



**GCSE**

## **Additional Science B**

General Certificate of Secondary Education **B624/02**

Unit 2: Modules B4, C4, P4

## **Mark Scheme for June 2010**

---

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of pupils of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support which keep pace with the changing needs of today's society.

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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

© OCR 2010

Any enquiries about publications should be addressed to:

OCR Publications  
PO Box 5050  
Annesley  
NOTTINGHAM  
NG15 0DL

Telephone: 0870 770 6622  
Facsimile: 01223 552610  
E-mail: [publications@ocr.org.uk](mailto:publications@ocr.org.uk)

B624/02

Mark Scheme

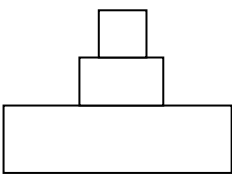
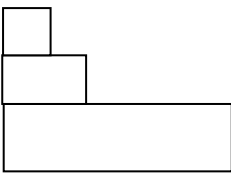
June 2010

Question			Expected Answers	Marks	Additional Guidance
1	(a)		upper epidermis (1)	1	<b>allow</b> labelled on diagram by part X
	(b)		<b>more</b> or <b>many</b> chloroplasts or chlorophyll (to absorb light) (1)  at or near <b>top</b> of leaf (to absorb light) (1)	2	<b>allow</b> densely packed <b>ignore</b> large surface area  <b>ignore</b> simply 'next to surface' i.e. must refer to <b>top</b> surface <b>ignore</b> closer to light <b>ignore</b> any reference to shape <b>ignore</b> permeable cell wall / membrane to absorb CO <sub>2</sub> or water
	(c)	(i)	<u>xylem</u> (1)	1	if answer line blank <b>allow</b> correct answer circled, underlined or ticked in list
		(ii)	chlorophyll (1)	1	<b>ignore</b> chloroplast
		(iii)	<b>any two from:</b> (minerals taken up by) active transport (1) against a diffusion gradient / from low to high concentration / AW (1) needs energy / respiration to occur (1)	2	<b>allow</b> against concentration gradient <b>ignore</b> simply from low concentration (in stem of question)  <b>allow</b> using energy from photosynthesis  <b>allow</b> higher level answer: carrier molecules / pumps (1) <b>allow</b> ATP / adenosine triphosphate (1)
			<b>Total</b>	<b>7</b>	

B624/02

Mark Scheme

June 2010

Question	Expected Answers	Marks	Additional Guidance
2 (a)	<p>blue tits (area 30 squares)</p> <p>caterpillars (area 50 squares)</p> <p>cabbages (area 450 squares)</p>  <p>correct labelled pyramid i.e. caterpillars in middle and blue tits on top (1)</p> <p>correct bar sizes to give accurate scale diagram (1) allow +/- ½ square tolerance on width and height of bars</p>	2	<p>second mark is dependent on first marking point</p> <p><b>allow</b> scale drawing non-pyramid e.g.</p>  <p>labelling of cabbages not required</p> <p>If all bars are all same height (10 small squares) then bar for caterpillars is 5 squares wide and bar for blue tits is 3 squares wide. If bars not all same height then bar for caterpillars must occupy area of 50 small squares and blue tits 30 squares.</p>
(b) (i)	respiration / heat (loss or transfer) / movement (1)	1	<p><b>allow</b> processes of heat transfer e.g. radiation, conduction, convection</p> <p><b>allow</b> evaporation</p> <p><b>allow</b> milk production</p> <p><b>ignore</b> sweating or breathing</p>
(ii)	1100 (kJ) (1)	1	
(iii)	<p>7.246 (%) or 7.25(%) or 7.2(%) or 7(%) scores (2)</p> <p>BUT <math>\frac{250}{3450} \times 100</math> scores (1)</p>	2	<p><b>allow</b> 7.24(%) or 7.3(%) or 7.0(%) (i.e. incorrect rounding) = (1)</p> <p><b>allow</b> 0.07246 or 0.0725 or 0.072 or 0.07 for 2 marks</p> <p><b>allow</b> 0.0724 or 0.073 or 0.070 for 1 mark</p>

