

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE  
General Certificate of Secondary Education



CYD-BWYLLGOR ADDYSG CYMRU  
Tystysgrif Gyffredinol Addysg Uwchradd

652/01

**GCSE IN APPLIED SCIENCE (Double Award)**

**Unit 2: Science for the Needs of Society**

**FOUNDATION TIER (Grades G-C)**

P.M. FRIDAY, 19 January 2007

(1 hour 30 minutes)

<b>For Examiner's use only</b>	
<b>Section A</b>	
<b>Section B</b>	
<b>Total</b>	

**INSTRUCTIONS TO CANDIDATES**

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

You are reminded to show all your working. Credit is given for correct working even when the final answer given is incorrect.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

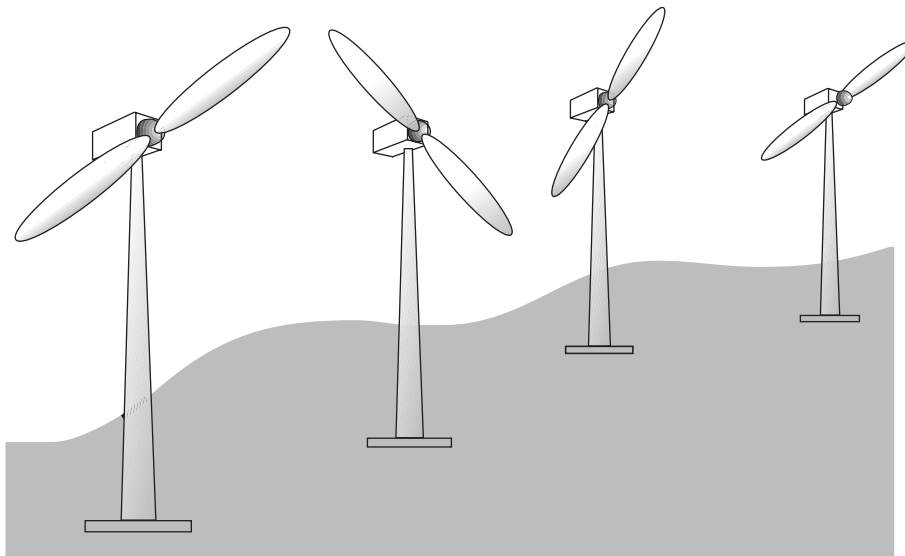
**SECTION A (50 marks)***Answer all the questions in the spaces provided.*

1. (a) Electricity is produced in this country using the energy sources listed in the table below.

**Tick (✓)** the correct boxes to show whether these sources are renewable or non-renewable. The first one has been done for you. [4]

Energy source	Renewable	Non-renewable
Oil		✓
Gas		
Solar		
Tides		
Coal		

- (b) Electricity can also be produced by wind farms.



- (i) Give **one** advantage of producing electricity using wind. [1]

.....

- (ii) Give **one** disadvantage of producing electricity using wind. [1]

.....

- (c) Electricity is also produced in this country using nuclear power. Some of our nuclear power stations are nearing the end of their useful life. Give **one** reason why it will be expensive to shut down a nuclear power station. [1]

.....

.....

2. Atoms are made from particles called **protons**, **electrons** and **neutrons**.  
Complete the following sentences about the particles inside an atom.

(i) The nucleus contains ..... and ..... [2]

(ii) ..... are found in shells or orbits around the nucleus. [1]

3. A trainee chef is finding out how the salt content of water can affect food placed in the water.

She cut five chips of the same size.

She placed each chip in water of different salt concentration.

The chips were measured at the start, and again after two hours.

The results are shown below.

