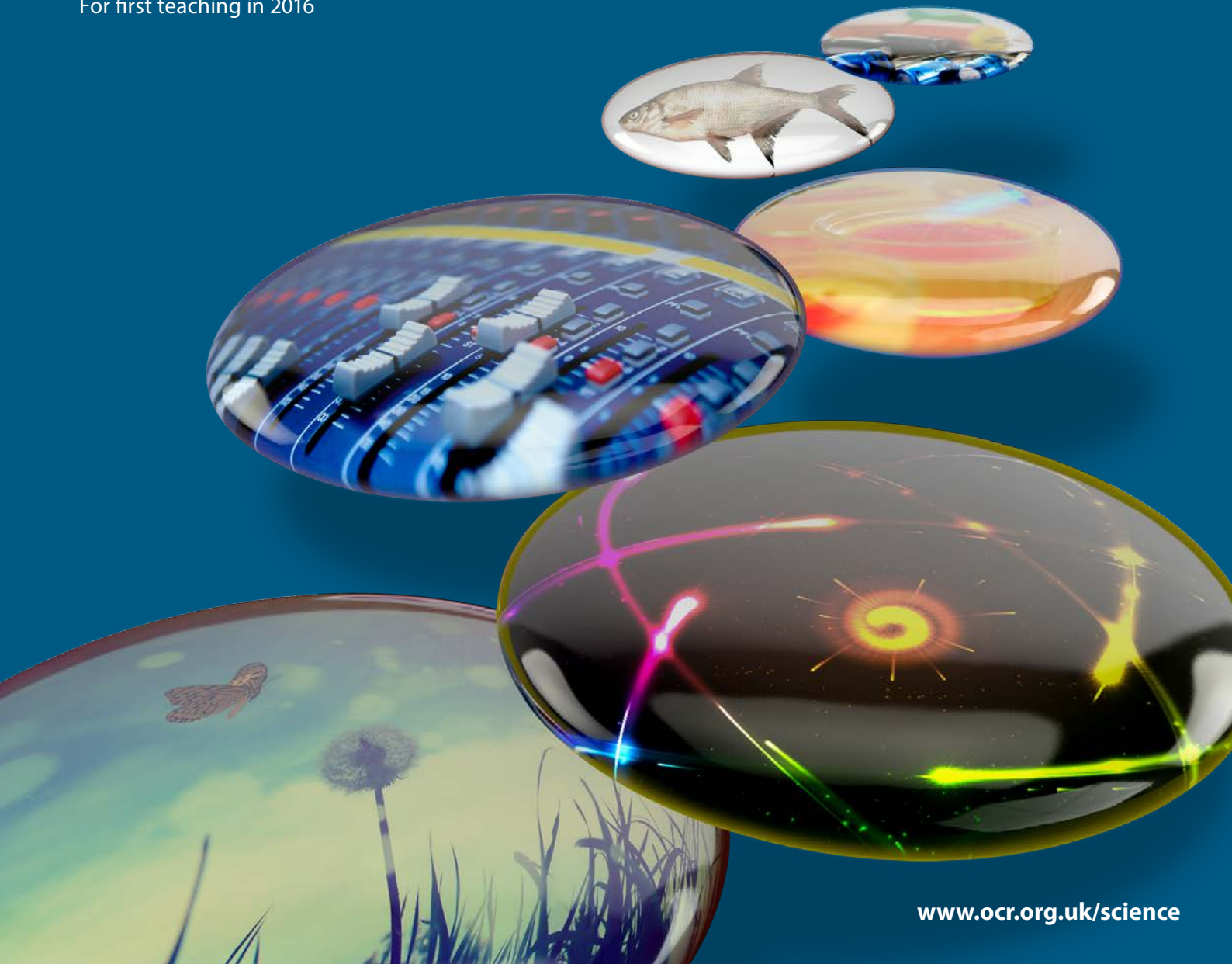
Qualification Accredited

OCR
Oxford Cambridge and RSA

GCSE (9–1)
Sample SAM Taster Booklet

GATEWAY SCIENCE SUITE

J247, J248, J249, J250
For first teaching in 2016



www.ocr.org.uk/science

GCSE (9–1)
GATEWAY SCIENCE SUITE

Our new GCSE (9–1) Gateway Science Suite specifications provide teachers with an easy to follow resource, which allows a level of flexibility to create lessons that are designed specifically to help your learners. It assists you to incorporate activities that enrich lessons and encourage learners' natural curiosity with the world around them.

