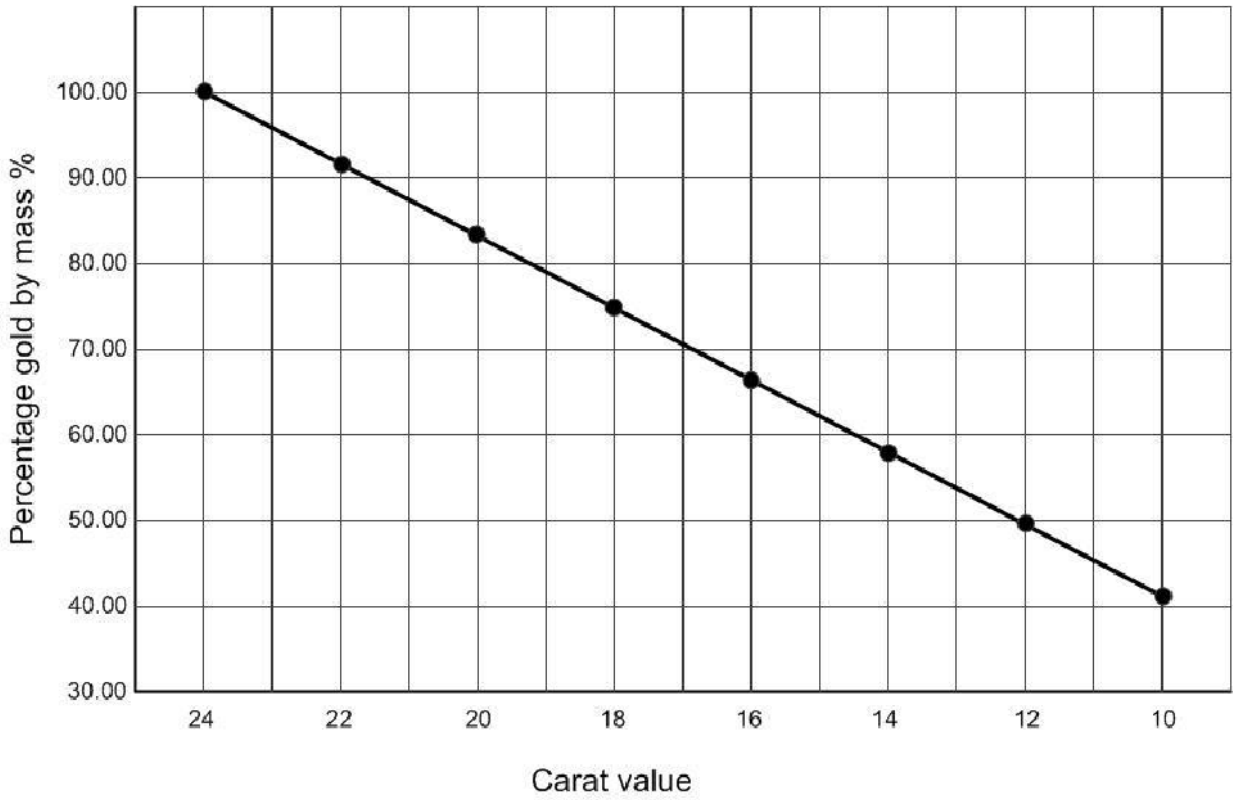
1(a). The purity of gold is measured in carats.

24 carat gold is almost pure gold.

Gold with lower carat values contains other metals.

The graph shows how the percentage of gold by mass is related to its carat value.



A 2.5 g sample of gold contains 1.9 g of gold.

(i) What percentage of gold does the sample contain?

Show your working.

percentage of gold = ______________________________ %

(ii) What is the sample's carat value?

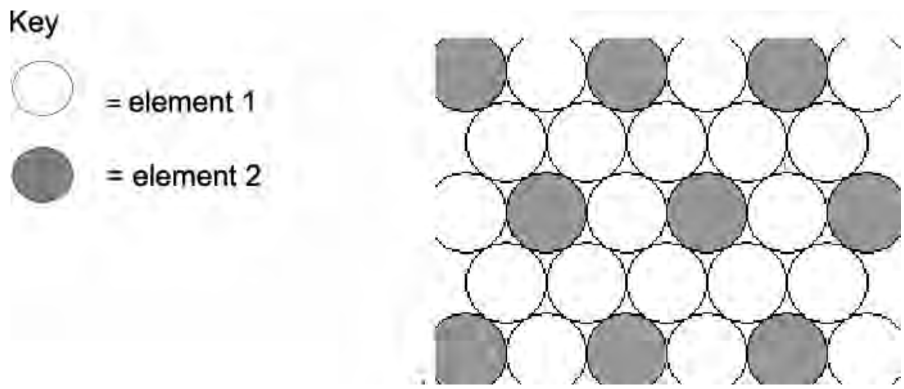
Use your answer to part **(i)** and the graph to help you answer.

carat value = ______________________________

(b). 22 carat gold is an alloy which contains approximately 92% gold atoms.