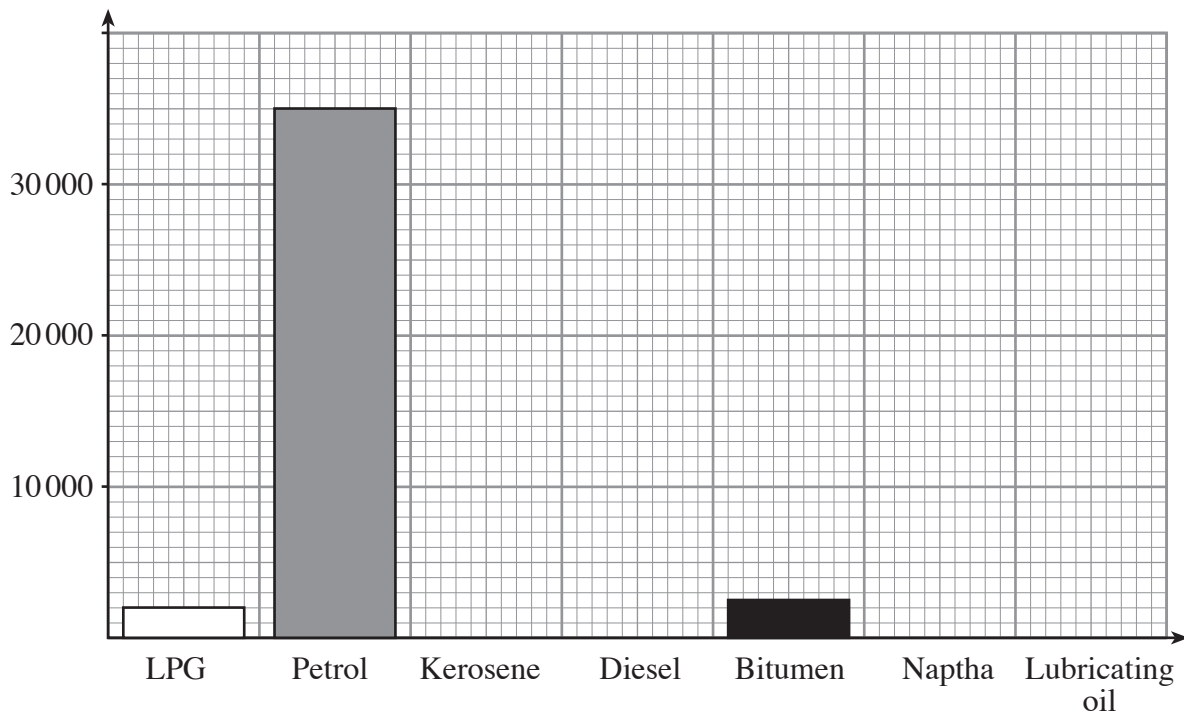
Solution	Salt concentration (g/1000 cm <sup>3</sup> )	Chip length at start (cm)	Chip length (cm) after 2 hours	Change in length (cm)
A	0	7.0	8.0	+1.0
B	20	7.0	7.5	.....
C	40	7.0	7.0	0.0
D	60	7.0	6.7	-0.3
E	80	7.0	6.5	.....

- (i) Fill in the gaps in the table. [2]
- (ii) In which solution **A, B, C, D** or **E** did the chip change in length the most?..... [1]
- (iii) In which solution did the chip stay the same size? ..... [1]
- (iv) State the concentration of salt dissolved inside the chip. .... g/1000 cm<sup>3</sup> [1]

4. The table below shows information about the products produced in oil refineries in 2004.

Product	Amount produced (thousands of tonnes)
Liquid petroleum gases	2 000
Petrol	35 000
Kerosene	10 000
Diesel	32 000
Bitumen	2 500
Naptha	2 000
Lubricating oil	6 000

(a) (i) Use the information in the table to complete the bar chart below to show the amount of **each** product. Three have been completed for you. [4]



(ii) **Name** the product which produced the greatest amount. .... [1]

(b) It is expected that in the future there will be a need for more aircraft as more and more people travel abroad.  
**Name** the product from the table that will need to be produced in greater amounts to meet this demand. [1]

A6
----

**BLANK PAGE**

5. An athlete is being tested by her physiotherapist to see how her breathing is affected by exercise.



- (a) Her breathing rate was monitored by the physiotherapist before, during, and after exercise. The results are shown in the table.

When breathing rate was measured	Before exercise	During exercise	1 minute after exercise	3 minutes after exercise	5 minutes after exercise
Breathing rate (breaths/minute)	17	72	35	22	17

Use the information in the table to complete the following sentences:

- (i) Exercise caused the athlete's breathing rate to ..... [1]
- (ii) After exercise, the athlete's breathing rate returned to normal in ..... minutes. [1]

- (b) The contents of the air breathed in, and breathed out, by the athlete were also measured. This information is shown below.

