Name of the Student:_____
Max. Marks : 14 Marks **Time : 14 Minutes**

Q1.

Answer the questions with a cross in the boxes you think are correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Two cyclists ride on a hilly road and go through points P, Q, R and S.

The diagram in Figure 7 shows how the vertical height of the road changes during the journey from P to S.

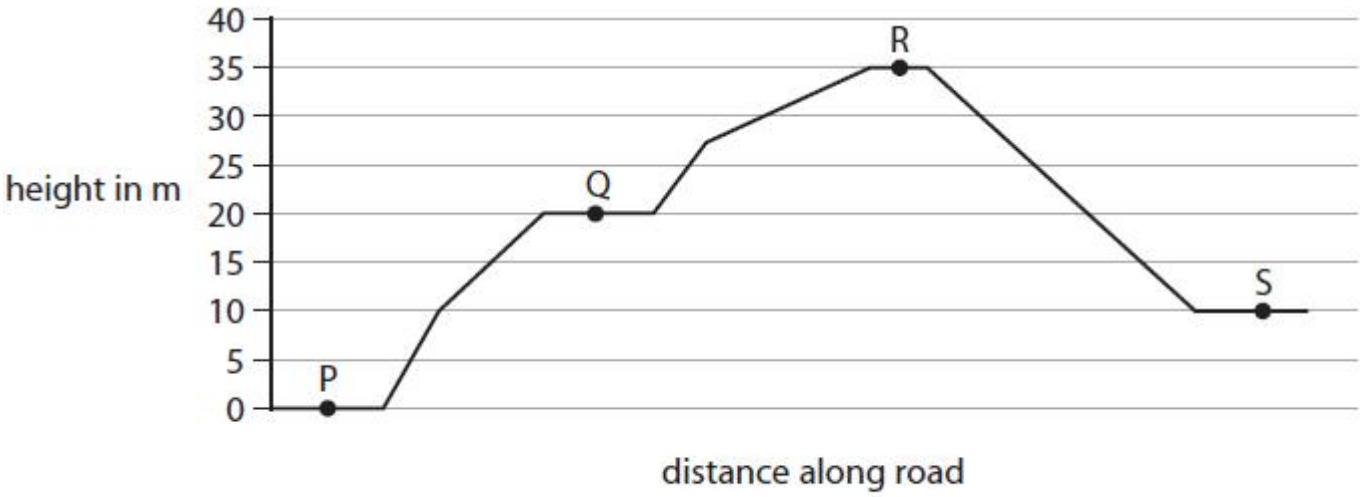

Figure 7

(i) The greatest overall change in gravitational potential energy for each cyclist is between which two points on the journey?

(1)

- ☒ **A** P and Q
- ☒ **B** Q and R
- ☒ **C** P and S
- ☒ **D** R and S

(ii) The total weight of one cyclist and bicycle is 700 N.

Calculate the total amount of work done against gravity when the cyclist travels from point P to point Q in the journey.

(2)

work done = ... J

(iii) The gravitational potential energy of the other cyclist changes by 11 250 J when travelling from point Q to point R.

Calculate the mass of this cyclist.
Gravitational field strength = 10 N / kg
Use the equation

$$\Delta GPE = m \times g \times \Delta h$$

(2)

mass = ... kg

(iv) Explain why the total amount of work done by a cyclist between points Q and R is different from the change in gravitational potential energy of the cyclist between points Q and R.

(2)

.....

.....

.....

.....

(v) The cyclists lubricated the chains and the wheel bearings of their bicycles before setting off.

Lubricating the chains and wheel bearings helps to

(1)

- ☒ **A** decrease the amount of work done against gravity
- ☒ **B** decrease the efficiency of the cyclist and bicycle
- ☒ **C** increase the efficiency of the cyclist and bicycle
- ☒ **D** increase the overall amount of energy transferred by the cyclist

(Total for question = 8 marks)

Q2.

Explain how unwanted energy transfers may be reduced in mechanical systems.

(2)

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.....

.....

.....

(Total for question = 2 marks)

Q3.

Figure 3 shows a book resting on a table with some forces involved.

