

**54th INTERNATIONAL
CHEMISTRY OLYMPIAD
2022
UK Round One
STUDENT ANSWER BOOK**

In order to print your certificate, we need to store your name, school, and mark in a database: these details are only viewable by your school and the RSC Chemistry Olympiad Working Group.

Your participation in the competition indicates that you are happy for us to do this.

Please PRINT details clearly:

Name

Nationality

Date of birth

School Year (e.g., Year 12, Scottish Higher)

Date paper taken

School use:

Centre number

Question	1	2	3	4	5	6	Total
Marks Available	9	9	24	13	19	12	86
Marks Scored							

1.	This question is about E10 petrol	Mark
(a)		<input type="checkbox"/>
(b)		<input type="checkbox"/>
(c)		<input type="checkbox"/>
(d)		<input type="checkbox"/>
(e)	<p>E5 = E10 =</p>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

(f)

(g)

Total out of 9

2.	This question is about the chemistry of nitrous oxide	Mark
(a)		<input type="checkbox"/>
(b)	A	<input type="checkbox"/>
(c)	B ⁺	<input type="checkbox"/>
	C ⁻	<input type="checkbox"/>
(d)	D	<input type="checkbox"/>
	E	<input type="checkbox"/>
	F	<input type="checkbox"/>
	X	<input type="checkbox"/>
(e)		<input type="checkbox"/>
<i>Total out of 9</i>		<input type="checkbox"/>

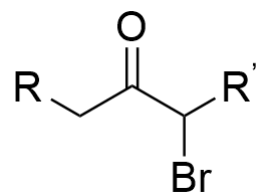
3.	This question is about cubane	Mark												
(a)		<input type="checkbox"/>												
(b)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th data-bbox="225 360 794 427" style="width: 50%;">Molecule</th> <th data-bbox="794 360 1362 427" style="width: 50%;">Number of peaks in ^{13}C NMR</th> </tr> </thead> <tbody> <tr> <td data-bbox="225 427 794 495">Cubane</td> <td data-bbox="794 427 1362 495"></td> </tr> <tr> <td data-bbox="225 495 794 562">Cubane-carboxylic acid</td> <td data-bbox="794 495 1362 562"></td> </tr> <tr> <td data-bbox="225 562 794 629">Cubane-1,2-dicarboxylic acid</td> <td data-bbox="794 562 1362 629"></td> </tr> <tr> <td data-bbox="225 629 794 696">Cubane-1,3-dicarboxylic acid</td> <td data-bbox="794 629 1362 696"></td> </tr> <tr> <td data-bbox="225 696 794 763">Cubane-1,4-dicarboxylic acid</td> <td data-bbox="794 696 1362 763"></td> </tr> </tbody> </table>	Molecule	Number of peaks in ^{13}C NMR	Cubane		Cubane-carboxylic acid		Cubane-1,2-dicarboxylic acid		Cubane-1,3-dicarboxylic acid		Cubane-1,4-dicarboxylic acid		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	Molecule	Number of peaks in ^{13}C NMR												
	Cubane													
	Cubane-carboxylic acid													
	Cubane-1,2-dicarboxylic acid													
	Cubane-1,3-dicarboxylic acid													
Cubane-1,4-dicarboxylic acid														
(c)	A	B	<input type="checkbox"/> <input type="checkbox"/>											
	(d)	W	X	<input type="checkbox"/> <input type="checkbox"/>										
(e)		Y		<input type="checkbox"/>										

(f)

C

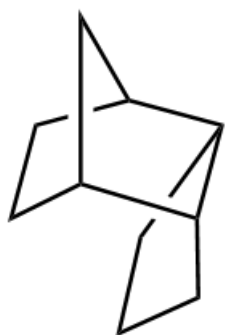


(g)



(h)

E

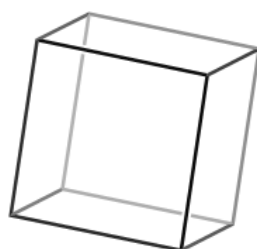


F

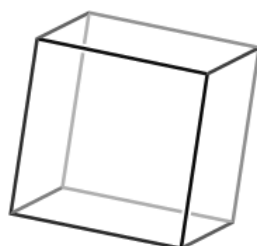


(i)

G

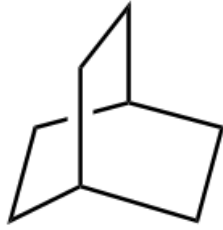


H

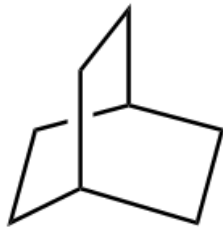


(i)

