1. Motion, forces and energy

1.4 Density

Paper 3 and 4

Answer Key

Paper 3

Q1.

Question	Answer	Marks
(a)	any **three** from: • part fill measuring cylinder with water	**B3**
	• measure / note volume (of water)	**B1**
	• submerge metal in measuring cylinder	**(B3)**
	• determine increase in volume OR measure new volume of water (and metal) AND • find the difference in the two volumes OR increase in volume = volume of metal	**(B1)**
(b)	19 (g / cm^3)	**A3**
	350 ÷ 18	(C2)
	density = mass ÷ volume OR $\rho = m \div V$	(C1)

Q2.

(b)(i)	45 (g)	**B1**
(b)(ii)	5(.0) (cm^3)	**A2**
	32 – 27	(C1)
(c)	8.9 (g / cm^3)	**A3**
	64 ÷ 7.2	(C2)
	(density =) mass ÷ volume OR (ρ =) $m \div V$	(C1)

Q3.

Question	Answer	Mark
(a)	any **three** from: • measuring cylinder (part) filled with water • volume of water measured or recorded/noted/read • metal submerged / placed in water owtte • new volume read / noted / measured / recorded	**B3**
	volume of metal = difference in volumes	**B1**
(b)	(ρ =) 6	**A3**
	(ρ =) 192 ÷ 30	(C2)
	(density =) mass ÷ volume **OR** (ρ =) m / V in any form	(C1)
	g / cm^3	**B1**

Q4.

Question	Answer	Marks
(a)	7.7	**A3**
	400 ÷ 52	(C2)
	(density =) mass ÷ volume **OR** m / V	(C1)

Q5.

(b)	(distance travelled =) 100 (m)	**A3**
	(distance travelled =) 8 × 13	(C2)
	(distance travelled =) area under graph **OR** $b \times h$	(C1)

Q6.

Question	Answer	Marks
(a)(i)	24 (cm^2)	**A2**
	(area in contact with ground) =length × width OR 12 × 2(.0)	**(C1)**
(a)(ii)	(weight =) 8.4 (N)	**A2**
	(weight =) mass × g OR 0.84 × 10	**(C1)**
(b)	(pressure =) 6(.0) (N/cm^2)	**A3**
	(pressure =) 24 ÷ 4(.0)	**(C2)**
	(pressure =) force ÷ area	**(C1)**

Q7.

Question	Answer	Marks
(a)	any **three** from: (put some coins) on top of each other OR in a stack idea measure the (total) thickness (of stack) 10 or more coins thickness (of one coin) = total thickness / 'length' ÷ number of coins	**B3**
(b)(i)	(D) = M ÷ V in any form	**C1**
	52.5 ÷ 5.4	**C1**
	9.7(2) (g / cm^3)	**A1**
(b)(ii)	floats AND coin is less dense (than mercury) ora	**B1**

Q8.

Question	Answer	Marks
(a)	(average thickness =) total thickness ÷ number of sheets	**C1**
	(average thickness =) 50 ÷ 200	**C1**
	0.25 (mm)	**A1**
(b)	density = mass ÷ volume OR (volume =) mass ÷ density	**C1**
	(volume =) 1377 ÷ 7.65	**C1**
	180 (cm^3)	**A1**
(c)	(top pan or chemical) balance	**B1**

Q9.

Question	Answer	Marks
(a)	density = mass ÷ volume in any form OR (mass =) density × volume	**C1**
	mass = 1000 × 0.05	**C1**
	50 (kg)	**A1**
(b)	Floats OR does not sink	**M0**
	density of full barrel OR its density OR density of plastic OR density of barrel OR density of (pure) water is less than sea water	**C1**
	density of plastic OR barrel AND (pure) water is less than sea water	**A1**

Q10.

Question	Answer	Marks
(a)	Any **four** from: pour some water into measuring cylinder record volume / reading of water (in measuring cylinder) place metal in water (in cylinder and completely submerge) record volume of water and metal (in cylinder) subtract starting volume from final volume (to give volume of metal)	**B4**
(b)(i)	balance	**B1**
(b)(ii)	density = mass √ volume	**C1**
	146 √ 20	**C1**
	7.3	**A1**
	g/cm^3	**B1**

Q11.