The other 8% contains silver atoms and copper atoms.

Fay finds this diagram of the atoms in an alloy on the internet.



Explain why this diagram does **not** fit the arrangement of atoms in 22 carat gold.
Include a calculation in your answer.

____

____

____ [2]

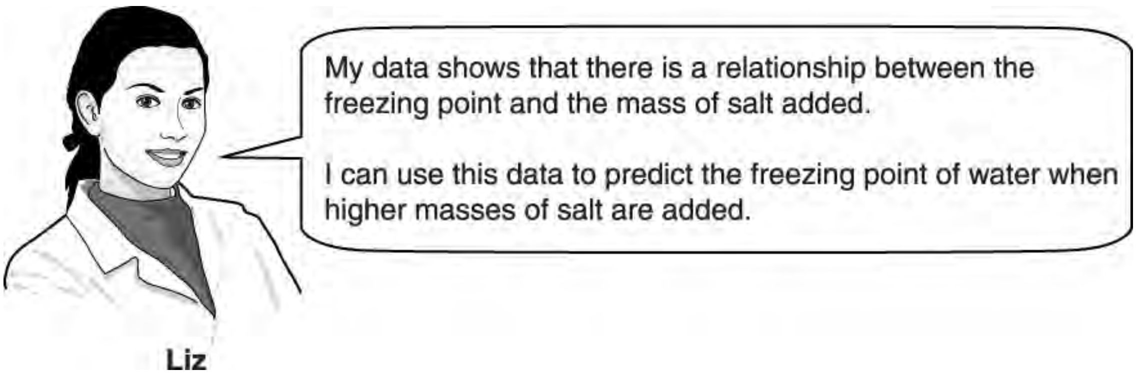
2(a). Salt is put on roads in winter because it lowers the freezing point of water.

Liz does some experiments to investigate whether salt can be used to stop water from freezing in extreme weather conditions.

She adds different masses of salt to 100 cm^3 of water and records the temperature when the water freezes. Here are her results.

Mass of salt added to 100 cm^3 water in g	Freezing point in °C
0.0	0
5.0	–3
10.0	–6
15.0	–9

Liz talks about her results.



(i) What is the relationship shown in this data between the mass of salt added and the freezing point?

____

____

____ **[2]**

(ii) Use the relationship to predict the freezing point when 25.0 g of salt are added.

Show your working.

Freezing point = ________________ °C **[2]** (b). Liz does another experiment using 35.0 g of salt.

The table shows her results

Mass of salt added to 100 cm^3 water in g	Freezing point in °C
35.0	–6

(i) Liz thinks that this result may be an outlier.
Explain why she thinks this.

--- [1]

(ii) What should Liz do to check whether this result is an outlier?

--- [1]

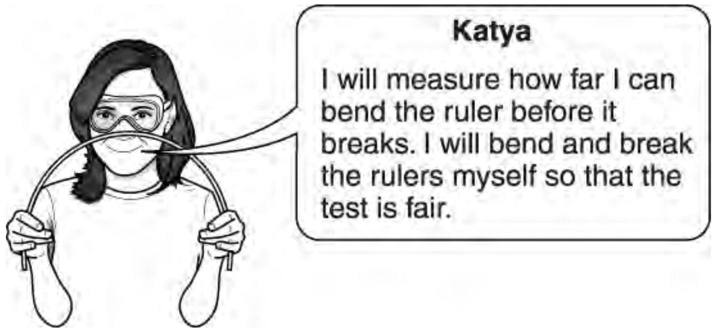
(iii) Liz wants to investigate the relationship between mass of salt and the freezing point of water when she adds up to 50.0 g of salt.

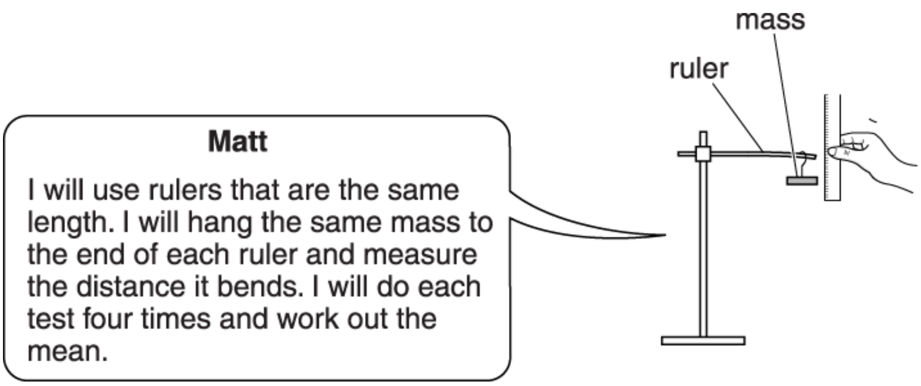
Describe what experiments she should do.

--- [3]

3(a). Some students investigate the stiffness of plastic rulers.

This is how three students plan their investigation.





Here are the measurements for one ruler.

