Education and Sport Development

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Departement van Onderwys en Sport Ontwikkeling
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NORTH WEST PROVINCE

NATIONAL SENIOR CERTIFICATE

GRADE 11

TECHNICAL SCIENCES

2018 JUNE EXAMINATION

MARKS: 150

TIME: 3 HOURS

This question paper consists of 15 pages including 1 graph sheet and 2 data sheets

NW/JUNE/TEC-SCNE/ EMIS/6*******

INSTRUCTIONS AND INFORMATION

1. This question paper consists of 9 questions. Answer ALL questions in the ANSWER BOOK.
2. Start each section on a NEW PAGE in the ANSWER BOOK.
3. Number your answers correctly according to the numbering system used in this question paper.
4. Leave a line between each sub-questions. E.g. between QUESTION 2.1 and QUESTION 2.2.
5. You may use a Non-Programmable calculator.
6. You may use appropriate mathematical instruments.
7. You are advised to use the attached DATA SHEET.
8. Show ALL formulae and substitutions in ALL calculations.
9. Answers should be rounded to two decimal places at the end, unless stated otherwise.
10. Write neatly and legibly

QUESTION 1

Various options are being provided as possible answers to the following questions. Each question has one correct answer. Write only the letter next (A-D) next to the question number (1.1 – 1.8) next to the question number. (e.g. 1.6 – A)

1.1. The SI unit for force is:

A. Kilogram

B. Pound

C. Force

D. Newton (2)

1.2. When two or more forces act on an object and are perpendicular to each other, which technique can be used to find its resultant force?

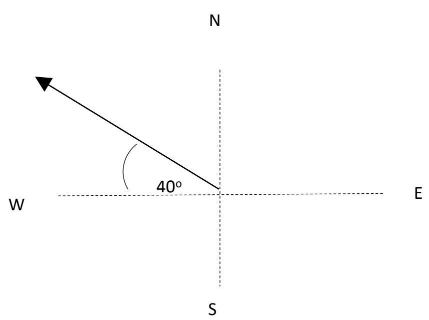
A. Hypotenuse theorem

B. Adjacent theorem

C. Pythagoras theorem

D. Opposite theorem (2)

1.3. Using the bearing method, direction of the vector in the diagram below is…



A. north west

B. 40^{o} north of east

C. bearing of 60^{o}

D. bearing of 310^{o} (2)

1.4. Static frictional force acts when an object is…

A. moving

B. stationary

C. falling

D. sliding (2)

1.5. Which of the following will be attracted by a magnet?

A. Carbon Rod

B. Iron fillings

C. Rubber pieces

D. Diamond pieces (2)

1.6. Which one of the following statement is TRUE about the magnetic field lines of a magnet? Magnetic field lines must…

A. always point from south to north

B. always touch or cross one another at the poles

C. must always be unevenly spaced

D. always point from north to south (2)

1.7. Longitudinal waves are …

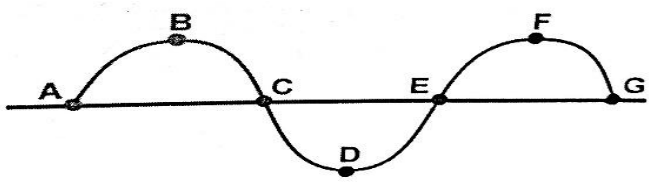
A. waves in which the particles of the medium vibrate at right angles to the direction of propagation of the wave.

B. waves in which the particle moves in a direction parallel to the direction of advance of the wave

C. electromagnetic waves

D. waves which can travel in a vacuum (2)

1.8. Indicate any two points that represents a full wavelength.



A. [A&D]
B. [A&E]
C. [D&G]
D. [C&E] (2)

[16]

QUESTION 2

Match Column A to the correct answer in Column B. Write only the letter next to the relevant number. E.g. 2.1 - B

COLUMN A		COLUMN B		
2.1	A single vector that has the same effect as all other vectors acting on an object.	A	Direct proportion	(2)
2.2	Vectors that have the same line of action.	B	Solar winds	(2)
2.3	A region in space in which a magnet or a ferromagnetic material will experience a force.	C	Constructive interference	(2)
2.4	A relationship where if one quantity increases the other one increases or visa versa.	D	Transverse waves	(2)
2.5	Streams of ionized particles that blow outwards from the sun towards the earth at a speed of $400 m.s^{-1}$.	E	Resultant Vector	(2)
2.6	A physical quantity that has both magnitude and direction.	F	Magnetic field	(2)
2.7	The particles vibrates at right angle to the direction of motion of the waves.	G	Vector	(2)
2.8	Superposition of two waves that are in phase.	H	Co-Linear Vectors	(2)

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QUESTION 3

Use the information on the table to answer the questions that follow.

