ALEXANDER ROAD HIGH SCHOOL

FEBRUARY 2018 45 MIN

PHYSICAL SCIENCE CONTROL TEST

CO **GRADE 12** TOTAL = 40

Instructions

- The question paper consists of 2 questions.
- Answer all the questions.
- Answer section A on the answer sheet provided AND section B on folio paper.
- 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 formula sheet is provided on the back 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 Which ONE of the following physical quantities is a measure of the inertia of a body?

A Mass

B Energy

C Velocity

D Acceleration.

1.2 The magnitude of the gravitational force exerted by one body on another body is ***F***. When the distance between the centres of the two bodies is doubled, the magnitude of the gravitational force, in terms of ***F***, will now be …

A ¼ F B ½ F C 2F D 4F

1.3 Which ONE of the following forces always acts on a body which is placed on a horizontal surface?

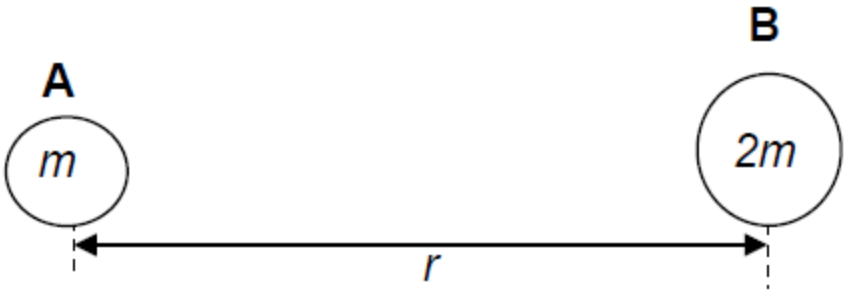
A Normal force perpendicularly to the surface

B Frictional force to the side

C Gravitational force upwards

D Tension force opposite to the friction force

1.4 Two isolated bodies, **A** and **B**, having masses *m* and 2*m* respectively, are placed a distance *r* apart.



Consider the following statements regarding the gravitational force exerted by the bodies on each other.

(i) The force exerted by **B** on body **A** is half that exerted by **A** on body **B**.

(ii) The force exerted on the bodies is independent of the masses of the bodies.

(iii) The force exerted on body **A** by **B** is equal but opposite to that exerted on body **B** by **A**.

(iv) The forces will always be attractive.

Which of the statements above is/are TRUE?

A (i), (ii) and (iv) only

B (ii), (iii) and (iv) only

C (iii) and (iv) only

D (iv) only

1.5 A net force, **F**, is applied on an object of mass **m** kg and causes an acceleration of **a** m.s^{-2}. When the net force, **F**, on the same object is doubled, the resulting acceleration, in m.s^{-2}, will be…

A a B $\frac{3}{2}$a C 2a D 3a

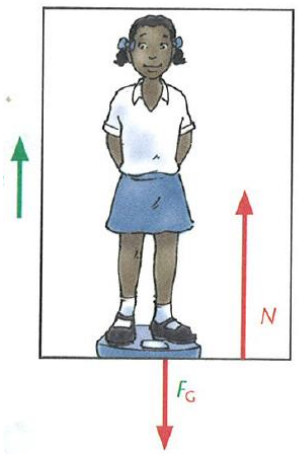
1.6 A girl of mass 50 kg stands in a lift, on a bathroom scale that measures in newtons. What will be the magnitude of the reading on the scale if the lift **accelerates upwards at 2 m.s^{-2}?**

A Reading = 50 x 2 – 50 x 9,8

B Reading = 50 x 2 + 50 x 9,8

C Reading = 50 x 9,8 – 50 x 2

D Reading = 50 x 9,8 + 50 x 2



1.7 A rocket can accelerate upwards when launched from the earth.

Which statement regarding *this* is correct?