Test number	1	2	3	4	5
Bend (mm)	23	26	13	19	24

(i) What is the range of **all** these measurements?

______________________ **[1]**

(ii) These measurements include an outlier.

Which measurement is the outlier?

______________________ **[1]**

(iii) What could the students do to decide whether or not to include the outlier when calculating the best estimate of the true value from their measurements?

____

____

____ **[1]**

(iv) **Include** the outlier and work out the best estimate of the true value of their measurements.

Show your working.

[2]

(b). Which plan is best? Explain why this plan is better than the other two plans.

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

____

____

____

____

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____

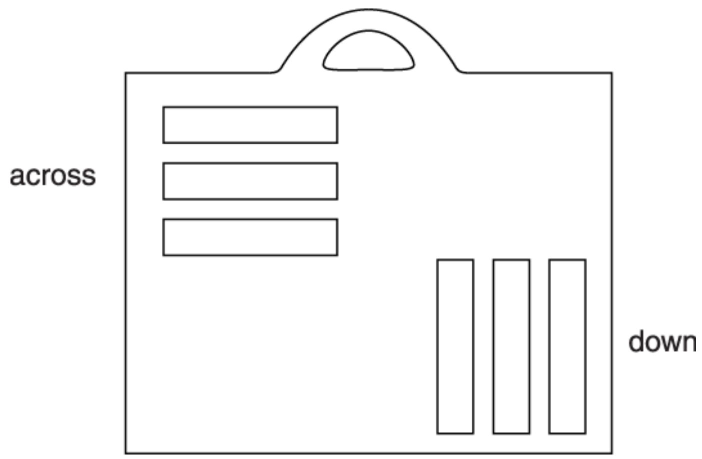
____

____ **[6]**

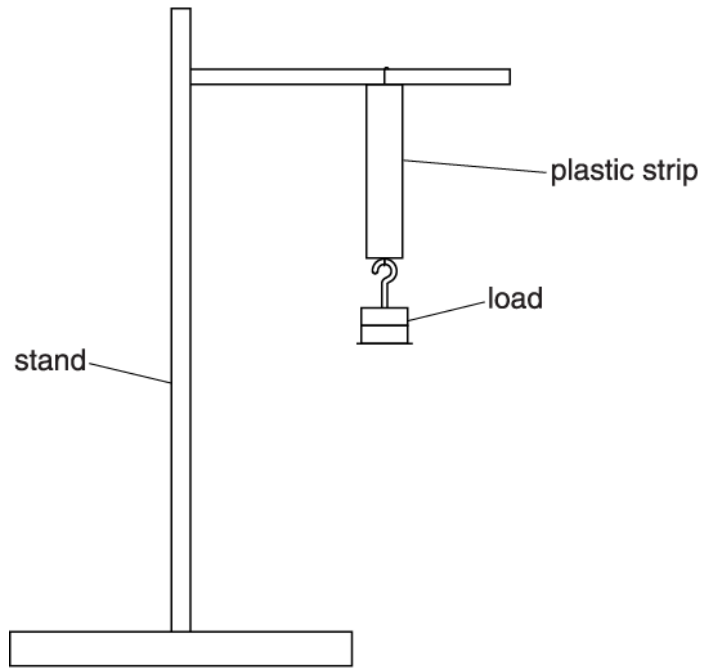
4. Students test strips of plastic from a shopping bag.

They cut some strips **down** the bag.

They cut some strips **across** the bag.



They use this apparatus.



Their results are shown in the tables.

Strips across the bag		
Load in g	**Length in mm**	**Total stretch in mm**
0	200	0
100	222	22
200	243	43
300	265	65
400	286	86
500	307	107

Strips down the bag		
Load in g	**Length in mm**	**Total stretch in mm**
0	200	0
100	209	9
200	221	21
300	231	31
400	242	42
500	252	....

Complete the table for the strips down the bag.

[1]

5. Scientists working for a shoe company look at materials that could be used to make walking shoes.

The table shows some of the properties of several materials when used in shoes.

Material	Is it renewable?	Hard-wearing?	How flexible is it?	Is it waterproof?
cotton fabric	yes	low	high	no
leather	yes	high	medium	yes
nylon fabric	no	high	high	no
vulcanised rubber	yes	high	high	yes
wood	yes	low	low	yes

Choose which material would be best for the upper and which would be best for the sole of these walking shoes.
Give reasons for your choices.

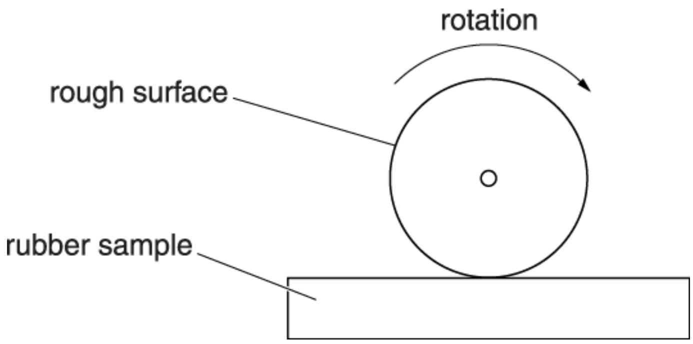
The quality of written communication will be assessed in your answer.

