



ALEXANDER ROAD HIGH SCHOOL

FEBRUARY 2019

60 MIN

PHYSICAL SCIENCE CONTROL TEST

JA

TOTAL = 40

GRADE 11

Instructions

- The question paper consists of 3 questions.
- Answer all the questions.
- Answer section A on the answer sheet provided AND section B on folio sheets.
- A non-programmable calculator may be used.
- Number the answers correctly according to the numbering system.
- Round off to two (2) decimal places where necessary.
- Formulas have been included on the reverse side of the answer sheet.

SECTION A

Answer on the answer sheet -

QUESTION 1: Multiple choice

Four possible options are provided as answers to the following questions. Each question has only 1 correct answer. Choose the correct answer and write the letter (A – D) next to the relevant question number (1.1 – 1.10) on the answer sheet.

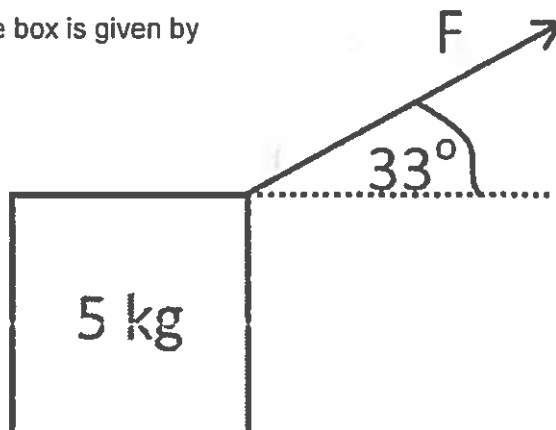
1.1 Which ONE of the following pairs of quantities are BOTH vectors?

- A. Weight and mass.
- B. Force and acceleration.
- C. Distance and velocity.
- D. Acceleration and time.

1.2 A force F acts on a 5 kg box at an angle of 33° to the horizontal as shown in the diagram below.

If the box is at rest, the static friction acting on the box is given by

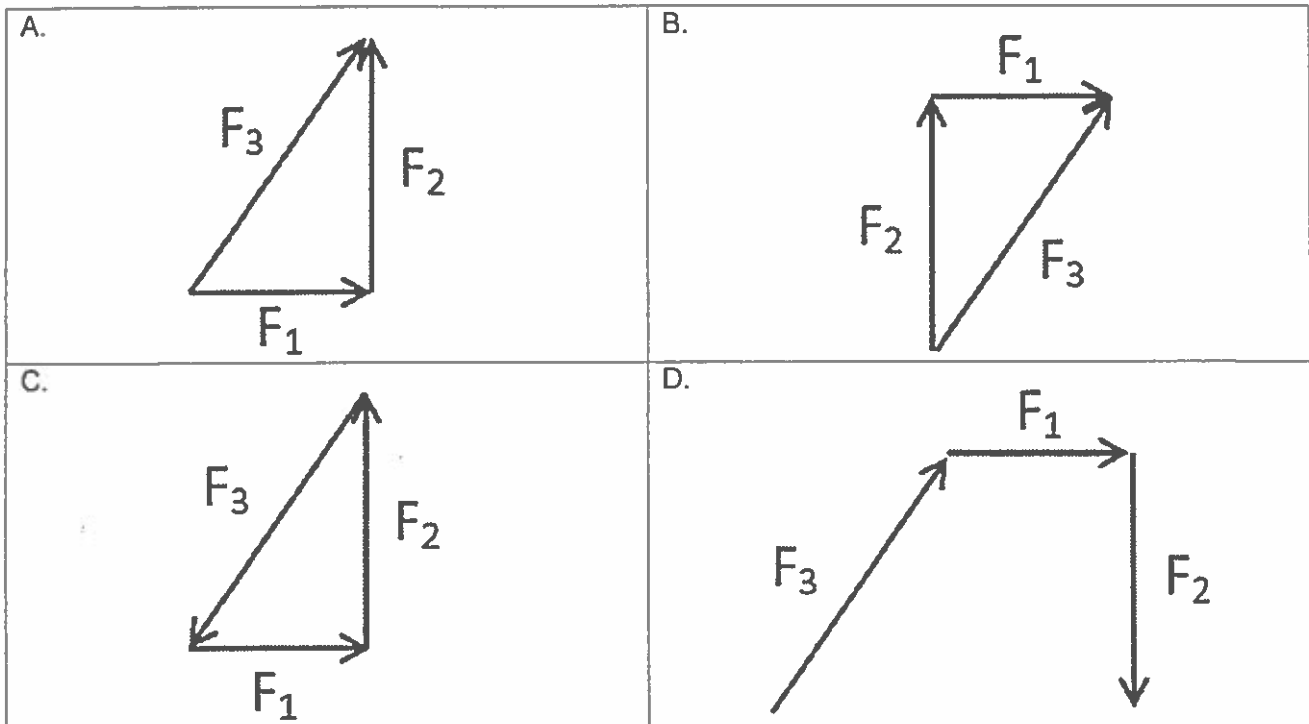
- A. $f_s = F \cdot \sin(33^\circ)$
- B. $f_s = mg \cdot \sin(33^\circ)$
- C. $f_s = F \cdot \cos(33^\circ)$
- D. $f_s = mg \cdot \cos(33^\circ)$



