higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

PHYSICAL SCIENCE
(First Paper)
NQF LEVEL 2

(10021002)

27 November 2018 (X-Paper)
09:00–12:00

A nonprogrammable calculator may be used.

Appropriate mathematical instruments may be used.

This question paper consists of 9 pages and 1 formula sheet.

Copyright reserved

TIME: 3 HOURS
MARKS: 150

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. ALL calculations, formula and substitutions must be shown.
5. ALL final answers must be accurately approximated to TWO decimal places.
6. Write neatly and legibly.

NC(E)

SECTION A

QUESTION 1

Give ONE word or a term for each of the following descriptions. Write only the answer next to the question number (1.1–1.5) in the ANSWER BOOK.

1.1 The rate at which charge flows through an electric circuit

1.2 Requires both magnitude and direction for its specification

1.3 The maximum displacement form its equilibrium position of a medium carrying a wave

1.4 The SI unit of potential difference

1.5 Rate of change of displacement measured over an infinitesimal (very small) time interval

(5 × 1) **[5]**

QUESTION 2

Choose a word from COLUMN B that matches a description in COLUMN A. Write only the letter (A–H) next to the question number (2.1–2.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
2.1	The rate at which an object's velocity changes	A	magnet
2.2	A physical influence that causes the motion of an object to change	B	power
2.3	A metal that can attract certain metal objects	C	acceleration
2.4	A process where an atom loses or gains electrons	D	dynamo
2.5	The change in direction of light rays when they pass through media of different densities	E	displacement
		F	refraction
		G	force
		H	ionisation

(5 × 1) **[5]**

Copyright reserved

QUESTION 3

Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (3.1–3.5) in the ANSWER BOOK.

3.1 Gravitational force is the natural force of attraction that causes objects with mass to decelerate towards the earth's surface.

3.2 Actual mechanical advantage is the mechanical advantage found when a machine loses no energy.

3.3 Superposition is when one wave interacts with another one, producing a new wave.

3.4 A virtual image cannot be cast on a screen.

3.5 A permanent magnet keeps its magnetism for a long time.

(5 × 2) **[10]**

QUESTION 4

Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (4.1–4.5) in the ANSWER BOOK.

4.1 A driver is driving a 5-tonne truck from Mpumalanga to the Eastern Cape.

The mass of the truck is …

A 5×10^{-3} kg
B 5 kg
C 5×10^{3} kg
D 5×10^{6} kg

4.2 The … energy of an object is the energy it possesses because of its position.

A kinetic
B chemical
C mechanical
D potential

4.3 … is NOT a scalar.

A Volume
B Momentum
C Distance
D Moment

Copyright reserved

4.4 When rubbing a plastic rod with a silk cloth, it is positively charged.

The …

A electrons are transferred from the cloth to the rod.
B protons are transferred from the cloth to the rod.
C protons are transferred from the rod to the cloth.
D electrons are transferred from the rod to the cloth.

4.5 A driver is driving a car at a speed of 30 $m.s^{-1}$. At what time will the driver have driven 600 m?

A 20 s
B 18 000 s
C 0,05 s
D 630 s

(5 × 3) **[15]**

TOTAL SECTION A: 35

SECTION B

QUESTION 5: MEASUREMENTS

Convert the following quantities to the measurement indicated:

5.1 360 $km.h^{-1}$ to $m.s^{-1}$

5.2 600 mm to m

5.3 50 g to kg

(3 × 2) **[6]**

QUESTION 6: MOTION

A driver is driving a Ford Bantam, transporting bags of oranges from town A to town B, 120 000 m apart. It took the driver 3 hours to reach town B.

Calculate:

