrium.

F

Force, F: A force is that which causes a change in the velocity of an object.
Unit: Newton, N
Formula: Force = Mass x Acceleration ($F = ma$)

Freezing: This is the changing of a liquid to a solid state.

Frequency, f: This is the number of waves that pass a particular point in one second.

Friction: This is a force which opposes motion between two objects in contact.

Fuse: A fuse is a safety device in an electric circuit. If the current gets too high the wire in the fuse melts which breaks the circuit switching off the current.

G

Galaxy: A large group of stars held together by its own gravity.

H

Heat: Heat is a form of energy.
Unit: Joules, J

I

Insulator: With regard to heat - is a substance, which does not allow heat to flow through easily.

Or – with regard to electricity - a substance which does not conduct electricity.

L

Latent heat: This is the heat absorbed or released when a substance changes state without changing temperature.

Law of conservation of energy: Energy cannot be created or destroyed but can be converted from one form to another.

Law of the lever: When a lever is balanced the sum of the clockwise moments is equal to the sum of the anti clockwise moments.

Lever: A lever is a rigid body, which is free to turn about a fixed point called the fulcrum.

Light: Light is a form of energy.

Loudness: The loudness of a sound depends on the amplitude

Lubricant: A lubricant is a substance capable of reducing friction.

Luminous: A luminous object is an object that gives out light.

Lunar eclipse: This happens when the earth passes between the sun and the moon.

M

Magnetic field: A space around a magnet in which the magnetism can be detected.

Mass, m: The mass of an object is the quantity of matter in it (Measured in kg)

Melting: This is the changing of a solid to a liquid state.

Moment: This is a measure of the turning effect of a force.
Formula:
Moment of a force = Force x Perpendicular distance from the fulcrum.

N

Newton's third law of motion: For every action there is an equal but opposite reaction.

O

Ohm's law: At constant temperature the voltage across a conductor is proportional to the current flowing through it.
Formula: Voltage = Current x Resistance ($V = IR$)

P

Pitch: The pitch of a sound is how high or low it is. It depends on the frequency of the wave.

Potential difference: Potential difference is also called voltage. It is the force, which moves the electrons around the circuit.
Unit: Volt (V)

Power: This is the rate at which energy is converted from one form to another.
Unit: Watts (W)
Formula: Power = Voltage x Current ($P = VI$)

Pressure: Pressure is force per unit area.
Formula: $\text{Pressure} = \frac{\text{Force}}{\text{Area}} \left(P = \frac{F}{A} \right)$
Unit: N/m^2 or Pascal (Pa)

R

Radiation: This is the transfer of heat by means of invisible rays, which travel outwards from the hot object, without needing a medium.

Rectifier: This is used to convert alternating current to direct current.

Reflection: The reflection of light is the bouncing back of light from a surface.

Refraction: The refraction of light is the bending of light as it passes from one medium to another.

Resistance, R: The opposition of a conductor to current is called its resistance. A good conductor has a low resistance and a bad conductor has a high resistance.

S

Solar eclipse: This happens when the moon passes between the sun and the earth.

Sound: Sound is a form of energy.

Speed, v: Speed is the distance travelled per unit time.

Formula: $\text{Speed} = \frac{\text{Distance}}{\text{Time}}$

Unit: m/s or ms^{-1}

Stable equilibrium: A body is in stable equilibrium if when slightly moved its centre of gravity rises.

Sublimation: This is the changing of a solid directly to a gas.
(Iodine is an example of a substance that sublimes).

T

Temperature: This is a measure of how hot an object is.
Unit: degrees Celsius (°C)

U

Unstable equilibrium: A body is in unstable equilibrium if when slightly moved its centre of gravity falls.

V

Velocity: Speed in a given direction.
Units: m/s

Volume: The volume of an object is the amount of space it takes up (measured in m^3 or cm^3).

W

Wave: A wave is a means of transferring energy from one point to another.

Formula: Velocity = Frequency x Wavelength $(v = f \times \lambda)$

Wavelength: The wavelength of a wave is the distance between any two successive crests.

Weight: Weight is the force of gravity on an object.
Formula: Weight = Mass x Acceleration due to gravity

CHEMISTRY

A

Acid rain: Rainwater with a pH of less than 5.7 is acid rain. It is caused by the gases NO_2 (from car exhaust fumes) and SO_2 (from the burning of fossil fuels) dissolving in rain. Acid rain kills fish, kills trees, and destroys buildings and lakes.

