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General Certificate of Education

Home Economics 5561/6561

HEC7

Mark Scheme

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HEC7

Question 1

(a) **Duvet cover** – the best blend for this is blend number **4.** 50 % cotton and 50 % polyester (1 mark)

Reasons

1. cotton is absorbent and will handle overnight perspiration without feeling damp
2. cotton has excellent comfort properties
3. polyester is durable and will enable the fabric to withstand frequent washing
4. polyester will provide quick drying properties
5. polyester will help to reduce the creasing and reduce ironing
6. the blend does not shrink (4 marks)

other valid reasons will be credited

Pair of summer socks - the best blend is number **3,** 80 % cotton and 20 % nylon (1 mark)

Reasons

1. cotton will absorb perspiration and reduce odour
2. cotton will provide coolness for the summer
3. polyamide will provide the durability for good wearing properties
4. polyamide will provide quick-drying properties
5. polyamide will provide adequate stretch properties assuming that the socks are knitted (4 marks)

other valid reasons will be credited

School trousers

The best blend is number **1** a blend containing 70 % polyester and 30 % cotton (1 mark)

Reasons

1. 30% cotton in the blend will provide good moisture absorption (coolness in summer)
2. the cotton will contribute significantly to the comfort and feel of the fabric
3. the polyester will give durability
4. the polyester will give good crease recovery during wear and after washing
5. the polyester will prevent the fabric from shrinking after frequent washing (4 marks)

other valid reasons will be credited

One-piece swimsuit

The best blend for this is number **2.** 95 % polyamide and 5 % elastane (1 mark)

Reasons

1. polyamide will itself produce good stretch and close–fitting properties
2. polyamide will give good resistance to attack by chlorine or sea water
3. polyamide will provide durability
4. elastane at only 5 % in the blend, will provide the essential stretch and recovery properties
5. both fibres are quick drying and crease–resistant (4 marks)

other valid reasons will be credited

Carpet for a lounge

The best blend for this is blend **5.** 80 % wool and 20 % nylon (1 mark)

Reasons

1. wool will give softness and warmth to the carpet
2. wool will give a luxury 'feel' to the carpet
3. polyamide will give high durability, a most important requirement of a carpet
4. high polyamide content will give quick–drying properties
5. limited staining and soiling will result mainly from the presence of the nylon in the blend and the quick–drying properties will help with the removal of dirt during vacuuming (4 marks)

other valid reasons will be credited **25 marks**

Question 2

(a) Yarn A is **polyamide**

Yarn B is **viscose rayon**

Yarn C is **cotton** (3 marks)

Reasons

Yarn A	high breaking strength (highest of the three yarns) little change in strength on wetting
Yarn B	strong when dry much weaker when wet
Yarn C	not as strong as the others when dry much stronger when wet (6 marks)

(b) (i) **dye fastness**

When exposed to different environments, the colour of the dye(s) present in coloured fabrics may change. Dye may be partially or sometimes totally lost from the fabric or it may change colour as a result of exposure to a particular environment. Exposure of dyed fabrics to hot washing water, dry cleaning solvents, perspiration, salt water, chlorine water, dry heat, constant rubbing, bright sunlight etc may affect the dye(s) present. How resistant to loss or change of shade as a result of exposure to these different conditions is called the **dye fastness.** (4 marks)

(ii) important fastness properties

- curtains light, heat, washing (3 marks)
- socks washing, rubbing, perspiration (3 marks)
- upholstery fabrics rubbing, dry-cleaning, light (3 marks)
- toddlers clothing washing, rubbing, light (3 marks)

other valid effects will be credited **25 marks**

Question 3

(a) **standard moisture regain**

(i) Standard Moisture Regain is defined as the percentage increase in weight when a bone–dry fibre or fabric sample is allowed to come into contact with air under standard conditions ie 21^{o} C and 65% relative humidity. (3 marks)

(ii) Depending on their structure, different fibres and fabrics respond differently to the presence of moisture in the air. Some fibres readily pick up moisture from the air (mainly natural fibres) while others (mainly synthetics) are hardly affected by the presence of moisture. (4 marks)

(b) **regenerated cellulosic fibres**

(i) As the name suggests these fibres are based on cellulose and are produced (reformed or regenerated) in a very different form from the original source of cellulose.