Gas	% in air breathed in	% in air breathed out
Nitrogen	79	79
Oxygen	20.97	17
Carbon dioxide	0.03	.....

Fill in the gap in the table.

[1]

- (c) Use a suitable word or words from the box to complete **each** sentence correctly.

breathing	oxygen	respiration	carbon dioxide	glucose
-----------	--------	-------------	----------------	---------

- (i) The athlete's body makes energy by the process of ..... [1]
- (ii) To make energy, the body needs oxygen and ..... [1]
- (iii) When energy is produced, one of the waste products is ..... [1]
- (iv) Air breathed out contains less ..... than air breathed in. [1]
- (d) Glucose has the chemical formula  $C_6H_{12}O_6$ .

Name the **three** elements present in a molecule of glucose.

[3]

- (i) .....
- (ii) .....
- (iii) .....

6. A car manufacturer makes two versions of the same model.  
One model runs on petrol, and the other runs on liquid petroleum gas (LPG).

(a) Some information about both cars is shown in the table.

Fuel type	Cost	Number of litres in a full tank	Distance travelled per full tank
LPG	40p/litre	5 litres	240 miles
Petrol	90p/litre	12 litres	360 miles

(i) Give **one** advantage of using an LPG fuelled car. [1]

.....

(ii) Give **one** disadvantage of using an LPG fuelled car. [1]

.....

(iii) Work out the cost of travelling 240 miles in the LPG fuelled car. [2]

Cost = £ .....

(b) The table below shows how much energy is used by both types of fuel.

Fuel type	Input energy	Useful output energy	Wasted energy
LPG	1000J	450J	.....
Petrol	1000J	.....	700J

(i) Fill in the gaps in the table. [2]

(ii) The information in the table shows that the efficiency of using LPG is 45%.  
**Explain** what this means. [2]

.....

.....

.....

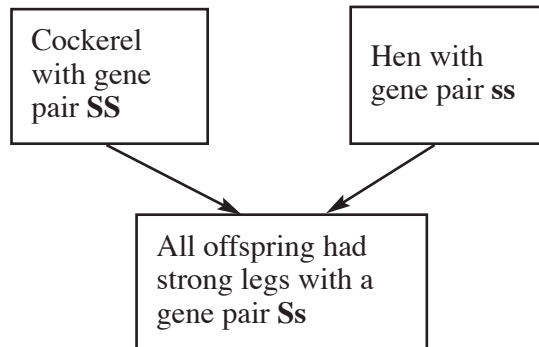


7. The farming industry uses selective breeding to produce offspring with certain characteristics. The breeding of chickens is one example. It is important that chickens have strong leg joints. Before being used for breeding, a chicken's legs are examined.



After a number of breeding cycles, all offspring will have strong leg joints.

- (a) In the first breeding cycle, a **chicken with strong legs** was crossed with a **chicken with weak legs**.



- (i) All the offspring had heterozygous gene pairs. **Explain** what this means. [1]  
.....
- (ii) Write down the letter for the **dominant gene** for leg strength. .... [1]
- (b) Two chickens from this first breeding cycle were then used for the second breeding cycle.

- (i) Complete the Punnett square to show the gene pairs for the new offspring. [3]

Gene from parent chicken	S	s
S	.....	Ss
s	.....	.....

- (ii) What fraction of chickens from this breeding cycle would be used for future breeding? [1]  
.....

8. Winter jackets are designed to keep the wearer as warm as possible.



The jacket is designed to reduce heat loss.

conduction                  radiation                  emitter                  reflector

Complete the following sentences by using suitable words from the box above.

- (i) The designer decides to make the colour of the inside lining of the jacket silver.  
This reduces heat loss by ..... because the silver lining is a good ..... [2]
- (ii) The designer uses a fibre as filler for the jacket.  
This reduces heat loss by ..... [1]
- (iii) The designer makes the colour of the outside of the jacket white.  
This reduces heat loss by ..... because the white colour is a poor ..... [2]

**SECTION B (40 marks)**

Answer **all** the questions in the spaces provided.

