



## **General Certificate of Education**

# **Applied Science**

## **8771/8773/8776/8779**

### **SC05      Choosing and Using Materials**

# **Mark Scheme**

*2008 examination – June series*

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**Question 1**

(a)	Nylon Brick Fibre glass  2 marks for 3 correct 1 mark for 2 correct	(1) (AO1) (1) (AO1)	<b>2</b>
(b)	Contains more than one material (bonded / joined)	(1) (AO1)	<b>1</b>
(c)	Any two from Non biodegradable / don't decay / don't rot Give off poisonous fumes/greenhouse gases when burnt More landfill space needed (for disposal) Uses up crude oil / a valuable resource / low reserves of oil/comes from a non-renewable source NOT 'pollution'	(1) (AO1) (1) (AO1)	<b>2</b>
(d)(i)	Any 2 from Metal and non-metal combine Electrons transferred (from metal to non-metal) Force of attraction Between ions / opposite charges	(1) (AO1) (1) (AO1)	<b>2</b>
(ii)	Has a high mp / heat resistant	(1) (AO2)	<b>1</b>
(e)(i)	Amorphous / non-crystalline	(1) (AO1)	<b>1</b>
(ii)	Hardens / toughens / strengthens	(1) (AO1)	<b>1</b>
(iii)	Arrow pointing to inside of curve	(1) (AO2)	<b>1</b>
(iv)	The broken pieces remain bound to the plastic layer / plastic absorbs energy or impact	(1) (AO2)	<b>1</b>
(v)	In any order visibility remains good less chance of injury to passengers/driver	(1) (AO2) (1) (AO2)	<b>2</b>

**Total Mark: 14****Question 2**

(a)	Allows heat (energy) to pass through Can bend easily/hammered into shape Can be drawn out into pipes /wires/shows plastic deformation Can withstand large <u>stretching</u> forces	(1) (AO1) (1) (AO1)  (1) (AO1) (1) (AO1)	<b>4</b>
(b)(i)	Low density (Accept light/lightweight wing/aeroplane)	(1) (AO1)	<b>1</b>
(ii)	High electrical conductivity	(1) (AO1)	<b>1</b>
(iii)	High melting point	(1) (AO1)	<b>1</b>
(c)(i)	(Metal) ion Electron	(1) (AO1) (1) (AO1)	<b>2</b>
(ii)	Free electrons / delocalised electrons/sea of electrons Electrons/charge/energy moves	(1) (AO2) (1) (AO1)	<b>2</b>
(d)(i)	Correct labelling of <u>both</u> a copper atom (small circle) and a zinc atom.(large circle)	(1) (AO2)	<b>1</b>
(ii)	Different sized atoms/zinc atoms/irregular structure make it more difficult for the copper atoms/layers to slide over each other	(1) (AO2)  (1) (AO2)	<b>2</b>

(iii)	Heat to <u>high temperature</u> Cool <u>rapidly</u> (in water/oil)	(1) (AO1) (1) (AO1)	<b>2</b>
(iv)	1 mark for property 1 mark for how it changes i.e. less malleable / more brittle / increases strength / increases stiffness	(1) (AO1) (1) (AO1)	<b>2</b>
(v)	7812.5 /7813                      2 marks for correct answer  kg/m <sup>3</sup> or kgm <sup>-3</sup> 1 mark for correct unit 1 compensation mark for correct formula or correct substitution	(1) (AO2) (1) (AO2) (1) (AO1)	<b>3</b>

**Total Mark: 21****Question 3**

	Any 8 of the following in a logical order  (one of the underlined points needed for full marks) Same length of thread used each time Secure to stand Masses added 100g/one at a time Until thread snaps <u>Repeat for other two threads</u> Repeat each experiment (for reliability) Check any anomalies Find average value for each thread <u>Compare force needed to break each thread</u>	(8) (AO3)	<b>8</b>
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**Total Mark: 8****Question 4**

(a)	Any 2 from Electrical insulator Heat insulator (1 mark for insulator only) Does not burn / melt / resists high temperature / high mp	(1) (AO1) (1) (AO1)	<b>2</b>
(b)	Burns fuel more completely / burning is more efficient Fewer exhaust emissions / less carbon / less hydrocarbons / less CO	(1) (AO2) (1) (AO2)	<b>2</b>
(c)	In any order Reason: vaporises / burns away more slowly / withstands a higher temperature Explanation: high mp/bp  Reason: (more) resistant to corrosion Explanation: less reactive / low reactivity Allow reason and explanation in any order	(1) (AO2) (1) (AO2)  (1) (AO2) (1) (AO2)	<b>4</b>
(d)	(Platinum) is more expensive / scarce	(1) (AO2)	<b>1</b>

**Total Mark: 9**

**Question 5**

(a)	A stiff material has a high Young's modulus value Or wtte e.g. inflexible/resistant to bending/hard to bend/rigidity	(1) (AO1)	<b>1</b>
(b)(i)	Stress = force / area	(1) (AO1)	<b>1</b>
(ii)	Strain = extension / original length	(1) (AO1)	<b>1</b>
(iii)	Axes with suitable scales All 7 points plotted correctly (+/- 1 square) (Allow 1 error) Line of best fit drawn correctly	(1) (AO3) (1) (AO3) (1) (AO3)	<b>3</b>
(iv)	Strain = $4.3 (x 10^{-5})$ +/- 0.1 ecf from graph	(1) (AO2)	<b>1</b>
(v)	$3 \times 10^5$ 2 marks for correct answer MNm <sup>-2</sup> / MPa 1 mark for correct unit  1 compensation mark for correct formula or for any correct pair of figures subst'd – e.g. 6/ $2 \times 10^{-5}$	(1) (AO2) (1) (AO2) (1) (AO1)	<b>3</b>
(vi)	Steeper line Drawn through origin	(1) (AO2) (1) (AO2)	<b>2</b>
(c)	Another suitable property e.g. ductility / tensile strength / density	(1) (AO2)	<b>1</b>

**Total Mark: 13****Question 6**

(a)(i)	Covalent	(1) (AO1)	<b>1</b>
(ii)	Electrons are shared	(1) (AO1)	<b>1</b>
(iii)	One shared pair is a single bond / two shared pairs is a double bond / double bonds are stronger (or converse)	(1) (AO1)	<b>1</b>
(b)	Monomer	(1) (AO1)	<b>1</b>
(c)	C <sub>5</sub> H <sub>8</sub> . Accept structural formulae (numbers must be subscript)	(1) (AO2)	<b>1</b>
(d)	Double (covalent ) bond / C=C	(1) (AO1)	<b>1</b>
(e)	Polyisoprene / poly(isoprene)	(1) (AO1)	<b>1</b>
(f)	Cross links (of sulphur atoms) are formed between the rubber chains/molecules. Chains cannot move past each other	(1) (AO1) (1) (AO1)	<b>2</b>
(g)	Any 2 of The chains/molecules are further apart (in plasticized PVC) Weaker forces between the PVC chains/molecules Chains move past each other <u>more</u> easily	(1) (AO1) (1) (AO1)	<b>2</b>
(h)(i)	Plastic is an insulator of electricity / metal conducts electricity / cannot get an electric shock	(1) (AO1)	<b>1</b>
(ii)	(Thermosetting) Must keep shape when hot / does not soften or melt when hot	(1) (AO1)	<b>1</b>
(i)	(diagram B) Links are shown between the chains / molecules	(1) (AO1)	<b>1</b>
(j)	Straight line through origin	(1) (AO1)	<b>1</b>

**Total Mark: 15**