Speed (km/h)	Travel time (h)
60	10
100	6
150	4
200	3
300	2

3.1. Draw a graph of speed versus time. Use the graph sheet provided (6)

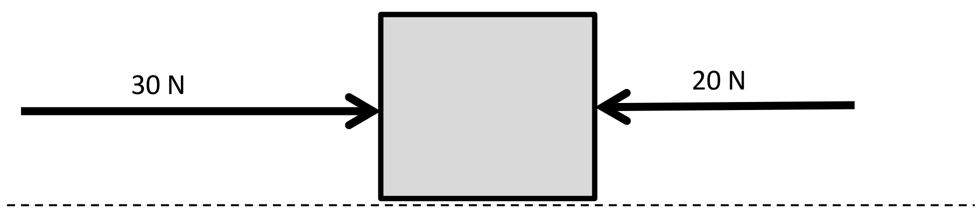
3.2. Give the relationship between speed and time.
Briefly discuss and support your answer by referring to the graph. (3)

[9]

QUESTION 4

4.1. Define the term *resultant.* (2)

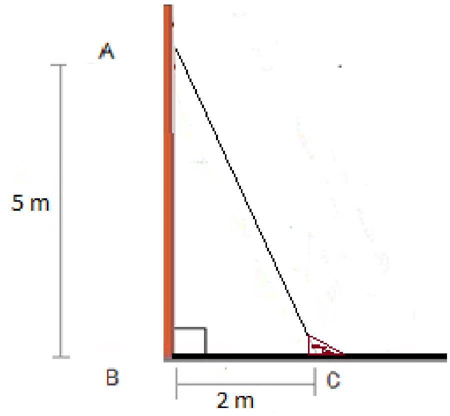
4.2. Consider the following forces acting on an object.



4.2.1. Draw a free-body diagram indicating only the horizontal forces acting on the object. (4)

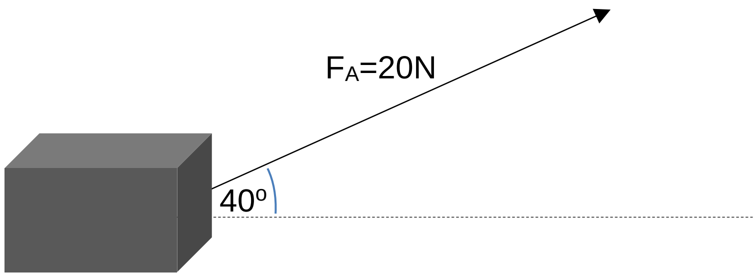
4.2.2. Determine the resultant of the forces acting on the object. (3)

4.3. The following diagram shows an electricity pole and a cable used to strengthen it. The cable is fastened at a height AB marked 5 meters from the bottom. The cable is fastened at a distance BC marked 2 meters to the right from the base of the pole as shown in the diagram below.



4.3.1. Calculate the length of the cable. (3)

4.4. A force F_A is applied to an object as illustrated below.



Determine the:

4.4.1. *x* component (3)

4.4.2. *y* component (3)

4.4.3. Draw a labelled vector diagram using the components calculated above and the applied force. (3)

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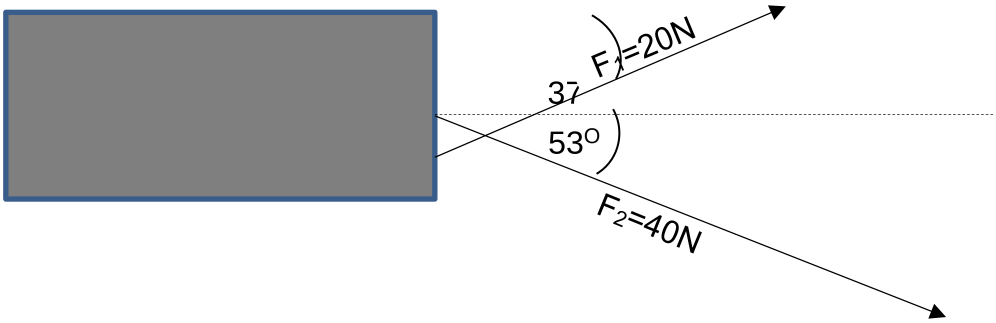
QUESTION 5

Two forces, F_1 (20N) and F_2 (40N) are exerted simultaneously to a block as indicated below.