1.3 Two forces with magnitudes 7 N and 24 N respectively act on an object simultaneously. Which ONE of the following CANNOT be the resultant of the two forces?

- A. 16 N
- B. 17 N
- C. 18 N
- D. 31 N

1.4 Three forces, F_1 , F_2 and F_3 , are in equilibrium. Which ONE of the following vector diagrams is CORRECT?



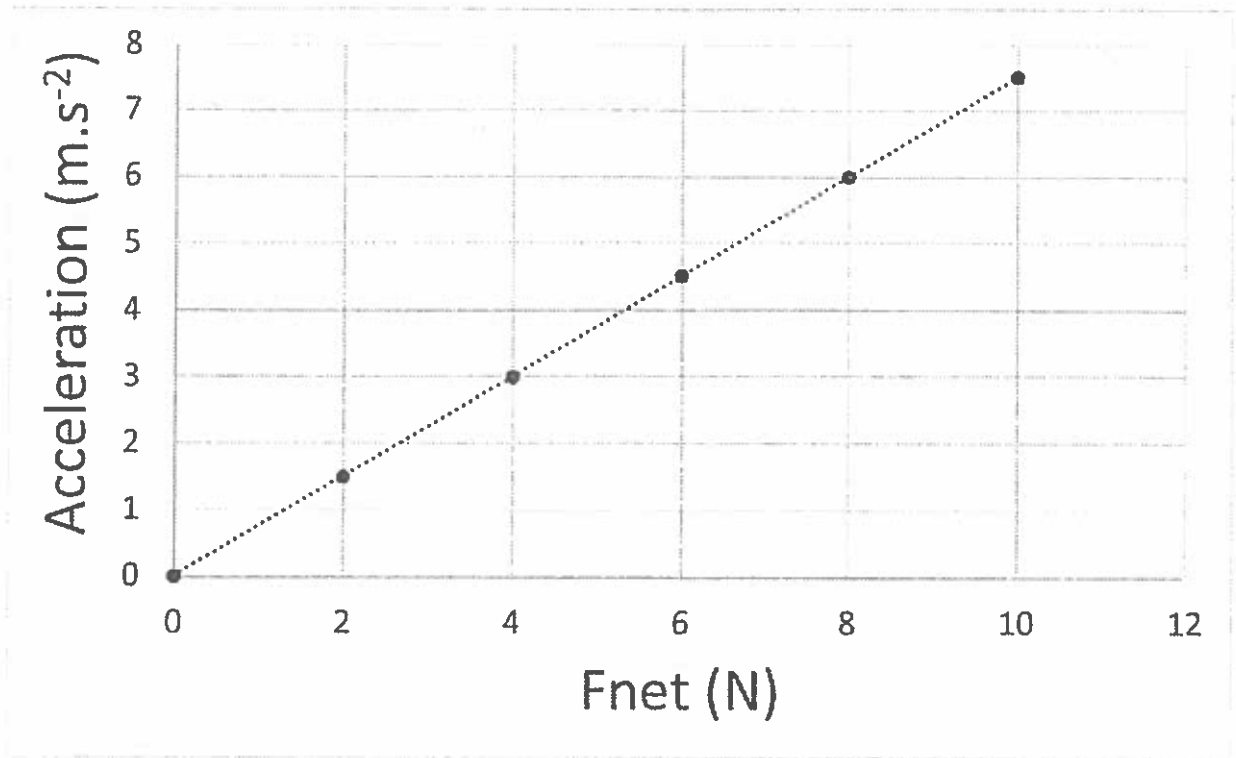
1.5 Newton's first law states:

