THIS IS A NEW SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

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Thursday 13 June 2013 – Morning

GCSE ADDITIONAL APPLIED SCIENCE

A192/01 Science of Materials and Production (Foundation Tier)

A134550613

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: 1 hour

A192012

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **50**.
- This document consists of **16** pages. Any blank pages are indicated.

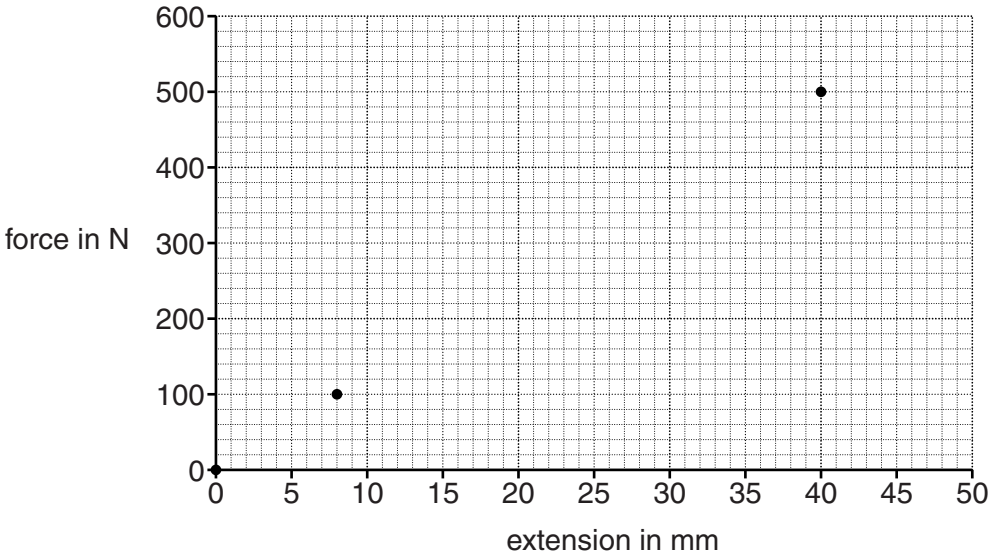
This paper has been pre modified for carrier language

Answer **all** the questions.

1 Edmund tests a climbing rope.

He measures the extension of the rope for weights of 100 N and 500 N hung on the end.

Here is a graph of his results.



(a) Edmund hangs a 200 N weight on the end of the rope.

By drawing a straight line on the graph, predict the extension of the rope for 200 N.

extension = ... mm **[2]**

(b) Edmund adds more weights to the rope until it breaks.

(i) What property of the rope is Edmund measuring?

Put a tick (✓) in the box next to the correct property.

density ☐

strength ☐

flexibility ☐

durability ☐ **[1]**

(ii) The climbing rope is designed to hold a maximum weight of 4000 N.
In Edmund's test, it breaks at a weight of 6000 N.
This gives the rope a **safety margin** of 2000 N.

Why is it important that the rope has such a large safety margin?

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.....

..... **[1]**

(c) A climbing rope is made from a material that is a polymer.
This is because it has the right material properties for the job it has to do.
A material that is a metal or a ceramic would have the wrong properties.

Draw a line to join each **type of material** to its correct **material properties**.

type of material	material properties
metal	very hard but brittle
ceramic	low density and high toughness
polymer	high density with high strength

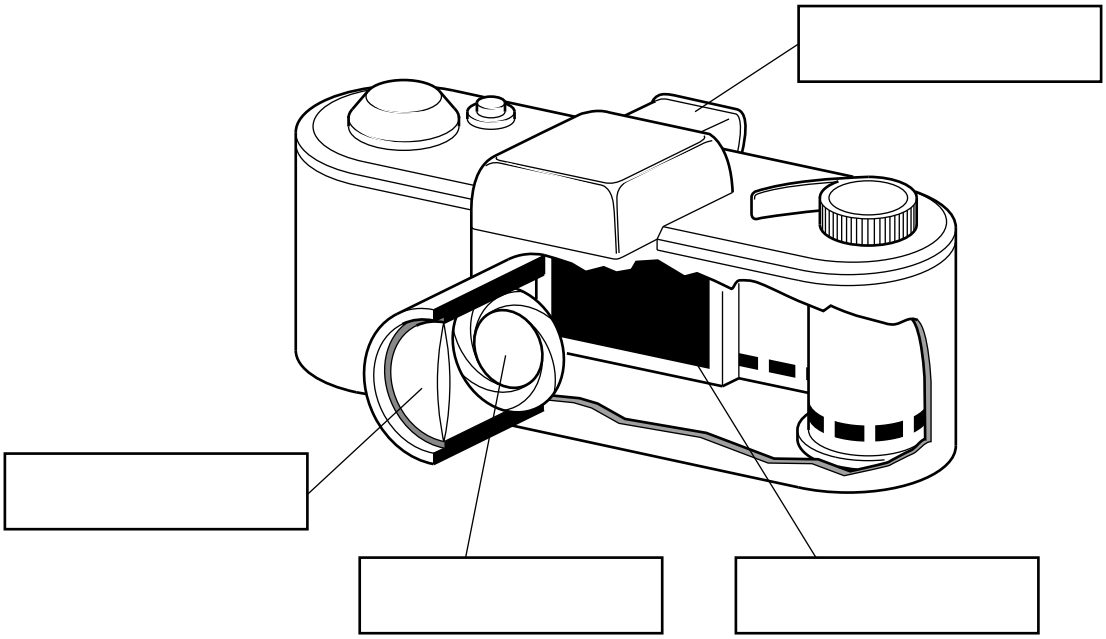
[2]

