# 3.9 Compound Measures: Speed, Density and Rates: Test Pack

Calculators not allowed · about 55 minutes

Name: _____ Date: ____ / ____ / _____

**Answer ALL questions. Show all your working.**

**1** Convert the following speeds so that each is in metres per second (m/s). Give exact values where possible.

**(a)** Convert 18 km/h to m/s. **(1)**

**(b)** Convert 54 km/h to m/s. Give your answer as a simplified fraction if necessary. **(1)**

**(c)** Convert 9 m/s to km/h. **(1)**

**(d)** Convert 2.5 m/s to km/h. Give your answer to 1 decimal place. **(1)**

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**2** A drone can fly at 12 m/s in still air. On a test flight it must cover a round trip from the base to a point 2 km away and return. There is a steady headwind of 4 m/s when flying out and a tailwind of 4 m/s on the return. Ignore acceleration and deceleration. Calculate the total time for the round trip in minutes. Give your answer to 2 decimal places.

**(5)**


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**3** A liquid has a density of 4.5 g/cm$^3$. It has a mass of 90 g. Work out its volume.

**(3)**

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**4** A liquid has a density of 3.1 g/cm$^3$. It has a mass of 31 g. Work out its volume.

**(3)**

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**5** A metal has a density of 2.5 g/cm$^3$. Work out the mass of 10 cm³ of the metal.

**(2)**

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**6** A tap fills a container at a rate of 4 litres per minute. How long does it take to put 180 litres into the container?

**(2)**

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**7** A block has a mass of 204 g and a volume of 40 cm³. Work out its density in g/cm$^3$.

**(2)**


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**8** A cyclist travels 75 km at an average speed of 50 km/h. How long does the journey take? Give your answer in hours and minutes.

**(3)**

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**9** A machine makes 90 bolts in 15 minutes. How many bolts does it make per minute?

**(2)**

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**10** A liquid has a density of 1.9 g/cm$^3$. It has a mass of 38 g. Work out its volume.

**(3)**

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**11** A runner travels at 20 m/s. Convert this speed to km/h.

**(3)**

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**12** A warehouse stores 2500 kg of grain in a container that has volume 2.5 m$^3$. Find the density of the grain in kg/m$^3$. Give your answer to the nearest whole number.

**(3)**


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**13** A tap fills a container at a rate of 0.4 litres per second. Work out how many litres it fills in 3 minutes.

**(2)**

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**14** A block of alloy has mass 1.2 kg and volume 150 cm³. Work out the density of the alloy in g/cm$^3$. (1 kg = 1000 g)

**(3)**

---

**15** Convert 8 m/s to km/h.

**(1)**

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**16** Find the mass of a liquid with density 1.2 g/cm$^3$ and volume 50 cm³.

**(1)**

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**17** A ferry travels 5.4 km in 18 minutes at constant speed. Work out its speed in km/h.

**(2)**


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# Mark scheme · 3.9 Compound Measures: Speed, Density and Rates: Test Pack

## Question 1

| | |
|---|---|
| (a) 5 m/s cao | B1 |
| (a) Answer: **5** | |
| (b) 15 m/s cao | B1 |
| (b) Answer: **15** | |
| (c) 32.4 km/h cao | B1 |
| (c) Answer: **32.4** | |
| (d) 9.0 km/h cao | B1 |
| (d) Answer: **9.0** | |

## Question 2

| | |
|---|---|
| convert 2 km to metres or use consistent units: 2000 m each way | M1 |
| find effective speeds: out 12 - 4 = 8 m/s; return 12 + 4 = 16 m/s | M1 |
| find times for each leg: 2000/8 and 2000/16 | M1 |
| total time in seconds 250 + 125 = 375 s or 6.25 minutes cao | A1 |
| final answer stated to 2 d.p. as 6.25 minutes cao | A1 |
| Answer: **6.25** | |

## Question 3

| | |
|---|---|
| volume = mass ÷ density | M1 |
| 90 ÷ 4.5 | M1 |
| 20 cm³ cao | A1 |
| Answer: **20 cm$^3$** | |

## Question 4

| | |
|---|---|
| volume = mass ÷ density | M1 |
| 31 ÷ 3.1 | M1 |
| 10 cm³ cao | A1 |
| Answer: **10 cm$^3$** | |

## Question 5

| | |
|---|---|
| 2.5 x 10 | M1 |
| 25 g cao | A1 |
| Answer: **25 g** | |

## Question 6

| | |
|---|---|
| 180 ÷ 4 | M1 |
| 45 minutes cao | A1 |
| Answer: **45 minutes** | |

## Question 7

| | |
|---|---|
| 204 ÷ 40 | M1 |
| 5.1 g/cm$^3$ cao | A1 |
| Answer: **5.1 g/cm$^3$** | |

## Question 8

| | |
|---|---|
| 75 ÷ 50 | M1 |
| converts the decimal hours to minutes | M1 |
| 1 hour 30 minutes cao | A1 |
| Answer: **1 hour 30 minutes** | |

## Question 9

| | |
|---|---|
| 90 ÷ 15 | M1 |
| 6 cao | A1 |
| Answer: **6** | |

## Question 10

| | |
|---|---|
| volume = mass ÷ density | M1 |
| 38 ÷ 1.9 | M1 |
| 20 cm³ cao | A1 |
| Answer: **20 cm$^3$** | |

## Question 11

| | |
|---|---|
| 20 x 3600 | M1 |
| ÷ 1000 | M1 |
| 72 km/h cao | A1 |
| Answer: **72 km/h** | |

## Question 12

| | |
|---|---|
| use density = mass/volume | M1 |
| substitute: 2500 / 2.5 | M1 |
| 1000 kg/m$^3$ cao | A1 |
| Answer: **1000** | |

## Question 13

| | |
|---|---|
| convert 3 minutes to 180 seconds | M1 |
| 72 litres cao | A1 |
| Answer: **72 litres** | |

## Question 14

| | |
|---|---|
| convert 1.2 kg to 1200 g | M1 |
| use density = mass/volume = 1200/150 | M1 |
| 8 g/cm$^3$ cao | A1 |
| Answer: **8 g/cm$^3$** | |

## Question 15

| | |
|---|---|
| 28.8 km/h cao | B1 |
| Answer: **28.8 km/h** | |

## Question 16

| | |
|---|---|
| 60 g cao | B1 |
| Answer: **60 g** | |

## Question 17

| | |
|---|---|
| convert 18 minutes to hours: 18/60 = 0.3 h | M1 |
| 18 km/h cao | A1 |
| Answer: **18 km/h** | |


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