[6]

6. Vulcanised rubber is made by reacting natural rubber with sulfur.

Samples of vulcanised rubber and natural rubber are tested to see how hard-wearing they are.

Scientists measure the time taken to wear away 1.0 cm of the rubber.



Here are their results.

Sample number		1	2	3	4	5	6	Range	Mean
Time in mins to wear away 1.0cm rubber	natural rubber	13	15	12	13	11	14	11–15	13
	vulcanised rubber	34	33	35	37	33	32	32–37	34

(i) Why were measurements made on several samples instead of just one?

Put ticks (✓) in the boxes next to the **two** correct statements.

It allows the procedure to be practised. ☐

One sample could be faulty. ☐

The mean is closer to the true value. ☐

To make sure all samples are the same size. ☐

Vulcanised rubber has been reacted with sulfur. ☐

[2]

(ii) What do these results suggest about the effect of vulcanisation on rubber?

____

-- [1]

(iii) How sure can you be that your answer to **(ii)** is correct?

Complete the sentences by putting a (ring) around the correct word in each box.

I am

sure
not sure

that my answer is correct.

This is because the

range
mean

of each set of results is

small
large

compared

with the difference between the two sets of results.

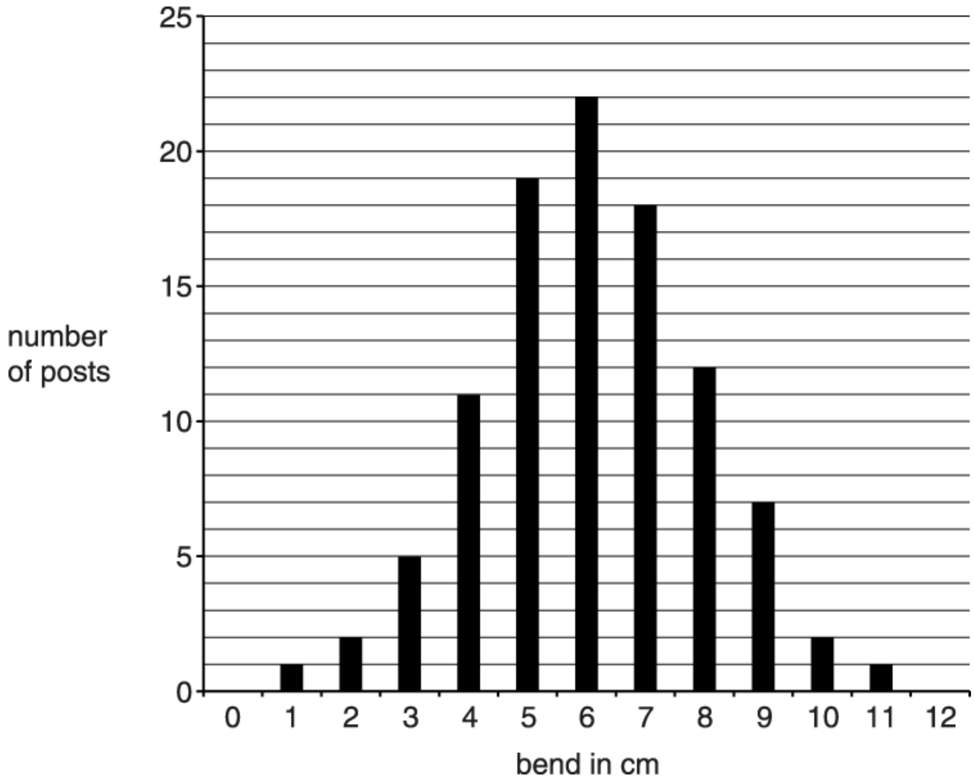
[2]

7(a). A company decides to make fence posts from a plastic.

The company makes and tests 100 fence posts with the same size and shape.

They measure how far each post bends under the same conditions.

The bar chart shows their results.



(i) In the test, how many posts bent 9 cm or more?

______________________________________ **[1]**

(ii) The company wants to make 500 posts each day.

They will not sell posts that bend 9 cm or more.

How many posts will they reject each day?

Show your working.

number of posts rejected = ______________________________________ [2]

(b).

The company decides that the plastic they have is too flexible and has too large a range of flexibility.

Technicians test small pieces of three other plastics.

All the samples used have exactly the same size.

They measure how far each sample bends under the same conditions.

Their results are shown in the table.

	Distance sample bends in mm						
Sample number	1	2	3	4	5	6	mean
Plastic A	35	33	35	34	34	33	34
Plastic B	14	13	14	15	13	15	14
Plastic C	10	18	12	14	17	13	14

Describe the advantages and disadvantages of each plastic for making fence posts.

Which plastic would you choose and why?

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

____

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____ [6]

8(a). Chemicals have different uses and properties.

Look at the data about some chemicals.