Acid: An acid is a proton donor. It turns litmus red.

Activity Series: The activity series is a list of metals in order of decreasing reactivity. From our experiment we found the following series of activity Ca>Mg>Zn>Cu

Alkali metals: These are the elements in group one in the periodic table.

Alkaline earth metals: These are the elements in group two in the periodic table.

Alloy: An alloy is a mixture of metals. Bronze is an example of an alloy it is formed from copper and tin. Brass is a mixture of Copper and Zinc

Atom: An atom is the smallest part of an element, which can exist.

Atomic number: The atomic number of an atom is the number of protons in the nucleus of the atom.

B

Base: It turns litmus blue. Has pH > 7 and a soapyfeeling.

C

Capillarity: This is the rising of liquids up a narrow tube.

Catalyst: A chemical that speeds up or slows down chemical reactions (eg manganeese dioxide (MnO_2) is the catalyst that causes H_2O_2 (hydrogen peroxide) to breake down to O_2 and water)

Chemical change: A chemical change is one in which there is a new substance formed.

Cobalt chloride paper: This paper is used to test for water. If water is present it changes colour from blue to pink.

Combustion: Combustion is also called burning. This is the combining of a substance with oxygen.

Compound: A compound is a substance made up of two or more elements chemically combined.

Corrosion: Corrosion is an undesired process where a metal is converted to one of its compounds, e.g. rusting.

Covalent bond: A covalent bond is a force of attraction between two atoms as a result of their sharing of electrons.

D

Distillation: The vaporisation of a liquid by heating and then the condensation of the vapour by cooling.

Ductile: Metals are ductile. This means they can be pulled out to form wires.

E

Electrode: An electrode is a conductor, which dips into an electrolyte and allows the electrons to flow to and from the electrolyte.

Electrolysis: This is the production of a chemical change using electricity. Electrolysis can be used to split up water into hydrogen and oxygen.

Electrolyte: An electrolyte is a substance which when dissolved in water conducts electricity.

Electroplating: This is where a metal is covered with a layer of another metal using electricity.

Element: An element is a substance, which cannot be split up into simpler substances by chemical means.

Endothermic reaction: An endothermic reaction is a reaction that takes in heat, e.g. adding water to ammonium chloride.

Exothermic reaction: An exothermic reaction is a reaction that gives out heat, e.g. burning of coal.

F

Fossil fuels: Fuels that were formed from the remains of plants and animals that lived millions of years ago.

Fuel: A fuel is any substance that burns in oxygen to produce heat.

H

Halogens: These are the elements in group seven in the periodic table.

Hard water: This is water that finds it difficult to form lather with soap due to presence of Ca or Mg ions.

I

Immiscible liquids: These are liquids that do not mix to form a solution, e.g. oil and water.

Indicator: An indicator is a substance, which shows by means of a colour change if a substance is acidic or basic.

Ion Exchange: This is a method of removing hardness from water. It replaces the positive ions that cause the hardness with H+ ions.

Ion: An ion is a charged atom or group of atoms, e.g. Na^{+}.

Ionic bond: An ionic bond is a force of attraction that occurs between oppositely charged ions in a compound. It results from a transfer of electrons.

J

Joule: This is the unit of energy and work.

M

Malleable: Metals are malleable. This means they can be hammered into sheets.

Mass number: The mass number of an atom is the number of protons and neutrons in the nucleus of the atom.

Matter: Matter is anything which occupies space and has mass.

Miscible liquids: These are liquids that mix to form a solution, e.g. alcohol and water.

Mixture: A mixture consists of two or more different substances mingled together but not chemically combined.

Molecule: A molecule consists of two or more atoms chemically combined.

N

Neutralisation: This is the reaction between an acid and a base to give salt and water.

O

Octet rule: During bonding atoms tend to reach an electron arrangement with eight electrons in the outermost shell.

Oxidation: Oxidation is the addition of oxygen or the losing of electrons.

P

pH scale: This is a scale from 0 to 14.
If the pH of a solution is 7 it is neutral; if the pH of a solution is less than 7 it is acidic; if the pH of a solution is greater than 7 it is basic.

Permanent hardness: This is hardness in water that cannot be removed by boiling. It is caused by calcium sulphate.

