Access to HE Diploma
Assignment Brief (Form AP3)

Provider name:	Sunshine College
Access Diploma title:	Science
Unit title and code:	Physics RC1/3/AA/04G
Assignment title and number, e.g. 1 of 1 or 1 of 2 etc:	2 of 4 Mechanics test
Assessor name:	John Smith

Assignment briefing and mapping to unit:

This assignment is a test covering Learning Outcomes 2 and 3.

You have a maximum of 2 hours to complete the test.

Assignment hand out date:	
Assignment submission deadline date:	
Draft(s) permitted: Yes/No *If yes, include deadline date(s) for draft(s)*	No

Mapping to Unit
This assignment covers the following learning outcomes & assessment criteria.

LO 2 Understand linear dynamics with constant acceleration ('suvat') equations
AC 2.1 Solve simple one dimensional problems with constant acceleration
For example: the velocity of a ball in freefall (negligible drag force)
AC 2.2 Solve two dimensional problems with constant acceleration.
For example: projectiles
AC 2.3 Perform calculations correctly on displacement, speed, velocity and acceleration

LO 3 Understand, and use, the concept of momentum and Newton's laws of motion.
AC 3.1 Summarise forces acting on objects in given situations.
AC 3.2 State each of Newton's laws of motion
AC 3.3 Recall and demonstrate the use of: F = ma, W = mg
AC 3.4 Describe the motion of an object falling in a fluid medium in terms of the forces acting on it.
AC 3.5 Recall and demonstrate Newton's 2nd.Law in the forms $\Sigma F = ma$ and $\Sigma F = \Delta p/\Delta t$
AC 3.6 State the principle of conservation of momentum
AC 3.7 Perform calculations correctly on linear momentum as the product of mass and velocity
AC 3.8 Use the principle of conservation of momentum in simple applications including elastic and inelastic interactions between two bodies in one dimension
(nb. knowledge of the concept of coefficient of friction is not required)

Access to HE Diploma Physics
2 hour assessment

Grading information for this assignment

Grade descriptor:	1a – Understanding of the subject
The student, student's work or performance:	
For a pass:	Meet the assessment criteria to achieve the learning outcomes for the unit
For Merit:	a. demonstrates a **very good** grasp of the relevant knowledge base Contextualisation: - You show that you understand the question and know the correct method for finding a solution most of the time. However, on occasions, full explanations are not given.
For distinction:	a. demonstrates an **excellent** grasp of the relevant knowledge base Contextualisation:- you show that you have an excellent understanding of the questions and know the correct method for finding a solution, providing full explanations at all times.
Additional Guidance notes	

Grade descriptor:	3a, b, c – Application of skills
The student, student's work or performance:	
For a pass:	Meet the assessment criteria to achieve the learning outcomes for the unit
For Merit:	a. **generally** selects appropriate • techniques and b. applies appropriate (selected or given) • methods with c. **very good** levels of • accuracy Contextualisation:- you usually obtain correct results to numerical questions. However, you do not always clearly state the principles involved and their bearing on the question. Numerical answers are given to a number of significant figures appropriate to the question most of the time.
For distinction:	a. **consistently** selects appropriate • techniques and b. applies appropriate (selected or given) • methods with c. **excellent** levels of • accuracy

Access to HE Diploma Physics

2 hour assessment

	Contextualisation: - you obtain correct results to numerical questions, in each case, clearly stating the principles involved and their bearing on the question. You quote numerical answers to a number of significant figures appropriate to the question.
Additional Guidance notes	

Grade descriptor:	**7c Quality**
The student, student's work or performance:	
For a pass:	Meet the assessment criteria to achieve the learning outcomes for the unit
For Merit:	c. taken as a whole, demonstrates a **very good** response to the demands of the brief/assignment Contextualisation:- you answer all the questions, usually providing correct responses. However, you do not always clearly state the principles involved and their bearing on the question. Numerical answers are not always given to a number of significant figures appropriate to the question. Your diagrams and explanations are clear and of good quality.
For distinction:	c. taken as a whole, demonstrates an **excellent** response to the demands of the brief/assignment Contextualisation:- You answer all the questions, obtaining correct results in each case and clearly stating the principles involved and their bearing on the question. You also quote numerical answers to a number of significant figures appropriate to the question. Your diagrams and explanations are very clear and of excellent quality.

