

**MARK SCHEME for the May/June 2012 question paper**  
**for the guidance of teachers**

**0608 TWENTY FIRST CENTURY SCIENCE**

**0608/04**

Paper 4 (Extended Written), maximum raw mark 60

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

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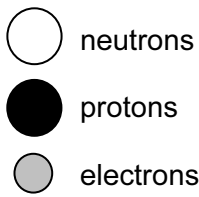
1 (a)	identifying beta-carotene, lycopene and tartrazine as natural / others are synthesised (1); colouring from a natural / plant source do not cause hyperactivity / colourings that may cause hyperactivity are synthesised (1)	[2]	First mark is for sorting the data and the second is for the conclusion.  'Those that do not cause hyperactivity are natural' or the reverse gets both marks
(b) (i)	not certain that these colourings cause hyperactivity (1) ban their use until we know more / it is better to be safe than sorry (1)	[2]	
(ii)	carry out risk assessment / description of how additives could be tested (1) to find how much can be added to food safely / to set a safe limit (1)	[2]	
	<b>Total:</b>	<b>[6]</b>	
2 (a)	there is a correlation between distance travelled and the number of asthma patients (1) as distance travelled increases number of asthma patients increases / correlation is positive (1)	[2]	if number of cars given (instead of distance), penalise once
(b)	a causal link / mechanism is needed / the graphs show correlation not cause (1) there may be other factors causing the rise in asthma patients (1) data does not give information on levels of particulates (1)	[2]	Any two allow air pollution comes from other sources
(c)	encourage people to use public transport / walk / cycle / encourage car sharing (1) design more efficient car engines / use electric cars / reduce car speed (1) have legal limits to emissions (1)	[2]	Any two
	<b>Total:</b>	<b>[6]</b>	
3 (a) (i)	$(285 + 279 + 282 + 289 + 284)/5$ or $1419/5$ (1) $= 284$ (1)	[2]	two marks for correct answer allow 283.8 allow one mark for 286 / 286.17 / 286.2 (no removal of outlier)
(ii)	mean for LDPE is not within the range for HDPE / mean for HDPE is not within the range for LDPE	[1]	do not allow ranges do not overlap
(b)	<i>HDPE (no mark) because</i> (tensile) strength is higher (1) so rope will not break easily (1)	[2]	no marks if LDPE chosen

(c) (i)	HDPE has longer chain length / HDPE has (more) cross linking	[1]	allow reverse answer
(ii)	force of attraction between polymer chains is higher (1) more energy needed to separate the polymer chains (1)	[2]	
	<b>Total:</b>	<b>[8]</b>	
4 (a)	<pre> graph BT     A[Plankton / Plants] --&gt; B[Sand Eels]     B --&gt; C[Puffins]     C --&gt; D[Seagull]     C --&gt; E[Rats]     C --&gt; F[Stoats]                     </pre> <p style="text-align: center;">(any order)</p>	[2]	<p>one mark for organisms in correct places</p> <p>one mark for arrows pointing in correct direction</p>
(b)	<p><i>inter:</i> any correct example of individuals from different species competing for food, e.g. stoats and rats competing for puffins</p> <p><i>intra:</i> any correct example of individuals from same species competing for food, e.g. puffins competing with each other for sand eels</p>	[2]	<p>note interspecific competition will only take place between rats, stoats and seagulls</p> <p>note intra specific competition will take place at any stage in food chain</p>
(c)	<p>increase: B D decrease: A C E</p>	[2]	<p>all 5 correct = 2 marks 4 correct = 1 mark</p>
	<b>Total:</b>	<b>[6]</b>	
5 (a)	<p><i>artery / A:</i> small internal diameter (lumen) – blood maintained at high pressure (1) thick wall – prevents artery bursting under high pressure (1) more elastic tissue – allows arteries to push blood along / maintains high pressure (1)</p> <p><i>vein / B:</i> large internal diameter (lumen) – allows large volume of blood to be carried (1) thin wall – blood not carried at high pressure / doesn't need to be thick to withstand pressures (1) valves – prevent blood flowing backwards (1)</p>	[3]	<p>Max 3 marks mark can only be given when feature linked to function</p> <p>max 2 marks for each of artery and vein</p>
(b)	<p>less oxygen reaching the heart (1) heart tissue dies (1)</p>	[2]	

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<b>(c) (i)</b>	as the amount of smoking increases, the risk of heart disease also increases / alternative wording	[1]	amount of smoking could refer to number of cigarettes / length of time
<b>(ii)</b>	there is no guarantee that smoking will give you heart disease (1) there are other risk factors involved / example of other risk factors (1) all individual cases are different (1)	[2]	
	<b>Total:</b>	<b>[8]</b>	
<b>6 (a)</b>	embryo produced outside the body / in laboratory / using IVF (1) genes of embryos tested (1) healthy embryo selected and replaced into mother (1)	[2]	any two
<b>(b)</b>	need both recessive alleles to get cystic fibrosis / each parent can pass on recessive allele (1) high risk of offspring (1 in 4) having cystic fibrosis (1) process would allow embryos with cystic fibrosis to be discarded (1)	[2]	any two points  first marking point is for explaining 'carrier'
<b>(c) (i)</b>	not considered as important as selecting baby without genetic disease (1) imbalance of gender in the population (1) strain on resources / too expensive (1)	[1]	leads to gender selection for cultural reasons / morally incorrect / against religious teaching
<b>(ii)</b>	not ethical / morally incorrect / against religious beliefs / involves killing embryos (1)	[1]	
	<b>Total:</b>	<b>[6]</b>	
<b>7 (a) (i)</b>	food absorbs microwaves (1); molecules (of water) in food vibrate (1); vibration heats food (1)	[2]	Any 2
<b>(ii)</b>	metal walls / screen / door (to reflect back microwaves)	[1]	reject glass
<b>(b)</b>	child's brain developing / child has thinner skull, so more at risk (1);  any named factor for having phone, e.g. ability to ring home in emergency (1)	[2]	Allow any statement of precautionary principle for first point insufficient evidence of harm to young children
	<b>Total:</b>	<b>[5]</b>	
<b>8 (a) (i)</b>	similar fossils (1); fit of continents (1); similar rock (layers) (1)	[1]	Any 1

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	(ii)	too different from own ideas (1); Wegener was outsider / not scientist (1); there were simpler explanations (1); no mechanism / no evidence at the time(1)	[1]	Any 1
	(b) (i)	magma erupts / spreads and solidifies (1); earth's magnetism recorded in rock (1); changes in Earth's field with time (1); (symmetrical) pattern shows changes (1)	[2]	Any 2
	(ii)	provides a mechanism for movement of continents / shows how continents move	[1]	
	(c) (i)	allow anything between 4.0 and 4.9	[1]	
	(ii)	no, because random variation present <b>and</b> no definite increasing pattern in number each year	[1]	
		<b>Total:</b>	<b>[7]</b>	
<b>9</b>	(a)	count (for same time) with each absorber (1); passes through paper and aluminium but not lead (1)	[2]	ignore any reference to background radiation
	(b)	 ○ neutrons ● protons ● electrons	[1]	
	(c) (i)	(radioactive materials in the) environment / rocks / ground / from space	[1]	
	(ii)	reading taken at 60 c/s (1); 0.8 s (1)	[2]	both marks for correct answer
	(iii)	400 (counts per second) (1); this is five half lives / $5 \times 0.8 = 4\text{s}$ / count of 120 falls to 4 and 12000 is 100× more so $4 \times 4 = 400$ (1)	[2]	
		<b>Total:</b>	<b>[8]</b>	