



**ALEXANDER ROAD HIGH SCHOOL
PHYSICAL SCIENCE
GRADE 10**

JUNE 2019
Examiner: PE

2 HOURS
TOTAL 100

Instructions

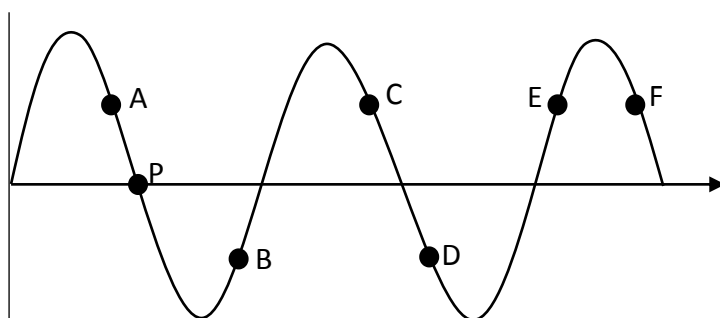
1. The question paper consists of 7 questions. Answer all the questions.
 2. Answer Question 1 (MCQ) and Q 6.1 on the answer sheet provided.
 3. A non-programmable calculator may be used.
 4. Some formulae and constants are given on reverse side of answer sheet.
 5. Show formulae in calculations and round off to 2 decimals unless otherwise stated.
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QUESTION 1 Multiple Choice:

Write just the letter corresponding to the best answer on the answer sheet provided.

Use the diagram below for the next two questions 1.1 and 1.2

- 1.1 Consider the diagram to represent a snap shot of a transverse wave moving through the medium from left to right. Point P is a particle of the medium



At the moment the snap shot was taken particle P was moving...

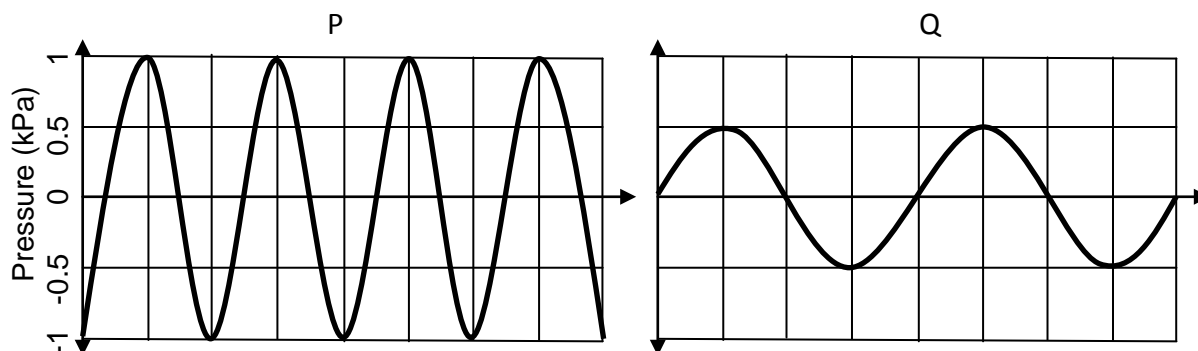
- A. ↓ B. ↑ C. ↘ D. Not moving because it's in equilibrium.

- 1.2 The points that are in phase are:

- A. A & B
- B. A,C,E & F
- C. C & F
- D. B & D

Use the diagram below for the questions 1.3 & 1.4:

Two sounds, P & Q, are captured by a microphone and their pressure wave forms, that appear on the computer or oscilloscope, are shown below.



1.3 The correct relationship between the two sounds is...

	P	Q
A	Louder & higher pitch	Softer & lower pitch
B	Faster & louder	Slower & softer
C	Softer & shorter wavelength	Louder & longer wavelength
D	Slower & higher pitch	Faster & lower pitch

1.4 From the description 'their pressure wave forms', we can deduce that sound....

- A. Is a transverse wave.
- B. Is an electromagnetic wave
- C. Is a longitudinal wave.
- D. Is NOT a mechanical wave

1.5 When a Perspex rod is rubbed with wool, the Perspex becomes positively charged. This is because:

- A. Protons are rubbed onto the Perspex from the wool.
- B. Electrons are rubbed onto the wool from the Perspex.
- C. Electrons are rubbed from the wool onto the Perspex
- D. Insufficient information

