

Surname _____

Other Names _____

Centre Number _____

For Examiner's Use

Candidate Number _____

Candidate Signature _____

ASSESSMENT AND QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Higher Tier

June 2010

Applied Science (Double Award)

Unit 2 Science for the Needs of Society

Written Paper

APSC/2H

Friday 28 May 2010 9.00 am

For this paper you must have:

- a ruler.

You may use a calculator.

TIME ALLOWED

- 1 hour 30 minutes plus your additional time allowance.

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

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INSTRUCTIONS

- **Use black ink or black ball-point pen.**
- **Answer ALL questions.**
- **You must answer the questions in the spaces provided.**
- **Do all rough work in this book. Cross through any work you do not want to be marked.**

INFORMATION

- **The marks for questions are shown in brackets.**
- **The maximum mark for this paper is 90.**
- **You are expected to use a calculator where appropriate.**
- **You are reminded of the need for good English and clear presentation in your answers.**

ADVICE

- **In all calculations, show clearly how you work out your answer.**

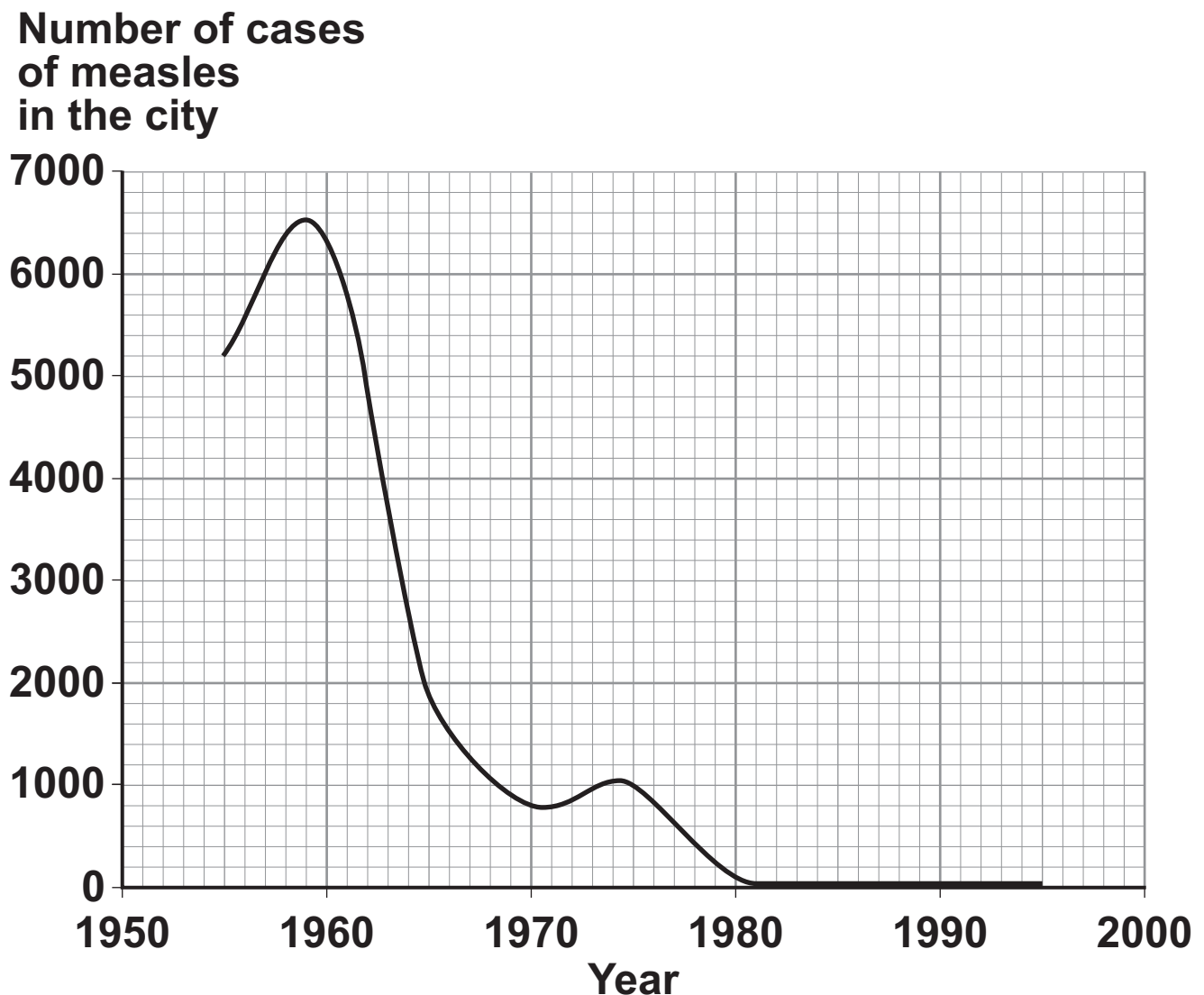
DO NOT TURN OVER UNTIL TOLD TO DO SO

Answer ALL questions in the spaces provided.

- 1 Health authorities record how many cases of measles have been reported in a city.

The graph shows the number of reported cases of measles in a city between 1955 and 1995.

Number of reported measles cases



- 1 (a) The measles vaccine was introduced to this city in 1959.

1 (a) (i) How many measles cases were reported in 1959? [1 mark]

1 (a) (ii) Describe how the number of reported cases of measles changed after 1959. [1 mark]

1 (b) The MMR vaccination protects against measles and two other diseases.

Name the TWO other diseases it protects against. [2 marks]

1 _____

2 _____

[Question 1 continues on the next page]

1 (c) A scientist suggested that it may be safer to have separate vaccinations instead of the MMR, which is a 'three-in-one' vaccine.

Having three separate vaccines may lead to an increase in the number of measles cases.

Suggest ONE reason why the number of cases might increase. [1 mark]

1 (d) Some components in our blood also protect us from microorganisms.

From the list, choose TWO components of blood that help to protect us from microorganisms.

