



SAMPLE ASSESSMENT TASKS

PHYSICS
GENERAL YEAR 12

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Sample assessment task

Physics – General Year 12

Task 3 – Unit 3

Assessment type: Science inquiry: Investigation

Conditions

Period allowed for completion of the task: two weeks

Task weighting

7% of the school mark for this pair of units

Investigation: Factors affecting the severity of collisions

(47 marks)

Many factors can influence how serious a vehicle collision is and how it effects the people in the car. These include:

- speed
- road surface – gravel or smooth bitumen, wet or dry conditions
- crash barriers on the sides of roads
- seat belts
- tyres
- crumple zones in cars
- brake efficiency
- air bags
- driver’s reaction time.

Task

Your task is to **design an investigation** to determine how **one** factor will influence the forces in a collision. You can investigate the effects of these forces on the vehicle or on the driver and passengers.

Decide which measurements you will make and how you will process the data in your analysis (do calculations to determine force, acceleration or deceleration).

Preparation

Research how far a car will travel after the driver decides to fully apply the brakes. This is called stopping distance and will depend on the initial speed of the car and other factors like the driver’s reaction time, tyres, road surface, vehicle type and mass of the car.

Present your information in a table. Include **two** sources of information.

Suggestions

- Use trolleys and ramps to alter the speed of a trolley. Test the effects of increasing speed on plasticine dummies or a barrier.
- Use trolleys and plasticine to model people in vehicles. Create crumple zones, air bags, seat belts or padded dashboards with other materials, and conduct crash tests.
- Design your own procedure.

Remember that if you are testing one factor (your independent variable), everything else (such as the mass and speed of the trolley) must be the same. These are your controlled variables.

Use the following *Planning and Report Worksheet for Science Investigations* to assist with writing up your investigation.

Stages of the Investigation

Preparation: Research into stopping distance (6 marks)

Part 1: Planning (19 marks)

In your group, plan the investigation, and decide which equipment you will need.

Part 2: Conducting (5 marks)

Conduct the investigation, and collect the data.

Part 3: Processing (13 marks)

Record your group's results and process them.

Part 4: Evaluating (4 marks)

Evaluate your investigation and suggest how it could be improved.

Planning and Report Worksheet for Science Investigations

Student name _____

Other members of your group _____

Part 1 – Planning

What is the question you are investigating?

What do you know about this topic from personal experience and from science?

Which variables may affect the phenomenon you are investigating?

Which of the variables are you going to investigate as your independent variable? (This is the variable you will change to see what effect it has on the dependent variable.)

How will the independent variable be changed in the experiment?

What is the dependent variable (i.e. the variable that responds to changes in the independent variable)?

How will you measure the dependent variable?

Write a hypothesis for the investigation.

Predict what you think will happen and explain why you think this.

Which variables are to be controlled (kept constant) to make it a fair test?

Describe your experimental set-up using a labelled diagram and explain how you will collect your data.

Clearly describe your method.

Are any special safety precautions required?

Part 2: Conducting

Carry out some preliminary trials. Were there any problems?

How did you modify your experiment to fix the problems?

Collect and record the data you need to test your hypothesis. Draw your data table here.

Title of table: _____

How did you make sure your data were valid?

