



Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. food preservatives
2. saponification
3. glycerol
4. hard water
5. detergent
6. herbicides
7. rodenticides
8. biomagnification

K • 4

Each carries 0.5 mark.

2 Label the diagram

1. tail: a hydrocarbon chain, loves oil
2. head $\text{-COO}^- \text{Na}^+$ loves water
3. grease spot on cloth
4. a micelle

K • 2

Each carries 0.5 mark.

3 Multiple choice

- i. **c. dieldrin, DDT, methoxychlor**

K • 1

Each of the other groups contains a salt (potassium chloride or sodium chloride), which isn't an insecticide.

- ii. **a. soap**

K • 1

Sodium stearate, $\text{C}_{17}\text{H}_{35}\text{COONa}$, is the sodium salt of stearic acid, a long-chain fatty acid: a soap.

- iii. **a. calcium carbide**

K • 1

Calcium carbide releases acetylene with moisture, which speeds ripening (though it is banned for this use, being harmful).

- iv. **b. ethylene (ethene)**

K • 1

Ripening fruit gives off ethylene (C_2H_4), a plant hormone. Calcium carbide releases acetylene (C_2H_2), which imitates it, but brings poisonous impurities with it.

- v. **b. soap forms an insoluble scum with calcium and magnesium ions; the calcium and magnesium salts of a detergent dissolve**

U • 1

The calcium and magnesium in hard water take soap out of the water as scum. Only once all of them have been used up does the extra soap lather. Detergents' calcium salts stay dissolved, so they keep cleaning.

4 Very short answers

- a. **MARKING SCHEME**

K • 1

✓ DDT: dichlorodiphenyltrichloroethane (0.5) and BHC: benzene hexachloride (0.5).

- b. **MARKING SCHEME**

K • 1

✓ Acetylene (ethyne, C_2H_2).

- c. **MARKING SCHEME**

K • 1

✓ Aluminium phosphide (or methyl bromide).



5 Short answers

a. MARKING SCHEME

U • 2

- ✓ Soap dissolves less in salty water.
- ✓ So adding salt makes the soap separate as a solid that can be filtered off, leaving the glycerol in the liquid (salting out).

b. MARKING SCHEME

U • 2

- ✓ Salt draws water out of the food and the microbes (osmosis), so microbes can't grow.
- ✓ Oil keeps out air, and vinegar or lemon makes it too acidic for microbes (spices kill some too).

c. MARKING SCHEME

U • 2

- ✓ DDT doesn't break down; it kills useful insects too and builds up in animals' fat, more at every step up the food chain (biomagnification).
- ✓ Top animals such as fish-eating birds are poisoned or fail to breed (thin eggshells), so the food chain and the ecosystem are upset.

d. MARKING SCHEME

U • 2

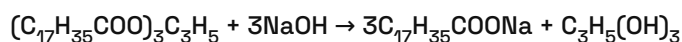
- ✓ Any one difference, e.g. soap is a sodium or potassium salt of a long-chain fatty acid, made from fats and oils; a detergent is made from petroleum.
- ✓ Any second difference, e.g. soap forms scum in hard water and lathers poorly; a detergent lathers in hard and soft water. (Or: soap is biodegradable; detergents are less so.)

6 Long answers

a. ANSWER

U • 4

Soap is made by **saponification**. Vegetable oil or animal fat is heated with sodium hydroxide solution, stirring, until it forms a thick paste; the fat breaks down into soap (the sodium salt of its fatty acids) and glycerol:
fat + sodium hydroxide → soap + glycerol, e.g.



Common salt is added, which makes the soap separate as a solid (salting out). The mixture is filtered: the soap stays on the filter paper, and the filtrate contains glycerol. The soap is pressed into molds, left to set, and can have perfume and color added.

MARKING SCHEME

- ✓ Oil or fat is heated with sodium hydroxide solution, stirring, until it forms a thick paste (saponification).
- ✓ Fat + sodium hydroxide → soap + glycerol (or the equation with tristearin).
- ✓ Common salt is added, so the soap separates as a solid (salting out).
- ✓ The mixture is filtered: soap stays on the filter paper, glycerol is in the filtrate; the soap is pressed into molds to set.



1. Train the farmers in **integrated pest management**: use chemicals only when really needed, the right one, in the right amount.
2. Use **bio-pesticides** and plant sprays: neem, jholmal, garlic and chilli; Bt and Trichoderma.
3. Use **traps**: yellow sticky cards, pheromone and light traps.
4. Protect **natural enemies**: ladybirds, spiders, frogs and birds.
5. Use good farming habits: crop rotation, mixed cropping, resistant varieties, removing diseased plants, clean seed.
6. Move towards **organic farming** with compost and farmyard manure; organic vegetables also sell for more.
7. Where pesticides must be used: protective clothing, safe storage, and keeping to the waiting period before harvest.
8. Ask the local government to arrange pesticide-residue testing and health checks, and awareness programs.

MARKING SCHEME

- ✓ Integrated pest management: use chemicals only when really needed, the right one in the right amount, with protective clothing and the waiting period before harvest.
- ✓ Bio-pesticides and plant sprays (neem, jholmal, garlic and chilli; Bt, Trichoderma), and traps (yellow sticky cards, pheromone or light traps).
- ✓ Protect natural enemies (ladybirds, frogs, birds) and use good farming habits (crop rotation, mixed crops, resistant varieties).
- ✓ Any one more, e.g. organic farming with compost, training and awareness programs, or pesticide-residue testing.

7 Numerical problems

a. ANSWER

A • 2

$25 \div 0.000003 \approx 8,300,000$: the birds carry about 8 million (nearly ten million) times the concentration in the water.

MARKING SCHEME

- ✓ $25 \div 0.000003$.
- ✓ About 8.3 million times (8,300,000).

b. ANSWER

A • 2

Seeds needed = 3 kg per liter $\times$ 20 liters = 60 kg.

MARKING SCHEME

- ✓ $3 \text{ kg} \times 20$.
- ✓ 60 kg.

8 Think

ANSWER

HA • 2

One day after spraying, much of the insecticide is still on the vegetables, so the residue is above the safe limit and the load fails the test. He should have waited for the waiting period written on the label (the number of days the pesticide takes to break down) before harvesting and selling, and sprayed only what was needed.

MARKING SCHEME

- ✓ The pesticide hadn't had time to break down, so too much residue was still on the vegetables.
- ✓ He should have waited the waiting period on the label before harvesting and selling (and used only the amount needed).



9 Activity: Ripen a banana faster

(not marked)

WHAT STUDENTS SHOULD FIND

The banana bagged with the ripe apple turns yellow first, the one bagged alone next, and the one in the open last. The ripe apple gives off ethylene, the fruit's own ripening gas, and the bag traps it around the banana, as a jute sack or a pit does in the traditional methods.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	13	13	8	2	36