For each component you choose, describe how it helps to protect our body from microorganisms.

red blood cells

white blood cells

hormones

platelets

oxygen

1 (d) (i) Component 1 _____

How it helps to protect the body [2 marks]

1 (d) (ii) Component 2 _____

How it helps to protect the body [2 marks]

[Turn over]

2 Metals are very useful in the modern world. Without metals there would be no cars, computers or light bulbs.

2 (a) Unreactive metals that are found in the Earth can be used straight from the ground.

Give ONE example of a metal that can be used straight from the ground. [1 mark]

2(b) Most metals are mined from the ground as ores.

Lead ore is being mined near a town.

The mining company wants to expand the mine, which will bring more employment to the area.

Give TWO disadvantages of expanding the mine. [2 marks]

1 _____

2 _____

2 (c) Metals can be extracted from their oxides by reduction with carbon.

2 (c) (i) Complete the word equation for the reaction between lead oxide and carbon. [2 marks]

Lead oxide + carbon → _____ + _____

2 (c) (ii) Give ONE use for lead. [1 mark]

2 (c)(iii) Name ONE other metal that can be extracted from its oxide using carbon. [1 mark]

[Question 2 continues on the next page]

2(d) Some metals are more reactive than others.

The table shows some facts about four metals.

METAL	REACTION
Calcium	Reacts with cold water to make hydrogen gas
Copper	Does not react with water
Magnesium	Reacts very slowly with hot water
Sodium	Reacts violently with water and has to be stored in oil so the oxygen in the air cannot react with it

2(d) (i) Write down the four metals in order of reactivity, with the most reactive first.
[1 mark]

most reactive _____

least reactive _____

2(d) (ii) Copper can be used for electrical wiring.

Give TWO properties of copper that make it a good choice of material for electrical wiring.
[2 marks]

1 _____

2 _____

3 Many electromagnetic waves are used in communication devices.

3 (a) The first commercial mobile phones were used in Japan in 1979.

3 (a) (i) Which part of the electromagnetic spectrum do mobile phones use to communicate over long distances? [1 mark]

3 (a) (ii) This part of the electromagnetic spectrum can be quite dangerous. Some scientists believe that mobile phones should carry a health warning.

Why would a mobile phone company not want to do this? [1 mark]

3 (a)(iii) Over very short distances some mobile phones can use infrared radiation.

