

**Western Australian Certificate of Education**

**ATAR course examination, 2018**

**Question/Answer Booklet**

11 PHYSICS

Name

**Test 3 - Forces, Work**

**and Energy**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Number: In figures |  |  |  |  |  |  |  |  |  |  |

**Mark:** In words

#### Time allowed for this paper

Reading time before commencing work: five minutes

Working time for paper: sixty minutes

**Materials required/recommended for this paper**

To be provided by the supervisor

This Question/Answer Booklet

Formulae and Data Booklet

***To be provided by the candidate***

Standard items: pens, (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: non-programmable calculators satisfying the conditions set by the School Curriculum and Standards Authority for this course

**Important note to candidates**

No other items may be taken into the examination room. It is your responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor before reading any further.

**Structure of this paper**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Section | Number of questions available | Number of questions to be answered | Suggested working time  (minutes) | Marks available | Percentage of exam |
| Section One:  Short Answers |  |  |  |  |  |
| Section Two:  Problem-solving | 7 | 7 | 60 | 47 | 100 |
| Section Three:  Comprehension |  |  |  |  |  |
|  |  |  |  | **Total** | 100 |

**Instructions to candidates**

1. The rules for the conduct of examinations at Holy Cross College are detailed in the College Examination Policy*.* Sitting this examination implies that you agree to abide by these rules.

2. Write your answers in this Question/Answer Booklet.

3. Working or reasoning should be clearly shown when calculating or estimating answers.

4. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.

5. Spare pages are included at the end of this booklet. They can be used for planning your

responses and/or as additional space if required to continue an answer.

• Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.

• Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number.

Fill in the number of the question(s) that you are continuing to answer at the top of the page.

6. Answers to questions involving calculations should be ***evaluated and given in decimal***

***form*.** It is suggested that you quote all answers to ***three significant figures***, with the

exception of questions for which estimates are required. Despite an incorrect final result, credit may be obtained for method and working, providing these are ***clearly and legibly set out***.

7. Questions containing the instruction "estimate" may give insufficient numerical data for their solution. Students should provide appropriate figures to enable an approximate solution to be obtained. Give final answers to a maximum of two significant figures and include appropriate units where applicable.

8. Note that when an answer is a vector quantity, it must be given with magnitude and direction.

9. In all calculations, units must be consistent throughout your working.

1. A cyclist moving at 15.0 ms-1 is brought to a halt in 10.0 s by an average retarding force of 1.20 x 102 N. If the mass of the cyclist and bicycle combined is 80.0 kg, calculate the change in momentum of the combination. [4 marks]

2. A ball travelling at 20.0 ms-1 East collides with a wall and rebounds at 12.0 ms-1 West. the ball has a mass of 0.150 kg and is in contact with the wall for 0.0800 s. Ignore the vertical movement of the ball as it contacts the wall.

(a) Calculate the change in momentum of the ball. [4 marks]

(b) Determine the impulsive force exerted by the wall onto the ball. [3 marks]

3. A body of mass 50.0 kg moving with a velocity of 20.0 ms-1 is brought to rest by a constant force in a distance of 5.00 m.

(a) Calculate the change in kinetic energy of the body. [3 marks]

(b) What is the work done in stopping the body? [2 marks]

(c) Determine the size of the force acting on the body. [3 marks]

4. A lift of combined mass2.05 x 103 kg is moving upwards at a constant velocity of 7.00 ms-1. It then decelerates to a stop in 4.00 s as it reaches the top floor.

(a) Calculate the deceleration of the lift. [3 marks]

(b)   the tension in the cable while the lift stops.   [3 marks]

(c)   the apparent weight of an 80.0 kg person in the lift during the last part of its motion.   [3 marks]

5. Describe **ALL** of the energy changes that take place when a 65.0 g golf ball is dropped from a height of 2.00 m onto a concrete floor and rebounds to 1.40 m above the floor. (Include numerical energy values in your answer.) [5 marks]

6. The diagram below shows a roller coaster of mass 3.50 x 103 kg moving at 5.00 ms-1 at point A. Assume the track is smooth and friction is negligible.



(a) Determine the total energy of the roller coaster at point A. [3 marks]

(b) Calculate the speed of the roller coaster at point B. [3 marks]

7. A 20.0 g bullet travelling at 2.50 x 102 ms-1 strikes a block of wood of mass 2.00 kg that is suspended on a long string. The bullet embeds in the block.

(a) With what velocity will the block and bullet move after the collision? [3 marks]

(b) Is mechanical energy conserved in this system? Justify your answer by comparing the kinetic energy of the system before and after the bullet embeds. [5 marks]