1.6 Textile fibres and fabrics

AQA 8552 · Calculator allowed · about 55 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions.

1 A maker has an unwashed woven cotton panel 1.25 m long. A test predicts that it will shrink by 4% of its original length during the first wash. Assume the panel shrinks by exactly this percentage. A single unjoined curtain piece must be at least 1.22 m long after washing, including all allowances.

(a) Calculate the length lost and the final panel length. Decide whether it can provide the required curtain piece. **(4)**

(b) Explain why washing suitable fabric before marking out the final curtain pieces can help achieve accurate finished dimensions. **(2)**

(Total for Question 1 is 6 marks)

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2 A reusable tool roll needs a fabric that supports at least 30 N in the stated strip test, survives at least 15,000 abrasion cycles and costs no more than GBP 5.00 per square metre. All samples have the same area and are tested using the same methods.

Sample	Structure	Maximum strip load (N)	Abrasion cycles to hole	Cost (GBP per square metre)
P	Plain woven	42	12,000	4.10
T	Twill woven	48	20,000	4.80
K	Knitted	25	16,000	4.00
N	Bonded non-woven	32	18,000	5.40

(a) Recommend the only sample that meets all three requirements. Support the recommendation using each requirement. **(4)**

(b) Explain why a sewn prototype should also be load-tested before the tool roll design is accepted. **(2)**

(Total for Question 2 is 6 marks)

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3 An outdoor sketching club is choosing a washable overshirt. It prioritises drying within 60 minutes, extending by at least 15% for movement and retaining a water-beading score of at least 70 after 15 washes. Fabric data below come from equal-sized samples tested under identical conditions. Higher beading means better surface water repellency.

Fabric	Fibre composition	Structure	Finish	Drying time (minutes)	Extension (%)	Beading after 15 washes /100
A	100% cotton	Woven	Repellent	95	6	80
B	70% polyester, 30% cotton	Knitted	Repellent	45	22	75
C	100% polyester	Woven	Continuous coating	35	8	92

(a) Recommend the fabric that meets all three priorities. Explain how the results support the recommendation. **(3)**

(b) A club member says, "These results prove that polyester alone causes faster drying, and that the highest beading score always gives the best overshirt." Explain two weaknesses in this claim and suggest one further test to help isolate the effect of fibre composition on drying. **(3)**

(Total for Question 3 is 6 marks)

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4 Three fabric structures are described below. No image is needed.

X: two sets of yarns cross over and under each other.

Y: yarn forms a series of interlocking loops.

Z: a web of fibres is bonded with adhesive without first making yarns.

(a) Identify the structure of X, Y and Z using woven, knitted and non-woven once each. **(3)**

(b) Name the lengthwise and crosswise sets of yarns in a woven fabric. **(2)**

(Total for Question 4 is 5 marks)

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5 A maker tests two equal-sized fabric samples for a reusable hand-drying cloth. The cloth should absorb plenty of water and dry quickly between uses. All tests use the same conditions.

Sample	Water absorbed (g)	Drying time (minutes)
C: cotton	18	100
P: polyester	2	30

(a) Choose the better sample if water absorption is the main priority. Justify your choice with a comparison of the results. **(2)**

(b) Explain one disadvantage of C for repeated use during a busy day. Use the drying results. **(2)**

(Total for Question 5 is 4 marks)

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6 A designer compares fabrics for a close-fitting pull-on wrist warmer. Each sample starts at 10.0 cm long and is stretched under the same load.

Sample	Structure	Length under load (cm)	Length after unloading (cm)
W	Woven	10.4	10.0
K	Knitted	13.6	10.1

(a) Calculate the percentage extension of K under load. Use percentage extension = (increase in length / original length) x 100. **(2)**

(b) Explain why K is more suitable than W for pulling over the hand. Refer to the structure and the extension data. **(2)**

(Total for Question 6 is 4 marks)

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7 A nursery needs circular liners for seedling pots. A liner is used once, must cost no more than 5 p and must support at least 2 N while wet. The nursery tests two materials.