6.1 The time taken to travel from town A to town B, in seconds (2)

6.2 The average speed from town A to town B (3)

6.3 The distance travelled from town A after 2 hours (4)

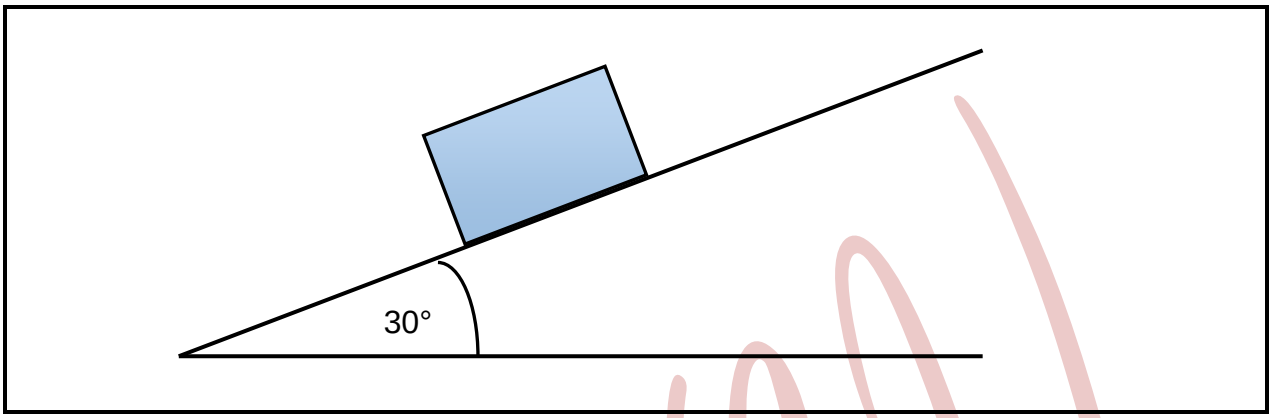
6.4 The time taken from town A after a distance of 90 km. Convert the time to hours. (4)

[13]

Copyright reserved

QUESTION 7: MECHANICAL ENERGY

A trailer is pulled up an inclined plane by a force of 8 500 N. The inclined angle is 30^{o} and the mass of the trailer is 2 500 kg.



7.1 Make a drawing of the trailer on the incline and indicate and name ALL the forces acting on it. (4)

7.2 Define *weight.* (2)

7.3 Calculate the weight of the trailer. (2)

A man that weighs 96 kg fell from the top of a tree, 120 m to the ground.

7.4 Define *kinetic energy*. (2)

7.5 Calculate the potential energy at the top of the tree. (3)

7.6 Determine the kinetic energy at the top of the tree. (1)

7.7 Calculate the potential energy on the ground. (1)

7.8 Calculate the kinetic energy when the man hits the ground. (2)
[17]

QUESTION 8: MECHANICAL ADVANTAGE

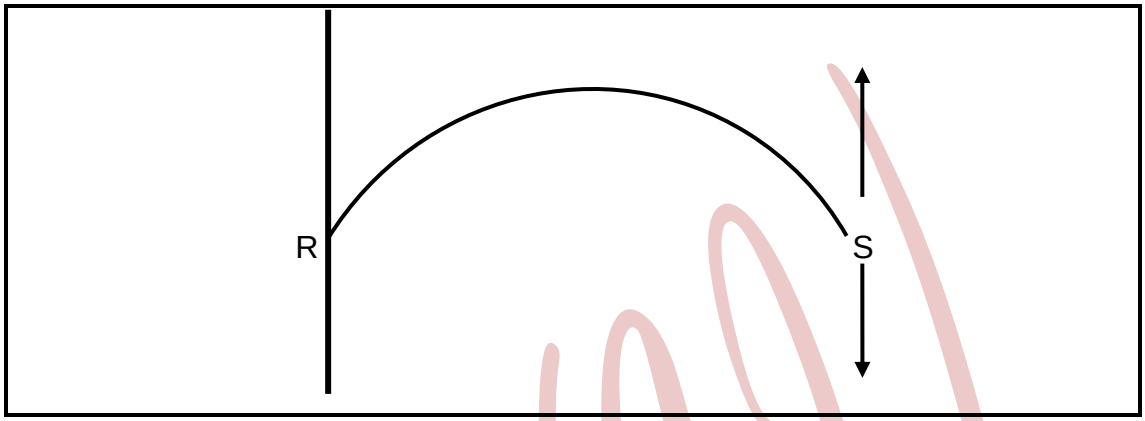
8.1 Draw a diagram of each of the THREE types of levers. (9)

8.2 Give ONE example of each of the THREE types of levers. (3)
[12]

Copyright reserved

QUESTION 9: WAVES, SOUND AND LIGHT

9.1 The diagram below shows a string of length L, fixed at one end, point R. The string is moved to and fro at point S, until a standing wave of one loop is formed.