Our Sample Assessment Material (SAM) taster booklet introduces you to the style of assessment for our new qualifications.

The booklet features the questions and mark schemes for the assessments that make up this suite of qualifications. The complete set of sample assessment materials is available on the OCR website www.ocr.org.uk/gcsescience

SUBJECT SPECIALIST SUPPORT

OCR Subject Specialists provide information and support to schools including specification and non-exam assessment advice, updates on resource developments and a range of training opportunities.

You can contact our Science Subject Specialists for specialist advice, guidance and support.

Meet the team at ocr.org.uk/scienceteam

CONTACT THEM AT:

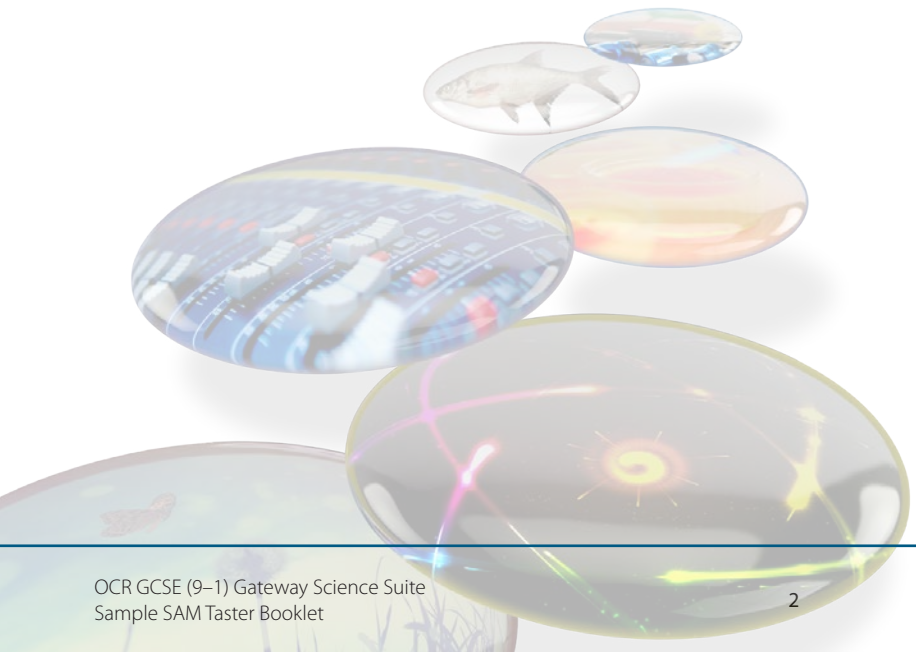
01223 553998

scienceGCSE@ocr.org.uk

@OCR_science

WHAT TO DO NEXT

- Sign up for regular updates, including news of our autumn calendar of events: http://www.ocr.org.uk/updates
- Book onto a GCSE reform training event to help you get to grips with the new qualification: https://www.cpdhub.ocr.org.uk/
- View our new range of resources that will grow throughout the lifetime of the specification: www.ocr.org.uk/science



MULTIPLE CHOICE QUESTIONS (MCQ)

In all Gateway science papers the first section will be MCQs. Candidates will find that MCQs may take more reading and thought than they expect; it may, therefore, take them longer than they expect to complete this section. Separate science candidates should aim to spend 20 to 30 minutes on this section. Combined science candidates should spend 15 to 20 minutes on the MCQ section. Candidates should try to eliminate the answers that they feel are obviously wrong to allow them to focus on choosing the correct answer. If they find it useful candidates may use annotations to help them work out the correct answer e.g. by drawing lines on graphs etc.

BIOLOGY MCQ

FOUNDATION TIER

1 A student uses a microscope.

The magnification on the eyepiece lens is ×10.

The magnification on the objective lens is ×4.

What is the total magnification?

