

# **Mark Scheme for January 2013**

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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## Annotations

Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt <b>not</b> given
	error carried forward
	information omitted
	ignore
	reject
	contradiction
	Level 1
	Level 2
	Level 3

**Subject Specific Marking instructions**

- / = alternative and acceptable answers for the same marking point
- (1) = separates marking points
- allow = answers that can be accepted
- not = answers which are not worthy of credit
- reject = answers which are not worthy of credit
- ignore = statements which are irrelevant
- ( ) = words which are not essential to gain credit
- = underlined words must be present in answer to score a mark (although not correctly spelt unless otherwise stated)
- ecf = error carried forward
- AW = alternative wording
- ora = or reverse argument

Question		Answer	Marks	Guidance
1	(a)		2	three correct equals two marks one or two correct equals one mark
	(b) (i)	<p><b>any one from effect of alcohol</b></p> <p>blurred / distorted vision / harder for him to see/can't see other cars or objects clearly / poor muscle control / alcohol is a depressant / poor judgement / slower reactions (1)</p> <p><b>any one from effect on driving</b></p> <p>might cause an accident / idea of increases stopping distance (1)</p>	2	<p><b>one mark for effect of alcohol and one mark effect on ability to drive</b></p> <p><b>ignore</b> vague answers e.g. affects eyesight / nerves / reaction time / dizzy</p>
	(b) (ii)	<p>(no)</p> <p>drunk 4.45 units (2)</p> <p><b>but if answer is incorrect then</b></p> <p><math>1.5 \times 2.3 + 1.0</math> (1)</p>	2	<p>if yes, 1 mark can be awarded for correct working</p> <p><b>allow</b> he drank 0.45 over the limit (2) <b>allow</b> 4.5 (2) <b>allow</b> 4.4 (1)</p> <p><b>allow</b> adds up to more than 4 (1) <b>allow</b> any number over 4 if qualified by the statement that this is over the limit (1)</p>
<b>Total</b>			<b>6</b>	

Question		Answer	Marks	Guidance
2	(a)	0.42 (2)  <b>but</b> $1.68 \div 4$ or $\frac{0.39 + 0.45 + 0.44 + 0.40}{4}$ (1)	2	
	(b)	tick in second box / males have faster reactions(1) tick in third box / reactions slow down (1)  Colin's reactions improved with practice. <input type="checkbox"/> Males have faster reactions than females. <input checked="" type="checkbox"/> Reactions slow down as you get older. <input checked="" type="checkbox"/> Younger people can follow instructions better. <input type="checkbox"/> Ewan plays a lot of computer games. <input type="checkbox"/>	2	any more than two ticks negates a mark
	(c)	retina (1)	1	<b>allow</b> (rods and) cones (1) <b>allow</b> fovea or yellow spot (1) <b>allow</b> phonetic spelling
	(d)	tick in second box colour blindness (1)  cystic fibrosis <input type="checkbox"/> colour blindness <input checked="" type="checkbox"/> sickle cell anaemia <input type="checkbox"/>	1	more than one tick score 0
<b>Total</b>			<b>6</b>	

Question	Answer	Marks	Guidance
3	<p><b>Level 3 (5–6 marks)</b> Answer includes the idea that the risks are a consequence of high blood pressure. <b>AND</b> Includes a detailed interpretation of data. Quality of written communication does not impede communication of the science at this level</p> <p><b>Level 2 (3–4 marks)</b> Answer includes one risk of high salt diet <b>AND</b> some interpretation of data. <b>OR</b> Mentions high blood pressure <b>AND</b> some interpretation of data. <b>OR</b> The idea that the risks are a consequence of high blood pressure.  Quality of written communication partly impedes communication of the science at this level</p> <p><b>Level 1 (1–2 marks)</b> An incomplete answer, some interpretation of data. <b>OR</b> Recalls one risk. <b>OR</b> Mentions high blood pressure. Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>This question is targeted at grades up to C</b> <b>Indicative points that may be included:</b></p> <p><b>risks of high salt diet</b></p> <ul style="list-style-type: none"> <li>• risk of heart disease / heart attack</li> <li>• Or possible high level answers to include the consequences of high blood pressure e.g. stroke / blood vessels bursting / kidney failure</li> </ul> <p><b>If heart problems are the only risk mentioned then treat as poor communication within the level.</b></p> <p><b>links blood pressure to risk</b></p> <ul style="list-style-type: none"> <li>• e.g. high blood pressure leads to heart attack etc</li> </ul> <p><b>interpretation of data at level 3</b></p> <ul style="list-style-type: none"> <li>• average intake is higher than recommended for both under 50 and over 50</li> <li>• under 50 eat 1100g more than they should /AW</li> <li>• over 50 eat 1900g more than they should /AW</li> <li>• eat 2900g more than they need</li> </ul> <p><b>interpretation of data at level 1 and 2</b></p> <ul style="list-style-type: none"> <li>• eating more salt than they should / AW</li> <li>• eating (more than) <b>twice</b> the amount they should</li> <li>• average intake is higher than what the body needs</li> </ul> <p>Use the L1, L2, L3 annotations on scoris. Do not use ticks.</p>
	<b>Total</b>	<b>6</b>	

