S6 Technology and Living Practice Paper (Set 2): Nutrition Labels, Protein Requirement and Amino Acid Score, Glycaemic Load, Food Additives and Bacterial Growth, Functional Foods, Fabric Shrinkage and Regain, Pattern Grading and Costing, Food Safety and HACCP (100 marks)

Level: S6 | Subject: Technology and Living | 75 minutes | 100 marks | 24 questions | question paper

Part 1 Food Science and Nutrients (16 marks)

Show all formulae, substitutions and calculation steps; express energy in kcal.

#	Question	Marks
1	A breakfast cereal contains, per 100 g, 62 g carbohydrate, 9 g protein, 8 g fat, 6 g dietary fibre and 420 mg sodium. (a) Using the Atwater factors (4 kcal/g for carbohydrate and protein, 9 kcal/g for fat), calculate the energy per 100 g; (b) the energy in a 40 g serving; (c) the percentage of total energy supplied by fat (1 d.p.).	4
2	A 15-year-old boy weighs 60 kg and the protein recommendation is 0.9 g per kg body weight per day. (a) Calculate his daily protein requirement; (b) his lunch provides 22 g of protein, so calculate the percentage of the daily requirement (1 d.p.); (c) name two foods that supply complete protein.	4
3	Cooked white rice has a glycaemic index of 83 and a bowl contains 52 g of available carbohydrate; wholemeal pasta has a GI of 45 and a portion contains 40 g of available carbohydrate. (a) Calculate the glycaemic load of each (GL = GI x available carbohydrate / 100); (b) classify them (10 or less low, 11-19 medium, 20 or more high); (c) explain why GL assesses the real glycaemic effect better than GI alone.	4
4	Millet protein contains 2.4 g of lysine per 100 g of protein while the reference pattern is 5.8 g per 100 g of protein. (a) Calculate the amino acid score; (b) identify the limiting amino acid of millet; (c) suggest one food to eat in the same meal to improve protein quality and explain why.	4

Part 2 Food Additives, Preservation and Food Microbiology (16 marks)

Show all formulae, substitutions and calculation steps, with units clearly stated.

#	Question	Marks
5	A preserved fruit sample of mass 250 g contains 0.36 g of benzoic acid; the legal limit is 2000 mg/kg. (a) Calculate the concentration in the sample (mg/kg); (b) the percentage of the legal limit; (c) decide whether the sample complies.	4
6	Fresh chicken initially carries 10^3 cfu/g and the bacteria double every 20 minutes at 25 C. (a) Calculate the number of generations in 2 hours; (b) express the bacterial count after 2 hours in scientific notation; (c) state what should be done to keep the count at or below 10^4 cfu/g within those 2 hours, and why.	4
7	A spoilage bacterium has a Q10 of 2. (a) Calculate the factor by which its growth rate rises when the temperature goes from 4 C to 25 C, using 2^(dT/10), to 2 d.p.; (b) hence explain the effect of refrigeration on shelf life; (c) explain why food left at room temperature is clearly more risky.	4
8	A bacterium has a D value of 2.5 minutes at 121 C. (a) Explain what the D value means; (b) calculate the time needed to achieve a 12 D reduction; (c) explain why the canning industry uses the 12 D standard.	4

Part 3 Functional Foods and Dietary Fibre (17 marks)

Show all formulae, substitutions and calculation steps, stating any reference values used.

#	Question	Marks
9	The daily fibre recommendation for adults is 25 g. A person takes 6.5 g at breakfast, 8.2 g at lunch and 7.4 g at dinner. (a) Calculate the daily total; (b) the shortfall from the recommendation; (c) the percentage of the recommendation met (1 d.p.).	4
10	Research shows that 3 g of beta-glucan a day helps lower LDL cholesterol. A cereal provides 0.8 g of beta-glucan per serving. (a) Calculate the minimum number of servings per day (whole number); (b) the amount actually supplied by that number of servings; (c) state which class of dietary fibre beta-glucan belongs to and its common food sources.	4
11	A prebiotic product contains 12 g of fructo-oligosaccharide per 100 g. (a) How many grams does a 30 g daily portion supply; (b) distinguish prebiotics from probiotics; (c) state the digestive effects of excessive intake.	4
12	A drink claims to be sugar free and contains 0.4 g of sugar per 100 mL in a 330 mL bottle. (a) Calculate the sugar in the whole bottle; (b) decide whether the claim holds under the definition of not more than 0.5 g per 100 mL; (c) name two other sugar-type ingredients found on such labels, and explain why a diabetic still has to count the carbohydrate in this drink.	5

