# Access to HE Diploma
# Assignment Brief (Form AP3)

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| **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:** | 3 of 4<br>Structured questions: Forces, Energy and Current Electricity |
| **Assessor name:** | John Smith |

**Assignment briefing and mapping to unit:**

This assignment consists of a series of questions. They should all be completed.

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

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

LO 4 Understand forces and solve related problems
AC 4.1 Verify the relationship between force and acceleration
AC 4.2 Demonstrate how to use a vector triangle to represent forces in equilibrium
AC 4.3 Define and use the moment of a force and the torque of a couple, to perform calculations
AC 4.4 Apply the principle of moments in calculations

LO 5 Be able to apply the concepts of work, heat, energy, power and efficiency to solve simple problems in energy conversion
AC 5.1 Summarise examples of different forms of energy
AC 5.2 Apply the principle of energy conservation in the context of the First Law of Thermodynamics to a range of examples
AC 5.3 Explain the concepts of heat and work as energy exchange mechanisms
AC 5.4 Discuss heat transfer in terms of a temperature driving force and work in terms of the product of a force and displacement
AC 5.5 Calculate Heat Transfer from the derived equation Q = mC$\Delta$T and Work Transfer from the equation W = Fs in appropriate situations
AC 5.6 Discuss energy associated with movement (Kinetic Energy, $\frac{1}{2}mv^2$) and position (Potential Energy, mgh) and their importance in the energy conservation equation
AC 5.7 Explain the conversion of energy transferred as heat into energy produced as a work output
AC 5.8 Describe power generation and associated efficiency
AC 5.9 Carry out calculations of energy outputs per unit time (power)

LO 8 Understand current electricity and related formulae
AC 8.1 Explain charge and the coulomb
AC 8.2 Explain electric current as the flow of charged particles, and use the equation Q = It (or I = $\Delta$Q/$\Delta$t) in calculations
AC 8.3 Explain potential difference and the volt
AC 8.4 Use V = E/Q in calculations

AC 8.5 Use P = VI and P = $I^2R$ in calculations
AC 8.6 Explain resistance and the ohm
AC 8.7 Recall and apply Ohms Law, V=IR
AC 8.8 Calculate the combined resistance for two, or more, resistors in series and/or parallel.
AC 8.9 Sketch and explain the I/V characteristics of a metallic conductor at constant temperature

**Grading information for this assignment**
*(Add/delete sections below if this assignment uses more than two grade descriptors)*

| **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<br><br>Contextualisation:- You have a very good grasp of the knowledge base. However, on occasions, full explanations are not given. |
| **For distinction:** | A demonstrates an **excellent** grasp of the relevant knowledge base<br><br>Contextualisation:- You have an excellent grasp of the knowledge base, 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<br>• techniques<br><br>and<br><br>b applies appropriate (selected or given)<br>• methods<br><br>with<br><br>**c very good** levels of<br>• accuracy<br><br>Contextualisation:- you 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 not always given to a number of significant figures appropriate to the question. |
| **For distinction:** | a **consistently** selects appropriate<br>• techniques<br><br>and<br><br>b applies appropriate (selected or given)<br>• methods |

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| | with<br><br>c **excellent** levels of<br>• accuracy<br><br>Contextualisation:- you obtain correct results to numerical questions, in each case, stating clearly 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<br><br>Contextualisation:- you provide correct responses to questions. 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. |
| **For distinction:** | c taken as a whole, demonstrates an **excellent** response to the demands of the brief/assignment<br><br>Contextualisation:- you obtain correct results to questions, in each case, stating clearly the principles involved and their bearing on the question. You also quote numerical answers to a number of significant figures appropriate to the question. |
| **Additional Guidance notes** | |