Part 3: Processing

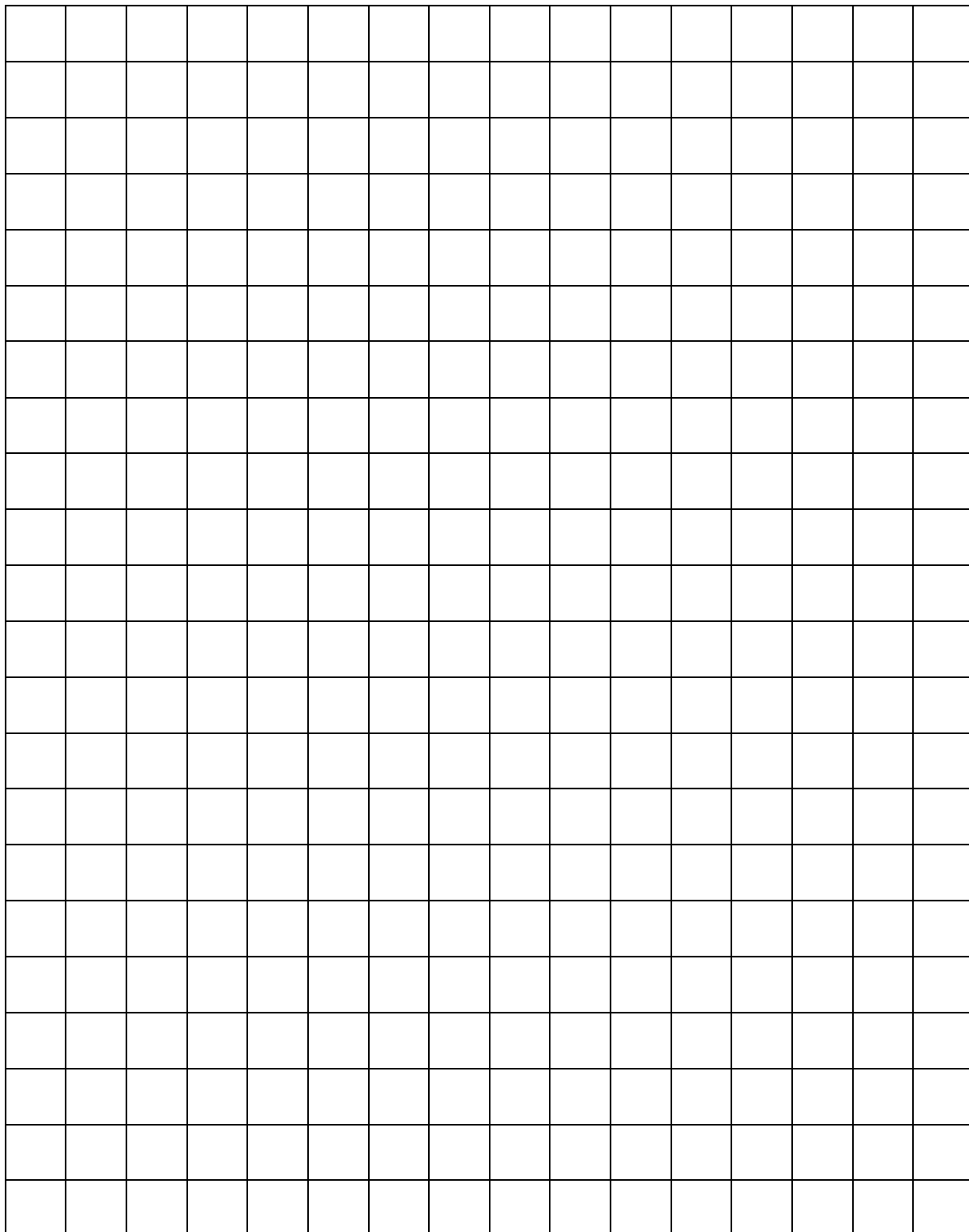
What is the best way to present your data? Is it appropriate to draw a graph? Which type of graph is most suitable? Use the graph paper provided.

Remember to plot the independent variable on the horizontal axis.

Remember that the title of the graph should mention both the independent and dependent variables.

Use this space to do any relevant calculations.

Graph title: _____



Are there any patterns or trends in your data? What is the relationship between the variables you have investigated?

Use science concepts to explain the patterns, trends or relationships you have identified in your data. What is your conclusion? Is the hypothesis supported by the data?

Part 4: Evaluating

What are the main sources of experimental error?

How confident are you with your conclusions? How much uncertainty/error is associated with your data?

How could the design of the experiment be improved to reduce error?

What have you learned about the topic of your investigation? Was the outcome different from your expectation? Explain.

ACKNOWLEDGEMENTS**Planning and Report Worksheet questions**

Adapted from: Hackling, M. W. (2005). *Working scientifically: Implementing and assessing open investigation work in science* (Rev. ed.) (Appendices 2 & 3: Planning and report worksheet for science investigations). Perth: Department of Education and Training, pp. 27–38.

