



FORM 3

PHYSICS

MARKING SCHEME

SECTION A		40 MARKS	
Question	Answer	Mark	Additional Guidelines
1 a i	$160.84\text{ g} - 130\text{ g}$ $= 30.84\text{ g}$	1 1	Working Answer and unit
1 a ii	30 cm^3	1	Accept 30
1 a ii	$Density = \frac{Mass}{Volume} = \frac{30.84}{30}$ $= 1.03\text{ g/cm}^3$	1 1	
1 a iv	read the bottom of the meniscus read at eye level	1	Accept any other suitable precaution
1 b i	the density of the egg is larger than the density of fresh water and/or the density of the egg is smaller than the density of the seawater	1	
1 b ii	any value between 1 g/cm^3 and 1.03 g/cm^3	1	

2 a	length of spring: 67 mm, 76 mm extension: 18 mm	2 1	
2 b	40 mm	1	
2 c	force and extension are directly proportional to each other	1	
2 d	a straight line graph	1	
2 e	if a large force is applied, the spring will exceed the elastic limit: <ul style="list-style-type: none"> • force and extension are no longer proportional • a permanent extension will be produced 	1 1	

3 a	If an object is in equilibrium, total clockwise moments are equal to anticlockwise moments	1	
3 b	$Moment = F \times s = 800 \times 0.05$ $= 40\text{ Nm}$	1 1	
3 c	40 Nm	1	
3 d	clockwise	1	
3 e	$Moment = F \times s \rightarrow 40 = F \times 0.4$ $\rightarrow F = 100\text{ N}$	1 1	
3 f	use a longer crowbar	1	

4 a	$2700 + 160 = 2860\text{ kg}$	1	
4 b	$W = mg \rightarrow W = 2860 \times 10$ $W = 28600\text{ N}$	1 1	
4 c	$Area\ of\ 4\ tyres = 0.04 \times 4$ $= 0.16\text{ m}^2$	1	

4 d	$P = \frac{F}{A} = \frac{28600}{0.16}$ $= 178750 Pa$	1 1	
4 e	Any one of the following: <ul style="list-style-type: none"> remove luggage and passengers from car to reduce downward force let air out of the tyres so as to increase base area 	2	

5 a	thermometer	1	
5 b	20°C	1	
5 c	30°C	1	
5 d	120 s	1	
5 e	$\Delta Q = mc\Delta\theta = 0.5 \times 3980 \times 30$ $= 59700 J$	1 1	
5 f	it will reduce heat loss by convection	1	
5 g	plastic	1	Accept any other suitable insulator

SECTION B		45 MARKS	
Question	Answer	Mark	Additional Guidelines
6 a	<ul style="list-style-type: none"> As water falls down the potential energy is converted to kinetic energy which turns the turbine. The turbine turns the generator which in turn changes kinetic energy into electrical energy to light the bulb. 	1 2	Accept any reasonable answer.
6 b i	5 J	1	
6 b ii	40%	1	
6 b iii	PE = mgh → 12.5 = m x 10 x 2.5 → m = 0.5 kg	3	2 marks for correct working, 1 mark for correct unit
6 c i	Graph: <ul style="list-style-type: none"> has correct axis is drawn over more than half the graph correct title is a straight line passes through origin 	1 1 1 1 1	
6 c ii	$Gradient = \frac{15}{3} = 5 N = Weight\ of\ water$	2	1 mark for correct working, 1 mark for correct unit

7 a	Milky Way	1	
7 b	the regularly repeated elliptical course of a celestial object around a star or planet	1	Accept any relevant answer
7 c	a planet reflects light whilst a star emits light	1 1	
7 d	a planet is smaller than a star	1	Accept any relevant answer
7 e	force of gravity	1	Do not accept 'gravity'

7	f	it decreases with increasing distance	1	
7	g	i	Venus, because it takes less time to orbit the sun	1 1
7	g	ii	time to spin once on its own axis, Venus	1 1
7	g	iii	Saturn, because it has the largest mass	1 1
7	g	iv	$V = \frac{m}{\rho} = \frac{5.97 \times 10^{24}}{5514}$ $V = 1.08 \times 10^{21} m^3$	1 1
				1 mark for correct working, 1 mark for correct unit.

8	a	by convection, hot air rises because it is less dense	1 1	
8	b	heat loss through conduction is reduced, as air is a poor conductor of heat. heat transfer by convection currents is also reduced because the gap is very narrow	1 1	
8	c	i	this is because the thicker the layer of air the higher the insulation	2
8	c	ii	energy transfer increases	1
8	c	iii	1 cm, since at this thickness the total energy transferred is the lowest.	1 1
8	d	i	Diagram that shows: • two containers that are coloured differently and show equal amounts of hot water in them • each container has a thermometer	1 1
8	d	ii	• Pour equal amount of hot water in each container and read the initial temperature • Record the temperature of water in both containers every 5 mins • Plot a graph of temperature vs time	1 1 1
8	d	iii	black surfaces are better emitters of heat	1

Please Note: When marking questions that involve calculations, apply the ‘**follow through**’ rule. This means that if a student gives a wrong value for part (a) of a question and then uses the value of (a) in the subsequent calculations, marks should be deducted for part (a) only. The subsequent parts should be given full marks if these are correct.