Chemical	Melting point in °C	Boiling point in °C	Electrical conductivity	Other points
A	3500	4000	does not conduct	very hard and strong
B	–210	–196	does not conduct	very unreactive
C	1500	2860	good	strong and malleable
D	–7	59	does not conduct	toxic

(i) Which chemical is a metal?

____

[1]

(ii) Which chemical is a gas in the air?

____

[1]

(iii) Which two chemicals are giant structures held together by strong bonds?

_____________________________ and _____________________________

[1]

(iv) Which chemical is diamond?

____

[1]

(b). Metals have many different uses.

Which property is **most** important when choosing a metal for the following uses?

Put **one** tick (✓) in each row.

Use	Properties			
	Melting point	Electrical conductivity	Malleability	Strength
Bridge supports				
Temperature probes for hot ovens				
Electric wiring				
Metal that must be hammered into shape to make horseshoes				

[2]

9. A supermarket uses plastic carrier bags.

The handles of some of a **new** set of bags break when customers carry their shopping away.

The supermarket complains to the company that makes the bags.

The company tests 5 of the new set of bags.

They find the mass that will break each bag.

Here are their measurements.

Bag number	1	2	3	4	5
Mass to break handle in kg	6.5	8.2	6.1	10.2	9.0

(i) Use **all** their measurements to find the mean value of the mass to break the handles.

Show your working.

____________________ kg **[2]**

(ii) What is the range of these measurements?

_____________ to _____________ kg **[1]**

(iii) Measurements on older bags have the same mean value.

The range for the older bags is 7.4 to 8.6 kg.

Use this information and your answer to part **(ii)** to suggest why some of the new bags are breaking more easily than the old ones.

____

____ **[1]**

10(a) Dave is buying new ropes for his boat.

.

Look at the properties of four synthetic fibres used to make ropes.

	Kevlar	Nylon	Polyester	Polypropene
Tensile strength in N / mm^2	210	70	70	65
Stiffness in MNm / kg	80	2	3	1
Density in g / cm^3	1.44	1.14	1.38	0.91
Floats on water or sinks	sinks	sinks	sinks	floats
Water absorbency in %	4.5	6.0	0.5	almost 0

The best ropes are made from fibres which are strong, flexible and light, even when wet.

Which fibre would make the best rope for Dave's boat?

Use the data to help you explain why you would choose that fibre and not the others.

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

--- [6]

(b). In countries where there is no chemical industry, ropes are made from plant material.

Which **two** statements show the advantages of using plant material?

Put ticks (?) in the boxes next to the **two** correct answers.

Ropes from plants will rot.	☐
Buying rope from other countries is expensive.	☐
Ropes from plants absorb more water than synthetic ones.	☐
There is a limited supply of plants.	☐
Making rope from plants uses local materials.	☐

[2]

11(a) Tennis balls used in competitions must have a similar bounce.
. The balls are dropped onto concrete and the height of the bounce is measured.

Why must the tennis balls be dropped onto the same surface?

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

Tennis courts are made of different materials.	☐
Changing the surface affects the outcome.	☐
So that the bounce height can be measured accurately.	☐
So that the balls do not bounce too high.	☐

[1]

(b). Ben measures the bounce of 50 tennis balls.
This is what he finds.

Height of bounce	Number of tennis balls
up to 130 cm	2
131 to 135 cm	8
136 to 140 cm	26
141 to 145 cm	14
146 to 150 cm	0
greater than 150 cm	0

He rejects all the tennis balls that bounce **higher** than 146 cm or **lower** than 136 cm.

(i) How many of the 50 tennis balls can he use?

_______________________ **[1]**

(ii) Ben needs 120 tennis balls for a competition.
He wants to know how many tennis balls he must test.
He uses this equation:

$$\text{Number of tennis balls he must test} = \text{Number of tennis balls needed} \times \frac{50}{\text{answer to part } \textbf{(i)}}$$

Work out how many tennis balls Ben must test.

_________________________ **[2]**

(iii) Josie watches Ben test the tennis balls.
Josie says he should test each tennis ball more than once.
Is she right? Explain why.

____

____ **[1]**

12. **Table 9.1** shows the properties of three polymers.

Polymer	Relative breaking strength	Flexibility	Temperature at which it softens (°C)	Cost
A	very high	fairly flexible	250	very high
B	low	very flexible	70	low
C	fairly low	stiff	150	low

Table 9.1

A company wants to make cups to hold boiling water.

Which polymer, **A, B** or **C**, should the company choose?

Give **two** reasons for your choice using the information in **Table 9.1**.

Polymer ....

Reason 1 ....

