(Life cycle assessments (LCAs))

Q1.(2018)

advantages

- produced from a renewable resource
- biodegradable so breaks down

disadvantages

- higher energy costs
- greater use of fossil fuels and consequent pollution
- not recyclable so uses landfill

Q2.(2020)

disposal at the end of useful life

Q3.a)(2022)

raw materials

- crude oil is finite
- quarrying / mining pollute the environment
- glass uses more energy to process raw materials

manufacturing

- glass uses more energy to make bottles
- glass is heavier so takes more energy to transport

use and operation

- glass bottles are reusable
- reuse of glass conserves (natural) resources
- reuse of glass consumes energy during washing
- reuse of glass consumes water during washing

disposal

- both glass and polymer bottles can be recycled
- recycling polymer conserves finite resources
- recycling glass and polymer uses less energy than making new glass and polymer
- both methods reduce use of landfill

other points

- energy needed may be derived from fossil fuels
- use of fossil fuels causes (specified) pollution
- total energy for glass (bottle) (7500 kJ) is greater than total energy for polymer (bottle) (1800 kJ)

Q3.b)(2022)

$$\text{mass} = \text{density} \times \text{volume}$$

$$\text{mass} = 0.40 \times 40$$

$$= 16 \text{ (g)}$$