| **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: |

# Access to HE Diploma Physics Time Structured Questions Assessment

Name ; _____ Date ;_____

**Instructions to Candidates**

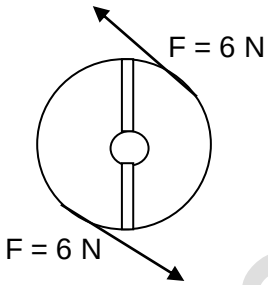
- Answer **all** questions.
- Write your answers on the paper provided.
- It is not sufficient for you to obtain correct results to numerical questions; you must state clearly the principles involved and their bearing on the question.
- You should quote numerical answers to a number of significant figures appropriate to the question.
- You are reminded of the need for good English and clear presentation.
- Acceleration due to gravity, g = 10 $ms^{-2}$
- charge on an electron = -1.6 x $10^{-19}$ C

| **Question** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Assessment Criteria** | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 5.4 | 5.3 5.4 | 5.5 | 5.6 | 5.7 | 5.8 | 5.9 | 8.1 | 8.2 | 8.3 | 8.4 | 8.5 | 8.6 | 8.7 | 8.8 | 8.9 |
| **Achieved? Y/N** | | | | | | | | | | | | | | | | | | | | | | |

1. (AC 4.1)
   a) State the relationship between force and acceleration, indicating the units which are used for the variables.
   b) Calculate the force needed to accelerate a boat of mass 30 tons uniformly from rest to a speed of 28.8 km $h^{-1}$ in 10 minutes.

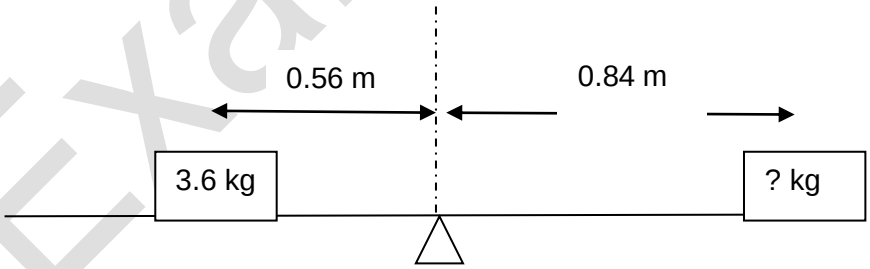
2. (AC 4.2)
   An object is subject to a force of 45 N at an angle of 0° and a second force of 70 N at an angle of 130°.
a) Draw a vector diagram to find the resultant force acting on this object and its angle.
b) What would be the magnitude and angle of the force that held this object in a state of equilibrium?

3. (AC 4.3)
a) What is meant by moment of a force?
b) What is a couple?
c) When making a turn, a driver exerts two forces on the steering wheel:




Assuming that the streering wheel has a diameter of 400 mm, determine the moment associated with these forces.

4. (AC 4.4)
   a) What mass will be required to make the beam below balance?




5. (AC 5.1)

State the energy transformations taking place in each of the following:
a) Toaster
b) Blender
c) Gas hob
d) Solar Panel

6. (AC 5.2)
   Define the first law of conservation and give 3 practical examples.

7. (AC 5.3, 5.4)
   Define the concepts of heat and heat transfer.

8. (AC 5.3, 5.4)
   What is meant by work?

9. (AC 5.5)
   a) How much work is done lifting a 5.5 kg block to a height of 1.8 metres?
   b) Calculate the Heat lost by the block when iron block decreases its temperature from 60°C to 40°C if the mass of the body is 2 Kg. (Specific heat capacity of iron, $C^{Fe}$ = 0.45 kJ $kg^{-1}$ $K^{-1}$).

10. (AC 5.6)
    A canister containing some meteorological equipment with a mass of 4 kg is fired vertically upwards from a gun with an initial velocity of 400 $ms^{-1}$. Neglecting air resistance find:
    a) The initial kinetic energy
    b) The velocity at a height of 1 km
    c) The maximum height reached

11. (AC 5.7)
    Briefly explain the conversion of energy transferred as heat into energy produced as a work output .

12. (AC 5.8)
    Describe how power is generated, and define efficiency.

13. (AC 5.9)
    a) A crane does 50 kJ of work in lifting an object 15 m. What is the mass of the object? If the lift takes 8 seconds what is the power of the crane?
    b) A mobile phone charger uses 4.25 J $s^{-1}$ but only 1.5 J $s^{-1}$ goes into the mobile phone's battery. How efficient is the charger and what happens to the 'missing' 2.75 $Js^{-1}$ ?