Name ONE other use for infrared radiation. [1 mark]

[Question 3 continues on the next page]

3 (a)(iv) Frequency is the number of waves per second.

Name the units used for measuring frequency. [1 mark]

3 (a) (v) Name an electromagnetic wave with a higher frequency than infrared. [1 mark]

3(b) Visible light can be received by telescopes.

An astronomer noticed that the light coming from other galaxies appeared to be different from the light emitted in our own galaxy. The further away the galaxy from Earth, the more noticeable the difference.

3(b) (i) Describe how the light coming from other galaxies appears to be different. [2 marks]

3(b) (ii) What does this suggest is happening to the universe? [1 mark]

8

[Turn over for the next question]

4 All individuals have some differences between them.



4 (a) Draw a ring around the correct words to complete each sentence. [1 mark + 1 mark]

4 (a) (i) Eye colour is affected by

- genetic causes.**
- environmental causes.**
- genetic and environmental causes.**

4 (a) (ii) Weight is affected by

- genetic causes.**
- environmental causes.**
- genetic and environmental causes.**

4(b) Some types of gene can lead to a genetic disorder in a baby.

Sickle-cell anaemia is an example of a recessive genetic disease that affects the red blood cells.

4(b) (i) What is the function of red blood cells in humans? [1 mark]

4(b) (ii) A person with sickle-cell anaemia feels more tired than a person with healthy red blood cells.

Explain why. [2 marks]

[Question 4 continues on the next page]

4 (b)(iii) Describe, using a genetic diagram, how it is possible for two healthy parents to produce a child with sickle-cell anaemia. [4 marks]

**Use N to represent the normal allele (gene).
Use n to represent the allele (gene) that causes sickle-cell anaemia.**

4 (c) Read the article, which is a report from a newspaper.

Scientists have announced that they may be able to treat certain genetic diseases using stem cells.

Stem cells can turn into any kind of cell in the body. Stem cells that have been inserted into the brains of people suffering from brain disorders have made new brain tissue and improved the quality of life for many people.

Stem cells are mainly obtained from embryos. Stem cells can be found in adults, but do not work as well.

4 (c) (i) Name the part of the cell that contains the genetic information. [1 mark]

4 (c) (ii) Suggest ONE reason why some people may be against stem cell treatment. [1 mark]

[Turn over]

5 (c) Sodium chloride is put onto roads to prevent ice from forming. Ice can cause an increase in braking distance and lead to accidents.

Explain how ice on the road can lead to an increase in braking distance. [2 marks]

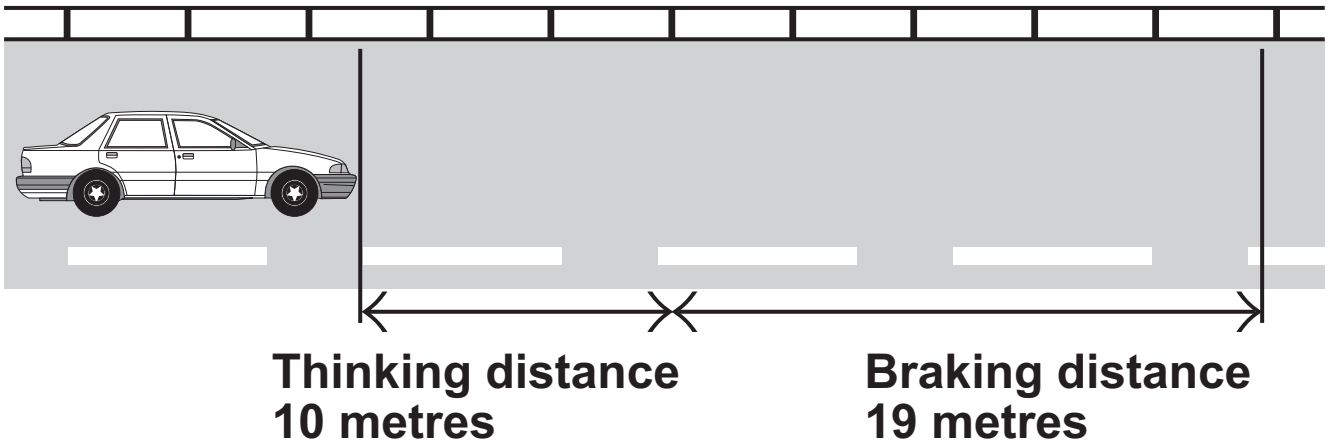
5 (d) Sodium chloride is a compound.