9. A nurse is learning how to monitor the heart of a patient.



The nurse will be able to tell if all the chambers of the heart are working properly.

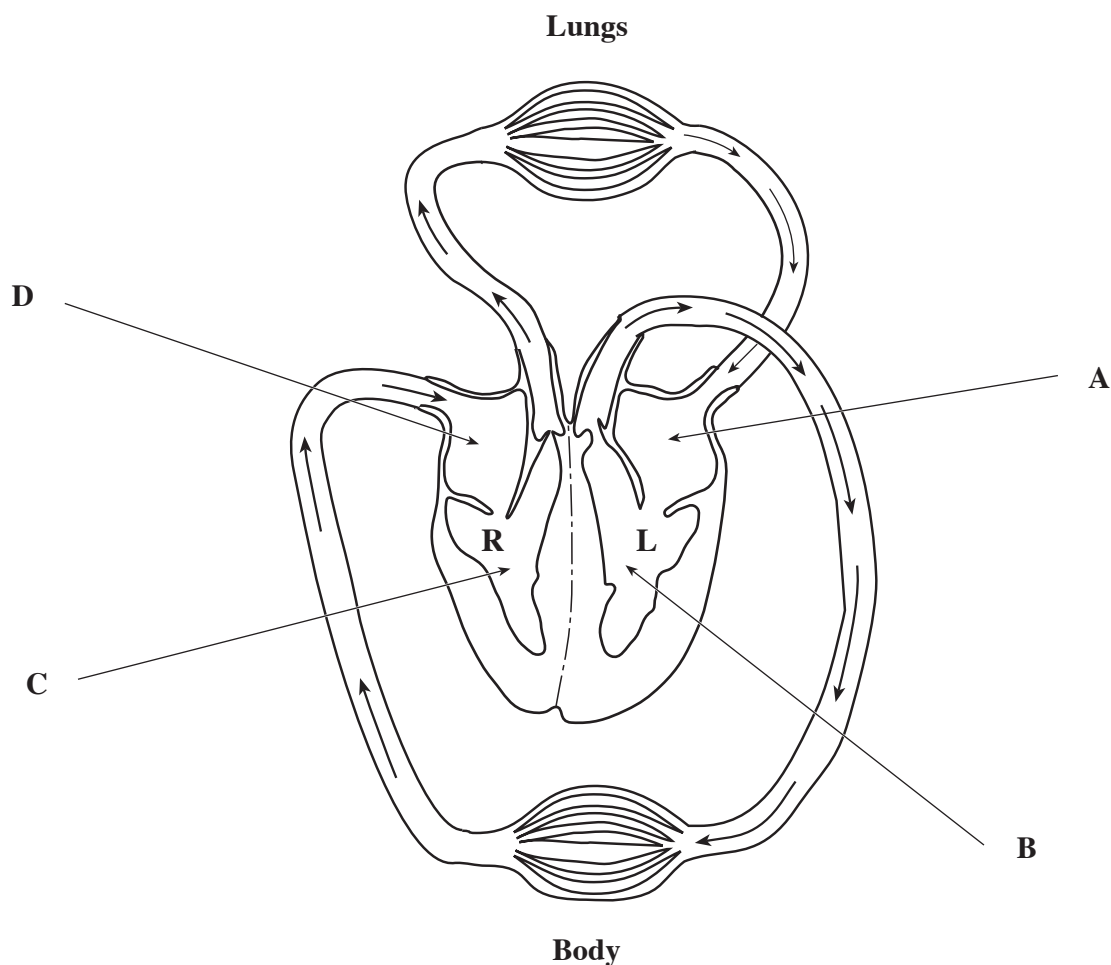
- (a) The nurse learns that the heart consists of four chambers, two on the right side and two on the left side.

**Name** the **two** chambers on the right side of the heart.

[2]

..... + .....

(b) Look at the diagram of the circulation system below and answer the questions that follow.



- (i) Which chamber, **A**, **B**, **C** or **D** pumps blood to the lungs? ..... [1]
- (ii) Into which chamber, **A**, **B**, **C** or **D** does blood return from the body? ..... [1]
- (iii) The nurse learns that symptoms of tiredness, shortness of breath and irregular heart rate may mean there is left ventricular failure.  
Which chamber **A**, **B**, **C** or **D** is the left ventricle? [1]  
.....
- (iv) **Add** an arrow labelled **V** to the diagram to show a vein. [1]

(c) The nurse takes a blood sample from the patient.  
This is sent to the laboratory for testing.