A 2.5

B 6

C 14

D 40

Your answer ☐ **[1]**

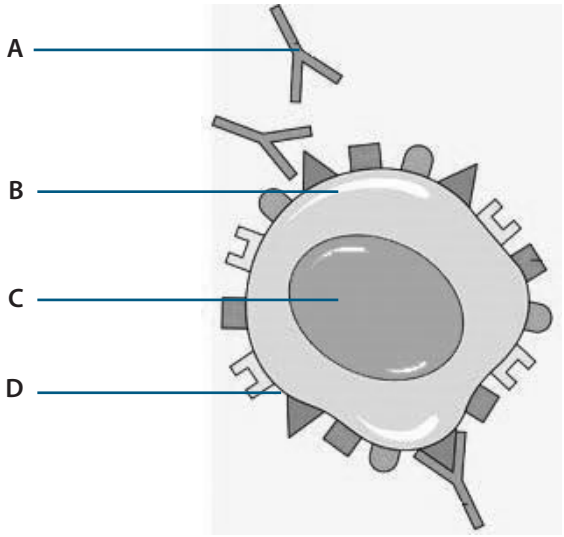
HIGHER TIER

2 Monoclonal antibodies can be used to treat some kinds of cancer.

Look at the diagram of a cancer cell.

It is being treated using monoclonal antibodies.

Which label, **A**, **B**, **C** or **D**, shows the monoclonal antibodies?



Your answer ☐ **[1]**

CHEMISTRY MCQ

FOUNDATION TIER

3 What is the best description of the particles in a liquid?

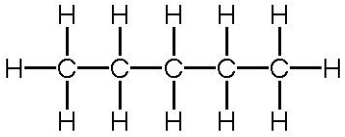
	Distance between particles	Movement of particles
A	close together	in continuous random motion
B	close together	vibrating about a fixed point
C	far apart	in continuous random motion
D	far apart	vibrating about a fixed point

Your answer ☐ **[1]**

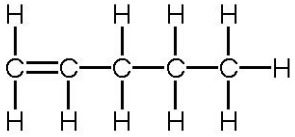
FOUNDATION AND HIGHER TIER

4 Which displayed formula includes the functional group of an alcohol?

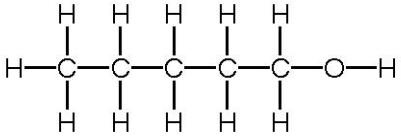
A



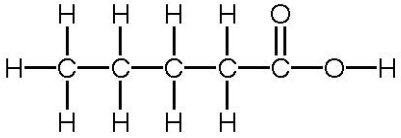
B



C



D

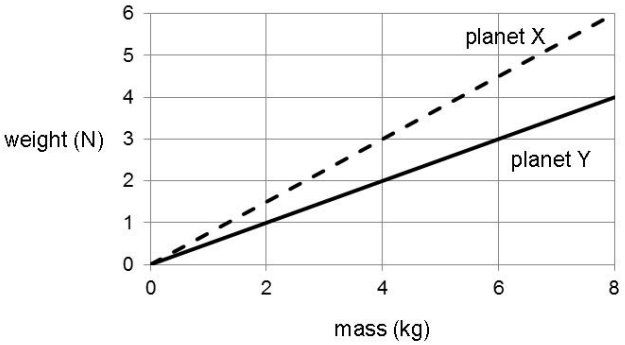


Your answer ☐ **[1]**

PHYSICS MCQ

FOUNDATION TIER

5 The graph shows the relationship between mass and weight on two different planets.



The weight of an object on planet **X** is 3 N.

What is the weight of the same object on planet **Y**?

A 1.5 N

B 2.0 N

C 4.0 N

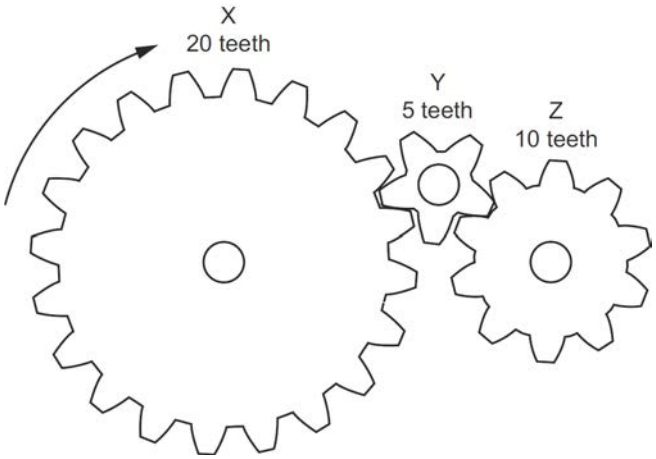
D 6.0 N

Your answer ☐

[1]

HIGHER TIER

6 The diagram shows 3 gears.



Gear **X** is rotated clockwise at 1.0 rotations per second.