5 (d) (i) Name the type of bonding in sodium chloride. [1 mark]

5 (d) (ii) Explain why this type of compound has a high melting point. [1 mark]

6 A car travelling along the road cannot stop instantly. The overall stopping distance is made up of two parts:

- 1 the thinking distance
- 2 the braking distance.



6 (a) (i) What do we mean by the term ‘thinking distance’? [1 mark]

6 (a) (ii) Describe and explain the difference between the braking distance of a lorry and the braking distance of a car. [2 marks]

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QUESTION 6 CONTINUES ON THE NEXT PAGE

- 6 (b) The table shows the thinking distances of a car travelling at different speeds.

Complete the table by filling in the missing numbers. [1 mark]

Speed (in mph)	Thinking distance (in metres)
20	6
30	9
40	
50	15
60	18
70	

- 6 (c) A car travels at a speed of 60 miles per hour for 20 minutes.

Use the formula to calculate the distance the car travels. [3 marks]

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

Show clearly how you work out your answer.

_____ miles

[Question 6 continues on the next page]

6(d) The article below is from a newspaper.

MAN WITHOUT A CAR ARRESTED FOR DRINK DRIVING

A local man was tested for alcohol by the police in the early hours of Saturday morning and was found to be over the limit. The man had his car keys in his pocket. He said “I could not believe it, I was nowhere near my car when I was stopped and searched.” He was fined £1000 and banned from driving for 6 months. A spokesman for the police said “In the 5 years before this law, there were 25 deaths due to drink driving in this area. In the last 5 years there have been only 3.”

The law states that someone who is drunk and has their car keys with them could be sent to jail for 3 years, given a fine of £2500 and banned from driving.

Give ONE argument for this law and ONE argument against this law. [2 marks]

For _____

Against _____

7 A farmer buys an area of woodland. He cuts down the trees to use the land for growing crops.

Monoculture is an example of intensive farming where only one type of crop is grown.

The area as woodland



The area as monoculture



7 (a) (i) Give ONE advantage of monoculture for the farmer. [1 mark]

[Question 7 continues on the next page]

**7 (a) (ii) Give ONE negative effect of monoculture on living things in the local environment.
[1 mark]**

**7 (a)(iii) Explain how monoculture causes this effect.
[1 mark]**

7 (b) Monoculture farms need large amounts of fertilisers.

**7 (b) (i) Explain why monoculture farms need to add large amounts of fertilisers to the soil.
[2 marks]**

7 (b) (ii) Give ONE way in which too much fertiliser affects the environment. [1 mark]

7 (c) An organic farmer uses natural methods to increase crop yield.

Name TWO natural methods used to increase crop yield.

Explain how each method helps to increase yield. [4 marks]

Natural method 1 _____

How it helps to increase yield _____

Natural method 2 _____

How it helps to increase yield _____

[Question 7 continues on the next page]

7 (d) Plants grow and make food by photosynthesis.

The farmer thinks about growing tomatoes in a commercial glasshouse.

Name TWO things the farmer could control in the glasshouse to increase the rate of photosynthesis. [2 marks]

