



ALEXANDER ROAD HIGH SCHOOL

MARCH 2018

60 MIN

PHYSICAL SCIENCE CONTROL TEST 2

CO, MH

GRADE 11

TOTAL = 60

Instructions

- The question paper consists of 7 questions.
- Answer all the questions.
- Rule off after each question in Section B.
- 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 on the reverse side of the answer sheet.

QUESTION 1: Multiple choice (answer on the answer sheet)

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 Consider the Lewis structure of the compound below:



Which one of the following is correct?

	Name of element X	Name of element Y	Molecular shape of compound
A	Chlorine	Oxygen	Angular
B	Oxygen	Chlorine	Linear
C	Chlorine	Sulphur	Linear
D	Sulphur	Chlorine	Angular

1.2 Which of the following will have the longest bonding length?

- A $C \equiv C$
- B $C = C$
- C $C - C$
- D $Cl - Cl$

1.3 Which ONE of the following chlorides will most likely have the most ionic character?

- A LiCl
- B CsCl
- C BeCl_2
- D CaCl_2

1.4 Which ONE of the following species contains a dative covalent bond?

- A NH_3
- B H_3O^+
- C CH_4
- D NF_3

1.5 Which of the following is true for METHANE?

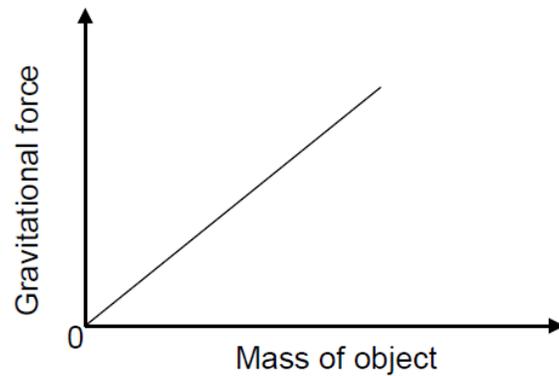
	Bond	Molecule
A	polar	polar
B	non-polar	polar
C	polar	non-polar
D	non-polar	non-polar

1.6 Two forces are acting on a 1,76 kg object as shown in the diagram; the object is not moving. The resultant force (in Newton) in the vertical direction is:



- A $20\sin 60 - 1,76 \times 9,8$
- B $20\sin 60 + 1,76 \times 9,8$
- C $20\cos 60 - 1,76 \times 9,8$
- D $20\cos 60 + 1,76 \times 9,8$

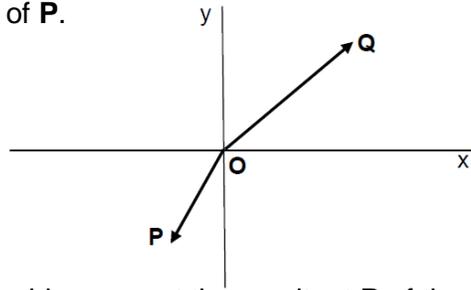
- 1.7 The electrostatic force between two charged spheres, a distance r apart, is F . When the charge on each sphere is doubled and the distance between the spheres is halved, the force between the spheres will now be ...
- A F
 - B $2F$
 - C $8F$
 - D $16F$
- 1.8 A graph of the gravitational force versus the mass of an object is shown below.



Which ONE of the following CORRECTLY represents the slope of the graph?

- A Weight of the object
- B Acceleration due to gravity (g)
- C Universal gravitation constant (G)
- D Radius of the earth

- 1.9 Two vectors, **P** and **Q**, act simultaneously at point **O** as shown in the diagram below. The magnitude of **Q** is greater than the magnitude of **P**.

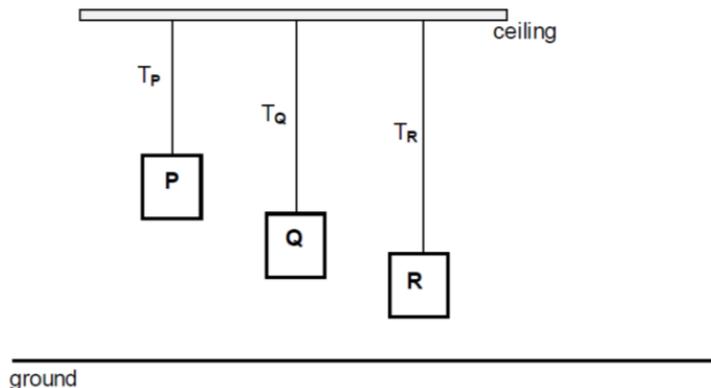


Which ONE of the following could represent the resultant **R** of the two vectors?

A		B	
C		D	

- 1.10 The diagram below shows three blocks, **P**, **Q** and **R**, suspended from a ceiling. The blocks are *identical*, *stationary* and have the *same mass* but are at different heights above the ground.

The connecting strings are light and inextensible. The tensions in the strings attached to the blocks are T_P , T_Q and T_R respectively.