Marking key for sample assessment task 3 – Unit 3

Preparation: Research into stopping distance		Marks
Constructs an appropriate table to present the research information		1
<ul style="list-style-type: none"> • appropriate title 		1
<ul style="list-style-type: none"> • appropriate column headings 		1
<ul style="list-style-type: none"> • columns for each type of factor affecting stopping distance 		1
<ul style="list-style-type: none"> • clear summary of research 		1
Includes two sources of information		1–2
Total		/6
Part 1 – Planning		Marks
Clearly describes the aim of the investigation		1
Identifies the independent variable		1
Identifies the dependent variable		1
Writes a hypothesis		1
States controlled variables		1–2
Lists all materials required		1–2
Shows a labelled diagram or photograph of equipment set-up		1–2
Clearly lists the procedure/method to be used		1–2
<ul style="list-style-type: none"> • clearly describes equipment and how it is set up 		1–2
<ul style="list-style-type: none"> • describes how trials are to be conducted in a clear logical manner 		1–2
<ul style="list-style-type: none"> • description of method allows for investigation to be repeated by others 		1–2
<ul style="list-style-type: none"> • states how measurements are to be collected 		1–2
<ul style="list-style-type: none"> • plans for repeat trials 		1
Total		/19
Part 2 – Conducting		Marks
Selects appropriate equipment and collects valid results		1–2
Displays data in suitable table		1
<ul style="list-style-type: none"> • appropriate headings for columns 		1
<ul style="list-style-type: none"> • column for averages 		1
Averages data from repeat trials		1
Total		/5
Part 3 – Processing		Marks
Selects appropriate equations		1–2
Calculates speed, acceleration or deceleration correctly		1–2
Displays data in a suitable graph		1
<ul style="list-style-type: none"> • title 		1–2
<ul style="list-style-type: none"> • labelled axes with units 		1
<ul style="list-style-type: none"> • data correctly plotted 		1
<ul style="list-style-type: none"> • line of best fit drawn 		1
Makes a valid statement about trends in the data		1–2
States conclusion and relates it to the hypothesis		1–2
Total		/13
Part 4 – Evaluating		Marks
Discusses sources of uncertainty and error in the investigation		1–2
Makes reasonable suggestions for improvements to procedure		1–2
Total		/4
Investigation total		/47

Sample assessment task

Physics – General Year 12

Task 5 – Unit 3

Assessment type: Extended response

Conditions

Period allowed for completion of the task: two weeks

Task weighting

10% of the school mark for this pair of units

Extended response: Physics of a sport

(45 marks)

Preparation: Class discussion

As a class, watch some video footage of a variety of sports. These could include football, skiing, motor sports or cycling. Discuss how the desirable forces (that produce acceleration and speed, or friction for changing direction) are maximised and the undesirable forces (like friction slowing objects) are minimised in the examples that you view.

Look at how the athlete's body or vehicle produces the desirable forces and decreases the undesirable forces.

Discuss how any equipment is used to produce the desirable forces or reduce the undesirable forces. For example, if you notice that a sprint cyclist has a particular shape helmet, explain how this assists the cyclist, using scientific concepts.

Written report

Choose a sport with which you are familiar. You will already have an understanding of the aims of the players and the techniques and skills involved. Your task is to explain these using physics principles. Refer to the concepts of acceleration; speed; forces including friction, gravity and thrust; and Newton's laws, and relate these to your sport.

Your information will be presented as a written report which includes labelled diagrams to illustrate your points. Your report should discuss **three aspects** of your sport in detail (for example, the tennis serve, the shoes, the ball's travel through the air), and be **four pages long, including diagrams**.

(36 marks)

Oral presentation

You are also required to give an oral presentation to your group using some audiovisual aids, and answer relevant questions from the audience.

(9 marks)

Marking key for sample assessment task 5 – Unit 3

Extended response: Physics of a sport

Description	Marks
Aspect 1 of sport	
Describes the aim of the aspect of the sport that is to be discussed, e.g. speed, acceleration, accuracy	1–2
Describes at least 2 ways desirable forces are increased	1–2
Explains relevant physics principles in these examples	1–2
Describes at least 2 ways undesirable forces are decreased	1–2
Explains relevant physics principles in these examples	1–2
Includes clear, labelled diagrams to illustrate forces involved	1–2
	/12
Aspect 2 of sport	
Describes the aim of the aspect of the sport that is to be discussed, e.g. speed, acceleration, accuracy	1–2
Describes at least 2 ways desirable forces are increased	1–2
Explains relevant physics principles in these examples	1–2
Describes at least 2 ways undesirable forces are decreased	1–2
Explains relevant physics principles in these examples	1–2
Includes clear, labelled diagrams to illustrate forces involved	1–2
	/12
Aspect 3 of sport	
Describes the aim of the aspect of the sport that is to be discussed, e.g. speed, acceleration, accuracy	1–2
Describes at least 2 ways desirable forces are increased	1–2
Explains relevant physics principles in these examples	1–2
Describes at least 2 ways undesirable forces are decreased	1–2
Explains relevant physics principles in these examples	1–2
Includes clear, labelled diagrams to illustrate forces involved	1–2
	/12
Oral presentation	
Presents information logically	1–2
Uses clear voice	1
Uses appropriate audiovisual aids	1–2
Answers relevant questions	1–2
Lists references (at least two)	1–2
	/9
Total	/45