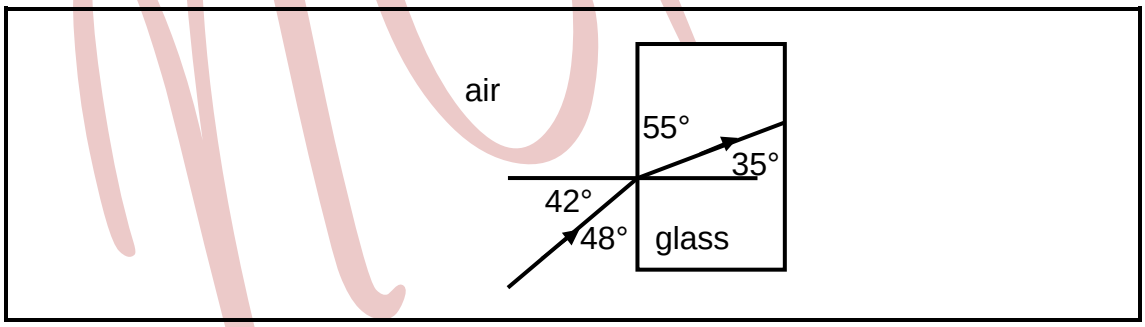
9.1.1 State FOUR conditions necessary for the formation of a standing wave. (4)

9.1.2 Draw a diagram showing the standing wave pattern formed if the frequency is TWO times greater than the one in the diagram above. (6)

9.1.3 What do the nodes and antinodes represent? (4)

9.1.4 Describe the *principle of the superposition* of waves. (2)

9.2 The following diagram shows an incident ray of light striking the interface between air and a glass block.



9.2.1 What is the size of the incident angle? (2)

9.2.2 What is the size of the refraction angle? (2)

9.2.3 Redraw the diagram to the ANSWER BOOK and show the path of the light ray as it passes out into the air. Label your diagram. (5)

9.3 If the sound wave is moving at a speed of 330 $m.s^{-1}$ and its frequency is 100 Hz, calculate its wavelength. (4)

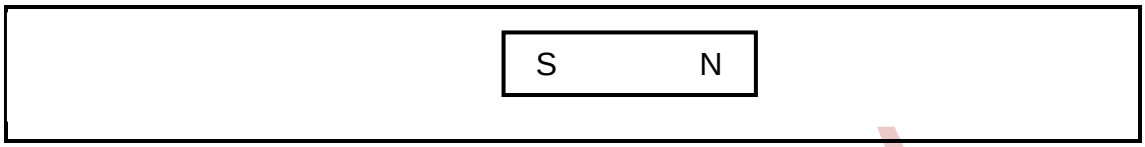
[29]

Copyright reserved

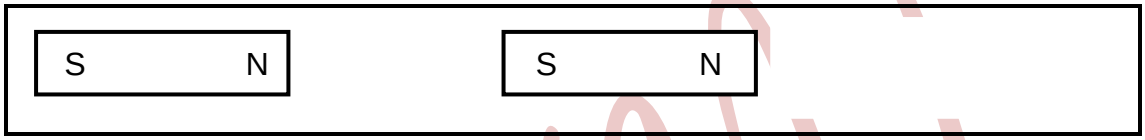
QUESTION 10: MAGNETISM AND ELECTROSTATICS

10.1 Explain what is meant by *magnetic field*. (2)

10.2 Redraw the following TWO diagrams of bar magnets in the ANSWER BOOK and add the magnetic fields that surround them.

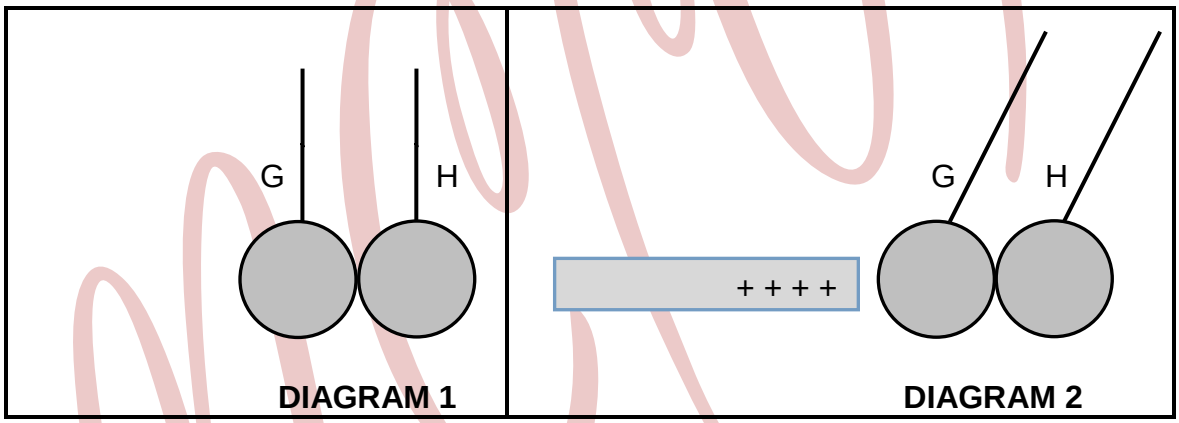


(3)



(6)

10.3 Two light, conducting spheres G and H, are suspended vertically using non-conducting thread so that they touch each other as shown in DIAGRAM 1. If a positively charged rod is brought close to the left-hand sphere, both spheres stay in contact and are attracted to the positively charged rod as shown in DIAGRAM 2.



