



3.10H Conversions and Units: Higher Tier Practice

EDEXCEL 1MA1 · Calculator allowed · about 65 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Convert 3.2 kilometres into metres.

(Total for Question 1 is 1 mark)

- 2** A recipe uses 450 millilitres of milk. Kit wants to make 0.6 of the recipe. Work out the volume of milk Kit needs in litres.

(Total for Question 2 is 2 marks)

- 3** Write 0.00042 kilograms in grams and then in milligrams.

(Total for Question 3 is 2 marks)

- 4** A rectangular metal plate measures 120 mm by 85 mm by 5 mm (thickness). Convert each dimension into centimetres and then work out the volume of the plate in cubic centimetres.

(Total for Question 4 is 3 marks)

- 5 A small bottle contains 250 cm^3 of liquid with density 1.32 g/cm^3 . Calculate the mass of the liquid in grams and give the mass in kilograms to 3 significant figures.

(Total for Question 5 is 4 marks)

- 6 A cyclist travels 18 metres in 2 seconds. Work out the speed in metres per second and convert this speed into kilometres per hour, correct to the nearest whole number.

(Total for Question 6 is 5 marks)

- 7 An engineer is designing a cylindrical water tank with radius r metres and height h metres. Give an expression for the volume in cubic metres. The engineer needs the volume in litres. Show the algebraic steps to convert the expression for volume in m^3 into litres and state the final expression in terms of r and h .

(Total for Question 7 is 6 marks)

- 8** A lorry carries fuel at a rate of 24 litres per minute to fill a generator. The generator requires fuel at a rate of 0.6 litres per second. Determine whether the lorry's supply rate is sufficient. Show your working and give a conclusion with appropriate units.

(Total for Question 8 is 8 marks)

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- 9** Show that converting a speed of x metres per second into kilometres per hour gives $3.6x$ km/h. Then a car travels at 25 m/s. Without using a calculator, use your result to find its speed in km/h and determine whether it exceeds 90 km/h.

(a) Show that converting x m/s into km/h gives $3.6x$ km/h. (3)

(b) Use the result to find the speed of the car in km/h and state whether it exceeds 90 km/h. (4)

(Total for Question 9 is 7 marks)

Mark scheme · 3.10H Conversions and Units: Higher Tier Practice

Question 1

- **B1** 3200 m cao
- **Answer: 3200 m**

Question 2

- **M1** $450 \times 0.6 = 270$ ml method or $450/1000 \times 0.6$
- **A1** 0.27 L cao
- **Answer: 0.27 L**

Question 3

- **M1** convert to grams: $0.00042 \times 1000 = 0.42$ g shown
- **A1** 420 mg cao (0.42 g = 420 mg)
- **Answer: 0.42 g and 420 mg**

Question 4

- **M1** correct conversion to cm: 12.0 cm, 8.5 cm, 0.5 cm
- **M1** method for volume: $12.0 \times 8.5 \times 0.5$
- **A1** 51 cm^3 cao
- **Answer: 51 cm^3**

Question 5

- **M1** use mass = density * volume: 1.32×250
- **A1** 330 g cao
- **M1** convert to kg: $330 / 1000$
- **A1** 0.330 kg awrt to 3 s.f. cao
- **Answer: 330 g and 0.330 kg**

Question 6

- **M1** compute speed in m/s: $18 / 2 = 9$ m/s
- **A1** 9 m/s cao
- **M1** convert to km/h: 9×3.6 or $9 \times 3600 / 1000$
- **M1** method to nearest whole number shown
- **A1** 32 km/h cao
- **Answer: 9 m/s, 32 km/h**

Question 7

- **M1** write volume in m^3 : $\pi \times r^2 \times h$
- **M1** state conversion $1 \text{ m}^3 = 1000 \text{ L}$
- **M1** multiply expression by 1000 to convert to litres
- **A1** $1000 \times \pi \times r^2 \times h$ litres cao
- **M1** show any algebraic rearrangement if needed, e.g. $V_L = 1000 \pi r^2 h$ oe
- **A1** final expression $V_L = 1000 \pi r^2 h$ cao
- **Answer: Volume in $\text{m}^3 = \pi \times r^2 \times h$. In litres: $V = 1000 \times \pi \times r^2 \times h \text{ L}$**

Question 8

- **M1** convert lorry rate to litres per second: $24 / 60 = 0.4 \text{ L/s}$
- **A1** 0.4 L/s cao
- **M1** compare 0.4 L/s with generator need 0.6 L/s
- **M1** state deficit: $0.6 - 0.4 = 0.2 \text{ L/s}$
- **A1** 0.2 L/s shortfall cao
- **M1** convert shortfall to litres per minute if required: $0.2 * 60 = 12 \text{ L/min}$
- **A1** 12 L/min cao
- **C1** conclusion: lorry rate is insufficient by 0.2 L/s or 12 L/min , so it cannot meet the generator demand
- **Answer: Lorry supplies $24 \text{ L/min} = 0.4 \text{ L/s}$. Generator needs 0.6 L/s . Shortfall $0.2 \text{ L/s} = 12 \text{ L/min}$. Conclusion: supply is insufficient.**

Question 9

- (a) **M1** state or use $1 \text{ km} = 1000 \text{ m}$ and $1 \text{ h} = 3600 \text{ s}$
- (a) **M1** correct method: convert $x \text{ m/s}$ to km/h as $(x / 1000) * 3600 \text{ km/h}$
- (a) **A1** simplify $3600/1000 = 3.6$ and conclude $3.6x \text{ km/h}$ cao
- **(a) Answer: $3.6x \text{ km/h}$**
- (b) **M1** substitute $x = 25$ into $3.6x$: $3.6 * 25$
- (b) **A1** 90 km/h cao
- (b) **M1** compare 90 km/h with 90 km/h
- (b) **A1** correct conclusion: it does not exceed 90 km/h , it equals 90 km/h cao
- **(b) Answer: 90 km/h ; it does not exceed 90 km/h , it equals 90 km/h**