5.1. Determine the resultant of the forces. (8)

5.2. Using the bearing method, determine the direction of the resultant. (5)

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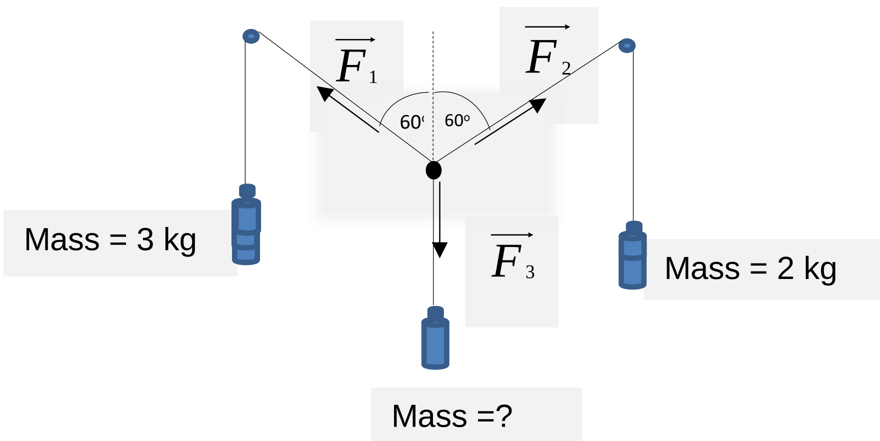
QUESTION 6

Below is a setup of an experiment conducted by a group of grade 11 learners in order to determine the mass of an unknown object. They used a set of frictionless pulleys and inextensible ropes.



6.1. Determine the magnitude of :

6.1.1. F_1. (3)

6.1.2. F_2. (2)

6.2. Determine, by ACCURATE CONSTRUCTION AND MEASUREMENT, the magnitude of the unknown mass.

Use scale 1cm: 3N (6)

[11]

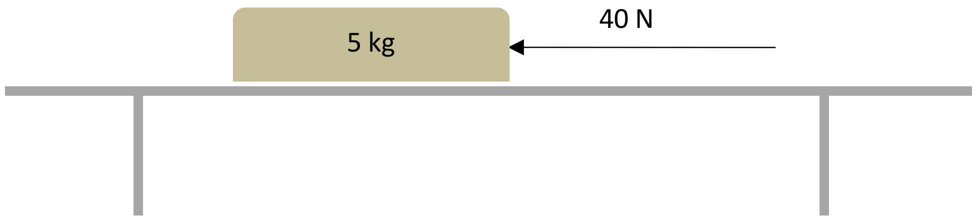
QUESTION 7

7.1. Define the following terms:

7.1.1. *Static* friction (2)

7.1.2. *Normal* Force (2)

7.2. A box of 5 kg is resting on a rough table. A learner applies a force of 40 N horizontally to the left as shown on the diagram below. The coefficient of static friction (μ_s) is 0,21



7.2.1. Draw a free-body diagram indicating all the forces acting on the block as it rests on the table. (4)

7.2.2. Calculate the normal force exerted by the table on the box. (3)

7.2.3. Calculate the static frictional force acting between the box and the table. (3)

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QUESTION 8

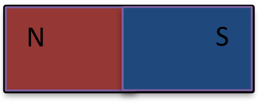
8.1. Define the term *magnet.* (2)

8.2. Magnets have magnetic fields around them, describe a simple procedure that can be used show the magnetic field around a bar magnet. (3)

8.3. Name three ways in which magnets can lose their magnetism (3)

8.4. Give three characteristics of magnetic field lines (3)

8.5. Below is an example of a simple bar magnet, re-draw the magnet on your answer book and draw magnetic field lines around it.