Q

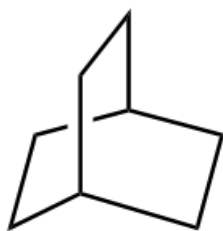


R



S

T



Total out of 24

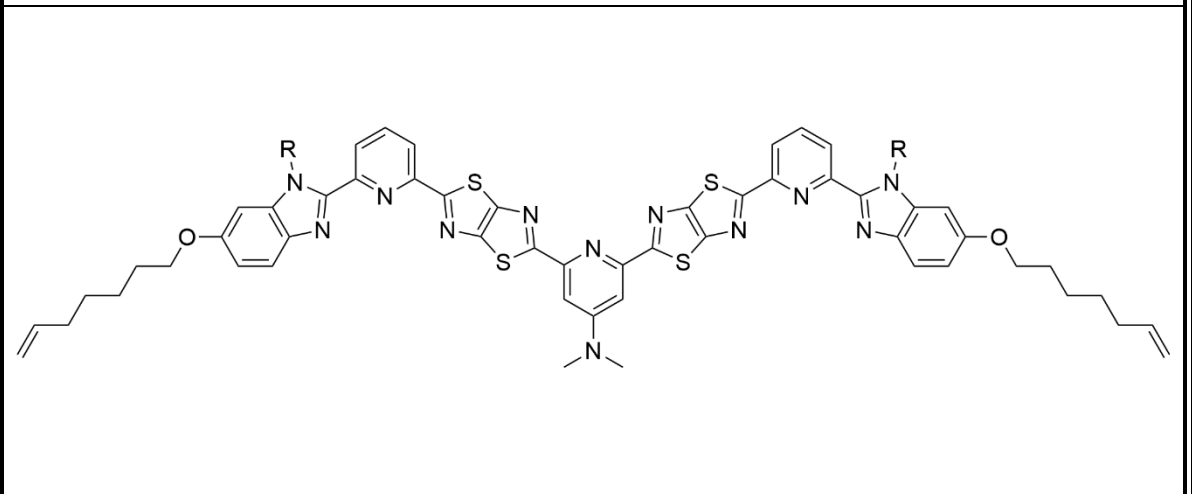
4.	This question is about coronavirus testing				Mark
(a)	Make a very acidic solution	Make a neutral solution	Make a very alkaline solution	Make a buffered solution	<input type="checkbox"/>
(b)	Very Acidic	Neutral	pH 7.4	Very Alkaline	<input type="checkbox"/>
(c)					<input type="checkbox"/>
(d)					<input type="checkbox"/> <input type="checkbox"/>
(e)	(i)				<input type="checkbox"/>
	(ii)				<input type="checkbox"/> <input type="checkbox"/>

(f)

(g)

Total out of 13

5.	This question is about making the smallest Chinese knot	Mark
(a)	(i) A	<input type="checkbox"/>
	(ii)	<input type="checkbox"/>
(b)	B	<input type="checkbox"/>
(c)	(i) C	<input type="checkbox"/>
	(ii) D	<input type="checkbox"/>

(d)	E			<input type="checkbox"/> <input type="checkbox"/>
	G			<input type="checkbox"/>
(e)				<input type="checkbox"/>
(f)				<input type="checkbox"/> <input type="checkbox"/>
(g)	tetrahedral	trigonal planar	square planar	<input type="checkbox"/>
	octahedral	square pyramidal	hexagonal planar	

(h)			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
(i)	(i)	Chinese knots	Two interlinked rings	<input type="checkbox"/>
		Individual rings	Linear organic molecules	
	(ii)	Chinese knots	Two interlinked rings	<input type="checkbox"/>
		Individual rings	Linear organic molecules	
	(iii)	Chinese knots	Two interlinked rings	<input type="checkbox"/>
		Individual rings	Linear organic molecules	
	(iv)	Chinese knots	Two interlinked rings	<input type="checkbox"/>
		Individual rings	Linear organic molecules	
<i>Total out of 19</i>			<input type="checkbox"/>	

6.	This question is about storing vaccines	Mark
(a)	Process 1: Process 2:	<input type="checkbox"/> <input type="checkbox"/>
(b)		<input type="checkbox"/>
(c)		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
(d)		<input type="checkbox"/>

(e)

(f)

Total out of 12