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

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Guidance
1	a	i	**FIRST CHECK THE ANSWER ON THE ANSWER LINE** **If answer = 76 (%) award 2 marks** 1.9/2.5 ✓ (x 100) = 76 (%) ✓	2	
		ii	18 ✓	1	**ALLOW ECF** from **(i)**
	b		19 ÷ 28 × 100 = 68 % less than 92 % ✓ only one other type of atom shown / gold contains two other types of atom ✓	2	
			Total	**5**	
2	a	i	decreases by 3 (°C); for every 5.0 (g) added; **Allow (1) mark for....** as mass increases, freezing point decreases / more salt added the lower the temperature ;	2	**Allow** 'melting point' as AW for 'freezing point' **Ignore** 'gets colder' Mass and freezing point show a negative correlation/are inversely proportional (1)
		ii	?15 (2) If answer incorrect: Working showing correct use of ?3/3	2	**Ignore** ?3 as answer with no working <u>Examiner's Comments</u> Most candidates showed that they understood the correlation between the mass added and the freezing point in (i), although there was some confusion about whether the freezing point was increasing or decreasing as it became more negative. Many went on to give the extra detail about the amounts. Few were unable to correctly predict the freezing point in (ii) although some omitted the negative sign.
	b	i	Freezing point/temperature is higher than expected/freezing point should be lower;	1	**ALLOW** same as for 10g/should be -21 **Ignore** does not fit pattern
		ii	Repeat the experiment again;	1	**Ignore** draw graph

Question			Answer/Indicative content	Marks	Guidance
		iii	measure/take/record the freezing point (for another experiment); Add a range of salt masses to water / 35g, 45g, 50g; Use $100cm^3$ water/same amount every time;	3	Need at least two different salt masses or 'range' idea **Ignore** 'add more' or 'add 50' alone **Examiner's Comments** There were some good answers in (i), explaining why it is an outlier by either stating what the freezing point would be if the trend continued or stating the mass that had produced the given freezing point. Again there was some confusion as to whether the freezing point was higher or lower than expected as it was a less negative number. Some answers were too vague, such as 'did not fit the pattern'. The need to repeat a test which has produced an outlier was well understood by candidates for (ii) although some described drawing graphs and lines of best fit. Few candidates were able to describe any suitable experiments for (iii). Some did have the idea of adding a further range of masses but most just added 50g in one go. Others did realise the need to keep the amount of water the same but hardly any described the need to measure the freezing point.
			Total	9	

Question			Answer/Indicative content	Marks	Guidance
3	a	i	13 – 26 (mm)	1	Allow 13 **Examiner's Comments** Most candidates could identify the range correctly.
		ii	test 3 / 13; (1)	1	**Examiner's Comments** Most candidates could identify the outlier correctly.
		iii	repeat test / check again / see how far away it is from the other values / see if the range is too large	1	**Ignore** 'real difference' for 'how far away it is' **Examiner's Comments** Candidates struggled to give a method to decide if a result was an outlier, instead they offered suggestions as to how they could remove this outlier to have the least impact on the data. This simply didn't answer the question.
		iv	(23+26+13+19+24)/5;(1) =21;(1)	2	correct answer gains 2 marks. Process of calculating a mean correctly = 1 mark **Examiner's Comments** A significant number of candidates did not attempt this question. Those who did could add the numbers together but failed to divide by 5. Of those that wrote down the correct process, there were several that had clearly not pressed '=' on the calculator before attempting the operation of division.

Question			Answer/Indicative content	Marks	Guidance
	b		[Level 3] Matt's plan chosen with at least 3 features that make it the best and linked reasons for 2 of them making it the best plan. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) [Level 2] Matt's plan chosen with 2 features and a linked reason for one of those features making it the chosen plan OR 3 features. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) [Level 1] Matt's plan chosen and 1 feature or reason for this choice. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) [Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C** **Features:** Same length of ruler Same mass / same force Measure distance bends Repeats Calculates mean Ruler fixed at one end **Explanations / reasons** Control variables (allow fair test) Increase reliability Identify outliers Can calculate estimate of best value Safety Accuracy - fixed rather than loose ruler - linked to calculating mean **Accept reverse argument in terms of why Jane / Katya are not chosen.** **Use the L1, L2, L3 annotations; do not use ticks.** **Examiner's Comments** There were many positive aspects to the candidates' responses, and they were able to select the good points in Matt's investigation. However, many did not understand the difference between precision, reliability, accuracy and controlling variables. They tended to use the term "fair test" for explaining every nuance of Matt's testing. Centres would be well-advised to ensure that candidates use the term "control" variable correctly in future. Candidates struggled to link their ideas about controlling variables to positive aspects of the plan. E.g. Matt used the same mass each time. This was a control variable.
			Total	11	

Question			Answer/Indicative content	Marks	Guidance
4			52	1	Examiner's Comments This question was generally well answered. Those candidates who gave an incorrect answer tended to calculate the difference between successive values rather than the difference between the original value and the stretch value for the load of 500g.
			Total	1	

