Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2009–2010

Science: Double Award (Modular)

Forces and Energy
End of Module Test
Higher Tier

C

[GDC02]

GDC02

THURSDAY 25 FEBRUARY 2010, MORNING

TIME

45 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all twelve** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
Total Marks	

1 A ballet dancer of weight 630 N balances on one toe.

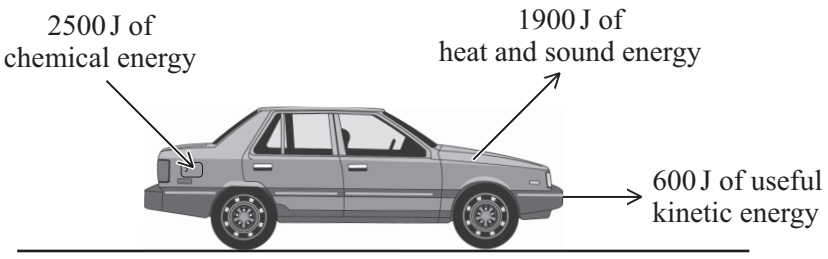
If the area of toe in contact with the floor is 3 cm^2, calculate the pressure exerted on the floor in N/cm^2.

You are advised to show your working out.

Pressure = _____ N/cm^2 [3]

Examiner Only	
Marks	Remark

2 The diagram below shows what happens to 2500 J of chemical energy input to the engine of a car.



Calculate the efficiency of the car's engine.

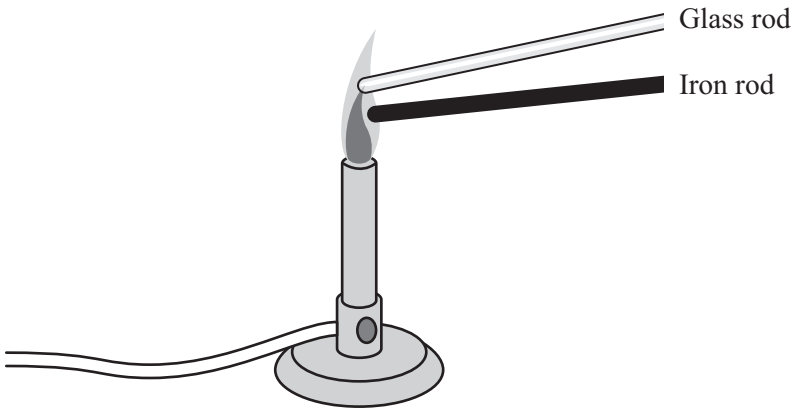
You are advised to show your working out.

Efficiency of engine = _____ [3]

Examiner Only

Marks	Remark

3 Two rods, one made of glass and the other of iron, are placed in a Bunsen flame as shown. The dimensions of the rods are exactly the same.



After each of the statements below, write the letter **G** if the statement applies to glass.
Write **I** if the statement applies to iron.
If the statement applies to both rods, then put **GI** in the box.