Physical change: A physical change is one in which there is no new substance formed.

Products: These are the chemicals that are produced in a chemical reaction.

R

Reactants: These are the chemicals that react together in a chemical reaction.

Reduction: Reduction is the removal of oxygen or the gaining of electrons.

S

Salt: A salt is formed when the hydrogen of an acid is replaced by a metal.

Saturated Solution: A solution, which contains as much solute as it can hold at that temperature.

Solution: A solution is a mixture of a solute (usually a solid) and a solvent (usually a liquid).

Suspension: A suspension is a mixture of a liquid and a finely divided insoluble solid.

T

Temporary hardness: This is hardness in water that can be removed by boiling. It is caused by calcium hydrogencarbonate.

Titration: This is the process of adding one solution from a burette, to a measured amount of another solution to find out exactly how much of each is required to react.

V

Valency: The valency of an element is the number of electrons an atom of the element wants to gain, lose or share so as to have a full outer shell.

BIOLOGY

A

Absorption: This is the movement of food into the bloodstream.

Amylase: This is an enzyme. It is found in saliva. It breaks starch down into maltose.

Antagonistic muscles: A pair of skeletal muscles that work together. When one contracts the other relaxes, e.g. the biceps and triceps.

Asexual reproduction: Reproduction that does not involve gametes.

Assimilation: This is the using of the food by the cells of the body after absorption.

B

Benedict's solution: This is used to test for a reducing sugar e.g. glucose. If a reducing sugar is present it turns brick red after being heated in a boiling water bath. (Fehlings solution does exactly the same)

Breathing: This is a physical process of taking in oxygen and breathing back out carbon dioxide.

Balanced Diet: Eating the correct amounts of the different food types

C

Carnivore: An animal that only eats other animals.

Carpel: The female part of the flowering plant. It is made up of the stigma, style and ovary.

Cell wall: Structure found outside the cell membrane in plant cells. Cell walls are absent in animal cells.

Chlorophyll: The green pigment found in the chloroplasts of plant cells. It is used in photosynthesis.

Competition: This is the struggle between organisms to gain a sufficient supply of a scarce resource e.g. Grasses and dandelions compete for water.

Conservation: This is the wise use of the environment:

D

Digestion: This is the breaking down of food into small soluble pieces.

Dispersal: The dispersal of seeds is the scattering of seeds. The advantage of dispersal is that it helps reduce competition.

E

Egestion: The getting rid of unused, undigested and unabsorbed food material

Endocrine glands: A ductless gland that releases hormones directly into the bloodstream, e.g. the pancreas (it releases insulin which controls blood sugar level).

Excretion: This is the getting rid of waste products from chemical reactions in the body.

F

Food chain: A food chain is a feeding relationship between organisms through which energy is transferred.

Food web: A food web is a number of interconnected food chains.

G

Gamete: A gamete is a sex cell. The male gamete is the sperm and the female gamete is the egg.

Genetics: This is the study of inheritance.

Geotropism: The growth of a plant in response to gravity.

Germination: Germination is the growth of a seed into a new plant. The requirements are warmth, moisture and oxygen.

H

Habitat: The place where a plant or animal lives is called its habitat.

Haemoglobin: The red pigment in red blood corpuscles. It is involved in transporting oxygen.

Herbivore: An animal that eats only plants.

Hormone: A chemical substance that is released by an endocrine gland.

Humus: The organic material of soil. It is formed from decomposing plants and animals.

I

Implantation: This is when the embryo attaches itself to the womb wall.

Ingestion: This is the taking in of food into the mouth.

Iodine solution: This is used to test for starch. If starch is present it turns blue-black.

Iris: The iris controls the amount of light entering the eye.

J

Joint: This is where two or more bones meet.

L

Leaching: The washing of minerals out of the soil.

Ligaments: Fibres that connect bone to bone.

Lime water: This is used to test for the presence of carbon dioxide. If carbon dioxide is present the lime water turns milky.

M

Motor nerve: A nerve that carries messages away from the brain and spinal cord.

N

Nutrient agar: This is used as a food supply for bacteria and fungi in the lab.

O

Omnivore: An animal that eats plants and animals.

Organ: A group of tissues working together e.g. heart.

Ovulation: This is the release of an egg from an ovary.

P

Phloem: This is a plant transport tissue. It transports food from where it is made to other parts of the plant.