Question		Answer	Marks	Guidance
4	(a)	diphtheria (1)	1	
	(b)	diphtheria and yellow fever (1)	1	both needed for mark, either order
	(c)	<p><b>any one from differences:</b></p> <p>malaria (pathogen) is a protozoa, yellow fever (pathogen) is a virus (1)</p> <p>malaria found in China but yellow fever found in Brazil (1)</p> <p><b>any one from similarities:</b></p> <p>both found in Kenya (1)</p> <p>both found in Gambia (1)</p> <p>both transmitted / carried / caught from mosquito / AW (1)</p>	2	<p><b>answer must include one similarity and one difference</b></p> <p>answer must be a comparison for differences</p> <p>e.g. malaria pathogen is a protozoa (0)</p> <p>e.g. one is a virus and one is a protozoa (0)</p> <p><b>allow</b> both found in Africa (1)</p>
	(d)	<p>(destroyed by) <b>white blood</b> cells (1)</p> <p>engulfed by (white blood cells) (1)</p> <p>idea that antibodies are made (1)</p>	3	<p><b>ignore</b> eaten or killed or fight</p> <p><b>allow</b> ingest / breakdown / digest (1)</p> <p><b>allow</b> white blood cells destroy them by engulfing them (2)</p> <p><b>allow</b> white blood cells destroy them by making antibodies(2)</p> <p><b>allow high level answers for function of antibodies as an extra marking point</b></p> <p>e.g. antibodies lock onto the antigens (2)</p> <p>e.g. white blood cells make antibodies that lock onto the antigens (3)</p> <p><b>ignore</b> stomach acid</p>
<b>Total</b>			<b>7</b>	

Question			Answer	Marks	Guidance
5	(a)	(i)	A / blue (1)	1	if answer line is blank <b>allow</b> correct answer circled, underlined or ticked
		(ii)	C / red (1)	1	if answer line is blank <b>allow</b> correct answer circled, underlined or ticked
	(b)		<p><b>binding medium</b> – sticks (pigment in the) paint to surface (1)</p> <p><b>solvent</b> – thins the paint / makes it easier to spread or apply (1)</p>	2	<p><b>If binding medium not mentioned then assume first answer refers to binding medium and second to solvent</b></p> <p><b>ignore</b> glues / sticks it all together</p> <p><b>ignore</b> makes it liquid</p> <p><b>ignore</b> solvent dries</p>
	(c)		<p>idea of protection from rusting or corrosion (1)</p> <p>idea of decoration (1)</p>	2	<p><b>allow</b> stop it rusting / stop it looking rusty (1)</p> <p><b>ignore</b> just protection</p> <p><b>allow</b> to give it colour /AW (1)</p> <p><b>ignore</b> idea of fading</p>
			<b>Total</b>	<b>6</b>	

Question		Answer	Marks	Guidance
6	(a)	any one from: paraffin / heating oil / naphtha (1)	1	<b>allow</b> lubricating oil / kerosene / airplane fuel / engine oil (1) <b>ignore</b> just oil
	(b)	butane – LPG eicosane – fuel oil dodecane – diesel	2	all three scores 2 one or two scores 1
	(c)	takes a long time to form (1)  are used up faster than they are formed <b>or</b> cannot be made again <b>or</b> finite (1)	2	<b>allow</b> takes a (many) years to form or thousands or millions of years to form (1) <b>ignore</b> takes hundreds of years to form  <b>allow</b> once it's gone, its gone / can't be replaced / will run out (1)  <b>ignore</b> cannot be used again <b>ignore</b> cannot be recycled
	(d)	elements – 2 (1) atoms – 38 (1)	2	
		<b>Total</b>	<b>7</b>	