This rod has no free electrons. ☐

Atoms are mainly responsible for heat conduction. ☐

Atoms vibrate more quickly when heat is added. ☐

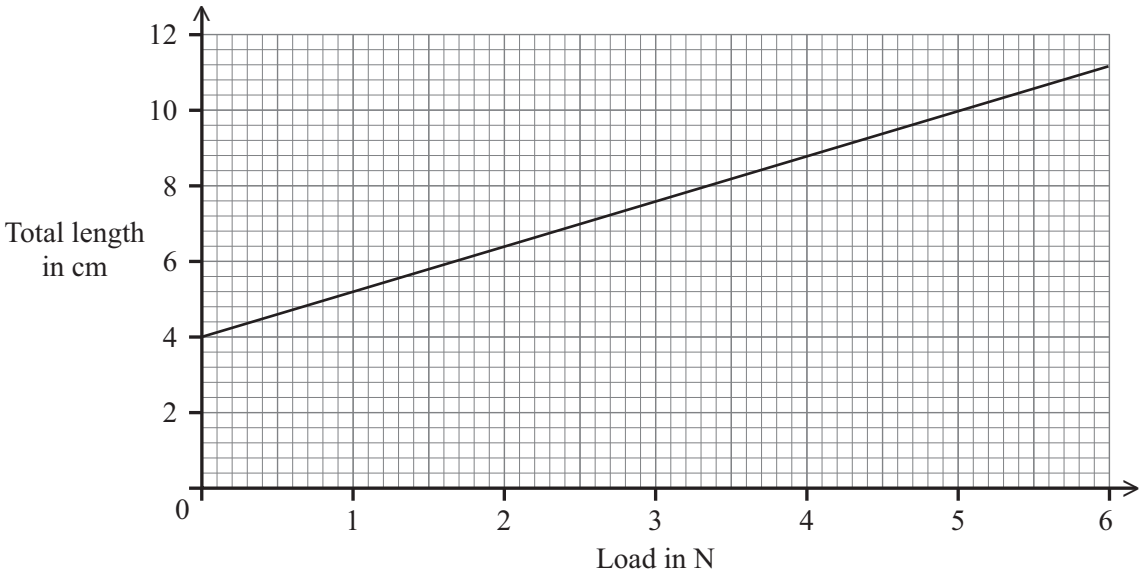
Heat is transferred when electrons collide with neighbouring atoms. ☐

[4]

Examiner Only

Marks	Remark

4 The graph below shows results from a Hooke's Law experiment for a steel spring.



(a) Is the load proportional to the total length of the spring?

Tick (✓) the correct box and give a reason for your answer.

Yes ☐

No ☐

Reason: _____ [1]

(b) What is the natural (unextended) length of the spring?

Natural length = _____ cm [1]

(c) An unknown load extends the spring by 6 cm. Use the graph to find the unknown load.

You are advised to show your working out.

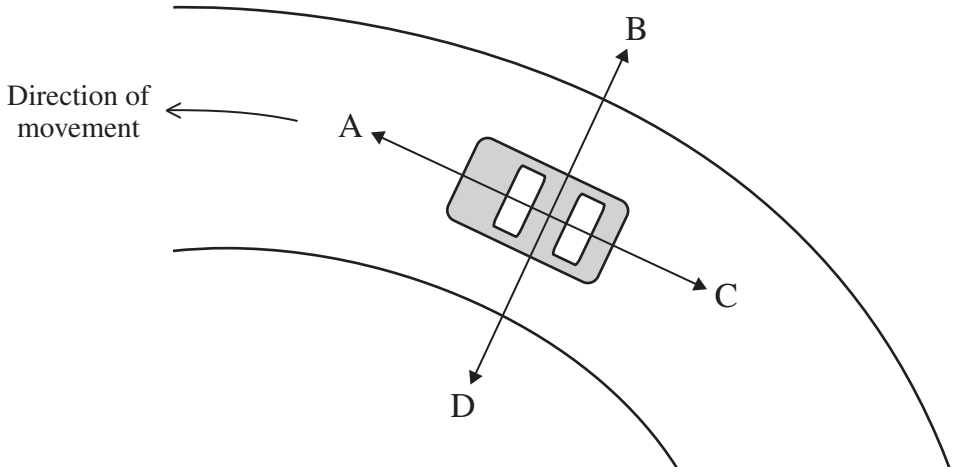
Unknown load = _____ N [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

5 The diagram shows a plan view (bird's eye view) of a car going round a circular track.



Four directions, A, B, C and D, are shown.

(a) (i) Which letter indicates the direction of the force which keeps the car moving in a circle?

Letter _____ [1]

(ii) What is the name of this force?

Force _____ [1]

(b) The car has a mass of 1500 kg and it is going at a constant speed of 20 m/s. Calculate the car's momentum.

You are advised to show your working out.

Momentum = _____ kg m/s [3]

Examiner Only	
Marks	Remark

6 Patricia wants to calculate the power she develops in running up a flight of steps.

The data sheet below gives one set of results recorded by her classmate.

Data Sheet

Patricia's weight = 700 N
Height of one step = 0.15 m
Number of steps = 20
Time to run up steps = 5 seconds

(a) Use the information in the data sheet to calculate the work done in running up the 20 steps.

You are advised to show your working out.