- (i) It is found that the number of red blood cells in the blood is too low.  
Give **one** reason why this will cause the patient to get tired easily.

[1]

.....

- (ii) The number of white blood cells present is normal.  
Why does your body need white blood cells?

[1]

.....

- (iii) The number of platelets in the blood is low.  
Give **one** reason why this may be a problem if the patient cuts himself.

[1]

.....

- 10.** Our digestive system contains many types of bacteria.  
Some types of these are called ‘friendly’ bacteria.  
Some people think that these ‘friendly’ bacteria keep us healthy.  
The dairy industry makes **probiotic** drinks that contain live ‘friendly’ bacteria.  
They claim that these drinks are good for us.

(a) One advert claims that people should take **probiotic** drinks especially after they have been on antibiotics for a time.

(i) **State** what will happen to the number of bacteria in the digestive system when taking antibiotics. [1]

.....

(ii) Give **one** reason for your answer. [1]

.....

(iii) **Explain** why the advert claims that you should take probiotic drinks after taking antibiotics. [1]

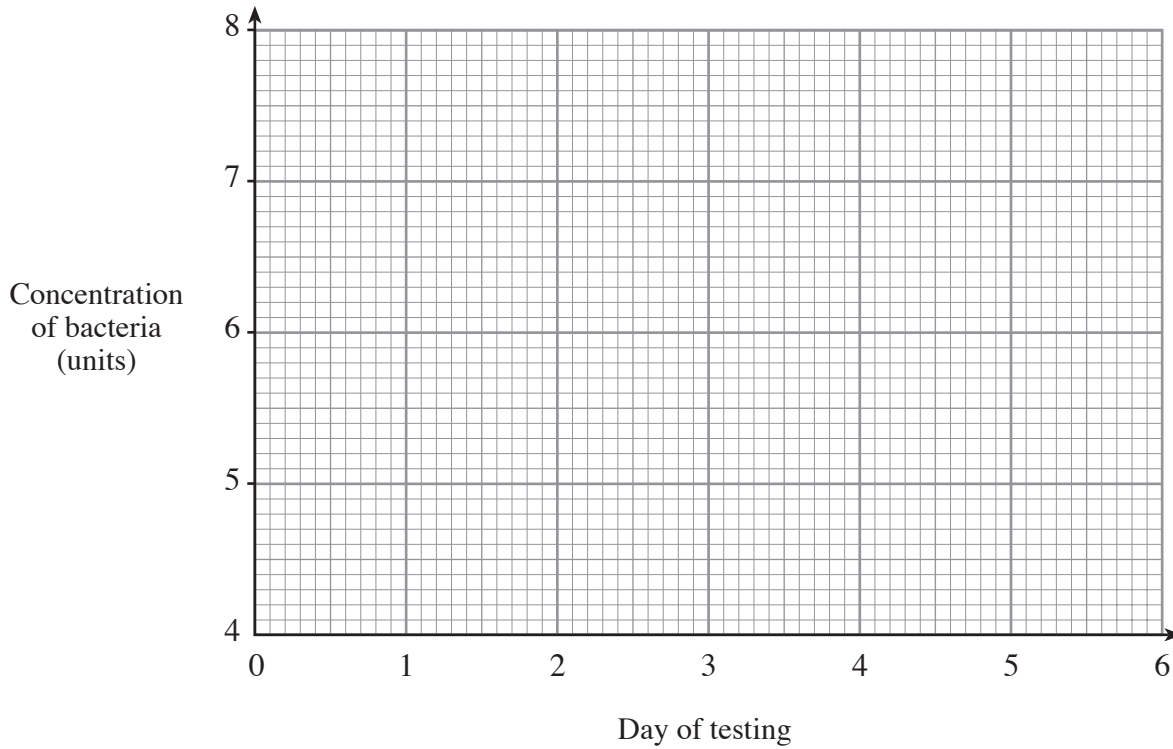
.....

