

This Exam Includes Two Exercises. It Is Inscribed on 2 Pages Numbered 1 and 2. The Use of A Non-programmable Calculator is Allowed.

Answer The Two Following Exercises:

Exercise 1 (10 points)

Breast milk

Breast milk is the best diet for infants during the first months of life. It provides babies with everything they need for their optimal physical and mental development. The principal sugar of mother's milk is lactose but 30 or more oligosaccharides are also present.

The principal mineral constituents of mother's milk are: sodium, potassium, calcium and magnesium.

What are the protective benefits of breast milk?

It's well known that breastfed babies get fewer infections and allergies than formula-fed babies. This is because breast milk naturally strengthens baby's immune system. Breast milk contains "probiotics", which act as food for "good" bacteria in baby's intestine such as "intestinal floras". The "good" bacteria encourage a protective lining to form in baby's intestine, that helps prevent stomach upset and diarrhea.

Document-1 represents the composition of one cup of milk for feeding a baby from 6 to 11 months.

Nutritive composition of 1cup of formula milk	
Nutrient	Mass
Carbohydrates	17g
Protein	2.9g
Total Fat	6.25g
Calcium	145 mg

Document-1

Given:

Energy value for 1 g of nutrient: Carbohydrates: 3.75 kcal ; Lipids: 9 kcal; Proteins: 4 kcal.

Questions:

- Referring to the text, answer the following questions:
 - 1.1. Give the role of probiotics found in mother's milk.
 - 1.2. State two protective benefits of mother's milk.
 - 1.3. Pick out the statement which justifies that mother's milk is a complete food.
- Name the common four chemical elements that constitute protein.
- State two functional roles for protein.
- Lactose undergoes hydrolysis reaction in the presence of the enzyme "lactase". For many babies and people, digestion and absorption of lactose cause a problem.
 - 4.1. Write the word equation of hydrolysis reaction of lactose.
 - 4.2. Specify whether this reaction is catabolic or anabolic reaction.
 - 4.3. The deficiency of the enzyme " lactase" causes a problem.
 - 4.3.1. Name this problem.
 - 4.3.2. List two of its symptoms.
- A mother provides 10 months old baby with 2 cups of formula milk daily.
 - 5.1. Determine the energy value provided by this amount of milk.
 - 5.2. Babies from 6 to 11 months old need 260 mg of calcium per day.
 - 5.2.1. Calcium is a macromineral. Justify.
 - 5.2.2. Verify whether this amount of milk covers the baby's need of calcium.

Exercise 2 (10 points)

Medical Prescription

Sami catches flu accompanied with headache, sharp cough, and fever. A physician gives him the following medical prescription:

- Amoxicilline[®] 500 mg
- Doliprane[®] 100 mg
- Toplexil[®] 0.33 mg / mL

The documents below show some information about four medicinal drugs.

AMOXICILLINE[®] 500 mg : Capsule

This antibiotic belongs to the penicillin family. It is used for the treatment of various infections, mainly for pneumonia, bronchitis, throat and ear infections...

Document-1

DOLIPRANE[®] 100 mg : Divisible Suppositories

This medicinal drug contains paracetamol. It is used to lower fever and in the treatment of painful infections.

Document-2

TOPLEXIL[®] 0.33 mg/mL: 150 mL syrup

It is used for symptomatic treatment of sharp cough. This medicine is for adults and children over 2 years of age.

For children, the daily dosage depends on the weight of the child: 1 mL of syrup per kg of body's weight per day.

Document-3

ASPIRIN[®]

Aspirin is a very effective analgesic even of its risky usage. It can cause severe damage to the stomach leading to significant bleeding.

Document-4

Questions:

- 1. Referring to document-1 and the medical prescription**, specify whether Sami suffers from viral or bacterial infection.
- To prevent bacteria resistance, the physician insists on taking Amoxicilline[®] for two weeks.
 - 2.1.** Define bacteria resistance.
 - 2.2.** List two mechanisms that make a bacterium resistant to antibiotic.
- 3. Referring to documents -2, 3 and 4**
 - 3.1.** Pick out the active ingredient of Doliprane[®].
 - 3.2.** Specify the pharmaceutical class of Doliprane[®].
 - 3.3.** Why the physician prescribes Doliprane[®] rather than Aspirin[®] ?
 - 3.4.** Sami is a child of 30 Kg. He must take Toplexil[®] in four divided doses per day. Determine the volume in mL of each dose.
- Indicate the formulation of the three medicinal drugs prescribed for Sami. Give a possible formulation for Aspirin[®].
- Medicinal drugs can be prepared by different ways.
Match each item of column A to the corresponding item of column B.

Column A

- a-Preparation by synthesis
- b-Fermentation or microbiological culture
- c-Extraction from animals

Column B

- i- Penicillin
- ii- Insulin
- iii- Aspirin

Exercise 1 (10 points)

Breast milk

Part of the Q	Answer	Mark
1.1.	<<Probiotics>> act as food for good bacteria that encourage a protective lining in baby's intestine.	0.5
1.2.	Two protective benefits of mother's milk: - It helps prevent stomach upset and diarrhea. - Breastfed babies get fewer infections and allergies than formula-fed babies	1
1.3.	Since it provides babies with everything they need for their optimal physical and mental development, mother's milk is considered as complete food.	0.5
2.	The common four chemical elements that constitute protein are: Carbon, hydrogen, oxygen and nitrogen.	1
3.	- Protein for transport (hemoglobin) - Protein for defense ...	1
4.1	The word equation of hydrolysis reaction of lactose: Lactose + water → glucose + galactose	1
4.2.	The reaction is a Catabolic reaction, since breaking down large molecules into smaller ones with release of energy.	0.75
4.3.1.	Lactose intolerance	0.5
4.3.2.	Two symptoms: Fullness, gases, nausea ...	0.5
5.1.	Energy produced by one cup: $E = (3.75 \times 17) + (2.9 \times 4) + (6.25 \times 9) = 131.6 \text{ Kcal}$ Energy produced by two cups = $2 \times 131.6 = 263.2 \text{ Kcal}$	1.5 0.5
5.2.1.	Calcium is a macromineral since it is needed by the body by an amount greater than 100 mg/day.	0.5
5.2.2.	m (Ca) equivalent for two cups is $(2 \times 145) = 290 \text{ mg} > 260 \text{ mg/day}$, then it covers the baby's need of calcium.	0.75

Exercise 2 (10 points)**Medical Prescription**

Part of the Q	Answer	Mark
1.	Since the medical prescription contains an antibiotic then Sami suffers from bacterial infection.	1
2.1.	Bacteria resistance is a process where the bacteria cannot be eradicated by the antibiotic.	1
2.2.	The two mechanisms are: - Production of enzyme that renders the antibiotic inactive. - Change its permeability to antibiotic.	1.5
3.1.	The active ingredient of Doliprane [®] is paracetamol	0.5
3.2.	The pharmaceutical class of Doliprane [®] is analgesic since it is used for the treatment of painful infections.	1
3.3.	Doliprane [®] and Aspirin [®] are both analgesics, but Doliprane [®] is more safe than Aspirin [®] since Aspirin [®] causes severe damage to the stomach leading to significant bleeding.	1
3.4.	Then Sami must take $30 \times 1 \text{ mL} = 30 \text{ mL}$ per day, each dose = $\frac{30}{4} = 7.5 \text{ mL}$	1.5
4.	The formulation of the three medicinal drugs prescribed for Sami are syrup, suppositories, and capsules. Aspirin can be formulated in tablets.	1
5	a. iii-Aspirin b. i- Penicillin c. ii-insulin	1.5