Re-draw the sketch and draw the magnetic field lines around it. (3)

8.6. What is the name of the magnetic field around the earth? Discuss the main function of this field. (3)

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QUESTION 9

9.1. Define the following:

9.1.1. *Wavelength* (2)

9.1.2. *Crest* (2)

9.1.3. *Amplitude* (2)

9.1.4. *Period* (2)

9.2. Two learners demonstrate superposition. They stand holding the opposite ends of a rope. They each generate a pulse on the opposite sides of the same rope and the pulses meet at a certain point. Each learner generate a pulse that has an amplitude of 10 cm.

9.2.1. State the principle of superposition (2)

9.2.2. Use the above principle to calculate the resulting amplitude if the pulses are:

A. In phase (2)

B. Out of phase (2)

9.3. A transverse wave with a frequency of 60 Hz propagates through a medium. The distance between the minimum and maximum points of the wave is 14 mm. The distance between 7 consecutive troughs is 60 mm.

9.3.1. Draw a diagram of the generated wave. Clearly indicate the measurements of the wave. (3)

Calculate the:

9.3.2. Amplitude (2)

9.3.3. Wavelength (3)

9.3.4. Period (3)

9.3.5. Speed of the wave (3)

9.4. A grade 11 learner with a starter pistol is standing a certain distance from a tall building. He simultaneously pull the trigger and start a stop watch. After 3.2 seconds he hears the sound of the gun again. Take the speed of sound in air as 343 $m.s^{-1}$. Ignore the effect of wind.

Calculate the distance between him and the building. (5)

[33]

[TOTAL: 150]

QUESTION 3.1 – GRAPH SHEET

NAME:____________________________________

DATA FOR TECHNICAL SCIENCES GRADE 11
GEGEWENS VIR TEGNIESE WETENSKAPPE GRAAD 11

TABLE 1: PHYSICAL CONSTANTS/TABEL1: FISIESE KONSTANTES

NAME/NAAM	SYMBOL/SIMBOOL	VALUE/WAARDE
Acceleration due to gravity Swaartekragversnelling	g	9,8 m·s^{-2}
Charge on electron Lading op electron	-e	-1,6x10^{-19}C

TABLE 2: FORMULAE/TABEL 2: FORMULES

MOTION	VECTORS	FORCE
Speed = distance/time $s = \frac{d}{t}$ **velocity= displacement/time** $\vec{V} = \frac{\Delta\vec{x}}{\Delta t}$ **Acceleration = change in velocity / time** $\vec{a} = \frac{\Delta\vec{v}}{\Delta t}$	$\vec{F}_R = \vec{F}_1 + \vec{F}_2$ $\vec{F}_R^2 = \vec{F}_1^2 + \vec{F}_2^2$ **Horizontal Component** $\vec{f}_x = \vec{F}\cos\theta$ **Vertical Component** $\vec{f}_y = \vec{F}\sin\theta$	$\vec{F}_{net} = m\vec{a}$ $\vec{F}_s = \mu_s N$ $\vec{F}_s^{max} = \mu_s N$ $\vec{F}_k = \mu_k N$

ENERGY	ELECTRICITY & ELECTROSTATICS	
$Ep = mgh$ $Ek = \frac{1}{2}mv^2$	$I = \frac{Q}{\Delta t}$ $V = \frac{W}{\Delta t}$ $V = IR$	$Q = \frac{Q1 + Q2}{2}$ $E = \frac{V}{d}$ $C = \frac{Q}{V}$
	Parallel Circuit	**Series Circuit**
	$\frac{1}{RT} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3} + \cdots$ $Rp = \frac{R1 \times R2}{R1 + R2}$ $VT = V1 = V2 = V3 = \cdots$ $IT = I1 + I2 + I3 + \cdots$	$RT = R1 + R2 + R3 + \cdots$ $VT = R1 + R2 + R3 + \cdots$ $IT = I1 = I2 = I3 = \cdots$

WAVES, SOUND AND LIGHT/*GOLWE, KLANK EN LIG*

$f = \frac{1}{T}$	$V = \frac{\lambda}{T}$
	$V = f\lambda$
$T = \frac{1}{f}$	$V = \frac{\Delta \vec{x}}{\Delta t}$