[Total: 6]

2 Bill has an old camera.

(a) Add these labels to the diagram of the camera.

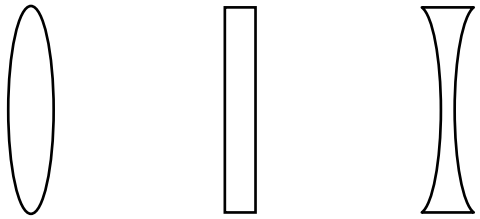
aperture **focal plane** **lens** **viewfinder**



[3]

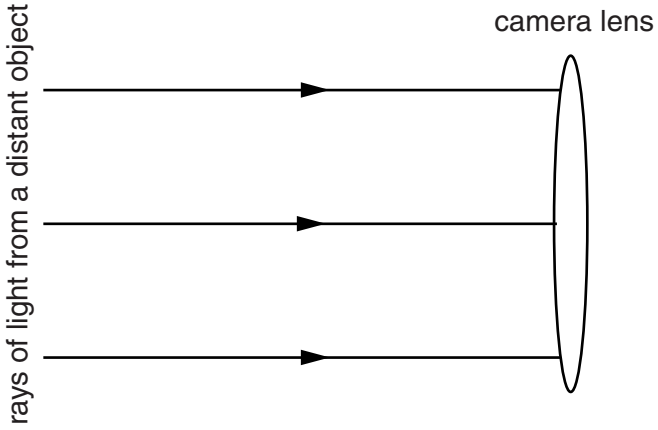
(b) The viewfinder contains a diverging lens.

Which **one** of these lenses, **A**, **B** or **C**, is diverging?



answer ..... **[1]**

(c) The diagram shows rays of light from a distant object approaching a camera lens.



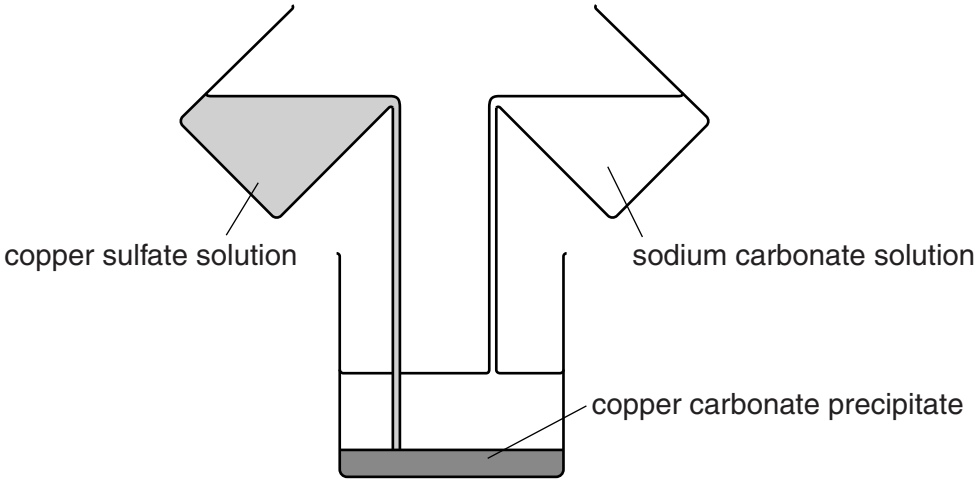
The lens focuses the rays to make an image.

Draw straight lines to show the rays of light **after** they have passed though the lens.

Label the point where the image is formed. **[2]**

[Total: 6]

3 Vince uses a batch process to make the blue-green pigment copper carbonate.
He mixes equal volumes of copper sulfate solution and sodium carbonate solution.
The copper carbonate forms a precipitate.



(a) Write down the word equation for the reaction that Vince is using.

[ ] + [ ] → [ ] + [ ]

[2]

(b) Copper sulfate is expensive, so Vince investigates the yield of his process.
Vince mixes the **same** volume of the reactants five times, using a different concentration of copper sulfate solution each time.
He measures the mass of copper carbonate each time.

Here are his results.