Which row is the correct description of the movement of gear **Z**?

	direction of rotation	rotations per second
A	anticlockwise	0.5
B	anticlockwise	2.0
C	clockwise	0.5
D	clockwise	2.0

Your answer ☐

[1]

ANSWERS TO MCQS

Number	Answer	Marks	AO
1	D	1	2.2
2	A	1	1.2
3	A	1	1.1

Number	Answer	Marks	AO
4	C	1	2.1
5	B	1	2.1
6	D	1	2.1

PRACTICAL QUESTIONS

If a candidate has been properly prepared by doing practicals throughout the course, these questions should not be difficult. Candidates should focus on the skills they have developed and apply these to the practical questions. They should find that they should be able to answer the question even if they have not done the practical in the question. Teachers can use the practical trackers from OCR to confirm that the learners have been adequately prepared for the practical component of the examination.

BIOLOGY PRACTICAL QUESTION

FOUNDATION AND HIGHER TIER

7 A group of students investigate the effect of temperature on the breakdown of the fat in milk by the enzyme lipase.

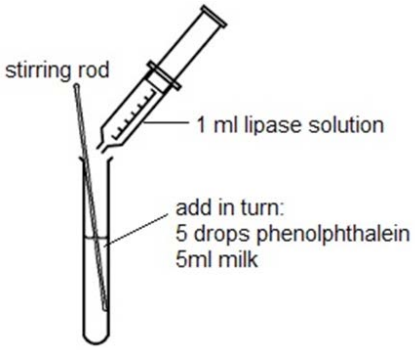
In their investigation they use an indicator called phenolphthalein.

Phenolphthalein is pink in alkali conditions but becomes colourless when the pH falls below pH 8.

A student puts 5 drops of phenolphthalein and 5 ml of full fat milk into a test tube.

She adds 1 ml of lipase, stirs the mixture and times how long it takes to lose the pink colour.

