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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Applied Science 8771/8773/8776/8779

SC05 Choosing and Using Materials

Mark Scheme

2009 examination – June series

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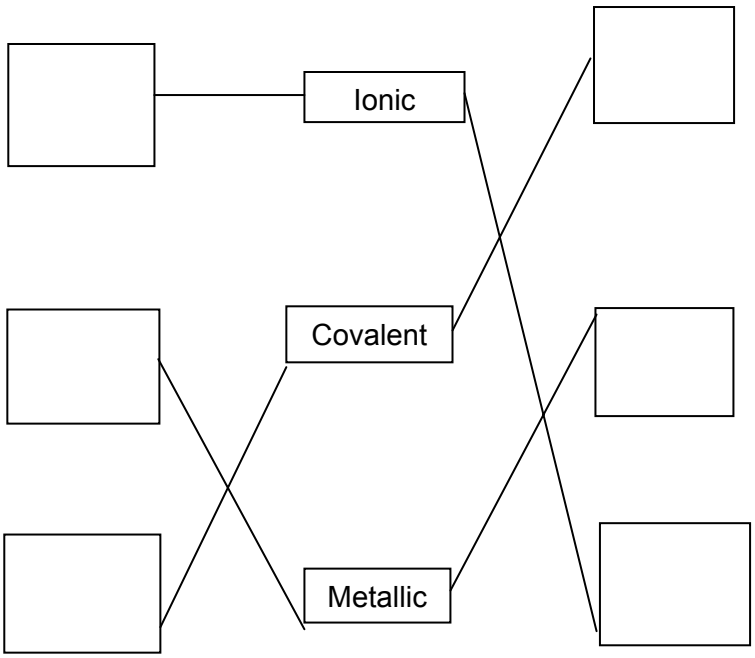
Question 1

	 One mark for each correct link If more than 6 lines drawn deduct 1 mark for each extra line	(6) (AO1)	**6**

Total Mark: 6

Question 2

(a)	Made from 2 or more materials (NOT chemically bonded)	(1) (AO1)	**1**
(b)	Any 2 from: • Lighter / less dense / lower density • Stronger • Tougher • Will not rust (NOT rot) Must be a comparison – e.g. NOT just strong	(1) (AO1) (1) (AO1)	**2**
(c)	More expensive	(1) (AO1)	**1**
(d)	Provide grip / friction / easier to hold	(1) (AO2)	**1**
(e)(i)	Any 2 from: • Carbon (graphite) conducts electricity • The rod could touch the cables (when casting) • Person (angler) could get an electric shock	(1) (AO1) (1) (AO2) (1) (AO2)	**2**
(ii)	Arrow pointing to the outside of the curved rod	(1) (AO1)	**1**
(f)	Tennis racquet / skateboard / surfboard / pole vault / javelin / hockey stick / kite / racing bicycle / arrow / yacht mast	(1) (AO1)	**1**

Total Mark: 9

Question 3

(a)	Too soft / wears easily / damages easily (allow gold is heavier than modern coins)	(1) (AO1)	**1**
(b)	A mixture of elements containing at least one metal / a mixture of metals	(1) (AO1)	**1**
(c)(i)	Prevents contact with air / water / oxygen	(1) (AO1)	**1**
(ii)	2008 coin will be attracted to a magnet / cut or scratch it to see the different metals or colours / compare density	(1) (AO2)	**1**
(d)	Any two from: • Hard **Ignore strong** • Hardwearing / durable • Difficult to bend / stiff • Unreactive / chemically resistant / does not rust	(1) (AO2) (1) (AO2)	**2**
(e)(i)	A	(1) (AO1)	**1**
(ii)	D	(1) (AO1)	**1**
(iii)	Tempering	(1) (AO1)	**1**

Total Mark: 9

Question 4

(a)	Resistance to corrosion / will not react with water	(1) (AO1)	**1**
(b)	**Using 'Displacement Can' Method** Any 5 of the following: • measure mass of lead (on balance) • fill can with water • up to spout • immerse lead • collect water displaced • measure volume of displaced water • using measuring cylinder • density = mass ÷ volume **Or Using 'Measuring Cylinder' Method** Any 5 of the following: • measure mass of lead (on balance) • pour water into measuring cylinder • note volume of water • immerse lead • note new volume of water • subtract volumes (to give volume of lead) • density = mass ÷ volume	 (1) (AO3) (1) (AO3) (1) (AO3) (1) (AO3) (1) (AO1) (1) (AO3) (1) (AO3) (1) (AO3) (1) (AO3) (1) (AO1)	**5**
(c)	11290.3 2 marks for correct answer (Accept 11290) 1 mark only for incorrect rounding beyond first decimal place kg/m^3 or kgm^{-3} 1 mark for correct units 1 compensation mark for correct formula (unless credited in (b)) or correct substitution	(1) (AO2) (1) (AO2) (1) (AO1)	**3**
(d)(i)	The (air bubbles in the) foam collapses / is squashed / is squeezed / crumples	(1) (AO2)	**1**