Question	Answer	Marks	Guidance
7	<p><b>Level 3 (5–6 marks)</b> Candidate explains how ethene can be converted into compound B to include at least two ideas. <b>AND</b> Candidate correctly deduces more than one piece of information on <b>TWO</b> of the compounds <b>OR</b> deduces one piece of information about <b>all THREE</b> compounds Quality of written communication does not impede communication of the science at this level</p> <p><b>Level 2 (3–4 marks)</b> Candidate explains how ethene can be converted into compound B explanation only partially correct. <b>AND</b> Candidate correctly deduces one piece of information about <b>TWO</b> of the compounds <b>OR TWO</b> deductions about one of the compounds. Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Candidate explains how ethene can be converted into compound B explanation only partially correct. <b>OR</b> Candidate correctly deduces <b>ONE</b> piece of information about one of the compounds. Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p>This question is targeted at grades up to C <b>Relevant points include:</b></p> <ul style="list-style-type: none"> <li>• ethene is a hydrocarbon / <b>only</b> contains carbon and hydrogen</li> <li>• ethene is an alkene</li> <li>• ethene has a (carbon to carbon) double bond</li> <li>• ethene is a monomer</li> <li>• ethene is unsaturated</li> <li>• compound <b>A</b> contains bromine - ignore Br</li> <li>• compound <b>A</b> is saturated</li> <li>• compound <b>A</b> is <b>not</b> a hydrocarbon</li> <li>• compound <b>A</b> is a (di)bromo compound</li> <li>• compound <b>A</b> is made by an addition reaction</li> <li>• compound <b>A</b> only contains (carbon to carbon) single bonds</li> <li>• compound <b>B</b> is an polymer / polyethene / polythene</li> <li>• compound <b>B</b> is a hydrocarbon <b>only</b> contains carbon and hydrogen</li> <li>• compound <b>B</b> is saturated</li> <li>• compound <b>B</b> only contains (carbon to carbon) single bonds</li> <li>• ethene is converted to compound <b>B</b> by polymerisation</li> <li>• (polymerisation) needs high pressure</li> <li>• (polymerisation) needs a catalyst.</li> <li>• double bond <b>breaks</b></li> <li>• idea that monomer is converted into a polymer</li> </ul> <p>Do not credit simple description of diagrams given e.g. A contains Br <b>If cracking / fractional distillation mentioned in place of polymerisation treat as impeding communication</b> Use the L1, L2, L3 annotations on scoris. Do not use ticks.</p>
	<b>Total</b>	<b>6</b>	

Question		Answer	Marks	Guidance
8	(a)	B (1)	1	
	(b)	No (no mark) idea that only C and/or D have acidic pH values / idea that A has alkaline pH value (1) C and/or D attack marble or A does not attack marble (1) C and/or D increase rusting or A does not increase rusting (1)	3	<b>ignore</b> yes, but continue marking <b>allow</b> idea that C and/or D have low pH or A has high pH (1) <b>allow</b> C and/or D damage or effect or react slowly with marble statues or ora (1) <b>allow</b> C and/or D cause rusting or ora (1) <b>allow</b> C and/or D damage or effect or react slowly with steel or ora (1)
	(c)	removes carbon monoxide (from exhaust gases) / changes carbon monoxide into carbon dioxide (1)	1	<b>allow</b> removes nitrogen monoxide (from exhaust gases) / changes nitrogen monoxide into nitrogen / reacts nitrogen monoxide with carbon monoxide <b>ignore</b> just produces carbon dioxide
	(d)	methane + oxygen → carbon dioxide + water (1)	1	<b>not</b> and/or/& for + <b>allow</b> = instead of → <b>allow</b> correct formulae or mix of words and correct formulae <b>allow</b> $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$ ie symbol equation does not have to be balanced <b>not</b> '+ energy or + heat' on either side of equation <b>ignore</b> 'heat' written above the arrow
<b>Total</b>			<b>6</b>	

Question			Answer	Marks	Guidance
9	(a)	(i)	1.4 (1)	1	<b>allow</b> 1.3 to 1.5 <b>allow</b> -1.4 / from '0 – 1.4'
		(ii)	4 (1)	1	<b>allow</b> 3.9 – 4.1 <b>allow</b> from '0 – 4'
	(b)		2400 (2) if incorrect $600 \times 4 = v$ (1)	2	<b>allow</b> ecf for 9 (a) (ii) (2)
			<b>Total</b>	<b>4</b>	

Question			Answer	Marks	Guidance
10	(a)		seismometer (1)	1	<b>allow</b> seismograph <b>allow</b> phonetic spellings
	(b)		<b>any two from:</b> tsunami / tidal wave (1)  damage to buildings / AW (1)  mud / land slides (1)	2	<b>ignore</b> large wave  <b>allow</b> floors shake (1)  <b>ignore</b> trigger volcanoes <b>ignore</b> idea of movement of the Earth's crust
	(c)		wearing sun block (1)  covered by clothing / hat (1)	2	<b>allow</b> sun cream / SPF / sunscreen / sun tan lotion / (high ) factor cream <b>not</b> baby oil  <b>ignore</b> stay in shade / use a sun shade / glasses / idea of avoiding midday sun
			<b>Total</b>	<b>5</b>	