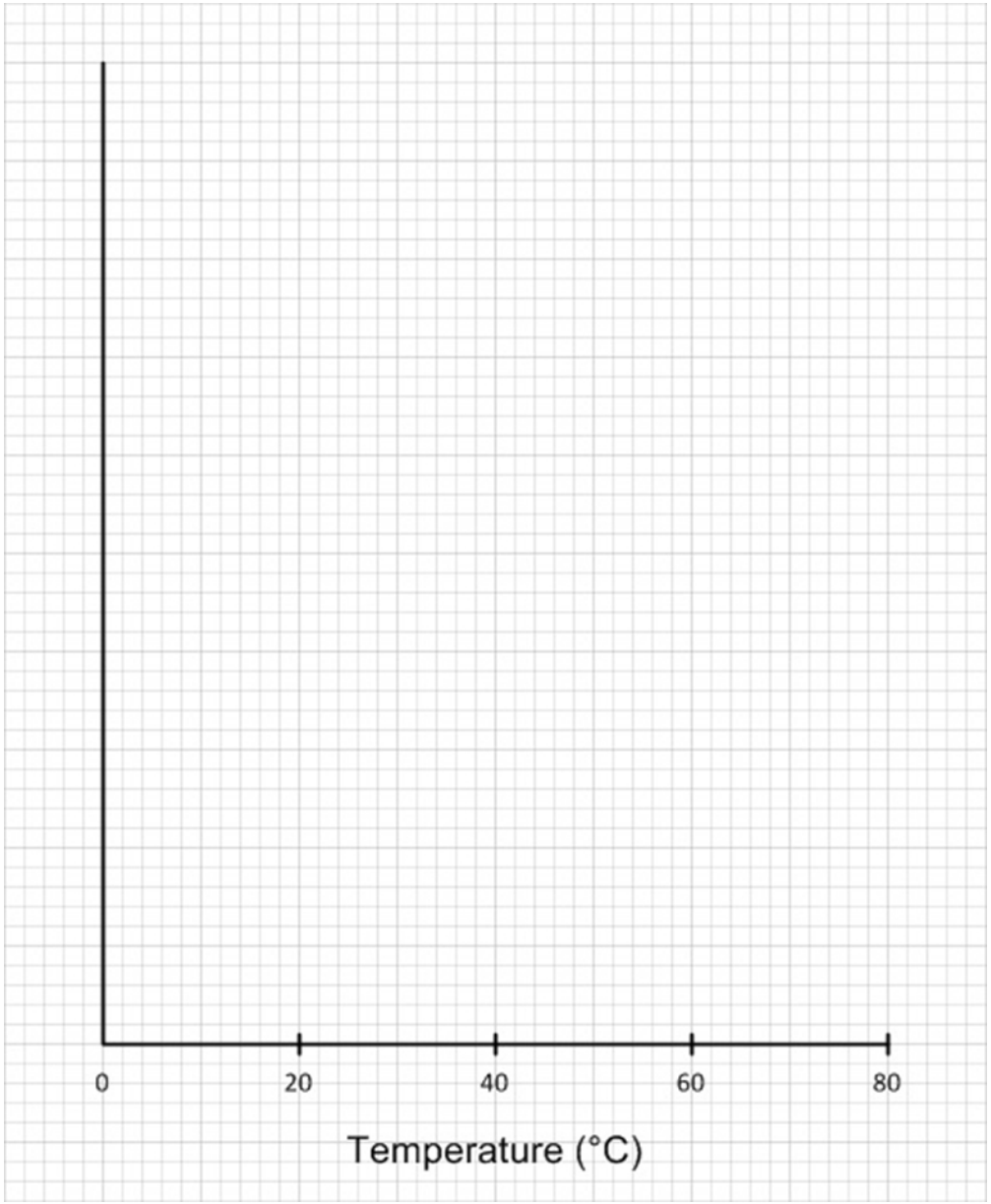
Other students repeat this but at different temperatures.



The table shows the group's results.

Temperature (°C)	Time for pink colour to disappear (s)
20	480
40	240
60	270
80	960

(a) Plot a graph of the results and draw a line of best fit.



[5]

(b) Explain the difference between the results at 20°C and 40°C.

.....

.....

.....

.....

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

(c) Explain the difference between the results at 80°C and 40°C.

.....

.....

.....

.....

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

(d) One student says that the results show that the optimum temperature for the lipase is 40°C.

The teacher says that she **cannot** say for certain that it is 40°C.

Explain why.

.....

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

CHEMISTRY PRACTICAL QUESTION
HIGHER TIER

8 Zinc nitrate can be made by reacting zinc oxide with nitric acid, HNO_3.

(a) Paul suggests this method for preparing zinc nitrate.

1. Measure 50 cm^3 of dilute nitric acid into a beaker.
2. Add one spatulaful of zinc oxide.
3. Heat the mixture until crystals of zinc nitrate are made.

Paul's method will not make a pure dry sample of zinc nitrate.

What improvements should Paul make to the method to make sure that:

- the reaction is complete
- the zinc nitrate can be separated from the nitric acid and the zinc oxide?

Explain your answer.

.....

.....

.....

.....

.....

..... **[4]**

(b) Describe why this reaction is a neutralisation reaction.

.....

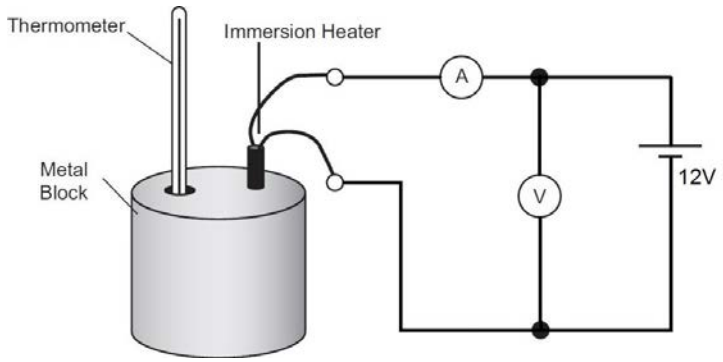
.....