Question			Answer/Indicative content	Marks	Guidance
5			(Level 3) Answer gives choice for upper and sole with full reasons why these materials are suitable (or others are not) and this is linked to purpose. Quality of written communication does not impede communication of the science at this level. (5–6 marks) (Level 2) Answer gives choice for upper and sole with full reasons why these materials are suitable (or other are not) but choices are not linked to purpose **OR** full reasons for choice of only one material and this is linked to purpose. Quality of written communication partly impedes communication of the science at this level. (3–4 marks) (Level 1) Answer gives choice for upper or sole with some reasons why they are suitable (or others are not). Quality of written communication impedes communication of the science at this level. (1–2 marks) (Level 0) Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to E** **Indicative scientific points may include:** Links to purpose • both upper and sole need to be waterproof • both upper and sole need to be flexible • preferable if material is sustainable / renewable Suitable • leather is waterproof / hard wearing / flexible • vulcanised rubber is waterproof / hard wearing / flexible Unsuitable • cotton not durable / not waterproof • nylon low sustainability / not waterproof • wood not flexible / not waterproof **Use the L1, L2, L3 annotations in Scoris; do not use ticks.** **Examiner's Comments** This six-mark extended-writing question gave good responses by candidates with most scoring Level 2 or Level 3 marks. Information about the materials was given in a table. Candidates were expected to extract the relevant information and make appropriate choices for 2 sections of a shoe. Level 2 responses could clearly identify the essential properties from the table but fewer candidates added linking sentences to describe why their chosen material was fit for purpose. Some candidates only mentioned one material but could still access Level 2 marks as they gave full descriptions of one relevant material and offered links to its purpose. Relatively few candidates chose unsuitable materials. This was a good differentiating question, with very few candidates omitting

Question			Answer/Indicative content	Marks	Guidance
					the question. It was pleasing to see lots of writing here. Preparation of candidates for such questions has clearly been developed.
			Total	6	
6		i	tick in box 2 (1) tick in box 3 (1)	2	**Examiner's Comments** This question was very well answered with almost all candidates scoring at least one of the two marks available.
		ii	it makes rubber more durable / more hard wearing / longer lasting / harder / stronger	1	owtte **Examiner's Comments** This question was very well answered with almost all candidates recognising that vulcanisation makes the rubber more hard wearing or durable and hence scoring the mark available.
		iii	sure range small	2	all three correct = 2 marks two correct = 1 mark **Examiner's Comments** Very few candidates scored both marks available here. Two correct responses were needed to score one mark and all three were correctly needed for both marks. The box that gave the biggest problem for candidates was the decision between range and mean.
			Total	5	

Question			Answer/Indicative content	Marks	Guidance
7	a	i	10	1	**Examiner's Comments** Candidates extracted the information from the graph very well. The calculation to scale up the number of rejected posts was also well answered. Many candidates scored the 'Error Carried Forward' mark if they did struggle reading the graph.
		ii	500 × 10 / 100 (1) = 50 (1)	2	**allow** 2 marks for correct answer without working **allow** ecf from (i) **Examiner's Comments** Candidates extracted the information from the graph very well. The calculation to scale up the number ofrejected posts was also well answered. Many candidates scored the 'Error Carried Forward' mark if they did struggle reading the graph.

Question			Answer/Indicative content	Marks	Guidance
	b		**Level 3 (5–6 marks)** Answer identifies most suitable plastic based on discussion of flexibility and range of data from the table. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Answer may identify most suitable plastic based on some discussion of flexibility and range of data from the table. Quality of written communication partially impedes communication of the science at this level. **Level 1 (1–2 marks)** Answer may identify most suitable plastic. Discussion is limited to flexibility or range of data from the table. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to C** **Indicative scientific points may include:** • plastic needs to be not too rigid but not too flexible • plastic needs to have small range of flexibility • plastic A is too flexible • plastic C has too large a range • plastic B is best choice **Use the L1, L2, L3 annotations in Scoris: do not use ticks** **Examiner's Comments** Many candidates correctly selected plastic B as the most suitable plastic to use but their arguments were weak. The majority of responses were only Level 1 responses. To moveup the levels, answers needed to include some analysis onthe data given using the numbers in the answer. Very few candidates managed this. Some vaguely attempted discussions about how polymers are made and tried to relate the strength of the polymer to the flexibility for use as a fence post. This was not required as the question only needed analysis of data given. Very few candidates could construct an argument about the range and the consistency of the data given. It was pleasing to see candidates attempting, andscoring on these six-mark extended-writing questions.
			Total	9	

Question			Answer/Indicative content	Marks	Guidance
8	a	i	C	1	
		ii	B	1	**Examiner's Comments** Some struggled to correctly identify a gas using the boiling point data and chemical D was a common error.
		iii	A and C	1	**ALLOW** C and A
		iv	A	1	**Examiner's Comments** Throughout this question, most candidates were able to select the appropriate chemicals by interpreting the given data.
	b		strength melting point electrical conductivity malleability	2	All correct = 2 3 or 2 correct = 1 **Examiner's Comments** Responses showed that candidates had a good understanding of the link between uses of metals and their properties.
			Total	6	