Material	Construction	Cost per liner (p)	Maximum wet load (N)
N	Adhesive-bonded fibre web	3	3
V	Woven yarns	8	10

(a) Describe how the fibres are held together in N and explain why this is a non-woven structure. **(2)**

(b) Choose the material that meets both requirements. Support your choice using both limits. **(2)**

(Total for Question 7 is 4 marks)

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8 A maker compares two versions of the same fabric for a soft indoor neck wrap. Brushing raises fibres from the surface to form a nap. A snag test counts loops or fibres caught by a standard hook; fewer is better.

Finish	Warmth rating (1 low, 5 high)	Softness rating (1 low, 5 high)	Snags per test
Unbrushed	2	2	1
Brushed	4	5	6

(a) Explain how brushing can increase warmth. **(2)**

(b) Give one benefit and one drawback of choosing the brushed version for this neck wrap. Use the results. **(2)**

(Total for Question 8 is 4 marks)

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9 A cafe is choosing an easy-care finish for fabric menu sleeves. After 20 washes, a sleeve fabric must have a crease-recovery angle of at least 120 degrees and a tear force of at least 20 N. A larger recovery angle indicates better crease recovery; a larger tear force indicates greater resistance to tearing. The same base fabric is used throughout.

Treatment	Recovery angle before washing (degrees)	Recovery angle after 20 washes (degrees)	Tear force after 20 washes (N)
U: untreated	100	95	30
A: finish A	150	140	16
B: finish B	135	125	24

(a) Select the only treatment that meets both requirements after washing. Justify the selection against both limits. **(3)**

(b) Describe two controls that would make the washing comparison fair. **(2)**

(Total for Question 9 is 5 marks)

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Mark scheme · 1.6 Textile fibres and fabrics

Question 1

(a) Uses 4/100 x 1.25, or 1.25 x 0.96 for final length. **M1**

(a) Length lost = 0.05 m; accept 5 cm. **A1**

(a) Final length = 1.20 m; accept 120 cm. **A1**

(a) Concludes it is too short because the final length is below 1.22 m. Follow through a numerical final length for a consistent comparison with 1.22 m. Correct values and comparison without working earn full marks. **B1**

(a) Answer: Length lost = 1.25 x 0.04 = 0.05 m. Final length = 1.25 - 0.05 = 1.20 m. It is 0.02 m too short for the required 1.22 m piece.

(b) Initial shrinkage occurs before final measuring/marking/cutting. **B1**

(b) Links this to reducing the risk that the finished curtain becomes undersized after its first wash. Accept checking dimensions after pre-washing before cutting. **B1**

(b) Answer: Pre-washing allows initial shrinkage to occur before the pieces are measured and cut, reducing later size changes in the assembled curtain.

Question 2

(a) Recommends T. **B1**

(a) Compares 48 N with the minimum 30 N. **B1**

(a) Compares 20,000 cycles with the minimum 15,000 cycles. **B1**

(a) Compares GBP 4.80 with the maximum GBP 5.00 per square metre. Credit each correct comparison independently of the recommendation. **B1**

(a) Answer: T supports 48 N, survives 20,000 abrasion cycles and costs GBP 4.80 per square metre, meeting all three limits.

(b) Identifies that seams, stitching, fastenings or the assembled product were not tested by the fabric strip test. **B1**

(b) Explains that these may be weaker/fail under the tools' load, so fabric strength alone does not establish the product's load capacity. Accept realistic loading or repeated use exposing an assembly failure. **B1**

(b) Answer: The strip test only tests the fabric. Seams or fastenings in the complete roll may fail when loaded with tools.

Question 3

(a) Recommends B and compares 45 minutes with the maximum 60 minutes. **B1**

(a) Links B's 22% extension to meeting the minimum 15% for movement. **B1**

(a) Links B's retained beading score of 75 to meeting the minimum 70 after washing. Each correct comparison can earn its mark independently if B is identified in that comparison. **B1**

(a) Answer: B: it dries in 45 minutes, extends by 22% and retains a beading score of 75, meeting all three priorities.

(b) Explains that structure and/or finish also vary, so faster drying cannot be attributed to polyester alone. Accept fabric mass/thickness not controlled in the supplied information as another possible confounding factor. **B1**

(b) Explains that beading alone ignores another requirement: C has the highest score but 8% extension is below 15%; accept A has a higher score than B but fails drying or extension. **B1**

(b) Suggests comparing drying of fabrics of different fibre composition while keeping structure and finish the same and controlling wetting/drying conditions. Accept a matched set additionally controlling area, thickness or mass per area; do not require every additional control. **B1**

(b) Answer: The samples also differ in structure and finish, so fibre composition is not isolated. C has the highest beading score but its 8% extension fails the movement priority. Compare drying of equal-sized, equal-mass-per-area fabrics with the same structure and finish but different fibre compositions, using the same wetting and drying conditions.