B624/02

Mark Scheme

June 2010

Question			Expected Answers	Marks	Additional Guidance
	(c)		<p>idea that herons' food is killed or reduced / pesticide kills or reduces things in food chain / AW (1)</p> <p>idea that pesticide passes along food chain / AW (1)</p> <p><b>BUT</b></p> <p>(bio) accumulation / (concentration) increases along food chain / highest (concentration) in herons (2)</p>	2	<p><b>ignore</b> (mechanism of transfer) run-off / leaching / spray drift from land into river</p> <p><b>ignore</b> references to eutrophication</p> <p>e.g. pesticide kills the stickleback</p> <p><b>ignore</b> simply 'kills / poisons herons'</p> <p><b>allow</b> (pesticide) builds up along food chain (2)</p> <p><b>allow</b> higher level answers: pesticide is persistent / is not broken down / is stored in body tissues / can not be excreted (1) pesticide reduces egg shell thickness (1)</p>
			<b>Total</b>	<b>8</b>	

B624/02

Mark Scheme

June 2010

Question		Expected Answers	Marks	Additional Guidance
3	(a)	<div>high temperature kills microorganisms <input type="checkbox"/></div> <div>the solution prevents microorganisms getting oxygen <input type="checkbox"/></div> <div>the solution causes microorganisms to lose water <input checked="" type="checkbox"/></div> <div>the solution is too acidic for microorganisms <input type="checkbox"/></div>	1	more than one tick scores zero
	(b) (i)	osmosis (1)	1	<b>allow</b> plasmolysis <b>ignore</b> loss of water / dehydration / desiccation <b>ignore</b> flaccid / crenation
	(ii)	plasmolysed (1)	1	<b>allow</b> flaccid <b>ignore</b> crenation <b>ignore</b> loss of turgor
	(c) (i)	pressure of water or membrane or cytoplasm or cell contents against (cell) <b>wall</b> (1)	1	<b>allow</b> cell wall resists pressure of water <b>allow</b> alternative wording for pressure e.g. water pushes against the cell wall
	(ii)	animal cells do not have a (cell) wall (1)	1	<b>ignore</b> plants have a cell wall <b>allow</b> animal cells burst or lyse but <b>not</b> cell walls burst
		<b>Total</b>	<b>5</b>	

B624/02

Mark Scheme

June 2010

Question			Expected Answers	Marks	Additional Guidance
4	(a)		101 (1)	1	
	(b)	(i)	nitric (acid) (1)	1	<b>allow</b> correct formula i.e. $\text{HNO}_3$
		(ii)	neutralisation (1)	1	if answer line blank <b>allow</b> correct answer circled, underlined or ticked in list
	(c)		<p><b>Level 1</b> (1 mark) idea that fertiliser or nitrates increase the growth of water plants <b>or</b> that the outcome is that living organisms in the water die</p> <p><b>Level 2</b> (2 marks) idea that (algal bloom) blocks off sunlight (from other plants which then die)</p> <p><b>Level 3</b> (3 marks) idea that in addition to level 2, (aerobic) bacteria use up the oxygen in the water</p>	3	<p><b>Use ticks in this question</b></p> <p><b>Mark scheme is hierarchical</b> – level 1 is required before level 2 can be awarded and levels 1 &amp; 2 required before level 3 can be awarded</p> <p><b>allow</b> algal bloom for increased growth of water plants idea that fertiliser kills or poisons fish does not score, but does not negate other correct science at level 1</p> <p><b>allow</b> idea that plants below surface cannot photosynthesis for level 2</p> <p><b>allow</b> decomposers or microbes or micro organisms for bacteria</p>
			<b>Total</b>	<b>6</b>	