Question			Answer/Indicative content	Marks	Guidance
9		i	(6.5 + 8.2 + 6.1 + 10.2 + 9.0) / 5 (1) = 8.0 kg (1)	2	Correct answer without working = 2 marks **Accept** 8 **Examiner's Comments** It was pleasing to see that most candidates could correctly calculate the mean. Where Candidates had made an arithmetic error but showed their working, one of the two marks were awarded, most commonly the correct addition and division of the numbers but perhaps '=' had not been pressed on the calculator. Some candidates incorrectly identified outliers and so lost marks
		ii	6.1 to 10.2	1	**Accept** 10.2 to 6.1 **Examiner's Comments** Almost all candidates could identify the range.
		iii	New bag range starts lower than old bag range / New bags have a lower breaking point;	1	**Accept** 'new bags lowest value 6.1 compared to old bag value 7.4' **Examiner's Comments** Very few candidates scored this mark as they couldn't make the link between the lower end of the range of the new bags and the breaking point. Perhaps the significance of the data was not understood.
			Total	4	

Question			Answer/Indicative content	Marks	Guidance
10	a		[Level 3] Chooses polypropene **and** uses properties to justify that choice **and** gives a reason why another material is not chosen. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) [Level 2] Chooses polypropene **and** uses properties to justify that choice. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) [Level 1] Chooses polypropene OR chooses any other material and justifies choice of that other material with a correct property. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) [Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	This question is targeted at grades up to C Indicative scientific points may include: Properties of polypropene: • low stiffness • low density • floats • low water absorbency Why another material is not chosen: • Kevlar is dense / sinks / stiff / absorbs water • Nylon is dense / sinks / absorbs water • Polyester is dense / sinks **ignore:** flexible and light (in the stem of question) **Use the L1, L2, L3 annotations in Scoris; do not use ticks.** <u>Examiner's Comments</u> Responses to this question showed a lack of understanding of the properties that might be needed from a sailing rope. A large number of candidates identified the incorrect fibre. All fibres were regularly selected and for a variety of reasons. Where this was the case few candidates could link the properties to the purpose for their choice, or even why they were chosen over the other fibres. The idea of ‘comparison’ was often overlooked. Some candidates struggled to relate the words used to describe the fibres in the stem of the question and the words used in the table, such as strong, light, flexibility with stiffness, density, tensile strength, water absorbency and the ability to float or sink. There were however, many good responses in this question, the best responses being those where candidates had processed the data, explained the properties **and** compared the properties with other materials. For example, good

Question			Answer/Indicative content	Marks	Guidance
					candidates showed that they understood a low number for stiffness equated a high flexibility, and low density was desirable because it made the rope lighter. Marks were most commonly lost when candidates merely restated the stem of the question, choosing a material and stating that it was light and flexible. In some instances, candidates incorrectly interpreted the data and assumed that the high values were always the best.
	b		<table><tr><td></td><td></td><td></td></tr><tr><td>Buying rope from other countries is expensive.</td><td>√</td><td>(1)</td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td>Making rope from plants uses local materials.</td><td>√</td><td>(1)</td></tr></table>	2	<u>Examiner's Comments</u> A significant number of candidates scored at least one mark in this question. The most common of the correct responses was 'buying rope from other countries is expensive'. The second correct response was identified to a lesser extent.
			Total	8	

Question			Answer/Indicative content	Marks	Guidance
11	a		Changing the surface affects the outcome. √ (1)	1	**Examiner's Comments** This question was generally well answered.
	b	i	40	1	**Examiner's Comments** A significant number of candidates correctly calculated that 26 and 14 added together equalled 40. Where incorrect responses were given, the common error was 10 (the number of rejected balls). Other common incorrect answers were 26 and 14.
		ii	120 × 50/40 = (1) 150 (1)	2	Correct answer with no working = 2 marks. **Allow** ecf from (i) **Allow** substitution of numbers into the equation given for 1 mark **Examiner's Comments** An encouraging number of candidates scored both marks in this question. The ‘error carried forward’ here gave several candidates the reprieve needed from their responses to the previous question. The formula being given directly in the question could have helped the candidates follow the calculation through to completion. Evidence of candidates substituting numbers onto the formula in the box supported this view and were evident on a number of occasions.
		iii	First measurement could be an outlier / reliability / repeatability / checking; (1)	1	**Allow** accuracy **Allow** to calculate a mean **Allow** idea of variation of results problems with controls eg wind, height etc **Ignore** fair test **Examiner's Comments** This question was generally well answered. The reasons why we repeat experiments still seems to bring up the idea of ‘fair testing’. Centres need to move away from this as a response and move towards the terms of accuracy, repeatability and reproducibility.

Question			Answer/Indicative content	Marks	Guidance
			Total	5	
12			A High relative breaking strength / less likely to break✓ High temperature needed to soften✓ OR C Any two from: Low cost ✓ Quite a high temperature needed to soften ✓ It is stiff ✓	2 (AO 3.2a × 2)	**DO NOT** credit choice without reason(s) **IGNORE** flexible, references to boiling point Examiner's Comments This question was answered well, with higher ability candidates gaining full credit. Some candidates confused the term "breaking strength" with "ease of breaking", and suggested that Polymer B had a low chance of breaking.
			Total	2	