10.3.1 Redraw DIAGRAM 2 in the ANSWER BOOK and indicate the distribution of positive and negative charges on spheres G and H. (3)

10.3.2 Draw your own diagram to show what you predict would happen if a negatively charged rod was used instead of a positively charged rod.

Show on your diagram the position of the negatively charged rod and the distribution of positive and negative charges on spheres G and H. (5)

10.3.3 What is the name or description used for this phenomenon? (2)

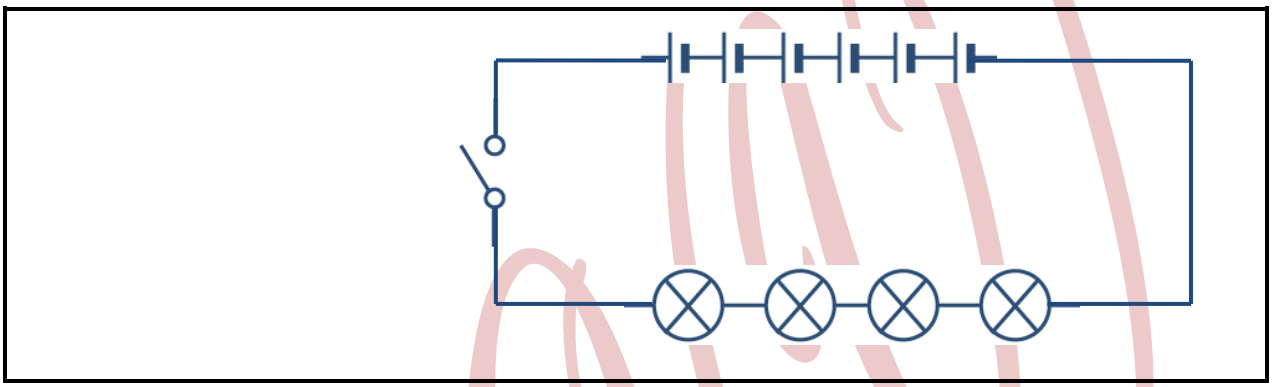
10.3.4 Two spheres, G and H, made of conducting material are fixed on insulated stands. G carries a charge of +6 nC and H a charge of -8 nC. The G and H spheres are moved so that they touch each other and are then separated.

Calculate the final charge on each sphere. (4)

[25]

QUESTION 11: ELECTRICITY

Four identical light bulbs are connected in series to six 1,5 V torch cells as shown in the following circuit diagram.



11.1 What is the EMF of the circuit? (2)

11.2 What is the potential difference across each bulb? (2)

11.3 The resistance of each light bulb is 5 Ω.

Calculate the total resistance of the circuit. (3)

11.4 Calculate the current in the circuit. (3)

11.5 How much charge passes through each bulb in 2 seconds when the current in the circuit is 4 A? (3)

[13]

TOTAL SECTION B: 115
GRAND TOTAL: 150

Copyright reserved

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Acceleration due to gravity	g	9,8 $m.s^{-2}$
Speed of light in vacuum	C	$3,0 \times 10^{8}$ $m.s^{-1}$

TABLE 2: FORMULAE

MECHANICS

$v = u + at$	$E_k = ½ mv^2$
$v^2 = u^2 + 2as$	$E_p = mgh$
$s = ut + ½ at^2$	*MA = load/effort
$s = ½ (v + u)t$	*VR = effort distance/load distance
$F = mg$	$W = F \times s$
	*Efficiency = MA/VR

WAVES, SOUND AND LIGHT

$v = f\lambda$	
$T = 1/f$	

MAGNETISM AND ELECTRICITY

$R = r_1 + r_2 r_3$	$Q = It$
$1/R = 1/r_1 + 1/r_2 + 1/r_3$	$E = IR + Ir$
$V = I R$	$V = W/Q$

Copyright reserved