(ii)	Insulation / packaging / ceiling tiles / cups	(1) (AO1)	**1**
(e)	Head does not stop suddenly / increases time taken for head to stop / increases stopping distance / reduces force or impact (on head)	(1) (AO2)	**1**

Total Mark: 12

Question 5

(a)(i)	Made up of long chain molecules / a long chain molecule (NOT a long chain of molecules) / a long chain of monomers	(1) (AO1)	**1**
(ii)	Any 2 from: • does not rot / does not decay / (most are) non-biodegradeable • burning produces toxic fumes / carbon dioxide • more landfill needed (for disposal) • uses up crude oil / a valuable resource	(1) (AO1) (1) (AO1)	**2**
(b)(i)	Any 6 of the following in a logical order: • clamp a length of plastic sheet • measure the length of the sheet • cut a nick into the sheet • at a measured distance from top / bottom clamp • measure the length of the nick / or say, for e.g., a 5mm nick • secure apparatus to stand • place mass hanger on bottom hook • add masses • 100g at a time • until plastic tears • record mass used • repeat with other two plastic sheets	(1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1)	**6**
(ii)	Any 2 of : • same <u>length</u> of sheet used (NOT same size) • nick to be the same length each time (Accept size) • nick to be the same distance from top / bottom clamp	(1) (AO3) (1) (AO3)	**2**
(iii)	Repeat the experiment for each plastic sheet	(1) (AO3)	**1**
(iv)	The sheet which requires the smallest mass is the easiest to tear (or converse)	(1) (AO3)	**1**
(c)(i)	Plastic **B** (no mark) Smaller forces between the chains / chains less tangled	(1) (AO2)	**1**
(ii)	1 mark for the property e.g. flexibility / melting point / density / stiffness 1 mark for comparison e.g. A is less flexible than B / A has a higher melting point than B / A has a larger density than B / A is stiffer than B (or converse) **Ignore strength**	(1) (AO1) (1) (AO2)	**2**
(iii)	Branched chains	(1) (AO2)	**1**

Total Mark: 17

Question 6

(a)	Axes drawn in correct place and labelled Suitable scales and units All 7 points plotted correctly (Allow half a square latitude for each point) Straight line drawn through all 7 points	(1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	**4**
(b)(i)	Hooke's law	(1) (AO1)	**1**
(ii)	10N = 7mm extension (or any other correct pair of figures) 85N = 8.5 x 7mm extension = 59.5 (mm) 2 marks for correct answer 1 compensation mark for correct working	(1) (AO2) (1) (AO2)	**2**
(c)(i)	An arrow between points B and C on the sketch graph	(1) (AO1)	**1**
(ii)	Elastic limit	(1) (AO1)	**1**
(d)(i)	Stress = 60×10^6 (from graph) Stress = force / area Force = stress x area = $60 \times 10^6 \times 1.5 \times 10^{-5}$ = 900(N) 3 marks for correct answer 2 compensation marks as follows: • 60×10^6 (give mark if graph has been used) • correct formula for stress / rearrangement / correct substitution	(1) (AO2) (1) (AO2) (1) (AO2)	**3**
(ii)	Young Modulus = stress / strain = $120 \times 10^6 / 0.8 \times 10^{-3}$ (or any other correct figures from graph) = 1.5×10^{11} Nm^{-2} (Pa) 2 marks for correct answer (1 compensation mark for correct formula / substitution) 1 mark for correct unit	(1) (AO2) (1) (AO2) (1) (AO1)	**3**
(e)	So the jumper does not hit the ground / water	(1) (AO2)	**1**

Total Mark: 16

Question 7

(a)(i)	Silicon dioxide	(1) (AO1)	**1**
(ii)	Covalent	(1) (AO1)	**1**
(b)	Giant molecule / giant covalent lattice	(1) (AO1)	**1**
(c)	Amorphous / non-crystalline / irregular arrangement of particles	(1) (AO1)	**1**
(d)	Transparent does not scatter light / Translucent scatters light (Allow 'jumbles' for scatters)	(1) (AO1)	**1**
(e)	Exterior doors / bathroom windows / etc	(1) (AO1)	**1**
(f)	Brittleness / elasticity	(1) (AO1)	**1**
(g)	Any reasonable suggestion e.g. patio doors, exterior doors. Security screens (NOT just windows or doors)	(1) (AO1)	**1**

(h)	Windows which are very high / inaccessible	(1) (AO1)	**1**
(i)	Won't shatter / not brittle Scratches less easily / longevity	(1) (AO1) (1) (AO1)	**2**

Total Mark: 11