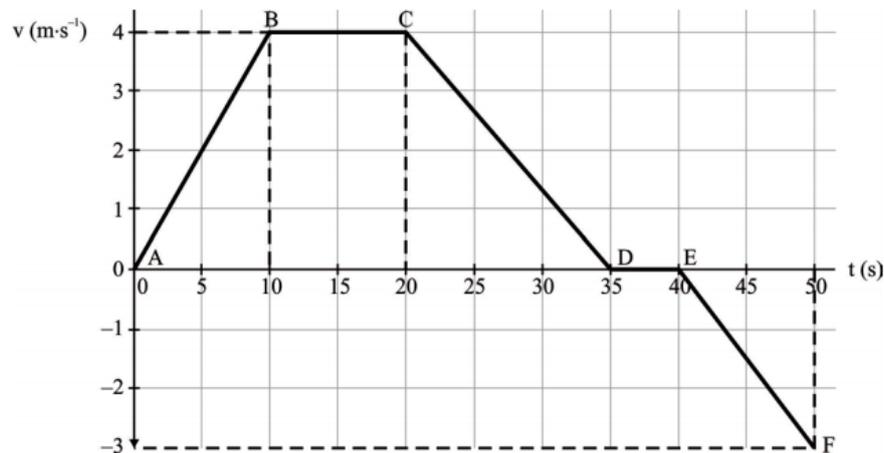


Kinematics Questions 2020

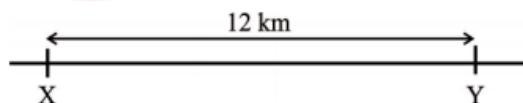
Question 1 (taken from IEB P1 Physics Final 2015 – Question 2)

1.1 A model car starts from rest and initially travels east. A velocity vs time graph of the motion is shown below.



- 1.1.1 Use the graph of motion to determine the acceleration of the car between 20s and 35s of the motion. (4)
- 1.1.2 During which time interval/s is the speed of the car increasing? (2)
- 1.1.3 Define displacement. (2)
- 1.1.4 Use the graph of motion to determine the displacement of the car after 50s. (4)
- 1.1.5 Calculating the distance travelled by this car from the graph would give you a value greater than the calculated displacement. Is the distance travelled for any object always greater than its displacement? Explain your answer. (2)
- 1.1.6 **Sketch a position vs time graph** for the car from 0s to 50s on the axes provided in the Answer Booklet. Values are not required but you must use the labels A – F. (5)

1.2 Motorists on the N3 highway in KwaZulu-Natal are often fined because their average speed exceeds the speed limit. A camera at position X takes a photo of a Toyota and records the time. At position Y, a distance of 12 km further along the road, a second camera takes a photo and again records the time.



- 1.2.1 The Toyota takes 7,6 minutes to travel the 12 km between X and Y. **Calculate the average speed** of the car in $\text{m}\cdot\text{s}^{-1}$. (4)

The speed limit in the area is 100 km/h.

- 1.2.2 Convert 100 km/h to $\text{m}\cdot\text{s}^{-1}$. (2)
- 1.2.3 Should the driver of the Toyota car be fined for exceeding the speed limit? (1)

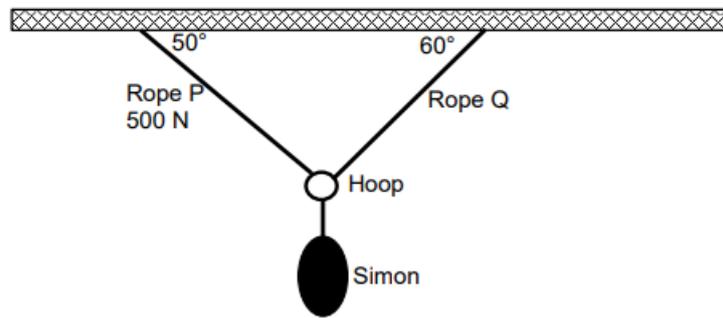
A BMW car travelling on the same road is stuck behind a slow truck for 6 km and only manages a speed of 60 km/h. The driver passes the truck and knowing that the average speed is 100 km/h, he travels at 140 km/h for the next 6 km.

- 1.2.4 **Calculate the average speed** of the BMW. For this question use km, hours and km/h. (5)

[31]

Question 2 (taken from IEB P1 Physics Supplementary 2016 – Question 2)

2.1 Simon is hanging at rest from a hoop, which is attached to the ceiling by two ropes. The ropes make angles to the horizontal ceiling of 50° and 60° as shown in the diagram. The tension in the rope P is 500 N.



