Version 1.0: 0708

ASSESSMENT and QUALIFICATIONS ALLIANCE

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)	**2**
(b)	Contains more than one material (bonded / joined)	(1) (AO1)	**1**
(c)	Any two from Non biodegradeable / 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)	**2**
(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)	**2**
(ii)	Has a high mp / heat resistant	(1) (AO2)	**1**
(e)(i)	Amorphous / non-crystalline	(1) (AO1)	**1**
(ii)	Hardens / toughens / strengthens	(1) (AO1)	**1**
(iii)	Arrow pointing to inside of curve	(1) (AO2)	**1**
(iv)	The broken pieces remain bound to the plastic layer / plastic absorbs energy or impact	(1) (AO2)	**1**
(v)	In any order visibility remains good less chance of injury to passengers/driver	(1) (AO2) (1) (AO2)	**2**

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)	**4**
(b)(i)	Low density (Accept light/lightweight wing/aeroplane)	(1) (AO1)	**1**
(ii)	High electrical conductivity	(1) (AO1)	**1**
(iii)	High melting point	(1) (AO1)	**1**
(c)(i)	(Metal) ion Electron	(1) (AO1) (1) (AO1)	**2**
(ii)	Free electrons / delocalised electrons/sea of electrons Electrons/charge/energy moves	(1) (AO2) (1) (AO1)	**2**
(d)(i)	Correct labelling of <u>both</u> a copper atom (small circle) and a zinc atom.(large circle)	 (1) (AO2)	**1**
(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)	**2**

(iii)	Heat to high temperature Cool rapidly (in water/oil)	(1) (AO1) (1) (AO1)	**2**
(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)	**2**
(v)	7812.5 /7813 2 marks for correct answer kg/m^3 or kgm^{-3} 1 mark for correct unit 1 compensation mark for correct formula or correct substitution	(1) (AO2) (1) (AO2) (1) (AO1)	**3**

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 Repeat for other two threads Repeat each experiment (for reliability) Check any anomalies Find average value for each thread Compare force needed to break each thread	(8) (AO3)	**8**

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)	**2**
(b)	Burns fuel more completely / burning is more efficient Fewer exhaust emissions / less carbon / less hydrocarbons / less CO	(1) (AO2) (1) (AO2)	**2**
(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)	**4**
(d)	(Platinum) is more expensive / scarce	(1) (AO2)	**1**

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)	**1**
(b)(i)	Stress = force / area	(1) (AO1)	**1**
(ii)	Strain = extension / original length	(1) (AO1)	**1**
(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)	**3**
(iv)	Strain = 4.3 (x 0^{-5}) +/- 0.1 ecf from graph	(1) (AO2)	**1**
(v)	3 x 10^{5} 2 marks for correct answer MNm^{-2} / MPa 1 mark for correct unit 1 compensation mark for correct formula or for any correct pair of figures subst'd – e.g. 6/ $2x10^{-5}$	(1) (AO2) (1) (AO2) (1) (AO1)	**3**
(vi)	Steeper line Drawn through origin	(1) (AO2) (1) (AO2)	**2**
(c)	Another suitable property e.g. ductility / tensile strength / density	(1) (AO2)	**1**

Total Mark: 13

Question 6

(a)(i)	Covalent	(1) (AO1)	**1**
(ii)	Electrons are shared	(1) (AO1)	**1**
(iii)	One shared pair is a single bond / two shared pairs is a double bond / double bonds are stronger (or converse)	(1) (AO1)	**1**
(b)	Monomer	(1) (AO1)	**1**
(c)	C_5H_8. Accept structural formulae (numbers must be subscript)	(1) (AO2)	**1**
(d)	Double (covalent) bond / C=C	(1) (AO1)	**1**
(e)	Polyisoprene / poly(isoprene)	(1) (AO1)	**1**
(f)	Cross links (of sulphur atoms) are formed between the rubber chains/molecules. Chains cannot move past each other	(1) (AO1) (1) (AO1)	**2**
(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 more easily	(1) (AO1) (1) (AO1)	**2**
(h)(i)	Plastic is an insulator of electricity / metal conducts electricity / cannot get an electric shock	(1) (AO1)	**1**
(ii)	(Thermosetting) Must keep shape when hot / does not soften or melt when hot	(1) (AO1)	**1**
(i)	(diagram B) Links are shown between the chains / molecules	(1) (AO1)	**1**
(j)	Straight line through origin	(1) (AO1)	**1**

Total Mark: 15