Declaration: I confirm that this assignment is my best attempt and all my own work and that it conforms to the course policy on plagiarism.		
Print name:	Student signature:	Date:

Name ; _____ Date ; _____

Instructions to Candidates:

Access to HE Diploma Physics

2 hour assessment

- Answer **all** questions. Remember to take into account the information shown previously as to how the Grade Descriptors will be assessed.
- Write your answers on the paper provided
- To achieve a Pass it is not sufficient for you to only obtain correct results to numerical questions; you must also state clearly the principles involved and their bearing on the question
- Clear diagrams should be used when appropriate
- You should quote numerical answers to a number of significant figures appropriate to the question
- Graph paper is available on request
- You are reminded of the need for good English and clear presentation
- Maximum time allowed: 2 hours
- Acceleration due to gravity, g = 10 ms^{-2}

Question	**1**	**2**	**3**	**4**		**5**	**6**	**7**	**8**	**9**	**10**
AC	**2.1**	**2.2**	**2.3**	**3.1**	**3.3**	**3.2**	**3.4**	**3.5**	**3.6**	**3.7**	**3.8**
AC achieved? Y/N											

Access to HE Diploma Physics

2 hour assessment

1. (AC 2.1)

   a) There are several equations of motion which can be used to study the dynamics of objects. Three are given below:

$$v = u + at \qquad v^2 = u^2 + 2as \qquad s = ut + \frac{at^2}{2}$$

   Name each of the terms in the formula and give their correct units

   b) A ball is dropped from a height of 100 m and falls vertically to the ground. Find its velocity (i) 80 m above the ground, (ii) 50 m above the ground and (iii) just before hitting the ground. Neglect air resistance.

2. (AC 2.2)

   a) A ball is thrown at an angle of 30° to the horizontal with an initial speed of 10 ms^{-1}. Calculate (i) its maximum height and (ii) its maximum range
   b) The same ball is thrown at an angle of 45° to the horizontal with an initial speed of 10 ms^{-1}. Calculate (i) its maximum height and (ii) its maximum range
   c) An archer wishes to achieve a range of 100 m. If the archer fires the arrow at an angle of 45° to the horizontal, what initial speed is required?

3. (AC 2.3)

   A car is travelling towards some traffic lights at 15 ms^{-1} when the driver sees the light change to red. It takes the driver 2.0 s to react, and the car decelerates on braking at a rate of $-7.5 \cdot ms^{-2}$. Calculate:
   a) the initial speed in $kmhr^{-1}$
   b) the distance the car travels before the driver reacts
   c) the distance travelled whilst the brakes are applied the total stopping distance
   d) the time taken to stop once the driver has started to brake
   e) the total time taken for the car to stop

4. (AC 3.1and 3.3)

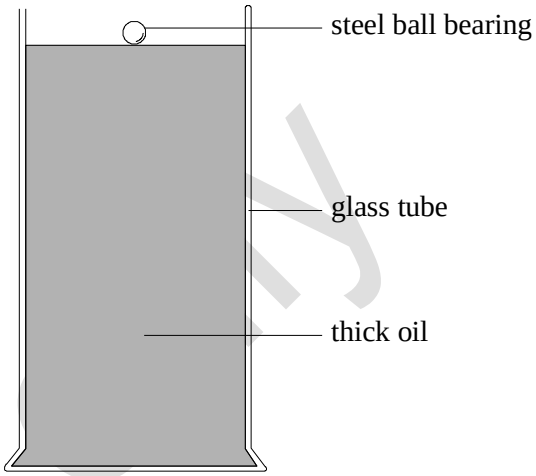
   a) Define the term resultant force
   b) Draw a force diagram to show a book at rest on a level table
   c) Draw a force diagram to show a book at rest on an inclined table
   d) From your diagrams in (a), show how W=mg
   e) Describe what is meant by W, m, and g, providing the units in each case

