3.9 Compound Measures: Speed, Density and Rates: 30-minute Pack

Calculators not allowed · about 30 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A small boat travels upstream against a current of 2 km/h. Its speed in still water is 8 km/h. What is the boat's speed relative to the riverbank when going upstream and when going downstream? Then find how long it will take to travel 10 km upstream. Give time in hours to 2 decimal places.

(4)

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2 Stretch: A pipeline fills a storage tank at a rate of 0.75 m³ per minute. A second pipeline empties the tank at 6 m³ per hour. If the tank starts empty, how long in minutes will it take to reach 15 m³ when both pipes are open? Give your answer to 1 decimal place.

(7)

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3 A car travels at 18 km/h. Convert this speed to metres per second.

(3)

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4 Complete the table: give the missing value in each row. Use units shown.

(a) Speed = 20 m/s, Time = 50 s, Distance = ? (m) **(1)**

.....

(b) Distance = 150 km, Time = 3 hours, Speed = ? (km/h) **(1)**

.....

(c) Speed = 72 km/h, Time = ? hours, Distance = 36 km **(1)**

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5 A cyclist travels 144 km at an average speed of 72 km/h. How long does the journey take? Give your answer in hours and minutes.

(3)

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6 A block of wood has volume 40 cm^3 and mass 32 g. Work out its density in g/cm^3.

(2)

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7 A train travels 231 km in 1 hour 45 minutes at a constant speed. Work out the speed of the train in km/h.

(3)

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Mark scheme · 3.9 Compound Measures: Speed, Density and Rates: 30-minute Pack

Question 1

calculate upstream speed 8 - 2 and downstream speed 8 + 2	M1
use time = distance/speed to find time for 10 km upstream	M1
upstream 6 km/h, downstream 10 km/h cao	A1
time = 10/6 = 1.666... so 1.67 h to 2 d.p. cao	A1

Answer: **Upstream 6 km/h; Downstream 10 km/h; Time 1.67 h**

Question 2

convert emptying rate to same time unit: 6 m³/h = 0.1 m³/min	M1
find net filling rate: 0.75 - 0.1 = 0.65 m³/min	M1
use time = volume / rate	M1
substitute: 15 / 0.65	M1
23.0769... minutes rounded to 23.1 min cao	A1
method shown clearly linking conversion and division	M1
final answer 23.1 minutes cao	A1

Answer: **23.1**

Question 3

18 x 1000 = 18000 m per hour	M1
÷ 3600	M1
5 m/s cao	A1

Answer: **5 m/s**

Question 4

(a) 1000 m cao	B1

(a) Answer: **1000**

(b) 50 km/h cao	B1

(b) Answer: **50**

(c) 0.5 h or 30 minutes cao	B1

(c) Answer: **0.5**

Question 5

144 ÷ 72	M1
converts the decimal hours to minutes	M1
2 hours cao	A1

Answer: **2 hours**

Question 6

use density = mass/volume	M1
0.8 g/cm^3 cao	A1

Answer: **0.8 g/cm^3**

Question 7

convert 1 hour 45 minutes to 1.75 hours	M1
use speed = distance/time = 231/1.75	M1
132 km/h cao	A1

Answer: **132 km/h**

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