

1.3 Vectors & Scalars

Question Paper

Course	DPIB Physics
Section	1. Measurement & Uncertainties
Topic	1.3 Vectors & Scalars
Difficulty	Medium

Time allowed: 70
Score: /54
Percentage: /100

Question 1a

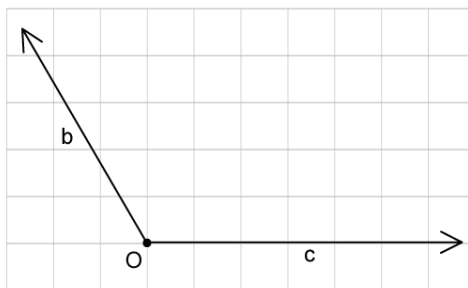
(a)
Complete the table by stating whether the quantity is a vector or a scalar and by giving the full name of its unit.

Quantity	Vector or Scalar	Unit
Momentum		
Weight		
Kinetic Energy		
Power		

[4 marks]

Question 1b

The diagram shows two forces **b** and **c** acting on an object at **O**.

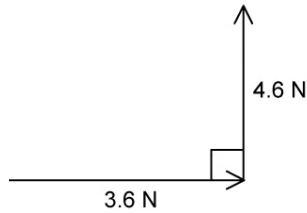


(b)
Draw a force triangle diagram to show the resultant force and state the value of this resultant force in terms of **b** and **c**

[3 marks]

Question 1c

The diagram shows two different forces with magnitudes 4.6 N and 3.6 N perpendicular to each other acting on an object.



(c)
Calculate the magnitude of this resultant force.

[2 marks]

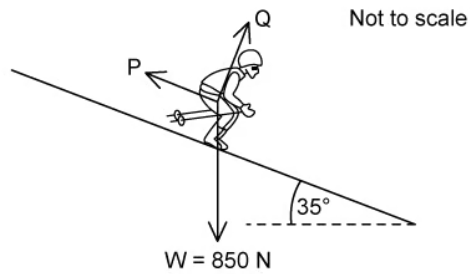
Question 1d

(d)
Calculate the angle to the horizontal at which the resultant force acts.

[2 marks]

Question 2a

The diagram shows a skier travelling at constant speed down a slope of 35°



The force labelled **P** is parallel to the slope. The force labelled **Q** is perpendicular to the slope. Assume that there is no friction between the skis and the snow.

(a)

Draw the force triangle and identify the forces labelled **P** and **Q**.

[4 marks]

Question 2b

(b)

Calculate the magnitude of force **Q**.

[2 marks]

Question 2c

(c)

Calculate the magnitude of the force **P**.

[2 marks]

Question 2d

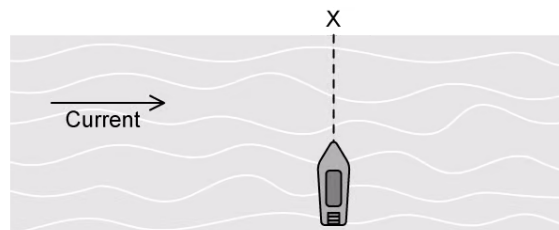
(d)

Draw a new force diagram and calculate the new resultant force down the slope on the skier.

[2 marks]

Question 3a

A man wants to cross a river in a motorboat. The speed of the motorboat in still water is

 7.0 ms^{-1} . The river is 32 m wide. There is a current in the river whose speed with respect to the shore is 5.0 ms^{-1} .

(a)

Draw a vector triangle to show the velocities of the motorboat in still water, the current and the resultant velocity of the motorboat.

[2 marks]

Question 3b

(b)

Calculate the resultant speed of the motorboat.

[2 marks]

Question 3c

The man aims his boat at point X.

(c)

Determine the distance from X further down the river at which he reaches the shore.

[2 marks]

Question 3d

A woman in an identical boat leaves from the same spot as the man but wants to land at point X.

(d)

Determine the direction in which she must turn her boat to do this.

[4 marks]

Question 4a

A cyclist cycles 15.0 km due east, followed by 23.0 km due north and then another 7.0 km east.

(a)

Draw a vector diagram to represent the cyclist's journey.

[3 marks]

Question 4b

(b)

Calculate the resultant displacement travelled by the cyclist:

[3 marks]

Question 4c

(c)

Calculate the angle from where the cyclist started to due north of the cyclist final destination.

[3 marks]

Question 4d

The cyclist wants to return home.

(d)

What angle clockwise from north must he take to go home directly?

[3 marks]**Question 5a**

(a)

State whether impulse is a scalar or vector quantity and explain why.

[3 marks]**Question 5b**

Electric charge can either be stated positive or negative.

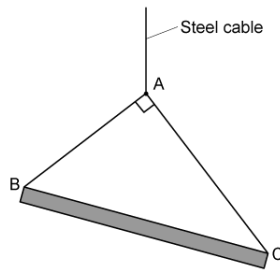
(b)

State whether electric charge is a scalar or vector quantity and explain why.

[3 marks]

Question 5c

The diagram shows a uniform beam supported by two light cables, **AB** and **AC**, which are attached to a single steel cable from a crane. The beam is stationary and in equilibrium.



(c)

Draw the vector triangle for this situation labelling the tension in both cables and the weight of the beam.

[3 marks]

Question 5d

The tension in the cable **AB** is 9 N and the tension in the cable **AC** is 12 N.

(d)

Calculate the resultant force required in the beam **BC** to keep the system in equilibrium.

[2 marks]