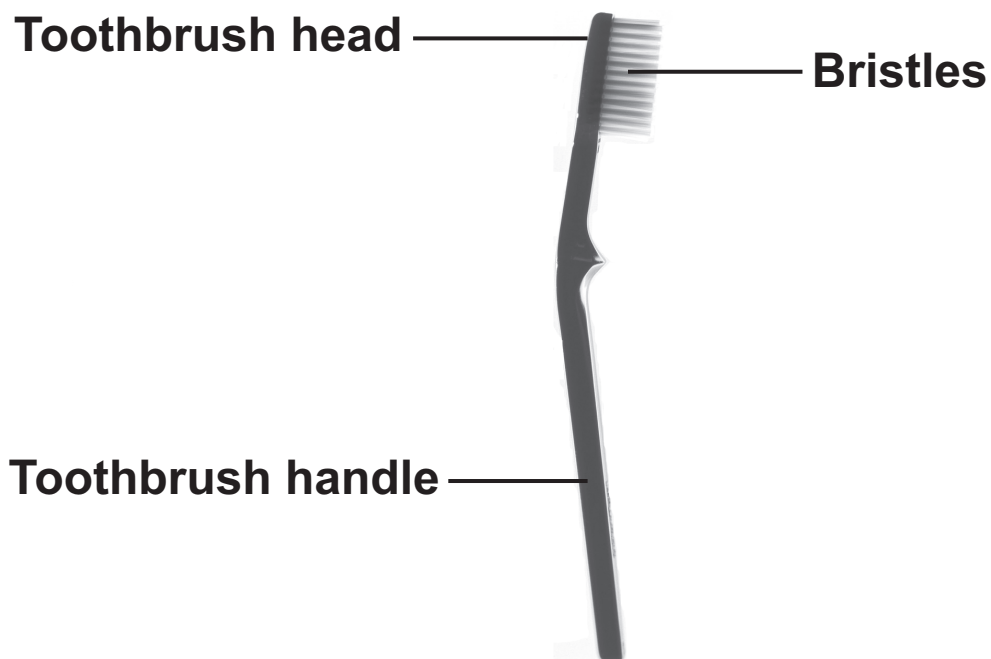
1 _____

2 _____

8 The first toothbrush was invented in China in the late 1400s.

It consisted of stiff hairs from a pig's neck that were attached to a wooden stick.

Now our toothbrushes are made from polymers.



8 (a) Give TWO advantages of using a polymer material to make toothbrushes instead of wood. [2 marks]

1 _____

2 _____

[Question 8 continues on the next page]

8 (b) Many polymers are made from hydrocarbons.

8 (b) (i) Name the raw material that can be separated into several different hydrocarbons. [1 mark]

8 (b) (ii) What is the process used to separate this raw material into different hydrocarbons? [2 marks]

8 (c) The table gives the properties of some polymers.

Name of polymer	Density (kg/m ³)	Melting point (°C)	Thermal conductivity (W/m.K)
Nylon	1150	190 – 350	0.25
Polyimide	1430	Very high	0.52
PVC	1380	80	0.16

Using information from the table, choose which polymer you would use to make each of the following items. For each one, give a reason for your choice. [2 marks + 2 marks]

8 (c) (i) Outer case of a toaster.

Choice of polymer _____

Reason _____

8 (c) (ii) Tent for hiking.

Choice of polymer _____

Reason _____

8 (d) Give ONE disadvantage of using plastic (polymer) bags instead of paper bags. [1 mark]

[Turn over for the next question]

9 In Brazil, it is the law that people must fuel their vehicles with a blend of petrol and ethanol containing at least 25% ethanol.

9 (a) What is the name of the fuel that is a blend of ethanol and petrol? [1 mark]

9 (b) Ethanol is made in a process called fermentation.

9 (b) (i) Balance the symbol equation for fermentation by writing the missing number. [1 mark]



9 (b) (ii) What are the differences between respiration in animal cells and fermentation? [2 marks]

9 (c) A disadvantage of burning fossil fuels inside an engine is that there may not be enough oxygen for complete combustion of the fuel.

Incomplete combustion of fuel in an engine reduces the engine's efficiency.

A car engine is 15% efficient.

Efficiency can be calculated using the equation.

$$\text{Useful energy in joules} = \frac{\text{Efficiency (\%)} \times \text{Total energy in joules}}{100}$$

9 (c) (i) Use the equation to find out how much energy is wasted when the total energy supplied by the fuel is 3kJ. [4 marks]

[Question 9 continues on the next page]

9 (c) (ii) Where does this wasted energy go? [1 mark]

9 (d) Apart from reducing the efficiency, describe the problems associated with incomplete combustion in car engines. [2 marks]

END OF QUESTIONS

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For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
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4	
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6	
7	
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9	
TOTAL	

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