- A. An object will remain at rest unless a non-zero resultant force acts on it.
- B. An object will remain at rest or in motion at a constant velocity unless a non-zero net force acts on it.
- C. An object will remain at rest or in motion at a constant velocity in the absence of friction.
- D. An object will remain at rest or in motion at a constant acceleration unless a non-zero net force acts on it.

1.6 A truck moving at constant velocity suddenly brakes to avoid hitting a child playing in the road. As the truck brakes, a crate in the back of the truck slides forward. The reason this happens is because...

- A. ...there is a net force acting on the crate in the forward direction.
- B. ...the force of inertia pushes the crate forwards.
- C. ...the crate is resting on a frictionless surface.
- D. ...the crate's inertia causes it to resist a change in its motion.

1.7 The following acceleration vs. net force graph was obtained for an object in a particular experiment.



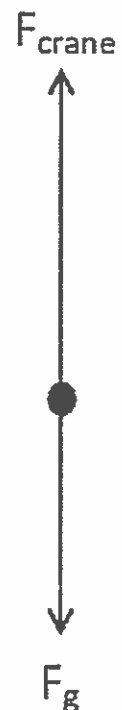
The mass of the object is:

- A. 0,25 kg
- B. 0,75 kg
- C. 1 kg
- D. 1,33 kg

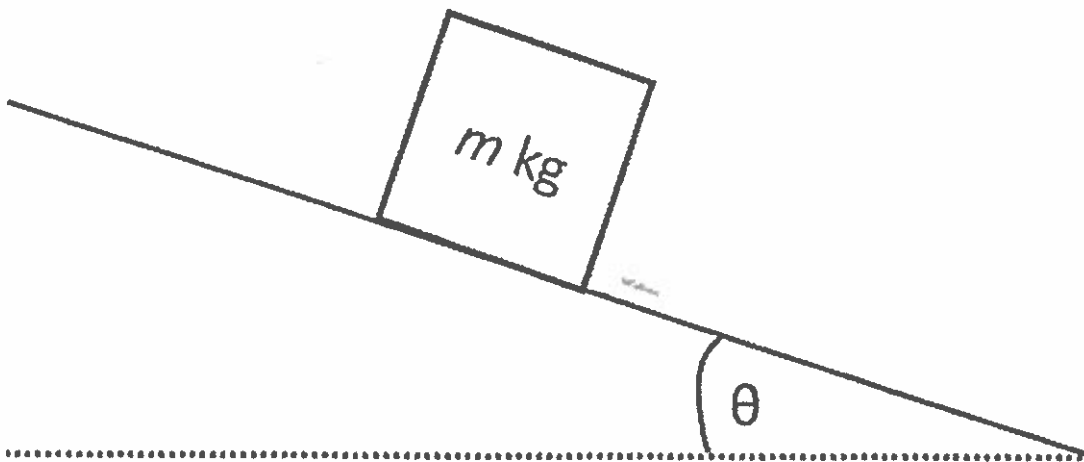
1.8 Consider the free-body diagram below which shows the forces acting on a car being lifted vertically upwards by a crane.