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

PHYSICS PRACTICAL QUESTION

FOUNDATION TIER

9 A student completes an experiment to find the specific heat capacity of a metal.



(a) The student takes voltage and current measurements.

Suggest **three** other measurements they need to take?

.....

.....

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

(b) Describe how these measurements could be used to determine the specific heat capacity of the metal.

.....

.....

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

	Answer	Marks	AO element	Guidance
7(a)	Y axes correctly labelled, including units (1)	1	2.2	
	Y axis even scales occupying more than half of the page (1)	2	2.2	
	all points correctly plotted = 2 marks but at least 3 points correctly plotted = 1 mark	2	2 × 2.2	
	line of best fit (1)	1	2.2	
7(b)	at 20°C: slower reaction (1)	1	3.1a	**ALLOW** reverse argument referring to 40°C
	particles moving more slowly (1)	1	2.1	
	less frequent collisions (1)	1	2.1	
7(c)	At 80°C: slower reaction (1)	1	3.1a	**ALLOW** reverse argument referring to 40°C
	enzyme denatured (1)	1	2.1	
	shape of active site changed / cannot bind to substrate (1)	1	2.1	
7(d)	(optimum) could be either side of 40°C / could be anywhere between 40°C and 60°C (1)	1	3.1a	
8(a)	**Any four from:** idea that an excess of zinc oxide must be added (1) so reaction is complete / all nitric acid is reacted (1) filter off excess zinc oxide (1) evaporate off some of the water (1) allow to crystallise (1)	4	3.3b	
8(b)	reaction between nitric acid (HNO_3), an acid and zinc oxide (ZnO), a base (1) to make zinc nitrate ($Zn(NO_3)_2$, a salt and water (only) (1)	2	1.1	Only award marks if reactions and products are named in the answer **ALLOW** the use of just chemical formulae
9(a)	Temperature rise **or** start and end temperatures (1) Time that the heater is switched on (1) Mass of the block (1)	3	3 × 1.2	
9(b)	Reference to: energy = voltage x current x time (1) SHC = energy / (mass x temp rise) (1)	2	2 × 1.2	

LEVEL OF RESPONSE (LOR) QUESTIONS

These questions are marked with a level of response (LOR) mark scheme. They allow the students to demonstrate their ability to construct and develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. When marking this section do look at the guidance at the beginning of the paper's mark schemes. Candidates will be able to identify questions that are marked with a level of repose mark scheme by the asterisk next to the question number.

BIOLOGY LOR QUESTION

FOUNDATION TIER

10* To estimate grass cover and the number of animals, they use a quadrat.

Why do scientists use sampling when studying the organisms living in a habitat?

Identify the limitations of this method and potential improvements that could be made to ensure that the estimated population size of plants and animals closely matches the actual value. **[6]**

CHEMISTRY LOR QUESTION

HIGHER TIER

11* A student is separating a mixture of three substances, **A**, **B** and **C**.

Look at the table. It gives information about these substances.

Substance	State at room temperature	Melting point (°C)	Boiling point (°C)	Solubility in water
A	liquid	0	100	soluble
B	liquid	–117	78	soluble
C	solid	1535	2750	insoluble

A and **B** mix together completely.

Suggest how the student can separate the mixture to get pure samples of substances **A**, **B** and **C**.

Explain in detail how each method works. **[6]**

PHYSICS LOR QUESTION

FOUNDATION AND HIGHER TIER

12* A student rubs a balloon against a scarf.

Describe how the balloon has become charged.

Suggest a way to show that the balloon is charged. What would you expect to see and why? **[6]**