Sources of cellulose vary from country to country but the most important types of natural cellulose used are pine wood and waste cotton (2 marks)

(ii) Because regenerated cellulose is easy to manufacture and the raw materials are readily available the product is quite cheap in comparison with other cellulosic fibres. Disposable items usually do not need to have a great strength or be durable during use and this is the case for regenerated cellulosics. Normally disposable items are white and these regenerated cellulosic fibres are produced as white fibres. The most important property is that they absorb large amounts of water and so are used in disposable nappies across the world in very large quantities. The fibres are quite soft next to the skin and are therefore

reasonable comfortable. Recycling these products are a problem because of the quantity used. (6 marks)

(c) **the effects of perspiration on silk**

Silk fibres can be seriously affected by human perspiration. Human perspiration contains substances which affect the structure of the amino-acids present in silk filaments and after prolonged exposure to perspiration silk fabrics are often weakened

At the age of about 40 years the nature of human perspiration changes. Below 40 perspiration is acidic while over 40 perspiration becomes alkaline. However both acids and alkalis adversely affect silk, they attack the fibres and cause damage
Both male and females experience these effects and top quality silk blouses and shirts have absorbent pads sown in under the arms to absorb perspiration and consequently protect the silk fabric. (5 marks)

(d) (i) **cationic fabric softeners**

Modern fabric softeners (or conditioners) are widely used to improve the softness of textiles (especially cottons) which have been washed in modern synthetic detergents. The natural oils present in cotton which give it its soft handle are removed during washing and there is a need to soften the cotton fabrics again.
Cationic softeners are molecules with a 'detergent-like structure' where the 'head' of the molecule is positively charged and the 'tail' is a long chain (water-hating) hydrocarbon group. (2 marks)

(ii) During the final rinse, the positively charged heads of the softener molecules attach themselves to the negatively charged surface of the cotton fibres and the hydrophobic tails point away from the fibre surface. The result of this is that the nature of the fibre/fabric surface is changed and feels soft. (3 marks)

25 marks

Question 4

(a) **a wool jumper is carelessly washed in hot water**

Unless the wool jumper has been treated so that it can be washed at high temperatures, hot water (>50^{o}C) and heavy-duty detergents will make the jumper shrink.
(2 marks)
Wool fibres are covered in very small scales and when the jumper is put into hot water with a detergent present and then agitated, the scale structure of the fibres ensures that the fibres move only in one direction towards the root. The consequence of this is that the fibres tangle together and cause shrinkage to occur. (2 marks)

A jumper may shrink by as much as 30–40 % after several washes, making it too small for the wearer. This shrinking process is irreversible. (2 marks)

(b) **dyeing polyester with a disperse dye**

Polyester is very hydrophobic (SMR = 0.5 %) and cannot be properly dyed with the water-soluble dyes which are used for cotton, wool and viscose. (1 mark)
When very hydrophobic polyester fibres were first produced commercially they were almost impossible to dye with the cotton dyes which were available at that time. Further research was

required to find dyes which were suitable for polyester fibres. Eventually dyes were developed for this purpose and they were called disperse dyes. (2 marks)
Disperse dyes are virtually insoluble in water, but at high temperatures and in the presence of special dye-carriers at the fibre surface, disperse dyes do penetrate the fibres and become fixed in the surface. High concentrations of dyes at the fibre surface ensure that enough dye penetrates the polyester fibres to give suitable depth of colour. (2 marks)

Disperse dyed polyester is has a high fastness to washing and today polyester cotton blends are very successfully dyed together in one operation. (1 mark)

(c) **burning taper is used to ignite a narrow strip of 50/50 polyester/cotton hanging vertically is ignited**

The dangerous flammability properties of this blend are well known and are a consequence of the different burning and melting behaviour of the two fibres. (2 marks)

Both fibres are very flammable and when the burning taper is used to ignite the strip of fabric, the polyester and cotton fibres begin to burn. Unlike the polyester, the cotton does not melt and acts as a support for the melting burning polyester. This effect is known as the scaffold effect. (4 marks)
The two fibres in the blend burn fiercely together producing a lot of heat and smoke. All the fabric burns leaving little some residual ash. (2 marks)

(c) **microfibre polyamide in tights**

The suffix ‘micro’ has become the accepted term for describing ‘microfibres’ where each fibre or filament has a linear density of less than 1 decitex. These fibres are finer than even the finest silk fibres and have been used in textiles for about 15 years now. (1 mark)

Microfibre polyamide filaments are ideal for tights when high stretch and good recovery from stretching is very important. (2 marks)

Only polyamide has the best combination of the necessary properties to make it very suitable for use in tights. Strength, durability, extensibility, excellent recovery from stretching and low moisture absorption are other very important properties required of tights. (1 mark)
In addition, the softness and fineness of microfibres has dramatically improved the next to skin comfort of these tights when compared with conventional nylon (1 mark)

25 marks