Photosynthesis: This is the process in which green plants make food.

Phototropism: The growth of a plant in response to light.

Placenta: The structure that binds the developing baby to the wall of the womb. It allows nutrients and waste to be exchanged.

Pollination: This is the transfer of pollen from the anther of the stamen to the stigma of the carpel.

Pollution: This is where things such as oil, sewage, slurry, sulphur dioxide, nitrogen oxides and litter damage the environment.

Pooter: A piece of equipment used to collect small animals.

Producer: An organism that can make its own food.

R

Respiration: This is a chemical process where energy is released from food.

Retina: The light sensitive layer at the back of the eye.

S

Sensory nerve: A nerve that carries messages to the brain and spinal cord.

Soda lime: This is used to absorb carbon dioxide.

Stamen: The male part of the flowering plant. It is made up of the anther and filament.

Stomata: These are pores (openings) in the leaves of a plant, which allows gases to diffuse.

Synovial fluid: A lubricating fluid found at a joint. It helps reduce friction.

System: A group of organs working together e.g. digestive system.

T

Tendons: Fibres that attach muscle to bone.

Tissue: A group of similar cells e.g. muscle.

Transpiration: This is the loss of water vapour from the surface of a plant. It is highest when there is a gentle breeze, sun and low humidity.

Trophic level: The position an organism occupies in a food chain.

Tropism: A growth response to a stimulus.

Tullgren funnel: A piece of equipment used to extract small animals from leaf litter or soil.

X

Xylem: This is a plant transport tissue. It transports water and minerals from the roots to other parts of the plant.

Z

Zygote: The cell, which results from the fusion of a male and female gamete.

Formulae in Junior Cert Science

The following are all the formulae which you need to know. The good news is that the question is very easy once you know which formula to use.

1. **Area of a regular object = length × width**

2. **Volume of a regular object = length × width × height**

3. $$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

4. $$\text{Speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

5. $$\text{Acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

6. **Weight (in newtons) = Mass (in kilograms) × 10**

7. **The Moment of a force = the force × distance (between the force and the fulcrum).**

8. $$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

9. **Work done = Force × distance**

10. $$\text{Power} = \frac{\text{Energy}}{\text{time}} \quad \text{or} \quad \text{Power} = \frac{\text{Work}}{\text{Time}}$$

11. **Voltage = Resistance × Current**

12. **The number of kilowatt-hours equals the number of kilowatts multiplied by the number of hours**
    kWh = kW × hours

13. $$\text{slope of a graph} = \frac{y_2 - y_1}{x_2 - x_1}$$

Units

You must know the units of each of the quantities listed below.

Time	seconds	s
Distance	metres	m
Velocity / speed	metres per second	m/s
Acceleration	metres per second squared	m/s^2
Mass	kilograms	kg
Volume	metres cubed	m^3
Density	grams per centimetre cubed	g/cm^3
Weight	newtons	N
Force	newtons	N
Pressure	pascals	Pa
Work	joules	J
Energy	joules	J
Power	watts	W
Current	amps	A
Voltage	volts	V
Resistance	ohms	Ω

Test yourself –what formula connects the following variables?

				Page in log tables
mass	volume	density	**density = mass/volume**	**57**
velocity	time	distance		
change in velocity	acceleration	time taken		
× 10	mass	weight		
force	moment of a force	distance		
pressure	force	area		**57**
distance	force	work done		**55**
time	work	power		**55**
voltage	resistance	current		**61**
kW	hrs	kWhrs		
			Area =	
			Volume =	
			Slope of a line =	

Test yourself – complete the table below

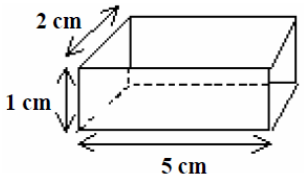
Quantity	Unit	Symbol
Time	seconds	s
Distance		
Velocity / speed		
Acceleration		
Mass		
Volume		
Density		
Weight		
Force		
Pressure		
Work		
Energy		
Power		
Current		
Voltage		
Resistance		

Junior Cert Science Maths Questions – some of the questions have been altered slightly from the original context.