Work done = _____ J [3]

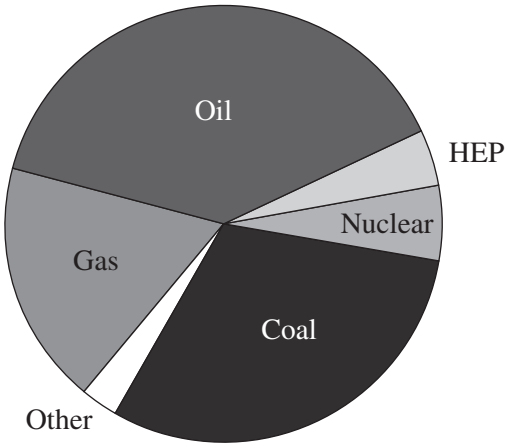
(b) Use the information in the data sheet and your answer to part **(a)** to calculate the power developed by Patricia.

You are advised to show your working out.

Power developed = _____ W [3]

Examiner Only	
Marks	Remark

7 The pie-chart gives an idea of the main sources of the energy used in the world today.



(a) Which two fuels are we most dependent on?

_____ and _____[1]

(b) **(i)** Choose an energy resource from the pie-chart which is renewable.

_____[1]

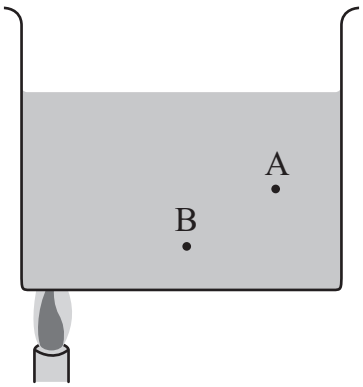
(ii) Explain why there will be an increase in the use of renewable energy sources by the year 2050.

_____

_____

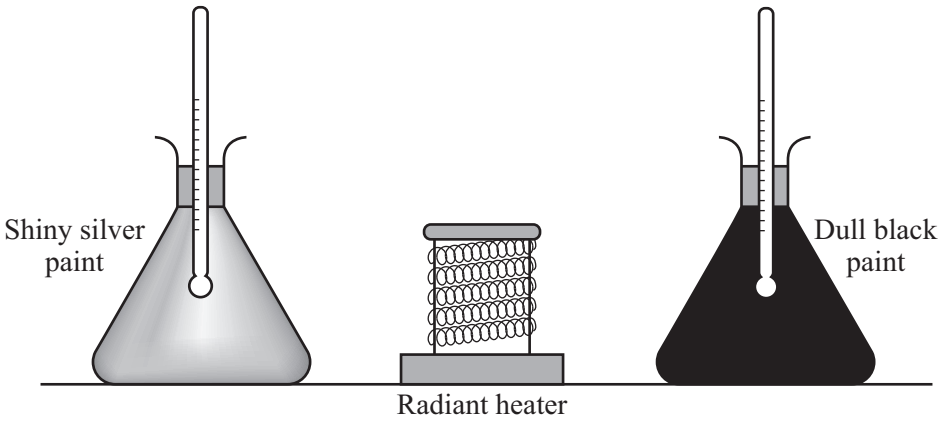
_____[1]

8 Jenny heats a beaker of water as shown.



(a) Draw an arrow at A and another arrow at B on the diagram, to show the direction of water movement. [2]

Two conical flasks contain the same amount of water at the same temperature. They are placed at equal distances from a radiant heater.



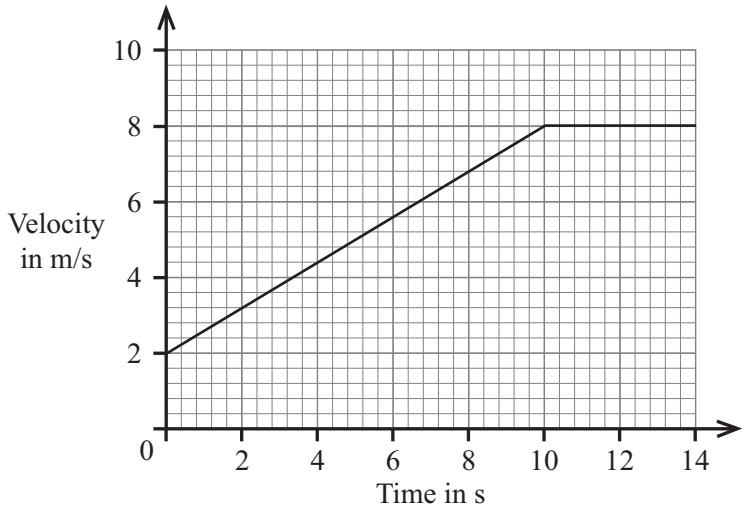
(b) Explain, fully, why the temperature of the water in the flask with the dull black paint rises more than in the flask with the shiny silver paint.

