S4 Technology and Living Practice Paper: Nutrition and Meal Planning, Food Science and Cooking, Food Safety and Hygiene, Textiles and Clothing, Consumer Resource Management, Food Labels

S4 | Technology and Living | Time: 75 minutes | Total: 100 marks | 24 questions

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Part A Nutrition and Meal Planning (16 marks)

Answer all questions and show your working.

1. A meal contains 30 g protein, 20 g fat and 60 g carbohydrate. Find the total energy (using 4, 9 and 4 kcal/g) and the percentage of energy supplied by fat. [4]

Answer: Total energy = 30x4 + 20x9 + 60x4 = 120 + 180 + 240 = 540 kcal; fat supplies 180 / 540 x 100% = 33.3%.

2. A 16-year-old girl weighs 55 kg and is 160 cm tall. Use the Harris-Benedict equation (655 + 9.6W + 1.8H - 4.7A) to find her basal metabolic rate, then apply an activity factor of 1.55 to find total daily energy expenditure. [4]

Answer: BMR = 655 + 9.6x55 + 1.8x160 - 4.7x16 = 655 + 528 + 288 - 75.2 = 1395.8 kcal; TDEE = 1395.8 x 1.55 = 2163.5 kcal.

3. The protein requirement is 0.8 g per kg body weight per day. How many grams of protein does the 55 kg girl need daily, and what percentage of the TDEE above does it supply (using 4 kcal/g)? [4]

Answer: Protein = 0.8 x 55 = 44.0 g; energy = 44.0 x 4 = 176.0 kcal; that is 176.0 / 2163.5 x 100% = 8.1%.

4. The girl is 1.60 m tall and weighs 55 kg. Calculate her body mass index (BMI = weight / height squared) and state her weight category using the Asian adult standard (normal 18.5-22.9). [4]

Answer: BMI = 55 / 1.60^2 = 55 / 2.56 = 21.5, which lies between 18.5 and 22.9, so her weight is normal.

Part B Food Science and Cooking (16 marks)

Show your working for every answer.

5. 100 g of flour is mixed with water at 75% hydration (relative to flour weight). How much water is needed and what is the total mass of the dough? [4]

Answer: Water = 100 x 0.75 = 75 g; dough mass = 100 + 75 = 175 g.

6. 50 g of sugar is fully dissolved in 150 g of water. Find the concentration of the syrup as a mass percentage of the solution. [4]

Answer: Total mass = 50 + 150 = 200 g; concentration = 50 / 200 x 100% = 25.0%.

7. A 200 ml vinaigrette uses oil and vinegar in the ratio 3:1. Find the volume of each, and explain why the oil must be added slowly. [4]

Answer: Oil = 200 x 3/4 = 150.0 ml; vinegar = 200 x 1/4 = 50.0 ml. Adding oil slowly keeps the droplets small and forms a stable emulsion.

8. A recipe uses 250 g of flour and is scaled up 1.5 times; yeast is 1% of the flour weight. Find the new flour weight, the yeast weight, and convert 180 degrees C to Fahrenheit (F = C x 9/5 + 32). [4]

Answer: Flour = 250 x 1.5 = 375.0 g; yeast = 375.0 x 0.01 = 3.75 g; 180 C = 180 x 9/5 + 32 = 356.0 F.

Part C Food Safety and Hygiene (16 marks)

Show the calculation or the reason clearly.

9. Food stays in the danger zone (4 C to 60 C) for 2 hours and bacteria double every 20 minutes. Find how many times the original number of bacteria, and state two ways to shorten the time. [4]

Answer: Doublings = 120 / 20 = 6, so the count becomes 2^6 = 64 times. Methods: chill to below 4 C quickly, and hold hot food above 60 C.

10. A fridge runs at 4 C and a freezer at -18 C. Find the temperature difference in kelvin. A 5-log reduction removes five orders of magnitude of bacteria; find the percentage killed. [4]

Answer: Difference = 4 - (-18) = 22 K; kill rate = 1 - 10^-5 = 99.999%.

11. Bleach is diluted 1:100 for wiping tables. How many millilitres of bleach are needed for 5 L of water, and why must it be made fresh each day? [4]

Answer: 5 L = 5000 ml, so bleach = 5000 / 100 = 50.0 ml. Diluted sodium hypochlorite decomposes on standing, so its strength falls.