	Answer	Marks	AO element	Guidance
10*	Please refer to the marking instructions on page 4 of the mark scheme for guidance on how to mark this question. **Level 3** **(5–6 marks)** **Explains improved animal sampling techniques** There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. **Level 2** **(3–4 marks)** **Explains advantages of plants being sedentary along with the limitations of animal sampling using a quadrat** There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence. **Level 1** **(1–2 marks)** **Provides a basic description of why sampling has to be used and use of or the limitations of the quadrat** The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear. **0 marks** No response or no response worthy of credit	6	3 × 1.2 3 × 3.3b	**AO3.3b: Analyse the information to develop the techniques to improve the sampling techniques** • use of capture / recapture • use of pitfall traps • use of pooters • plants are sedentary so will not move and as such are easy to count • animals can move away/frightened away • risk of counting animal more than once • missing some animals e.g. burrowing and • further limitations of these methods **AO1.2: Demonstrate knowledge of sampling techniques and why sampling is carried out** • a basic description of use of capture/recapture pitfall traps and pooters • gives a basic description as to why sampling techniques are used • the habitat is often too large to count everything • saves time / would take too long otherwise

	Answer	Marks	AO element	Guidance
11*	Please refer to the marking instructions on page 4 of the mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** **Describes the bonding of both materials** **AND Makes a comparison** **AND Makes a choice with a justified reason** There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. **Level 2 (3–4 marks)** **Describes the bonding of both materials** **OR Describes the structure of one material AND Makes a choice with a justified reason** There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence. **Level 1(1–2 marks)** **Describes the bonding of one material** **OR makes a choice with a justified reason** The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear. **0 marks** No response or no response worthy of credit.	6	3 x 1.1 3 x 3.2a	**AO1.1: Knowledge of bonding in metals and polymers** Bonding in polymers: • Covalent bonds in molecule/ Macromolecule. • Weak intermolecular forces. • Some have cross linkages. Bonding in metals: • Cationic lattice. • Free/mobile pool of electrons. Comparison • Polymers are weaker because intermolecular forces are weaker than metallic bonds. • Metals conduct electricity because of free electrons. **AO3.2a: Analyse information in the table to make judgements** • Not carbon-fibre-reinforced-polymer – too expensive. • Aluminium – strong, corrosion resistant, low density so easy to carry but quite expensive. • Steel – strong, cheap but higher density so heavy to carry, corrodes/rusts but can be painted to make look better and resist corrosion. • PVC – corrosion resistant, low density means cost per chair is low, easy to carry, easy to shape, may not be strong enough. • Titanium – strong, corrosion resistant, fairly low density but very expensive.

	Answer	Marks	AO element	Guidance
12*	Please refer to the marking instructions on page 4 of the mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** **Detailed description of charging the balloon AND an experiment linked appropriately with an explanation of the observations.** There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. **Level 2 (3–4 marks)** **Description of charging the balloon AND of an experiment to demonstrate.** There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence. **Level 1 (1–2 marks)** **Simple description of how the balloon may become charged OR a suggestion of an appropriate experiment.** The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear. **0 marks** No response or no response worthy of credit.	6	3 × 1.2 3 × 2.2	**AO2.2: Description of an experiment with explanation** • Holding a charged balloon by water/paper/wall/hair/gold leaf electroscope/another charged balloon • Use of a gold leaf electroscope. A charged balloon causing the gold leaf to rise when the plate is touched by the balloon • Caused by charge moving down the leaf and metal plate with the same charge repelling one another • Idea of induction if relevant to investigation **AO1.2: Description of charging an insulator** • Mention of electrostatic forces • Attraction of opposite charges • Repulsion of like charges • Electrons are rubbed on/off the balloon from/to the scarf / **ORA** • Idea of negative charge linking to electrons • Removal of electrons result in positive charge

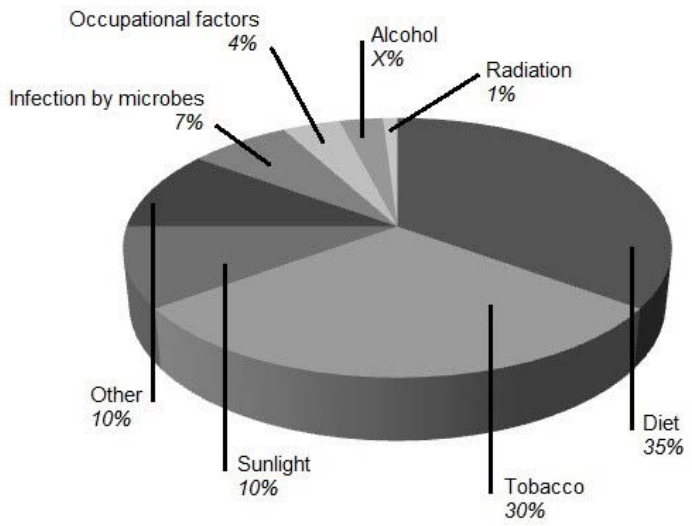
MATHEMATICS QUESTIONS

Don't forget to show your working!