A The earth pushes the rocket upwards according to Newton's law of gravitation

B Gases from the exploding fuel inside the rocket pushes on earth to lift the rocket from earth

C Fuel explodes inside the rocket and pushes the rocket upwards, and the gases push on the ground downwards

D The exploding rocket fuel inside the rocket is pushed out by the rocket and the gases push on the rocket upwards

1.8 Why do you appear to "fall" forward in a bus that **suddenly** slows down after moving at constant velocity?

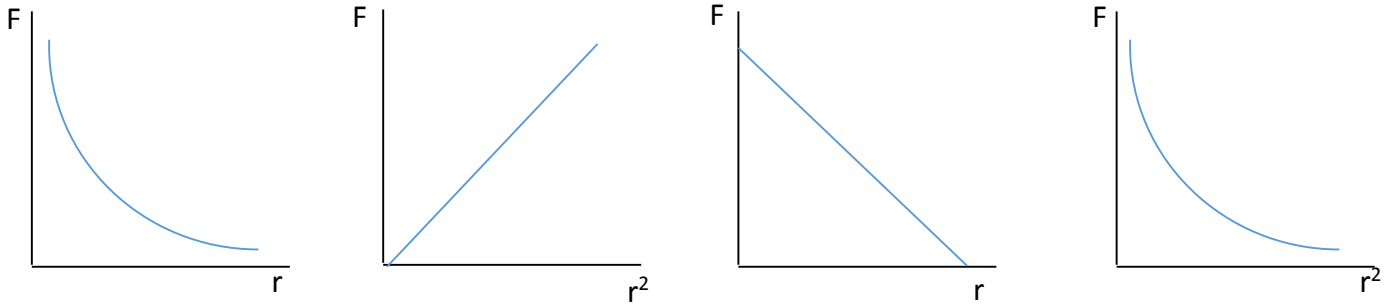
A Newton 3 implies that you will move forward because the bus is **suddenly** exerting a force backwards

B Newton 1 implies that you, as a separate body, will continue moving forward with the constant velocity, even though the floor is **suddenly slowing down**

C Newton 2 implies that you, as a separate body, will continue moving forward with the constant velocity, even though the floor is **suddenly slowing down**

D Newton 1 implies that you will move forward because the bus is **suddenly** exerting a force backwards

1.9 Two objects with different masses are placed at a distance **r** apart. A force **F** is acting between the objects. Which graph is correctly showing the relationship between **F** and **r**?



A **B** **C** **D**

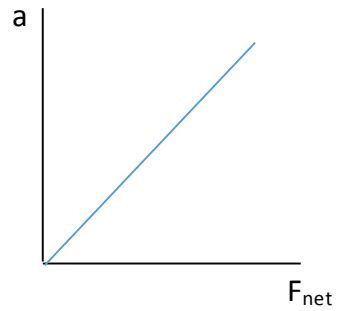
1.10 The graph below refers to acceleration of an object with mass $\boldsymbol{m}$, with force F_{net} acting on it. Which law of motion is investigated here and what will be the gradient of this graph?

A Newton 1 – gradient = $\boldsymbol{m}$

B Newton 2 – gradient = $\boldsymbol{m}$

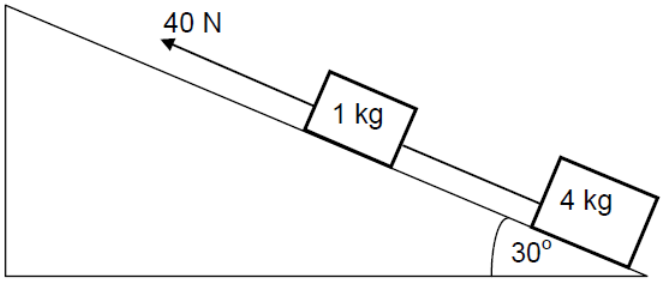
C Newton 1 – gradient = $\frac{\mathbf{1}}{\boldsymbol{m}}$

D Newton 2 – gradient = $\frac{\mathbf{1}}{\boldsymbol{m}}$



QUESTION 2 (Section B: do it on folio paper)

A block of mass 1 kg is connected to another block of mass 4 kg by a light inextensible string. The system is pulled up a rough plane inclined at 30° to the horizontal, by means of a constant 40 N force parallel to the plane as shown in the diagram below.



The magnitude of the kinetic frictional force between the surface and the 4 kg block is 10 N. The coefficient of kinetic friction between the 1 kg block and the surface is 0,3.

2.1 State Newton's third law in words. (2)

2.2 Draw a labelled free-body diagram showing ALL the forces acting on the **1 kg block** as it moves up the incline. (5)

2.3 Calculate the magnitude of the:

2.3.1 kinetic frictional force between the 1 kg block and the surface. (3)

2.3.2 tension in the string connecting the two blocks. (6)

2.3.3 the accelaration of the system (2)

2.4 **Name** one example (a force pair) in this scenario where Newton' s third law applies (clearly name the objects, force magnitudes and directions) (2)

[20]