5. (AC 3.2)

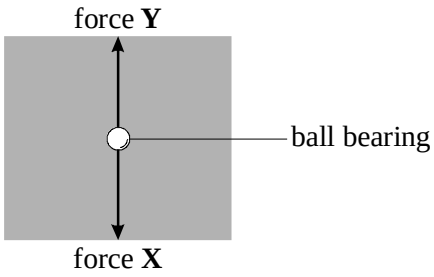
State each of the three Newton's laws of motion

6. (AC 3.4)

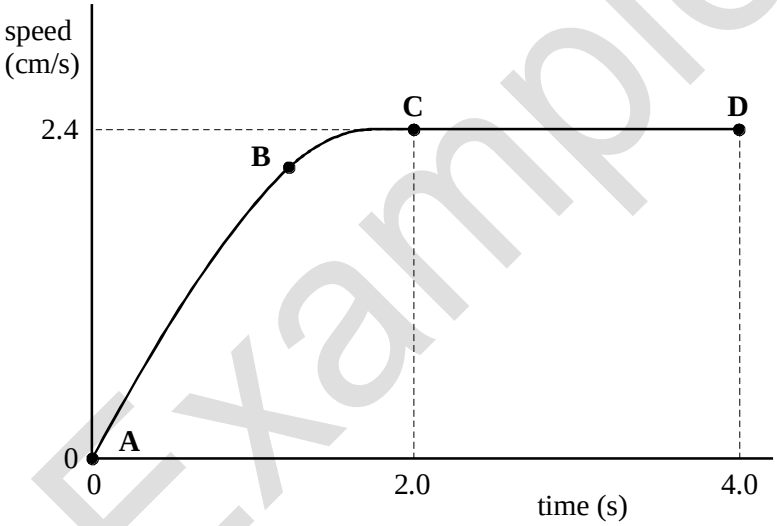
A student carries out an experiment with a steel ball bearing and a tube of thick oil. The diagram shows the apparatus used. The student releases the ball bearing and it falls through the oil.



The forces X and Y act on the ball bearing as it falls through the oil. This is shown on the diagram.



The graph shows how the speed of the ball bearing changes as it falls through the oil.



a) What is happening to the speed of the ball bearing between points A and B?
b) Explain, in terms of forces X and Y, why this happens.
c) What is happening to the speed of the ball bearing between points C and D?
d) Explain, in terms of forces X and Y, why this happens

7. (AC 3.5)

   a) State two equations which can be used to represent Newton's Second Law
   b) A child pushes a small wagon with a dog in it. The total mass of the dog and wagon is 45 kg. The wagon accelerates at 0.85 ms^{-2}. What force is the child pulling with?
   c) A force of 10 N is applied to a body of mass, 6 kg. What acceleration is produced?

   d) A force of 100 N produces, on a body, an acceleration of 4 ms^{-2}. What is the mass of the body?

8. (AC 3.6)

   State the principle of conservation of momentum

9. (AC 3.7)

   a) Calculate the momentum of a bullet (mass, 50 g) travelling at a velocity of 100 ms^{-1}.
   b) Calculate the momentum of a car (mass 1000 kg) travelling with a velocity of 20 $kmhr^{-1}$.

   c) Calculate the velocity of a body, mass 500g, which has a momentum of 10 $kgms^{-1}$.

10. (AC 3.8)

    a) A racing car moving at 25 ms^{-1} collides with a wall. The driver of mass 65 kg is brought to rest by their seatbelt in 0.2 s. Calculate the change in momentum of the driver.
    b) A gas molecule of mass, 5 x 10^{-26} kg, travelling at 320 ms^{-1} strikes the side of a container perpendicularly. The collision is elastic. Calculate the change in momentum of the molecule during its collision with the side of the container.

    c) A body (mass, 5 kg) travelling with a velocity of 10 ms^{-1} collides with a stationary body (mass, 15 kg). They move off together. Assuming conservation of momentum, what is the resultant velocity of the two bodies?