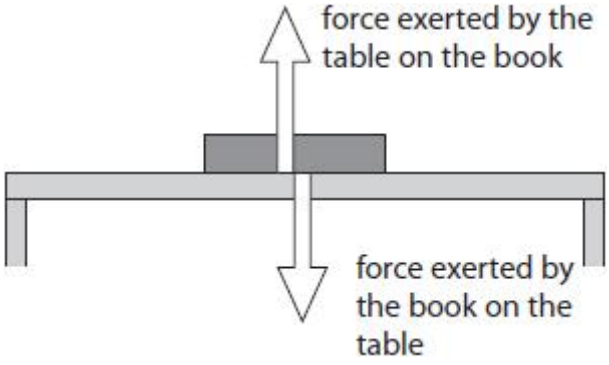

Figure 3

State why this diagram is **NOT** a free body force diagram.

(1)

.....

.....

(Total for question = 1 mark)

Q4.

In which of the following situations is a non-zero resultant force acting?

(1)

- ☒ **A** a book rests on a table
- ☒ **B** a car travels along a road at a constant speed
- ☒ **C** a javelin moves through the air after leaving an athlete's hand
- ☒ **D** a steel ball bearing descends through some car oil at a constant velocity

(Total for question = 1 mark)

Q5.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

The magnitude and direction of a force can be represented by a vector.
Figure 13 shows the forces acting on four identical trolleys. The arrows show the magnitude and direction of the forces.

Which diagram shows a pair of forces that will produce zero acceleration?

(1)

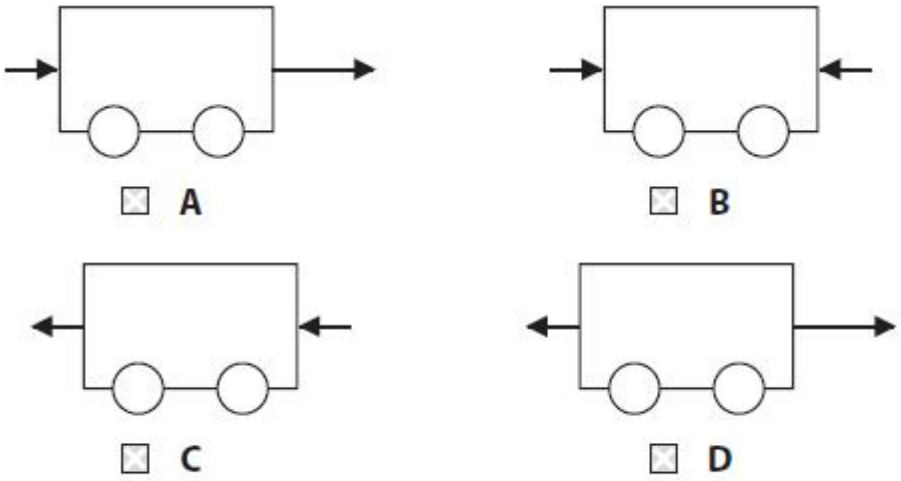

Figure 13

(Total for question = 1 mark)

Q6.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Figure 8 shows a different spring hanging from a hook fixed to the ceiling.

A block hangs from the other end of the spring.

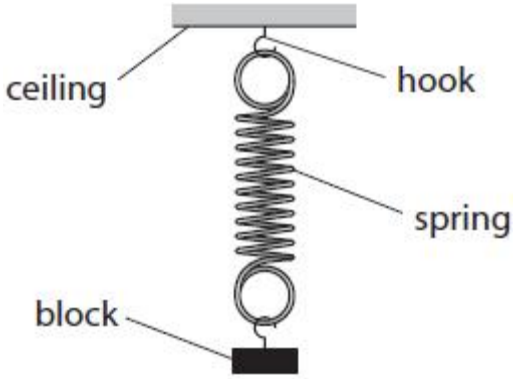

Figure 8

The weight of the spring is 1 N.
The weight of the block is 5 N.

The force exerted on the top of the spring by the hook is

(1)

- ☒ **A** 4 N down
- ☒ **B** 4 N up
- ☒ **C** 6 N down
- ☒ **D** 6 N up

(Total for question = 1 mark)