Mass, Volume and Density

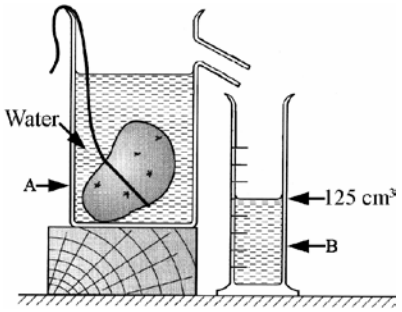
1. [2008 OL]
   If the mass of a stone is 20 g and the volume of the stone is 10 cm^3, find the density of the stone.

2. [2007 OL]
   A block of metal has the measurements shown on the right.
   The mass of the metal block is 21 g.
(i) What is the volume of the block?
(ii) What is the density of the block?



3. [2009 OL]
   The mass of a metal block is 14.7 g. It has a volume of 7 cm^3.
   Calculate the density of the block.
   Give the units of density with your answer.

4. [2009]
   A pupil measured the volume of a potato using the items of laboratory equipment, labelled A and B as shown in the diagram.
   The potato had mass 175 g and volume 125 cm^3.
   Calculate the density of the potato.
   Give the units of density with your answer.



Solutions

1.
(i) Density = Mass ÷ Volume = 20 ÷ 10= 2 g/cm^3
2.
(i) Volume = 2 ×1 × 5 = 10 cm^3
(ii) Density = Mass ÷ Volume = 21 ÷ 10: 2.1 g/cm^3
3. Density = 14.7÷7 = 2.1 g/cm^3
4. Density = 175÷ 125 = 1.4 g/cm^3

Velocity and Acceleration

1. [2007 OL]
   The speed of a car is 15 m/s. What distance will the car will travel in 5 seconds?

2. [2009 OL]
(i) A cyclist moves 20 metres along a track in 4 seconds.
   Calculate the speed of the cyclist.
(ii) Calculate the distance the cyclist will travel in 2 seconds.

Solutions

1. Distance = speed × time = 15 × 5 = 75 m
2. Speed = distance ÷ time = 20 ÷ 4 = 5 m/s
   Distance = speed × time = 5 × 2 = 10 m

Force

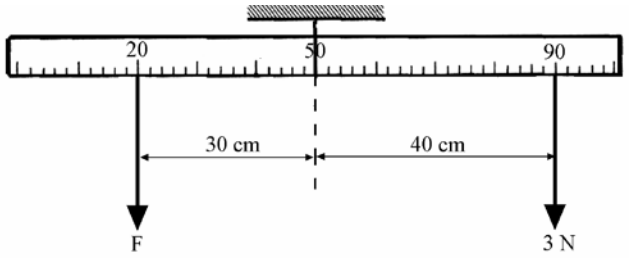
1. [2009]
   A stone has a mass of 2 kg. What is the weight of the stone on earth? Give the unit.

Solution

1. Weight = mass × 10 = 2 × 10 = 20 Newtons.

Moment of a force

1. [2007]
The diagram shows a metre stick suspended from its centre of gravity.
A force of 3 N acts on the stick at the 90 cm mark and a force of F newtons acts on the stick at the 20 cm mark. The metre stick is balanced horizontally.
Calculate force F.



Solution

1. Moment clockwise = moment anti-clockwise {and moment of a force = force × distance]
$\Rightarrow$ $3 \times 40 = F \times 30$
$\Rightarrow$ $120 = 30\ F$
$\Rightarrow$ $F = 120 \div 30$
$\Rightarrow$ $F = 4$ N
$\Rightarrow$

Pressure

1. [2006 OL]
Give the formula for calculating pressure.

2. [2009 OL]
Answer the following questions about pressure.
A metal block applies a force of 20 N on an area of 5 cm^2. Find the pressure being applied by the block.

Solutions

1. Pressure = Force ÷ Area
2. Pressure = 20 ÷ 5 = 4 Pa

Work, Energy and Power

1. [2007]
The driver of a moving car applied the brakes.
The brakes produced an average stopping force of 8 kN (8000 N) and the car stopped having travelled 20 m after the brakes were applied.
Calculate the work done in stopping the car.

2. [2006]
A girl of mass 60 kg (weight 600 N) climbed a 6 m high stairs in 15 seconds.
Calculate the work she did and the average power she developed while climbing the stairs.

Solutions

1. Work (= force × distance) = 8000 × 20 = 160000 J
2. Work (= force × distance) = 600 × 6 = 3600 J.
Power (= work ÷ time) = 3600/15 = 240 W.