COMBINED SCIENCE BIOLOGY QUESTION

FOUNDATION TIER

13 The pie chart shows some of the main causes of cancer.



(a)(i) Calculate the percentage of cancer cases caused by alcohol.

Answer ..... % **[1]**

(ii) In a sample of 150 people with cancer, give an estimate for the number of people whose cancer was caused by infection by microbes?

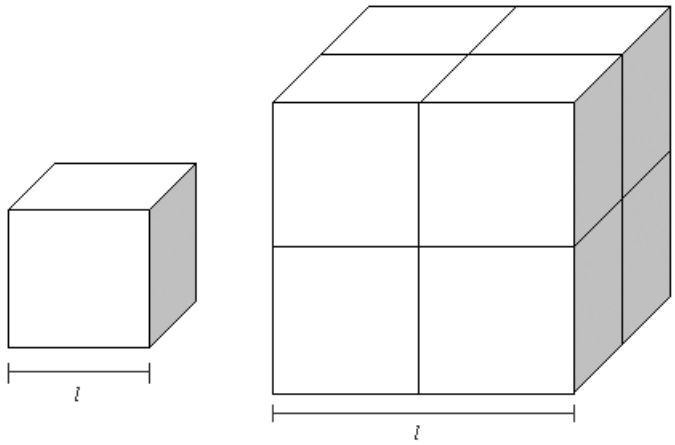
..... **[1]**

COMBINED SCIENCE CHEMISTRY QUESTION
HIGHER TIER

14 William investigates the reaction between calcium carbonate and hydrochloric acid.

He thinks the reaction will be faster if he uses smaller pieces of calcium carbonate.

He uses different sized cubes of calcium carbonate.



William finds out that the larger the surface area to volume ratio, the faster the reaction.

The surface area to volume ratio for a cube with l = 1cm is 6.0.

Calculate the surface area to volume ratio for a cube with l = 5cm.

surface area to volume ratio .....

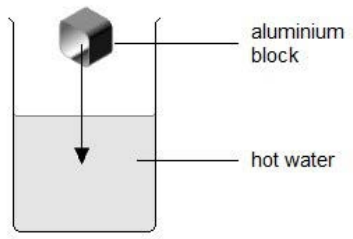
[3]

COMBINED SCIENCE PHYSICS QUESTION
HIGHER TIER

15 (a) A beaker contains hot water.

The pupil wants to calculate the thermal energy lost by the hot water when she puts a cold aluminium block into it.

He uses different sized cubes of aluminium.



(i) The volume of the aluminium cube is 8.0×10^{-6} m^3 and its density is 2 712 kg/m^3.

Calculate the mass of the aluminium.

Show your working.

.....

.....

Answer ..... kg **[2]**

(ii) The specific heat capacity of aluminium is 0.9×10^3 J/kg°C and it rises in temperature from 5°C to 18°C after it has been in the water for a few minutes.

Calculate the amount of energy it has gained.

Show your working.

.....

.....

Answer ..... J **[3]**

	Answer	Marks	AO element	Guidance
13(a)(i)	3 (%) (1)	1	2.2	
13(a)(ii)	11 (1)	1	2.1	
14	surface area = (5 × 5) × 6 = 150 (1) volume = 5 × 5 × 5 = 125 (1) surface area: volume = 150: 125 = 1.2 (1)	3	1.2	
15(a)(i)	Rearrange and apply density = mass/volume (Mass = $2712 \times 8.0 \times 10^{-6}$) (1) 0.02 kg (1)	2	2 × 2.1	
15(d)(ii)	Change in temperature = 13 °C (1) Use of $E = mc\Delta\theta$ $E = 0.02 \times 0.9 \times 10^{3} \times 13$ (1) E = 234 (J) (1)	3	3 × 2.1	

OCR customer contact centre
General qualifications
Telephone 01223 553998
Facsimile 01223 552627
Email general.qualifications@ocr.org.uk