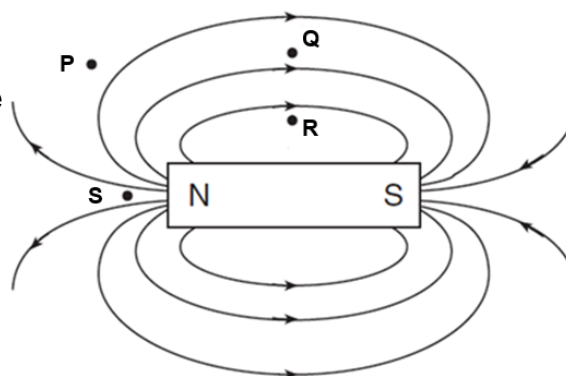
- 1.6 Use the portion of the tribo-electric series given below to determine which of the following substances becomes 'positive' and which 'negative' when pairs of Perspex, Polythene or Silk are rubbed against each other.

	positive	negative
A	polythene	perspex
B	silk	perspex
C	polythene	silk
D	perspex	polythene

Tribo Series	
Very positive	Air
positive	Perspex
	Silk
Neutral	Cotton
negative	Polythene
Very negative	Teflon

- 1.7 The diagram below represents the magnetic field around a bar magnet.

At which point is the magnitude of the magnetic field of the bar magnet the greatest?



- A. P
- B. Q
- C. R
- D. S

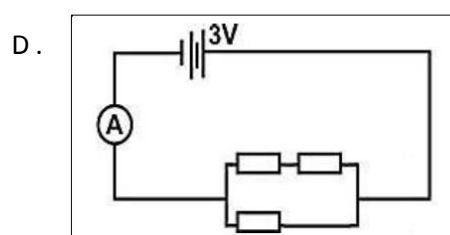
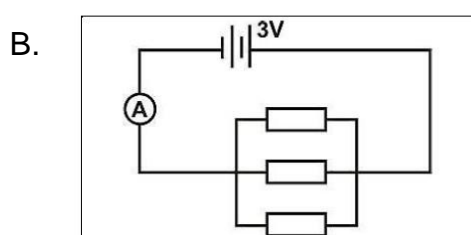
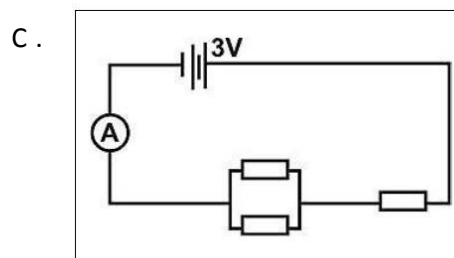
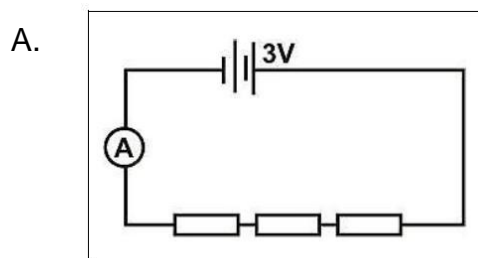
- 1.8 When adding resistor in parallel:

- A. The total resistance increases and the current decreases.
- B. The total resistance decreases and the current increases.
- C. The total resistance and current both increase.
- D. The total resistance and current both decrease.

- 1.9 The equivalent units for current strength and potential difference are:

	Current Strength	Potential difference
A.	I	V
B.	C.s	J.C
C.	V	A
D.	C.s ⁻¹	J.C ⁻¹

- 1.10 A learner is provided with three identical resistors to insert in any manner in a circuit. Which ONE of the following circuit diagrams will allow the largest current through the ammeter?

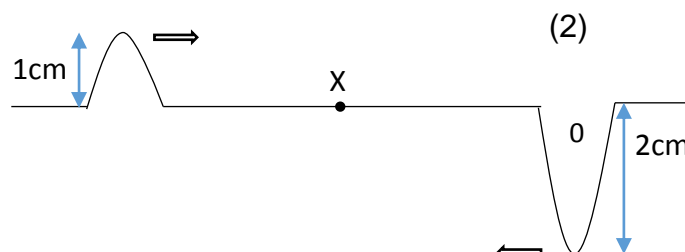


[2x10 =20]

QUESTION 2: Waves

- 2.1 Define the wave length.

The drawing alongside shows two pulses approaching each other in a medium.



- 2.2.1 What do we call the interaction between the pulses at position X? (1)

- 2.2.2 Draw the resultant pulse at X and give its amplitude. (2)

- 2.2.3 Draw the pulses a short while after meeting at point X. Remember to show their direction. (1)

- 2.3 A man stands between two high cliffs. He finds that when he claps his hands he hears the echo from the one cliff after 3s and the echo from the other cliff after 5s.

Calculate the distance between the two cliffs if the speed of sound is $340 \text{ m}\cdot\text{s}^{-1}$.