1.0 litres of sodium carbonate solution (concentration in g/l)	**1.0 litres of copper sulfate solution (concentration in g/l)**	**Copper carbonate (mass in g)**
100	50	36
100	100	72
100	150	108
100	200	115
100	250	115

(i) Vince decides to scale up his process to make 920 g of copper carbonate.

He uses the 250 g/l copper sulfate solution.

Calculate the volume of copper sulfate solution he will need.

volume = ... litres **[2]**

(ii) He decides to use the 250 g/l copper sulfate solution from now on.

Is this the best concentration for him to use?

Use his results to justify your answer.

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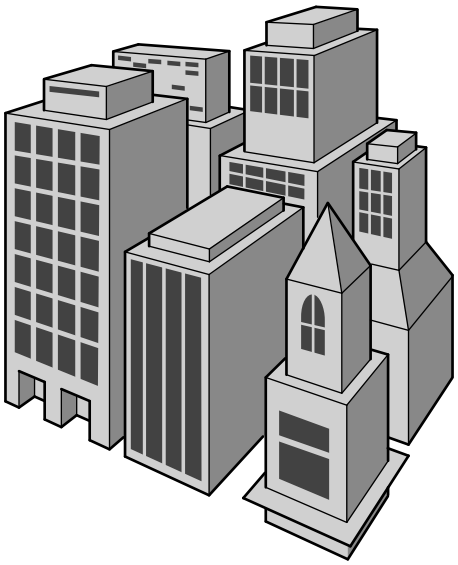
..... **[3]**

[Total: 7]

4 Stanley designs blocks of flats.



Stanley tries to make sure that people who live in his flats are not disturbed by noisy neighbours. This means that he needs to know how to use materials that can control sound.

Explain the use of suitable materials for controlling the noise from the other flats.

The quality of written communication will be assessed in your answer to this question.

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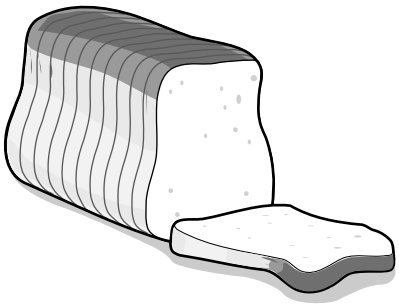
..... **[6]**

[Total: 6]

5 Sally always buys bread made from wheat that is grown organically.
She thinks that it is better for her than bread made from wheat that is not grown organically.



Compare the **production** of wheat that is grown organically with wheat that is not grown organically.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

[Total: 6]

6 Susan climbs mountains.

She carries an ice-axe to increase her safety.

The cutting head of the axe and the handle are made of different materials.

The table gives information about three different types of material.

Type of material	Thermal conductivity in W/mK	Strength in MPa	Stiffness in GPa	Density in kg/m^3
metal	80	70	50	7000
polymer	0.3	40	5	1000
ceramic	1.5	15	75	2000

(a) The cutting head is made of metal.

Use information from the table to explain why.

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..... **[2]**

(b) Susan wants a handle which will not feel cold.

Which type of material is best for the handle?

Use information from the table to justify your choice.

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..... **[2]**

(c) Susan buys a new ice-axe with a handle made from a composite material.

(i) What is the **best** description of a composite material?

Put a tick (✓) in the box next to the best description.

a mix of materials which is biodegradable	☐
sheets of different materials fastened together	☐
fibres of two different materials knotted together	☐
fibres of one material in a matrix of another material	☐

[1]

(ii) Suggest a composite material which could be used for the handle of the ice-axe.

..... **[1]**

[Total: 6]

7 Microorganisms are used to make some drinks.
For example, yeast is used to convert grape juice into wine.

(a) Name **one** other food or drink which is made with the help of microorganisms.

..... **[1]**

(b) Yeast produces alcohol by **anaerobic fermentation** of the sugars in the grape juice.

Complete the word equation for anaerobic fermentation.

Choose words from this list.

alcohol **carbon dioxide** **oxygen** **sugar**

	→		+	

[2]

(c) Wine is often stored in bottles.
Wine spoils if the bacterium *Acetobacter* is allowed to grow in it.

(i) At 10 °C, each *Acetobacter* bacterium can divide into two every 5 hours.

Complete the table.

Assume that there is plenty of food for the bacterium.

Time in hours	Bacterium population in millions/ml
0	2
5	4
10	

[1]

(ii) Calculate the total number of hours it will take for the initial bacterium population of 2 millions/ml to reach 64 millions/ml.

Show your working.

total number of hours = ... **[2]**

(iii) Sometimes the *Acetobacter* bacterium is already in the bottle before the wine is added.

Suggest how the bottle could be treated to stop the wine from being spoiled.

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..... **[1]**

[Total: 7]

8 Copper sulfate is a soluble salt which has blue crystals.
It can be made by reacting solid copper oxide with dilute sulfuric acid.

Describe how you would make **large** copper sulfate crystals by reacting solid copper oxide with dilute sulfuric acid.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

[Total: 6]

END OF QUESTION PAPER

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