12. Cooked food must cool from 60 C to 21 C within 2 hours, then to 5 C within 4 hours. Find the maximum total cooling time and explain the risk of leaving food out overnight. [4]

Answer: Maximum time = 2 + 4 = 6 hours. Leaving food out overnight keeps it in the danger zone for hours, so bacteria multiply and may produce toxins.

Part D Textiles and Clothing (16 marks)

Give units in every answer.

13. A fabric weighs 200 g per square metre. A pattern piece measures 1.5 m by 1.2 m. Find its area and mass. [4]

Answer: Area = 1.5 x 1.2 = 1.8 m2; mass = 200 x 1.8 = 360.0 g.

14. A garment uses 2.3 m of fabric at $48 per metre, plus $8 of thread and $60 of labour. Find the fabric cost, the total cost, and the selling price at 1.6 times the total cost. [4]

Answer: Fabric = 2.3 x 48 = $110.4; total cost = 110.4 + 8 + 60 = $178.4; selling price = 178.4 x 1.6 = $285.44.

15. A pattern piece is 60 cm by 80 cm and a 1.5 cm seam allowance is added on all four sides. Find the new area in cm2 and in m2. [4]

Answer: New size = (60 + 3) x (80 + 3) = 63 x 83 = 5229 cm2 = 0.5229 m2.

16. A 500 g blended fabric is 65% polyester and 35% cotton. Find the mass of each fibre and give one advantage of each. [4]

Answer: Polyester = 500 x 0.65 = 325.0 g, advantage: quick drying and wrinkle resistant; cotton = 500 x 0.35 = 175.0 g, advantage: absorbent, breathable and skin friendly.

Part E Consumer and Resource Management (16 marks)

Show the working; give money answers to the cent.

17. The same brand of rice costs $42 for 1.5 kg and $54 for 2 kg. Find the unit price of each, state which is cheaper and by what percentage. [4]

Answer: Unit price = 42 / 1.5 = $28.0 per kg and 54 / 2 = $27.0 per kg. The 2 kg pack is cheaper by (28 - 27) / 28 x 100% = about 3.6%.

18. A household earns $24,000 a month and spends 40% on housing, 20% on food and 10% on transport; the rest is saved. Find the savings percentage and amount. [4]

Answer: Savings = 100% - 40% - 20% - 10% = 30%; amount = 24000 x 30% = $7200.

19. A 1500 W kettle is used 4 minutes a day. Find the electricity used in a 30-day month in kWh, and the cost at $1.2 per kWh. [4]

Answer: Daily use = 1500 x 4 / 60 = 100 Wh; over 30 days that is 3 kWh; cost = 3 x 1.2 = $3.6.

20. A $6,000 refrigerator is depreciated on a straight-line basis over 8 years. Find the annual depreciation and the book value after 3 years, and suggest one way to extend its life. [4]

Answer: Annual depreciation = 6000 / 8 = $750.0; book value after 3 years = 6000 - 3 x 750.0 = $3750. Method: clean the condenser regularly and avoid opening the door often.

Part F Food Labels and Integrated Application (20 marks)

Show the working and add one sentence of comment on health or value for money.

21. A biscuit label shows 1,900 kJ of energy per 100 g. How much energy is in a 30 g serving, in kJ and in kcal (1 kcal = 4.184 kJ)? [5]

Answer: Energy per serving = 1900 x 30 / 100 = 570.0 kJ, which is 570.0 / 4.184 = 136.2 kcal.

22. The same label shows 12 g of sugar per 100 g (4 kcal/g) and 1,900 kJ (that is 454.1 kcal) of energy per 100 g. Find the percentage of energy supplied by sugar. [5]

Answer: Energy from sugar = 12 x 4 = 48 kcal, which is 48 / 454.1 x 100% = 10.6%, a high share, so portion size should be limited.

23. A label shows 0.48 g of sodium per 100 g. Using salt = sodium x 2.5, find the salt content per 100 g and its percentage of the WHO daily limit of 5 g. [5]

Answer: Salt = 0.48 x 2.5 = 1.2 g, which is 1.2 / 5 x 100% = 24.0% of the limit, so 100 g already uses nearly a quarter of the daily allowance.

24. A pack of the biscuits costs $32.5 and contains 8 servings. Find the cost per serving. In a survey of 250 customers, 62% said they would buy again; find that number and compare the cost per serving with a rival at $5.5 per serving. [5]

Answer: Cost per serving = 32.5 / 8 = $4.06; repeat buyers = 250 x 0.62 = 155. It is $1.44 cheaper per serving than the rival, so it is better value.
