S6 Technology and Living Practice Paper (Set 1): Diet Energy and Macronutrient Ratio, Food Cost and Gross Margin, Food Safety and Bacterial Growth, Textile Shrinkage and Fabric Cost, Family Savings and Emergency Fund, Instalment Credit and APR

Senior Secondary Technology and Living

S6 Technology and Living Set 1: 24 parts, 100 marks, 75 minutes on diet energy, macro ratios, food cost, gross margin, bacterial growth, textile shrinkage and APR.

Question 1 Diet Energy and Macronutrient Ratio (18 marks)

An S6 student takes in 75 g protein, 70 g fat and 280 g carbohydrate in one day. Energy factors: protein 4 kcal/g, fat 9 kcal/g, carbohydrate 4 kcal/g. Her total daily energy expenditure is 2,050 kcal and the recommended fat share is 15%-30%.

#	Question
1	(a) Calculate the energy supplied by each macronutrient and the total energy intake.
2	(b) Find the percentage of total energy from each macronutrient (1 d.p.) and judge whether the fat share meets the recommendation.
3	(c) If she in fact takes in an extra 410 kcal per day, and 7,700 kcal equals 1 kg of fat, how much fat would she gain in one week (7 days) in theory?
4	(d) A 250 g pack declares 6.4 g dietary fibre per 100 g. Find the fibre in the whole pack and its percentage of the 25 g daily recommendation; what if only 150 g is eaten?

Question 2 Food Cost and Gross Margin (18 marks)

A school caterer buys 12.5 kg of vegetables at $86 per kg. The usable yield after trimming is 88% and each portion uses 220 g. Each portion sells at $52 and the target gross margin is 65%.

#	Question
5	(a) Find the usable weight, the number of whole portions and the ingredient cost per portion.
6	(b) Find the gross profit and gross margin per portion (1 d.p.).
7	(c) To reach a 65% gross margin, what is the minimum selling price (to $0.1)?
8	(d) On a day needing 80 portions, how many kg must be bought and what is the total cost?

Question 3 Food Safety and Bacterial Growth (17 marks)

A ready-to-eat food starts with 10^2 CFU/g. The generation time of coliform bacteria is 18 hours at 4 C and 1.5 hours at 30 C. The safety limit is 10^5 CFU/g and the count doubles each generation.

#	Question
9	(a) How many generations are needed to grow from 10^2 to 10^6? How long does that take at 4 C and at 30 C?
10	(b) What is the count after 12 hours at 30 C, and is the safety limit exceeded?

#	Question
11	(c) What is the count after 48 hours at 4 C (to the nearest whole number)?
12	(d) At 30 C, starting from 10^2, what is the shortest time before the limit is first exceeded?

Question 4 Textile Shrinkage and Fabric Cost (17 marks)

A factory cuts 60 tops from cotton of 1.5 m width. Each panel has a net area of 0.84 m2 (60 cm x 140 cm) and the marker utilisation is 82%. Fabric costs $38 per metre. After washing the fabric shrinks 4% in the warp and 3% in the weft.

#	Question
13	(a) Find the total panel area, the fabric area required and the length of fabric needed.
14	(b) The finished size is 140 cm (warp) x 60 cm (weft). Find the size after washing and the cutting size needed so that the washed garment still meets the specification.
15	(c) Find the total fabric cost and the fabric cost per garment.
16	(d) Pre-shrunk fabric (1% shrinkage) costs $46 per metre and needs 2% more area. Find the length and total cost, and state which fabric is cheaper.

Question 5 Family Savings and Emergency Fund (15 marks)

A family earns $32,000 a month, spends $18,400 on fixed items and $7,600 on variable items, and saves the rest. The emergency fund target is six months of essential spending and the family already holds $78,000. Inflation is 3.2%.

#	Question
17	(a) Find the monthly saving and the saving ratio (1 d.p.).
18	(b) Find the emergency fund target and the present achievement rate.
19	(c) With inflation at 3.2% a year, what monthly amount is needed in three years for the same standard of living (to the nearest dollar)?
20	(d) If the saving ratio rises to 25%, how much is saved monthly and how many months are still needed to reach the target (ignoring interest)?

Question 6 Instalment Credit and APR (15 marks)

A borrower takes $60,000 over 24 monthly instalments at a flat rate of 0.55% per month with no fee. APR may be approximated by APR = 24 x total interest / (principal x (number of instalments + 1)).

#	Question
21	(a) Find the monthly interest, monthly repayment, total repayment and total interest.
22	(b) Use the approximation to find the APR (1 d.p.).
23	(c) An alternative is 36 instalments at a flat rate of 0.6%. Find the monthly repayment, total interest and APR.

#	Question
24	(d) Under the 24-instalment plan, after 12 payments the borrower settles the remaining $30,000 at once with a 1.5% fee on the balance. Compare total interest and fee paid and state the saving.