Which ONE of the following statements is CORRECT?

- A. There is a resultant force acting on the car in the downward direction.
- B. The crane is lifting the car at a constant speed.
- C. The car is accelerating upwards.
- D. The car is in free fall.



1.9 A box with mass m is at rest on a slope as shown in the diagram below.



If the force of friction acting on the box is 4,9 times the mass of the box (i.e. $f_s = 4,9m$), the angle of inclination (θ) of the slope is

- A. 30°
 - B. 45°
 - C. 49°
 - D. 60°
- 1.10 Two twin brothers, Tom and Jerry, go sandboarding on a sunny Saturday afternoon. Tom's sandboard is twice as large as Jerry's but both sandboards, as well as the brothers, have the same mass. Which ONE of the following statements is CORRECT?
- A. Sand is a frictionless surface.
 - B. Tom will experience more friction than Jerry.
 - C. Jerry will experience more friction than Tom.
 - D. Both brothers will experience the same amount of friction.

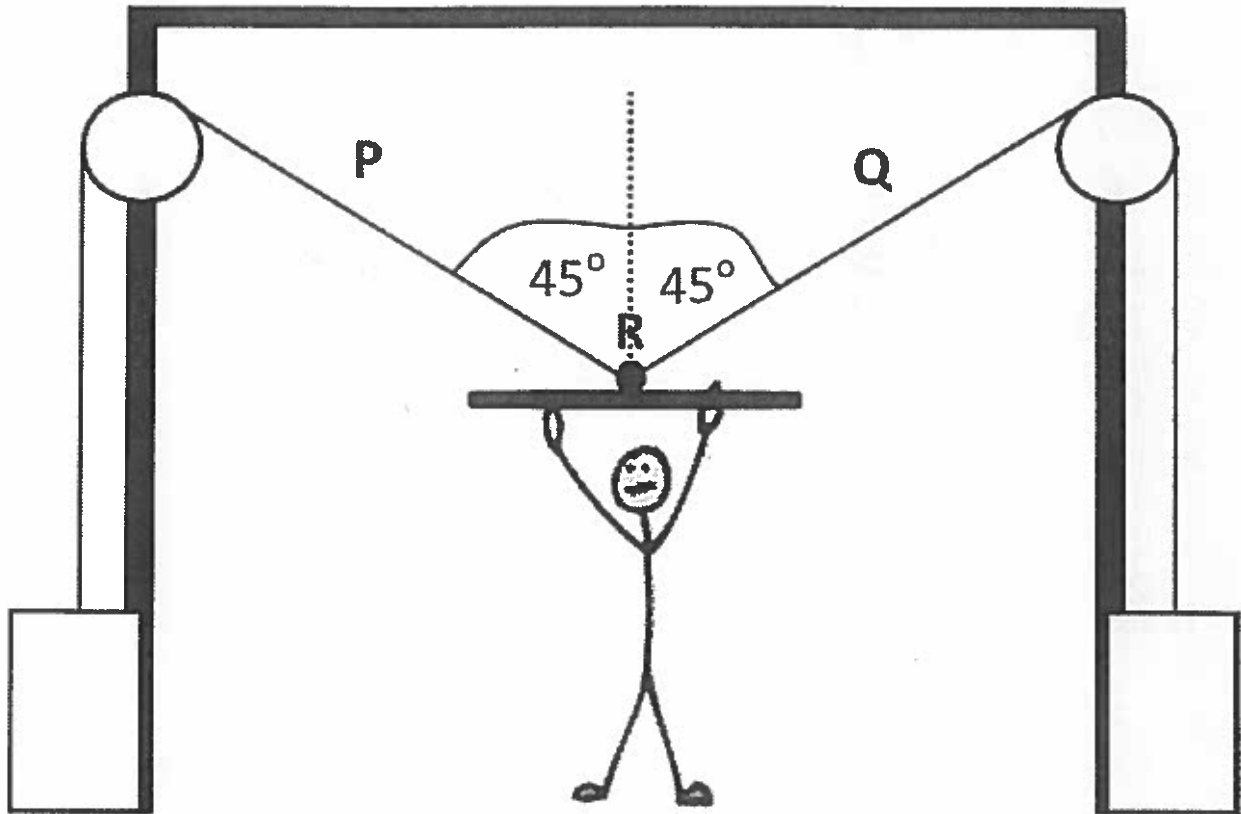
[20]