14. (AC 8.1)
    Define electric charge and state the unit in which it is measured.

15. (AC 8.2)
    a) Explain electric current as the flow of charged particles, Q=It.
    b) Calculate the charge passing through a torch bulb in 5 minutes when the torch bulb carries a steady current of 0.3 A.
    c) Calculate the number of electrons hitting the screen of a television tube each second when the beam current is 1 mA.

16. (AC 8.3)
    Explain potential difference and the volt.

17. (AC 8.4)
    How much energy is transferred when the potential difference between two points in an electric circuit is 120 V and the charge transferred is 2 C?

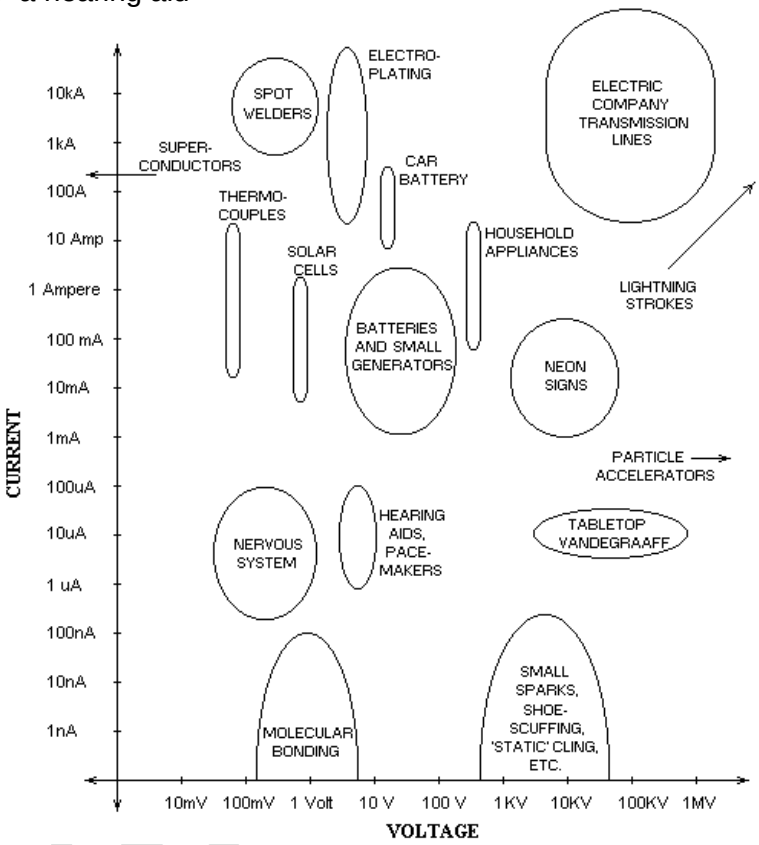
18. (AC 8.5)

a) A 12.0 V car battery, of negligible internal resistance, is connected to a bulb with a power rating of 6.0 W. Calculate:

(i) the current flow through the bulb
(ii) the effective resistance of the bulb.
(iii) the amount of energy which is converted in the bulb in 5 minutes.

b) Use the chart (below) to estimate the power developed by:

(i) a Van De Graaff generator
(ii) a car battery
(iii) a hearing aid




(from ; http://www.eskimo.com/~billb/miscon/ele-map.html)

19. (AC 8.6)
Define electrical resistance

20. (AC 8.7)
A potential difference of 12.0 V is maintained across an 8 Ω resistor. Calculate the electrical current passing through the resistor.

21. (AC 8.8)
Calculate the combined resistance for each of the following resistor combinations:
a) an 8 Ω resistor and a 16 Ω resistor connected (i) in series, and (ii) in parallel
b) three 8 Ω resistors connected (i) in series, and (ii) in parallel

22. (AC 8.9)
Sketch and explain the I/V characteristics of a metallic conductor at constant temperature