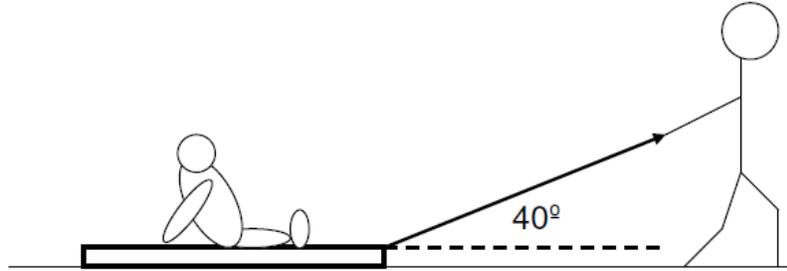


Which ONE of the following statements about the tensions is CORRECT?

- A $T_P > T_Q > T_R$
- B $T_P < T_Q < T_R$
- C $T_P = T_Q = T_R$
- D $T_P > T_Q$ and $T_Q < T_R$

Long questions (answer on folio paper)

2. Jemma, mass 17kg is sitting on a piece of hardboard, mass 800g, on the ground. Her dad fastens a rope to the hardboard and starts to pull it with a force of 50N at an angle of 40° to the horizontal.



The board moves over the grass with a frictional force of 9N acting between the grass and the board.

- 2.1 Draw a free body diagram of all the forces acting **on the board**. (4)
2.2 Calculate the magnitude of the acceleration of the board. (6)
2.3 What will happen to Jemma if her dad suddenly stops pulling. (1)
- [11]**

- 3.1 Newton investigated the relationship between the force (F) between two bodies with mass, and the distance (r) between their centres. The data given below was collected:

r (m)	F (N) ($\times 10^{-9}$)
0,35	5,4
0,4	4,2
0,55	2,2
0,6	1,9
0,65	1,6

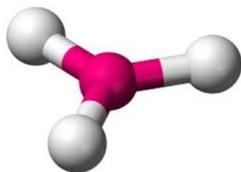
Plot this data, suitably, on the provided graph paper (on the answer sheet) in order to obtain a **labelled straight line** graph. The data in the table may be manipulated mathematically – more columns have been added, on the answer sheet, if you need it. Fill in any calculated values if you use different values as those provided (Hint: the bigger the graph, the better, and no calculations for the new values need to be shown)

(5)

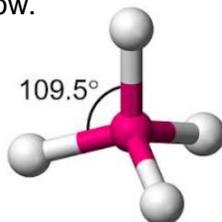
- 3.2 Calculate what the gradient of the graph **should** be if a 2kg and a 5kg mass were used? (do NOT determine the gradient of *your* graph). (2)
- 3.3 Which other Newton law (Newton 1,2 or 3) could be applied to this scenario of the two masses? (1)

[8]

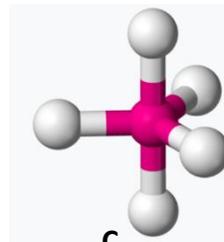
4. Three molecule shapes are given below.



A



B



C

4.1 Name the shapes of each molecule. (3)

4.2 Give an example of an actual molecule (compound) for molecule B. (1)

4.3 If molecule A represents BCl_3 , will the bonds be polar or non-polar? (1)

4.4 Which molecule could be represented by C? (1)

4.5 Why is molecule A 'flat', and not bent in any way? (You may not simply repeat your molecule shape answer given in 4.1) (1)

[7]

5.1 Define what a 'Dative covalent bond' is. (2)

5.2 Show the formation of the NH_4^+ ion by using Lewis structures. (3)

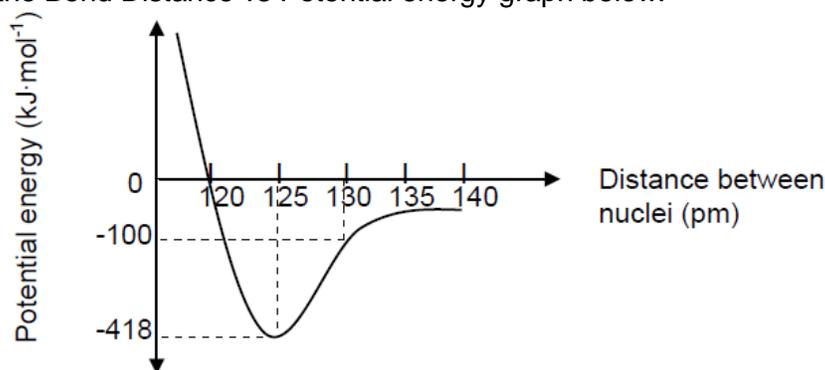
5.3 Draw the Lewis diagram for NH_3 . (2)

5.4 How many shared electron pairs are there in this (in 5.3) molecule? (1)

5.5 Is this a polar or a non-polar molecule? Give a reason for your answer. (2)

[10]

6. Consider the Bond Distance vs Potential energy graph below:



6.1 What does the reading of -418 mean? Explain. (2)

6.2 What is the distance between the nuclei of the formed molecule? (1)

[3]

7. Consider the following bond energies and bond lengths for 2 different carbon-carbon bonds:

	Bond length (pm)	Bond Energy (kJ.mol^{-1})
A	154	347
B	120	839

Which pair of values, A or B, represents a $\text{C} - \text{C}$ bond, and not a $\text{C} \equiv \text{C}$ bond?

[1]