.....

- (b) Some scientists claim that the bacteria in **probiotic** drinks will not survive in the stomach. The dairy industry claim that not only will the bacteria survive, but their numbers will increase.  
Science technicians working for a dairy producer are asked to investigate which claim is correct.  
They produce a model of the stomach and add live bacteria that are found in the **probiotic** drink.  
They measure the bacteria concentration for five days.  
The results are shown below.

Day of testing	Concentration of bacteria (units)
1	5.0
2	6.4
3	4.8
4	5.6
5	4.8

- (i) Plot these points on the grid **and** join them together from point to point. [3]



- (ii) Some scientists claimed the bacteria would not survive.  
**Explain** whether the results agree with this claim. [2]

.....

.....

- (iii) The dairy industry claimed that the number of bacteria would increase.  
**Explain** whether the results agree with this claim. [2]

.....

.....

- (c) It is important that harmful bacteria do not get into the probiotic drinks when they are being produced.  
State **two** methods of making sure this does not happen. [2]

1. ....

2. ....

11. The table below shows information about some alloys of iron.

Alloy	Made from	Properties
Mild steel	99.8% iron 0.2% carbon	Easily pressed into shape
High carbon steel	98% iron 1.7% carbon 0.3% manganese	Hard but brittle
Manganese steel	85% iron 1.2% carbon 13.8% manganese	Very hard
Stainless steel	74% iron 0.3% carbon 18% chromium 7.7% nickel	Rust resistant

(a) All the alloys shown contain carbon and iron.

Iron is a metal; carbon is a non-metal.

Give **two** properties of metals that are different from non-metals. [2]

1. ....

.....

2. ....

.....

(b) Use the information in the table to answer the questions below:

(i) **Name** the most suitable alloy for making kitchen sinks. .... [1]

(ii) Why is high carbon steel **not** suitable for making car bodies? [1]

.....

(c) Which elements have been added to iron to make it rust resistant? [2]

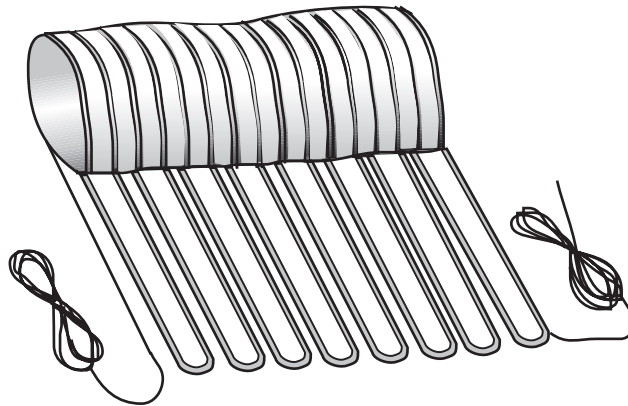
..... **and** .....



12. Manufacturers make products from mixing solids, liquids and gases together.  
There are different types of mixtures.  
Complete the sentences below.

- (i) Bleach is a solution. It is a mixture made from dissolving a .....  
in a ..... [2]
- (ii) Whipped cream is a mixture made from a .....  
and a ..... [2]
- (iii) Tiny droplets of one liquid mixed with another liquid is an example of  
an ..... [1]
- (iv) In a suspension, the ..... has not dissolved in  
the ..... [2]

13. A new version of heating the home is available for homeowners.  
It is made from metal ribbons that can be laid under carpets.



The suppliers claim it will be cheaper than using other types of heating.

- (a) When being tested, the metal ribbons were connected to a 230 V mains supply.  
The current through the ribbons was 0.5 A.

(i) Write down in words an equation connecting power, current and voltage. [1]

.....

(ii) Calculate the power developed in the ribbons. [2]

Power = ..... W

- (b) The number of ribbons required to heat a room would produce a power of **1500 W**.  
Calculate the cost of using this form of ribbons for **6 hours**. [3]  
Assume one unit of electricity costs **8p**.  
You may use the following equations:

$$\text{Energy used (kWh)} = \text{power (kW)} \times \text{time (h)}$$

$$\text{Total cost (p)} = \text{energy used (kWh)} \times \text{cost per unit (p)}$$

Total cost = ..... p