Question		Answer	Marks	Guidance												
11	(a)	D (1)	1	mark answer on line first allow answer ringed, underlined or ticked on diagram if no answer on the answer line												
	(b)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>dull</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>black</td> <td></td> </tr> <tr> <td>shiny</td> <td></td> </tr> <tr> <td>black</td> <td></td> </tr> <tr> <td>silver</td> <td></td> </tr> <tr> <td>white</td> <td></td> </tr> </table>	dull	✓	black		shiny		black		silver		white		1	
dull	✓															
black																
shiny																
black																
silver																
white																
<b>Total</b>			<b>2</b>													

Question	Answer	Marks	Guidance
12 (a)	<p><b>Level 3 (5–6 marks)</b> Chooses one method within cost for the first year and gives a reason which <b>does</b> take into account payback time</p> <p><b>AND</b> suggests a further method for a future year.</p> <p>Quality of written communication does not impede communication of science at this level</p> <p><b>Level 2 (3–4 marks)</b> Chooses one method within cost for the first year and gives a reason which <b>may</b> take into account payback time</p> <p><b>OR</b> chooses one method within cost for the first year and suggests a further method for a <b>future year</b></p> <p>Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Chooses one method within cost for the first year.</p> <p><b>OR</b> correctly calculates payback for at least one method</p> <p>Answer may be simplistic. Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p>This question is targeted at grades up to C</p> <p><b>Relevant Points include:</b> takes into account payback time</p> <ul style="list-style-type: none"> <li>• cavity / foam insulation 5yrs</li> <li>• double glazing 20 years</li> <li>• draught excluders 1yr 8 months</li> <li>• loft insulation 2 years</li> </ul> <p>reasons at level 2</p> <ul style="list-style-type: none"> <li>• idea that loft insulation or cavity / foam insulation saves more than draught excluders</li> <li>• loft insulation has one of the lowest payback times</li> <li>• loft insulation is one of the cheapest or has one of the highest savings</li> <li>• draught proofing has the highest percentage saving</li> </ul> <p>further methods for future years</p> <ul style="list-style-type: none"> <li>• the second year / next year there will be enough money to install cavity / foam insulation or loft insulation or draft excluders</li> <li>• after 6 years he could get double glazing or idea of fitting double glazing in stages</li> </ul> <p>methods</p> <ul style="list-style-type: none"> <li>• fit loft insulation</li> <li>• fit draught excluders</li> <li>• fit cavity / foam insulation</li> </ul> <p><b>allow</b> ‘after 6 years he could get double glazing’ on its own then level 1 can be awarded</p> <p><b>ignore insulation unqualified</b></p> <p>use the L1, L2, L3 annotations on scoris. do not use ticks.</p>

Question		Answer	Marks	Guidance
	(b)	<p><b>any two from:</b>            idea of using less fuel / energy / electricity (1)            idea of saving fossil fuels (1)            idea of new regulations required for better insulation (1)</p>	2	<p><b>allow</b> less carbon dioxide emissions / less global warming (1)  <b>allow</b> saves money on <b>heating</b> costs (1)  <b>allow</b> easier to sell the house (1)  <b>allow</b> keeps more heat in / loses less heat (1)  <b>but ignore</b> keep house warmer</p>
<b>Total</b>			<b>8</b>	

Question		Answer	Marks	Guidance
13	(a)	<p>16800 (2)</p> <p><b>but if incorrect</b></p> <p>2 x 4200 x 2 (1)</p>	2	
	(b)	larger radiator (1)	1	<p><b>allow</b> larger mass of water / more water  <b>allow</b> higher specific heat capacity liquid  <b>allow</b> higher temperature (of water) / turn radiator up  <b>allow</b> thinner metal on radiator  <b>allow</b> darker colour radiator  <b>ignore</b> use silver foil / keep the radiator on longer</p>
<b>Total</b>			<b>3</b>	

Question		Answer	Marks	Guidance
14	(a)	B (1)	1	<b>mark answer on line first</b> <b>allow</b> answer ringed, underlined or ticked on diagram if no answer on the answer line
	(b)	<b>any two from:</b> automatic doors (1) thermal imaging (1) passive infrared sensors / PIR (1) bar code scanners (1) wireless key board or mouse (1) cooking food in oven or grill or toasters / heaters (1)	2	<b>allow</b> night vision cameras (1)  <b>allow</b> cooking / heating on their own (1) <b>but not</b> microwave cooking  <b>ignore</b> references to remote controls as in the question
		<b>Total</b>	<b>3</b>	

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