(6)

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QUESTION 3 **Electromagnetic spectrum**

- 3.1 With the aid of the diagram below, explain how an electromagnetic wave propagates. (3)



- 3.2 Arrange the following types of Electromagnetic radiation in order of **decreasing** wavelength: Infrared, gamma rays, visible, X-rays (2)
- 3.3 Electromagnetic radiation has a wave-particle duality. What does this mean? (2)
- 3.4 Electromagnetic waves of wavelength 2.5×10^{-7} m are emitted. ($c = 3 \times 10^8$ m.s⁻¹)
Calculate:
- 3.4.1 The frequency of the electromagnetic waves. (3)
- 3.4.2 The amount of energy that the photons of this wave have. (3)
- 3.5 What radiation is used to sterilize surgical equipment? (1)

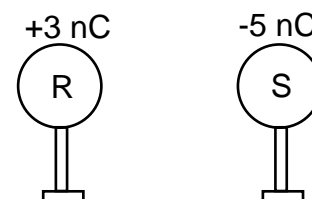
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QUESTION 4 **Electrostatics**

- 4.1 Two identical spheres are charged and placed on insulating stands as shown in the diagram.

They have the charges $Q_R = +3$ nC and $Q_S = -5$ nC respectively, (nC = nano coulombs = 10^{-9} C).

They are brought together to touch and then separated again.

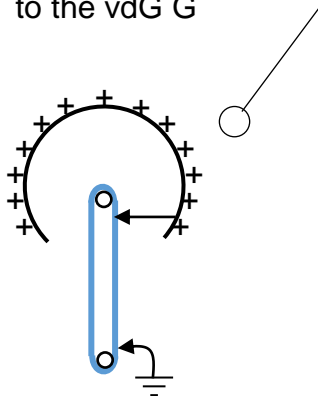


- 4.1.1 What is the final charge on each sphere? (3)
- 4.1.2 How many electrons were originally rubbed off sphere R, i.e. before they touched? (3)

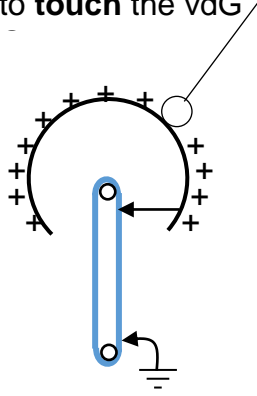
4.2 The schematic diagrams below show a demonstration with the Van der Graaf Generator (vdG G). A small polystyrene ball that is covered in graphite is suspended by a piece of cotton and held near the vdG G.

The following observations are made in sequence as steps A-C below:

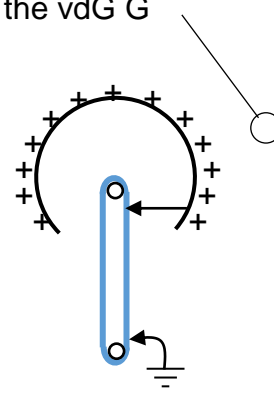
A. First it is **attracted** to the vdG G



B. Then it is allowed to **touch** the vdG



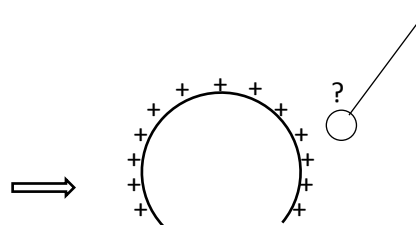
C. Then it **repels** the vdG G



4.2 Explain each step in the sequence with the aid of a diagram each time.

It is sufficient to draw just the dome, the ball and charges for each step, e.g. the incomplete first step shown alongside.

Label the drawings with comments about the charge distribution and movement.



(2,2,2)

4.3 What is the name of an instrument used to detect and test charges? (1)

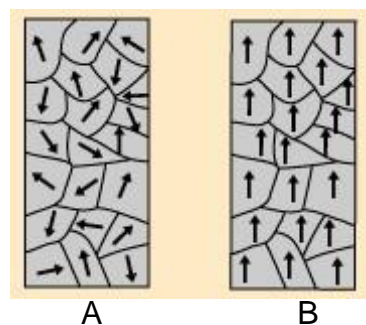
4.4.1 Application: Explain, using electrostatics why spray paint does not come out in splodges but rather as a fine mist. (1)

4.4.2 When spray painting a car, the body of the car is given a high-voltage negative charge. Explain why this is more effective than 'ordinary' spray painting. (1)

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Question 5 Magnetism

The diagrams below show samples of a ferromagnetic material (eg. Iron). The one diagram shows the magnetised material and the other shows the demagnetised material.