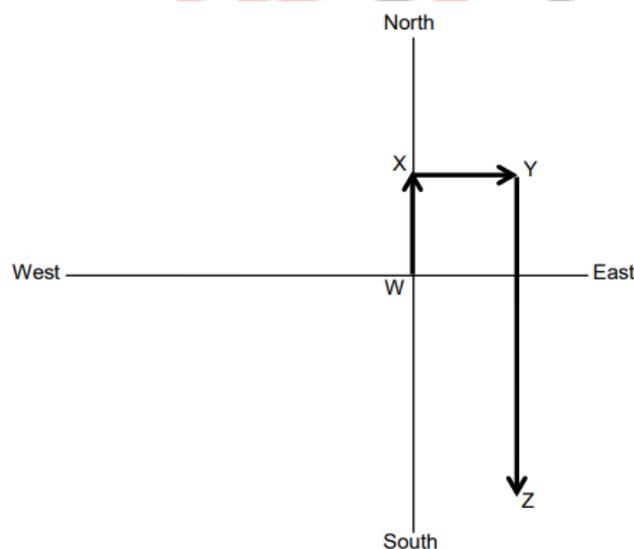
2.1.1 Define a vector. (2)

2.1.2 Determine the magnitude of the horizontal component of the tension in rope P. (2)

2.1.3 Calculate the magnitude of the tension in the rope Q. (3)

2.1.4 Determine Simon's mass. (5)

2.2 A sportsman is busy training and is sprinting a marked-out pattern on a field. The diagram below shows the path taken by the sportsman. He started the stopwatch at point W. The positions of all the points and the reading on the stopwatch are given in the table after the diagram.



	Stopwatch reading (s)	Position from W
W	0	0
X	5	40 m North
Y	10	40 m East, 40 m North
Z	25	40 m East, 80 m South

2.2.1 Define distance. (2)

2.2.2 Determine the sportsman's distance for the 25s illustrated. (2)

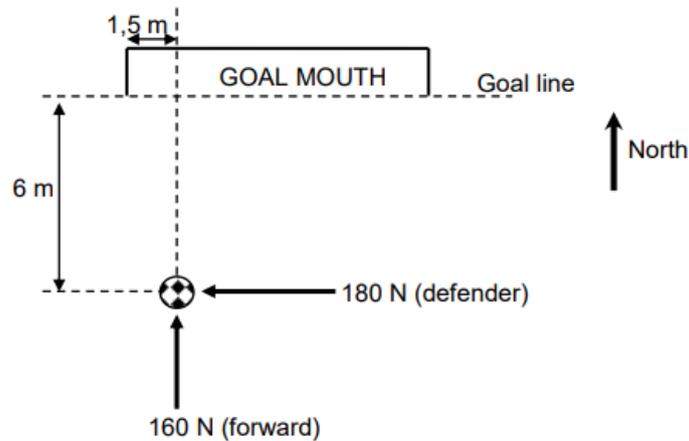
2.2.3 Determine the sportsman's displacement for the 25s illustrated. (5)

2.2.4 Determine the average speed for the sportsman for the 25 s illustrated. (3)

[24]

Question 3 (taken from IEB P1 Physics Supplementary 2018 – Question 3.1)

3.1 Two players kick a stationary soccer ball at the same time. The defender kicks with a force of 180 N due West while a forward kicks the ball with a force of 160 N due North as shown in the diagram. Assume that the time of contact between the ball and the players are the same.



3.1.1 Calculate the resultant force acting on the soccer ball while being kicked. (Ignore the weight of the ball.) (4)

The ball is at the position shown in the diagram. The ball leaves the players at a speed of $18 \text{ m}\cdot\text{s}^{-1}$. The ball experiences frictional forces from the grass and the air and accelerates at $2,5 \text{ m}\cdot\text{s}^{-2}$.

3.1.2 Calculate the distance travelled by the ball before it stops. (3)

In order to score a goal, the ball must go into the goal mouth and cross the goal line.

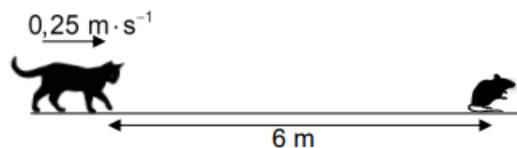
3.1.3 Will a goal be scored? Use a calculation to motivate your answer. (5)

[12]

Question 4 (taken from IEB P1 Physics Final 2016 – Question 3)

4.1 A child is holding a red ball and a blue ball over the edge of a roof. The child throws the red ball vertically up in the air and, at the same moment drops the blue ball over the edge. On the same set of axes, sketch the velocity vs time graph for both balls. Label the two lines red and blue. Choose up as the positive direction for your graph. (3)

4.2 A cat is 6m from a mouse and walking slowly.



The cat hunts the mouse for 10s in two stages. For the first 8s the cat stalks the mouse slowly at a constant $0,25 \text{ m}\cdot\text{s}^{-1}$ and for the last 2s runs at a constant faster speed and catches the mouse. The mouse did not see the cat coming and sat still.

4.2.1 Calculate how far the cat is from the mouse after 8s. (3)

4.2.2 Draw a position vs time graph for the cat for 0 – 10s. Relevant values of position and time must be shown on the axes. Consider the mouse's position as position zero. (3)

4.2.3 Calculate how fast the cat ran for the last 2s of the hunt. (2)

[11]