Question	Answer	Marks
(a)(i)	balance	**B1**
(a)(ii)	density = mass ÷ volume in any form	**C1**
	1260 ÷ 150	**C1**
	8.4	**A1**
	g / cm^3	**B1**
(a)(iii)	1.26 (kg)	**B1**

Q12.

Question	Answer	Marks
(a)	(678 – 318 =) 360 (g)	**B1**
(b)(i)	160 (cm^3)	**B1**
(b)(ii)	400 (cm^3)	**B1**
(b)(iii)	D = m/v in any form	**C1**
	360 ÷ 400	**C1**
	0.9 (g/cm^3)	**A1**

Q13.

Question	Answer	Marks
(a)(i)	measure mass of empty measuring cylinder/beaker add measured/fixed volume of liquid measure mass of measuring cylinder/beaker and liquid determine mass of liquid (by subtracting mass empty from mass when full) use of D = M/V	**5**
(a)(ii)	g / cm^3 **OR** kg / m^3	**1**
(b)(i)	(polythene is) less dense (than water)	**1**
(b)(ii)	W = m × g in any form **OR** (m =) W ÷ g **OR** 100 g weighs 1 N	**1**
	0.84 ÷ 10 **OR** 100 (g) × 0.84	**1**
	0.084 (kg) **OR** 84 g	**1**

Paper 4

Q14.

Question	Answer	Mark
(a)	(A = 44 × 20 =) 880 (m^2)	C1
	V = A × depth in any form OR (d =) V / A	C1
	(d = 264 / 880 =) 0.30 m	A1
(b)	ρ = m / V in any form OR (ρ =) m / V	C1
	(ρ = 2.7 × 10^5 / 264 =) 1020 kg / m^3	A1

Q15.

Question	Answer	Marks
(a)	mass = 0.25 (kg) OR $\rho = m/V$	C1
	volume = ($\pi \times 0.03^2 \times 0.1 = 2.8 \times 10^{-4}$ (m^3))	C1
	density = (0.25 / 2.8 × 10^{-4}) = 890 kg / m^3	A1
	OR	
	mass = 250 (g) OR $\rho = m/V$	
	volume = ($\pi \times 3^2 \times 10$ =) 280 cm^3	
	density = (250 / 280 =) 0.89 g / cm^3	
	OR	
	$\rho = F/A = hpg$	
	$\rho = F/Ahg$ OR 2.5 / $\pi \times 0.03^2 \times 0.1 \times 10$	
	= 890 kg / m^3	

Q16.

Question	Answer	Marks
(a)	(volume =) $\pi r^2 h$ or $\pi(0.035^2) \times 0.12$ **or** 4.62 × 10^{-4} (m^3)	C1
	$\rho = m/V$ in any form OR $(m =) \rho V$	C1
	(mass = 900 × 4.62 × 10^{-4} =) 0.41 (kg)	A1
	0.66 kg **or** 250 g or 0.25 kg correctly added to previous result	B1

Q17.

(c)	P = hdg or in words OR (d =) P ÷ hg OR 2500 ÷ (0.32 × 10)	1
	780 kg / m^3	1
	OR d = M ÷ V = 4.8 ÷ (0.12 × 0.16 × 0.32)	(1)
	780 kg / m^3	(1)

Q18.

Question	Answer	Marks
(a)	average/overall/combined density (of the metal and air contained) less (than density of sea water)	1
(b)	(P =) $h \times \rho \times g$ **OR** (V=) $A \times l$ in any form	1
	(P= 1.2 × 1020 × 10 =) 12 000 (Pa) **OR** (V= 0.8 × 1.2 =) 0.96 (m^3)	1
	$P = F \div A$ **OR** (F =) $P \times A$ **OR** (W =) $V \times \rho \times g$	1
	(F = 12240 × 0.80 =) 9800 N **OR** (F = W =) 9800 N	1
(c)	same numerical answer as **(b)**	1
	resultant/net (vertical) force = 0 **OR** downward force = upward force **OR** forces are balanced	1