Part 4 Textile Fibres and Functional Fabrics (17 marks)

Show all formulae, substitutions and calculation steps; give percentages to 1 d.p.

#	Question	Marks
13	A cotton fabric is 120 cm long before washing and 115.2 cm long after washing as directed by the care label. (a) Calculate the shrinkage in length (%); (b) explain how shrinkage affects pattern dimensions; (c) state one industrial treatment that reduces shrinkage.	4
14	A jacket needs 1.35 m of fabric, three jackets are cut, the fabric costs 68 dollars per metre and cutting waste is 8%. (a) Calculate the net fabric used; (b) the actual fabric including waste; (c) the total fabric cost to 2 d.p.	4
15	A fibre sample weighs 200 g when dry and 216 g after conditioning in the standard atmosphere. (a) Calculate the moisture regain (%); (b) compare the regain of cotton and polyester and explain the effect on comfort; (c) explain why regain matters for the official mass of a fabric consignment.	4
16	Two summer jackets are labelled UPF 50 (A) and UPF 25 (B). (a) Calculate the percentage of ultraviolet radiation each blocks; (b) compare the ultraviolet transmitted, as a multiple; (c) give three design or use measures that raise the sun-protective performance of a fabric.	5

Part 5 Pattern Making and Production Costing (17 marks)

Show all formulae, substitutions and calculation steps; give money values in dollars to 2 d.p.

#	Question	Marks
17	A womens top comes in five sizes (XS to XL) with bust measurements from 84 cm to 100 cm, graded at equal steps. (a) Calculate the step between sizes; (b) the bust of size M (the third size); (c) explain why the armhole and neckline are graded by smaller steps than the bust.	4
18	A T-shirt uses 42 dollars of fabric, 8 dollars of trims, 35 dollars of labour and 3 dollars of packing, and the target gross margin is 45%. (a) Calculate the unit cost; (b) the selling price, where margin = (price - cost) / price; (c) the gross profit per unit to 2 d.p.	4

19	A workshop completes 30 garments in 240 minutes. (a) Calculate the average time per garment; (b) how many garments an 8-hour production day yields; (c) the daily output if efficiency rises by 15% (whole number).	4
20	A brand has fixed costs of 24000 dollars a month and a contribution of 60 dollars per unit. (a) Calculate the monthly break-even quantity; (b) if a 10 dollar price cut lowers the contribution to 50 dollars, find the new break-even quantity; (c) calculate the percentage increase in break-even quantity.	5

Part 6 Food Safety, HACCP and Consumer Protection (17 marks)

Show all formulae, substitutions and calculation steps, and briefly justify each answer.

#	Question	Marks
21	The Centre for Food Safety states that 4 C to 60 C is the danger zone. (a) State whether 32 C is inside it; (b) cooked food has stood at 32 C for 3 hours, so state what the 2-hour rule requires; (c) give two correct practices that shorten the time food spends in the danger zone.	4
22	Household bleach contains 5.25% sodium hypochlorite, i.e. 52500 ppm, and is diluted 1:99 for use. (a) Calculate the available chlorine concentration after dilution (ppm); (b) state what this concentration is used for; (c) give two safety precautions.	4
23	A packaged food is produced on 1 March 2026 with a shelf life of 9 months. (a) Calculate the best-before date; (b) distinguish best before from use by; (c) explain how a rise in storage temperature after opening affects the real shelf life.	4
24	A food factory sold 1250 units this month and received 25 complaints. (a) Calculate the complaint rate (%); (b) list four of the seven HACCP principles; (c) explain why HACCP stresses prevention rather than relying on end-product testing.	5