ALEXANDER ROAD HIGH SCHOOL

MARCH 2014 — 1 HOUR

PHYSICAL SCIENCE CONTROL TEST

IC, CO, KB — TOTAL = 60

GRADE 11

Instructions

- The question paper consists of 5 questions.
- Answer all the questions.
- Answer section A on the answer sheet provided AND section B on folio sheets.
- 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.
- A periodic table has been included on the back of the answer sheet

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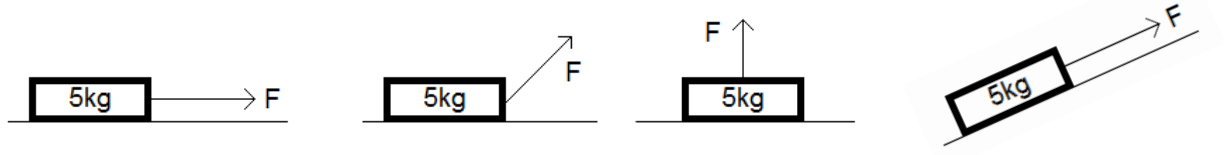
SECTION A

- Answer on the answer sheet -

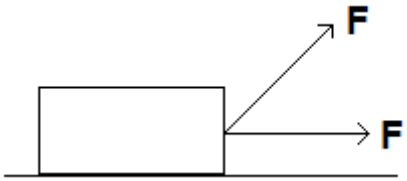
QUESTION 1: Multiple choice

1.1 A 5kg block is placed on a surface and pulled with a 5N force (F). In which case will the normal force be the **GREATEST**…

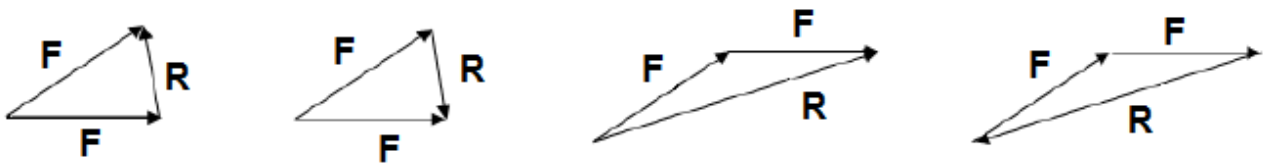


A B C D

1.2 A crate is pulled along a frictionless surface by two forces, each with a magnitude of **F**, as shown in the diagram…



Which vector diagram correctly shows how the resultant force R on the crate can be determined?



A B C D

1.3 Who established the following relationship?

The pressure exerted on an enclosed gas in a set volume is directly proportional to the temperature.

A Boyle

B Charles-Lussac

C Charles

D Gay-Lussac

1.4 A chemical reaction with an enthalpy change of -26kJ.mol^{-1} is a(n) _____ reaction.

A Exothermic

B activated

C complex

D Endothermic

1.5 Which of the following molecules has the highest bond energy?

A H_2 B F_2

C O_2 D N_2

1.6 The angles between the bonds in a tetrahedral molecule are…

A 120° B 109,5^o

C 104,5^o D 90^0

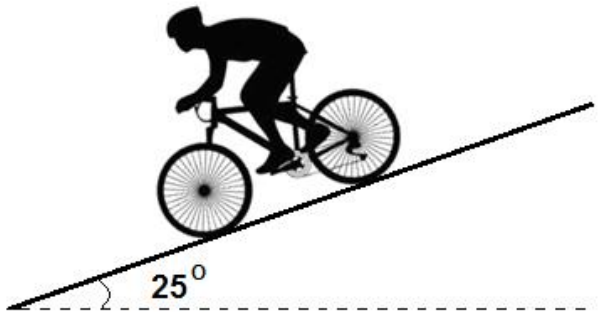
[6 x 2 = 12]

<u>SUB – TOTAL:</u> <u>12</u>

SECTION B

QUESTION 2

A cyclist free wheels (ie. moves without pedaling) down a straight stretch of road that makes an angle of 25^0 with the horizontal. The mass of the cyclist and his bike is 100kg. Throughout the motion, the cyclist experiences a frictional force of 120N. The cyclist and his bike are to be considered as a single object.



2.1 Draw a free-body diagram showing all the forces acting on the object. (3)

2.2 Determine the components of the objects weight, F_g:

2.2.1 Acting parallel to the slope, $F_{g//}$ (2)

2.2.2 Acting perpendicular to the slope, $F_{g\perp}$ (2)

2.3 If the kinetic frictional force is 120N calculate:

2.3.1 The magnitude of the resultant force acting parallel to the slope. (2)

2.3.2 The magnitude of the normal force. (1)

2.3.3 The coefficient of kinetic friction. (2)

[12]

QUESTION 3

A passenger in a motor car notices that an air-freshener hanging from the rearview mirror of the car looks like it moves backwards when the car accelerates forward away from a stop street.

3.1 State Newton's first law of motion. (2)

3.2 Use it to explain this observation. (2)

[4]

QUESTION 4

4.1.1 Draw the Lewis structure for NH_3. (2)

4.1.2 How many lone pairs and bonding pairs are present in the NH_3 molecule? (2)

4.1.3 What is the VSEPR name given to the shape of this molecule (NH_3). (1)

4.1.4 Are the bonds in the NH_3 molecule polar or non-polar?
(Use calculations to support your answer) (3)

4.1.5 Using a sketch, indicate whether the NH_3 molecule is polar or non-polar? (2)

4.1.6 Explain why the NH_3 molecule has a different shape to the BF_3 molecule. (3)

4.1.7 Use Lewis Structures to show the formation of the NH_4^+ ion through dative covalent bonding. (3)

[16]

QUESTION 5

5.1 500 cm^3 of helium gas is kept in a container at a pressure of 90kPa. If the temperature remains constant, calculate:

5.1.1 The volume of the helium at a pressure of 100kPa. (3)

5.1.2 Calculate the amount of moles of gas present at 27ºC. (4)

5.2 Define absolute temperature. (2)

5.3 Draw a graph of volume versus temperature and **indicate** on the graph where and how absolute zero temperature was graphically and theoretically established. (4)

5.4 Draw a labeled graph of E_p vs *Progress of reaction* for an endothermic reaction (3)

[16]

TOTAL 60 MARKS

Gas Laws:

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \qquad PV = nRT \qquad n = {}^{m}/_{M}$$

Mechanics: friction: $f_s = \mu_s N$ $f_k = \mu_k N$