Question 4

(a) X is woven. **B1**

(a) Y is knitted. **B1**

(a) Z is non-woven; accept bonded non-woven. **B1**

(a) Answer: X: woven. Y: knitted. Z: non-woven.

(b) Lengthwise yarns are the warp. **B1**

(b) Crosswise yarns are the weft. **B1**

(b) Answer: Lengthwise: warp. Crosswise: weft.

Question 5

(a) Chooses C (cotton). **B1**

(a) Supports the choice with 18 g versus 2 g, or 16 g more water absorbed. The numerical comparison may earn this mark independently. **B1**

(a) Answer: C: it absorbed 18 g compared with 2 g for P.

(b) Uses the longer drying time of C: 100 minutes versus 30 minutes, or 70 minutes longer. **B1**

(b) Links the delay to a damp cloth being unavailable for dry reuse, needing spare cloths or slower turnaround. **B1**

(b) Answer: C takes 100 minutes to dry compared with 30 minutes for P, so it is more likely to remain wet when needed again.

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Question 6

(a) Uses (13.6 - 10.0) / 10.0 x 100, or equivalent. **M1**

(a) 36%. Accept a correct answer without working. **A1**

(a) Answer: (13.6 - 10.0) / 10.0 x 100 = 36%.

(b) Knitted loops can change shape/open out under tension; accept loops allow greater extension. **B1**

(b) Links K reaching 13.6 cm rather than 10.4 cm (or 3.6 cm versus 0.4 cm extension) to passing over the hand more easily. **B1**

(b) Answer: The interlocking knitted loops can change shape, allowing K to extend by 3.6 cm rather than 0.4 cm, so it can pass over the hand more easily.

Question 7

(a) Adhesive bonds hold the fibres together. **B1**

(a) Fibres form a web directly, rather than interlaced or looped yarns; accept no weaving or knitting stage. **B1**

(a) Answer: Adhesive bonds hold the fibres together in a web. There are no interlaced or looped yarns.

(b) Chooses N and links its 3 p cost to the maximum of 5 p. **B1**

(b) Links N supporting 3 N to the minimum requirement of 2 N. Award independently if the choice is clear from this comparison. **B1**

(b) Answer: N costs 3 p, below 5 p, and supports 3 N, above the required 2 N.

Question 8

(a) Raised fibres/nap trap a layer of air. **B1**

(a) Trapped air insulates or reduces heat loss/heat transfer; accept air is a poor conductor. **B1**

(a) Answer: The raised fibres trap air near the surface. This air layer reduces heat transfer from the wearer.

(b) Benefit supported by data: softer (5 versus 2) for skin contact, or warmer (4 versus 2) for the neck. Accept an unambiguous directional comparison instead of numbers. **B1**

(b) Drawback supported by data: more snagging (6 versus 1), so the surface can catch more readily. Accept an unambiguous directional comparison. Do not infer poorer wash durability from these results. **B1**

(b) Answer: It has a higher softness rating (5 rather than 2), but catches more snags (6 rather than 1).

Question 9

(a) Selects treatment B. **B1**

(a) Compares B at 125 degrees with the minimum 120 degrees. **B1**

(a) Compares B at 24 N with the minimum 20 N. Award limit comparisons independently of an incorrect selection. **B1**

(a) Answer: B: 125 degrees is at least 120 degrees and 24 N is at least 20 N.

(b) One relevant controlled variable kept the same for all samples: number of washes, base fabric, wash temperature, detergent type/dose, wash programme/agitation, drying method, sample dimensions or wash load. **B1**

(b) A second distinct relevant controlled variable from that list or another justified control. Credit the same number of washes and the same base fabric, even though these controls are already stated in the question. **B1**

(b) Answer: Use the same wash temperature and the same detergent type and dose for all samples. Alternatively, use the same number of washes (20) and the same base fabric for all treatments.

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