_____

_____ [2]

Examiner Only
Marks | Remark

9 The graph shows the motion of a lorry.



(a) Use the graph to calculate the acceleration of the lorry during the first 10 seconds.

You are advised to show your working out.

Acceleration = _____ m/s^2 [3]

(b) Describe the motion of the lorry from time $t = 10$ s to time $t = 14$ s.

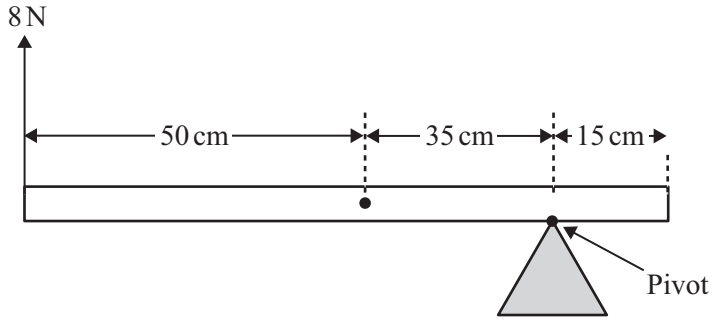
_____

_____ [1]

Examiner Only

Marks	Remark

10 A uniform rod 1 metre long is pivoted at 15 cm from one end. It is held in equilibrium, by an upward force of 8 N.



(a) Draw an arrow on the rod, labelled W, to show where the weight of the rod acts. [1]

(b) Use the principle of moments to calculate the weight W of the rod.

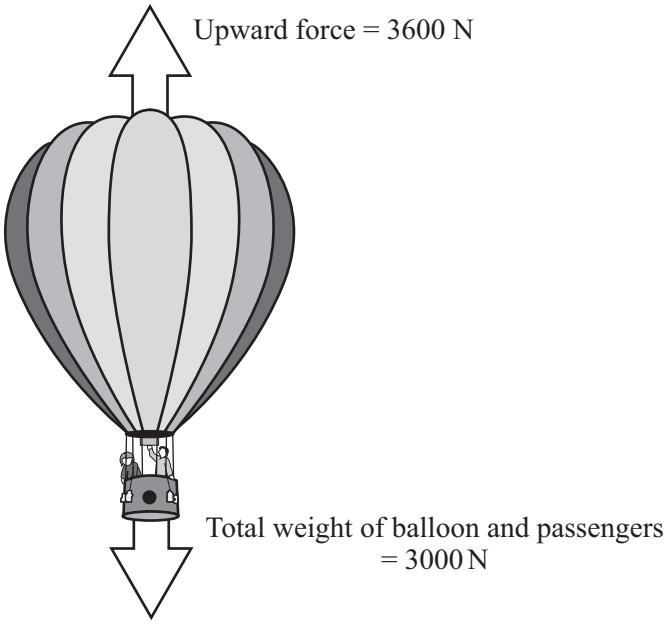
You are advised to show your working out.

Weight = _____ N [3]

Examiner Only

Marks	Remark

11 A hot air balloon is accelerating upwards as shown in the diagram below.



Calculate the acceleration of the hot air balloon.

You are advised to show your working out.

Acceleration = _____ m/s^2 [4]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

12 (a) A car of mass 550 kg is travelling at 20 m/s.
Calculate its kinetic energy.

You are advised to show your working out.

Kinetic energy = _____ J [3]

(b) Another car has a kinetic energy of 88 000 J. The driver of this car brings it to rest in 22 m. All of the kinetic energy of the car is converted into work by the car's brakes.
Calculate the average force applied by the car's brakes.

You are advised to show your working out.

Average braking force = _____ N [3]

THIS IS THE END OF THE QUESTION PAPER