Electricity

1. [2006]
Calculate the resistance of the filament of a car headlamp when 12 V produces a current of 5 A in it.
In what unit is resistance measured?

2. [2007 OL]
An electric cooker has four hot plates.The total power rating of the four hot plates is 7 kW.
All four are used for a total of 2 hours each day.

(i) How many units of electricity (kWh) are used in 1 week?
(ii) If electricity costs 11 cent per unit how much does this cost?

3. [2006 OL]
   The ESB charges for electricity at a rate of 12 cent per kW h.
   A tumble drier of power rating 2.5 kW is used for 2 hours each week for 4 weeks.

(i) How many units of electricity are used?

(ii) What is the cost, in cent, of using the tumble drier?

Solutions

1. $R = V \div I = 12 \div 5 = 2.4$ Ohms (2.4 Ω)
2.

(i) $7 \times 2 \times 7 = 98$ units

(ii) $98 \times 11 = €10.78$

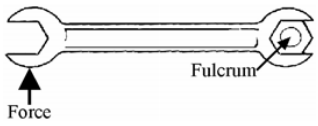
3.

(i) $2.5 \times 2 \times 4 = 20$ units.

(ii) $20 \times 12 = 240$ cent

Practice Questions

1. A stone has a mass of 120 g and a volume of 20 cm^3, what is the density of the stone?
2. The density of Iron is 8 g/cm^3. Calculate the mass of 6 cm^3 of Iron.
3. What is the volume of an object which has a mass of 20 g and a density of 4 g/cm^3?
4. Calculate the velocity of a swimmer who swims 100 m in 20 seconds.
5. Calculate the distance travelled by a teacher who runs at a speed of 5 m/s in for 3 s.
6. How long does it take a girl to travel 1000 m, if her speed is 2 m/s?
7. When a girl was a certain distance from a high cliff she shouted loudly. One and a half seconds later the echo returned from the cliff. How far was the girl from the cliff? (take the speed of sound to be 340 m/s).
8. What are the units of velocity?
9. One car can go from 0 to 100 m/s in 10 seconds while another car which can go from 100 m/s to 150 m/s in 3 seconds. Which car has the greater acceleration?
10. What are the units of acceleration?
11. Calculate the weight (in Newtons) of a bag of sugar, which has a mass of 5 kg.
12. A man has a mass of 100 kg. What is his weight?
13. Would the man weigh less or more on the moon?
14. Why does the man have a different weight on the moon?
15. A force of 75 N is used to turn the spanner in the diagram. If the distance between the force and the nut is 10 cm calculate the moment of the force.



16. A wrench 50 cm long is used by a mechanic to turn a nut.
    If the force he exerts on the end is 4 Newtons, calculate the moment of the force.
17. A boy held a book of weight 20 Newtons in his fully outstretched hand, at a distance of 50 cm away. Calculate the moment of the force.
18. Beyonce weighs 500 N and is sitting at one end of a see-saw which is 4 m long and balanced in the middle. Jordan is 2000 N. Where should she sit in order to balance the see-saw?
19. If a metal block applies a force of 20 N on an area of 5 cm^2, find the pressure being applied by the block.
20. Calculate the area of the base of a wooden box, which weighs 48 newtons if the pressure exerted is 12 pascals.
21. A girl of mass 50 kg (weight 500 N) climbed a 7 m high stairs in 20 seconds.
    Calculate the work she did and the average power she developed while climbing the stairs.
22. A force of 30 N was used to pull a sofa 4 metres across a room. How much work was done?
23. If the time taken in the previous question was 20 seconds, calculate the average power.

24. A weight-lifter lifted a weight of 1000 N a distance of 1.5 metres. How much work was done?

25. If the time taken in the previous question was 2 seconds, calculate the average power.

26. Complete the table below

Voltage	Current	Resistance
10	5	
	2	200
120		30
100	2	
	0.5	20
120		10

27. The ESB charges for electricity at a rate of 11 cent per kW h.
A hair-drier of power rating 1.5 kW is used for 20 minutes each day.

(i) How many units of electricity are used?

(ii) What is the cost, in cent, of using the hair- drier for six days?

Watts (W)	kilowatts (kW)	Hours (Hr)	kWhr	Cost (12 cent per unit)
50	0.05	60	3	24
20		5		
1000		1 day		
500		10 minutes		
60		1 week		