SECTION B

Answer on the folio paper –

QUESTION 2:

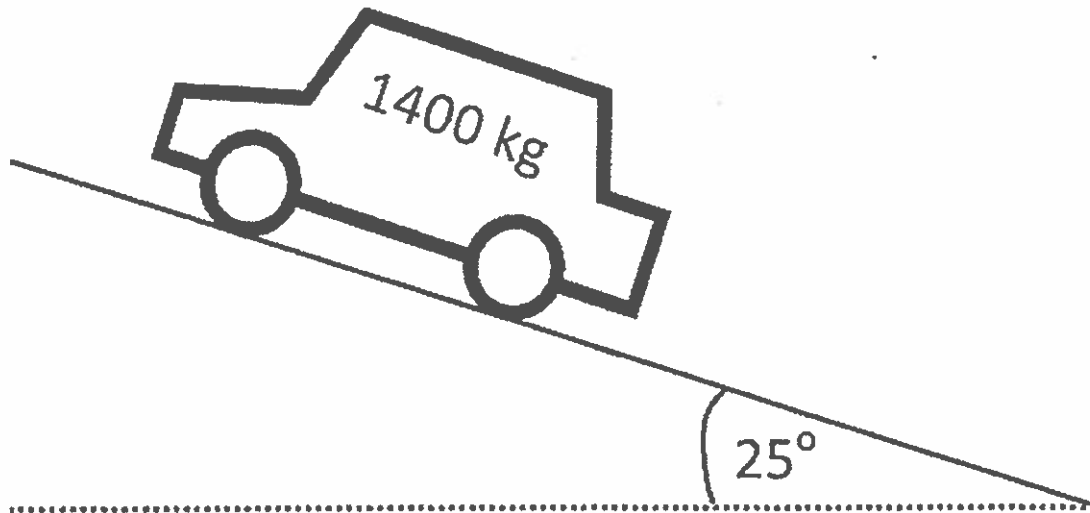
Dwayne goes to the gym and sets up the cable machine as shown in the diagram below. Assume the pulleys are frictionless. Both rope P and Q meet at point R at an angle of 45° to the vertical. The tension in rope P is 539 N and the tension in rope Q is 588 N.



- 2.1 Calculate the resultant between the tension in rope P and rope Q. (3)
- 2.2 Assume Dwayne pulls vertically downwards. What is the magnitude of the Dwayne's pulling force if the system moves with a constant velocity? (1)
- 2.3 What term is used to describe a force, such as Dwayne's pulling force, which causes a system to move with a constant velocity. (1)
- [5]

QUESTION 3:

A car of mass 1400 kg (including the driver's mass) accelerates at $2 \text{ m} \cdot \text{s}^{-2}$ up a hill inclined at 25° to the horizontal as shown in the diagram below.



- 3.1 State *Newton's second law of motion* in words. (2)
- 3.2 Draw a free-body diagram showing ALL forces acting on the car. (4)
- 3.3 Calculate the resultant force acting on the car. (3)
- 3.4 If the car's motor exerts a force of 18 550 N up the incline, determine the coefficient of kinetic friction between the car's tyres and the asphalt road surface. (6)

[15]