B624/02

Mark Scheme

June 2010

Question			Expected Answers	Marks	Additional Guidance
5	(a)		$\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$ formulae (1) balancing (1)	2	balancing mark is conditional on correct formulae <b>allow</b> any correct multiple e.g. $2\text{N}_2 + 6\text{H}_2 \rightarrow 4\text{NH}_3$ <b>allow</b> = or $\rightleftharpoons$ for arrow <b>not</b> 'and' or & for + <b>allow</b> one mark for correct balanced equation with incorrect use of upper and lower case formulae e.g. $\text{n}_2 + 3\text{H}_2 \rightarrow 2\text{nH}_3$ e.g. $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}^3$
	(b)		rate - increases yield - no effect (1)	1	<b>both required for the mark</b>
	(c)		used to make fertilisers / produce more food (1)	1	<b>allow</b> make nitric acid / make polymers or plastics / dyes / explosives / as a fertiliser / smelling salts / cleaning materials / hair perms <b>allow</b> increased plant growth but <b>ignore</b> 'helps plants grow' <b>allow</b> provides nitrogen / nitrates <b>ignore</b> to make lots of different chemicals <b>ignore</b> bleach
	(d)	(i)	(yield or it) decreases / goes down / AW (1)	1	<b>ignore</b> references to rate
		(ii)	(yield or it) increases / goes up / AW (1)	1	<b>ignore</b> references to rate
			<b>Total</b>	<b>6</b>	



B624/02

Mark Scheme

June 2010

Question			Expected Answers	Marks	Additional Guidance
6	(a)		filtration - to remove <b>solid</b> particles (1)  sedimentation (1)	2	<b>allow</b> remove (large) objects or bits <b>allow</b> to remove insoluble particles <b>ignore</b> to remove (large) particles
	(b)		from lead pipes (1)	1	<b>allow</b> from lead compounds in petrol / shot gun pellets / (lead) fishing weights / (lead) roofing <b>ignore</b> just 'from pipes' <b>allow</b> from old pipes <b>allow</b> from rocks
			<b>Total</b>	<b>3</b>	

B624/02

Mark Scheme

June 2010

Question		Expected Answers	Marks	Additional Guidance
7	(a)	allotrope (1)	1	if answer line is blank then <b>allow</b> correct answer circled, underlined or ticked in list
	(b)	layers weakly held together / layers can slide over each other (1)	1	<b>ignore</b> references to intermolecular forces or bonds
	(c)	(delocalised) electrons move (1)	1	<b>allow</b> delocalised electrons / free electrons / sea of electrons
	(d)	hard (1)  high melting point (1)	2	<b>allow</b> hard wearing <b>allow</b> it can't be scratched <b>ignore</b> hard to break or good at cutting hard things <b>ignore</b> strong or sharp or dense <b>ignore</b> durable  <b>allow</b> it will not melt <b>allow</b> (good) thermal conductor as an additional marking point
		<b>Total</b>	<b>5</b>	

B624/02

Mark Scheme

June 2010

Question			Expected Answers	Marks	Additional Guidance
8	(a)		electrons	1	more than one answer scores (0) <b>allow</b> correct answer underlined, circled or ticked in list if answer line is blank
	(b)		dust (on insulators) / clothes clinging (1)	1	<b>allow</b> sparks or explosion risk or fire risk <b>allow</b> examples of the above e.g. when refuelling or e.g. flour mill <b>allow</b> lightning (damage) / AW <b>allow</b> damage to electronic components or electrical appliances <b>allow</b> interference with communications e.g. interferes with TV signals e.g. crackling on TV screen <b>allow</b> burn or kill (people) <b>ignore</b> causes pain / it hurts or references to hair standing on end
			<b>Total</b>	<b>2</b>	