5.1.1 What name is given to the outlined areas (each with an arrow) in the diagrams? (1)

5.1.2 Which diagram (A or B) represents the magnetised material? (1)

5.1.3 Give a reason for your answer in 5.1.2 above. (2)

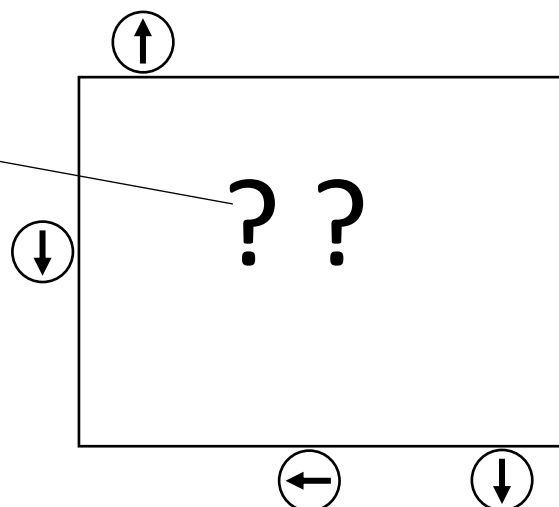
5.2 Imagine TWO bar magnets are inside a closed container.

Use the information in these sketches to show how the magnets are placed inside the container.

The circles with arrows show the direction of the field at the point, i.e. the direction of a little compass needle at that point.

Redraw the sketch and then complete it showing how the magnets are arranged in the box.

(4)

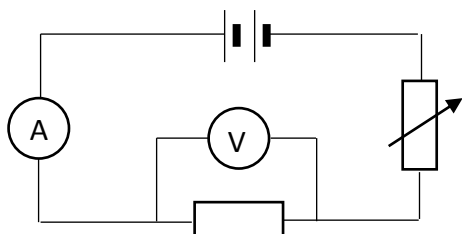


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Question 6 Scientific Methodology

In an investigation into verifying Ohm's law the circuit in the diagram below was built and the ammeter and voltmeter readings taken as the variable resistor was adjusted.

6.1 Plot and draw the graph of the Voltage vs. Current on the graph axes given on the answer sheet. (3)



Readings	Current (A)	Voltage (V)
1	2	3
2	4	6
3	6	9
4	8	12

6.2 Which is the dependant and which the independent variable in the investigation? (2)

6.3 What can be concluded from the investigation? (3)

[7]

QUESTION 7 Electric Circuits

Define the following electrical concepts:

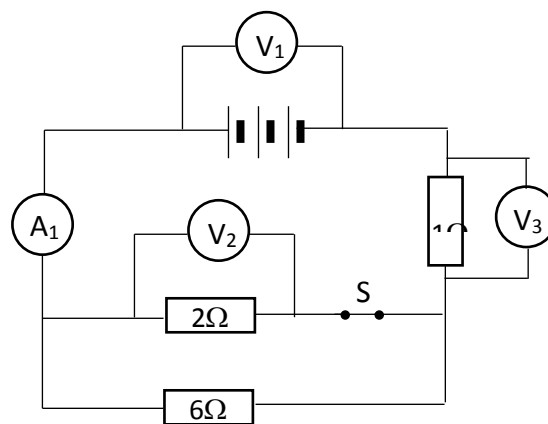
- 7.1.1 Potential difference. (2)
- 7.1.2 Current strength. (2)
- 7.1.3 Compare and contrast (see table below) an ammeter and voltmeter, in terms of:
- What they measure, (2)
 - Their resistance & (2)
 - How they are connected in the circuit. (2)

Create a table like the one shown for your answer.

Q 7.1.3	Ammeter	Voltmeter
a) What it measures:	?	?
b) It's resistance:	Very high or very low?	Very high or very low?
c) How it's connected:	In series or parallel?	In series or parallel?

7.2 Given the circuit shown. Each cell is 2V.

- 7.2.1 What is the reading and unit on voltmeter V_1 ? (1)
- 7.2.2 Determine the effective resistance of the parallel resistors. (3)
- 7.2.3 What is the total resistance in the circuit? (1)
- 7.2.4 Determine the reading and unit on ammeter A_1 . (3)
- 7.2.5 Determine the voltage measured by V_2 . (3)
- 7.2.6 a) What happens to the value of the current in A_1 when switch S is opened? Write just INCREASES, DECREASES OR STAYS THE SAME. (1)
- b) Give a reason for your answer in a) above. (2)



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