B624/02

Mark Scheme

June 2010

Question			Expected Answers	Marks	Additional Guidance
9	(a)		(speed) - fast / AW (1)  (description) - electron (1)	2	<b>allow</b> very fast / medium (fast) / quite fast (1) <b>allow</b> any description indicating speed is between alpha and gamma <b>ignore</b> average  <b>allow</b> $e^-$
	(b)	(i)	neutrons (1)	1	
		(ii)	unstable / AW (1)	1	<b>allow</b> it breaks down or it can split or decays <b>allow</b> too many neutrons <b>ignore</b> unbalanced
	(c)		<b>any four from:</b> tracer or radioisotope in pipe or liquid / AW (1)  gamma mentioned (1)  idea of radiation getting through ground or pipe/ alpha or beta NOT getting through ground (1)  (radiation detected by) Geiger tube / GM tube / Geiger counter / gamma camera (1)  idea of blockage indicated by more <b>radiation</b> at or before <b>OR</b> idea of blockage indicated by less or no <b>radiation</b> after (1)	4	<b>use ticks in this question</b> <b>allow</b> gamma in pipe (2)    <b>allow</b> idea of gamma radiation getting through ground or pipe or idea of gamma radiation can penetrate (2) <b>not</b> alpha or beta goes through the ground  <b>allow</b> photographic paper   <b>allow</b> idea that <b>radiation</b> level changes at or near the blockage
	(d)	(i)	(material X) - 2 (days) (1)	1	if answer line blank <b>allow</b> correct answer on the graph
		(ii)	points plotted at (3,40) and (6,20) or line which passes through these points (1)	1	<b>allow</b> +/- $\frac{1}{2}$ square tolerance if points only plotted correctly (with no line), award the mark <b>ignore</b> any line or points after 6 days
			<b>Total</b>	<b>10</b>	

B624/02

Mark Scheme

June 2010

Question			Expected Answers	Marks	Additional Guidance
10	(a)		4 (2)  but if answer incorrect then  12 ÷ 3 scores (1)	2	ignore incorrect units
	(b)		doubles / 6 (amps) / AW (1)	1	allow increases / AW not 5 or 96 (amps) ignore stronger
			<b>Total</b>	<b>3</b>	

B624/02

Mark Scheme

June 2010

Question		Expected Answers	Marks	Additional Guidance
11	(a)	high frequency scores (2)  <b>but</b> any correct mention of frequency or pitch or Hz (1)	2	e.g. pitch or frequency or Hz above threshold of human hearing (2) (pitch or frequency or Hz) above 20 000 <b>Hz</b> / 20 <b>kHz</b> (2) high pitched or high Hertz / Hz (2) if candidate refers to an incorrect numerical value (in Hz) ignore it and credit other marking points  ultrasound or “it” is 20 000 on its own scores (0)  <b>allow</b> low <b>frequency</b> or pitch scores (1) <b>allow</b> above the threshold of human hearing (1) if no other mark scored <b>allow</b> too <b>high</b> to hear (1)  <b>ignore</b> too quiet <b>ignore</b> outside the range of human hearing
	(b)	reflections or echoes (from layers) /  (reflections) return at different times (1)	1	<b>ignore</b> ultrasound waves bounce off layers  e.g. signals bounce back <b>at different times</b> scores 1
	(c)	no damage to (living) cells or tissue or organs (1)	1	assume unqualified answer refers to ultrasound e.g. it could damage cells scores 0, but X-rays damage cells scores 1  <b>allow</b> can detect soft tissue / AW or reverse argument <b>allow</b> X-rays cause cancer or mutations or affect DNA <b>ignore</b> unqualified damage e.g. X-rays are harmful to humans / ultrasound is safer <b>ignore</b> shows movement
	(d)	(high speed) electrons hitting metal / (high speed) electrons fired at metal / AW (1)	1	<b>allow</b> named metal (e.g. tungsten)
		<b>Total</b>	<b>5</b>	

**OCR (Oxford Cambridge and RSA Examinations)**  
**1 Hills Road**  
**Cambridge**  
**CB1 2EU**

**OCR Customer Contact Centre**

**14 – 19 Qualifications (General)**

Telephone: 01223 553998

Facsimile: 01223 552627

Email: [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)

**[www.ocr.org.uk](http://www.ocr.org.uk)**

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

**Oxford Cambridge and RSA Examinations**  
**is a Company Limited by Guarantee**  
**Registered in England**  
**Registered Office; 1 Hills Road, Cambridge, CB1 2EU**  
**Registered Company Number: 3484466**  
**OCR is an exempt Charity**



**OCR (Oxford Cambridge and RSA Examinations)**  
**Head office**  
**Telephone: 01223 552552**  
**Facsimile: 01223 552553**