Sample assessment task

Physics – General Year 12

Task 11 – Unit 4

Assessment type: Test

Conditions

Time for the task: 45 minutes

Task weighting

7% of the school mark for this pair of units

Test: Electric power, safety, magnetism

(54 marks)

1. (a) An electric power cord has a plug with three prongs or pins. One of these pins is connected to the earth wire. Describe what the earth wire in an electric circuit does. (3 marks)

- (b) Sam is using the washing machine to wash his clothes. If the earth wire is not correctly connected in the electric lead, there could be a short circuit in the washing machine. If Sam has wet hands when he touches the washing machine's metal case, describe the effects a short circuit could have in Sam's body. (3 marks)

2. If people are caught in a lightning storm, they are told to stay inside their car rather than getting out of the car.
- (a) How does a metal car protect them from electric shock? (2 marks)
- (b) Name **one** added precaution they should take when staying inside the car. (1 mark)
3. Most household electrical appliances contain fuses. Explain how this protects the device. (4 marks)
4. (a) Sort the following materials into conductors and insulators in the table below:
rubber, glass, aluminium, plastic, copper, graphite, wood, iron. (8 marks)

CONDUCTORS	INSULATORS

(b) Draw a diagram of an electrical circuit showing how you would connect equipment to test whether a sample is a conductor or not. Use the correct circuit symbols. (3 marks)

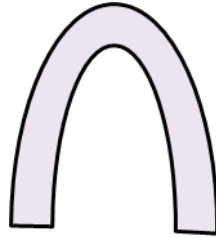
5. For thousands of years, navigators have used compasses to determine their direction.

(a) List **three** essential elements of a simple compass. (3 marks)

(b) Explain how a compass works. (3 marks)

6. Label north and south poles on the horseshoe magnet and the bar magnet and draw the magnetic fields around the following three objects. Draw at least **five** magnetic field lines on each diagram. (9 marks)

(i)



(ii)



- (iii) The diagram below is of a wire with current travelling into the page.



7. (a) Explain how electricity can be produced using magnets and wires. (3 marks)

(b) Describe **three** ways of increasing the amount of electricity produced. (3 marks)

(c) Most electric power stations burn gas or coal to produce steam. Electricity can be produced by wind turbines without the need to produce heat. Describe how this happens. (2 marks)

(d) Describe **one** advantage and **one** disadvantage of wind turbines compared with oil-fired power stations. (2 marks)

8. (a) Our households use a 240 volt power supply, and a clothes dryer has a power rating of 5000 watts. Calculate the current that this clothes dryer would use.

Use the formula $P = VI$ and show the correct units in your answer.

(3 marks)

- (b) A washing machine has a power rating of 500 watts. How would the cost of running the washing machine compare with running the clothes dryer in part (a)? (2 marks)

Marking key for sample assessment task 11 – Unit 4

Test: Electric power, safety, magnetism

- An electric power cord has a plug with three prongs or pins. One of these pins is connected to the earth wire. Describe what the earth wire in an electric circuit does.
 - Sam is using the washing machine to wash his clothes. If the earth wire is not correctly connected in the electric lead, there could be a short circuit in the washing machine. If Sam has wet hands when he touches the washing machine's metal case, describe the effects a short circuit could have in Sam's body.

Description	Marks
(a) safety	1
provides a low resistance pathway for current	1
prevents current travelling through the person	1
(b) muscle spasm	1
burns	1
possible heart failure and/or death	1
Subtotal	/6
Accept other relevant answers	

- How does a metal car protect them from electric shock?
 - Name **one** added precaution they should take when staying inside the car.

Description	Marks
(a) metal is a good conductor	1
it conducts the electricity around outside of car	1
(b) don't touch the side of the car	1
Subtotal	/3

- Most household electrical appliances contain fuses. Explain how this protects the device.

Description	Marks
if there is too much current entering the circuit	1
fuse is made of low melting point wire	1
fuse melts, breaking the circuit	1
protecting the appliance from high current	1
Subtotal	/4

- Sort the following materials into conductors and insulators in the table below.
 - Draw a diagram of an electrical circuit showing how you would connect equipment to test whether a sample is a conductor or not. Use the correct circuit symbols.

Description	Marks
(a) conductors: aluminium, copper, graphite, iron insulators: rubber, plastic, glass, wood	1–8
(b) power source correct symbol	1
globe or ammeter	1
wires to connect to sample	1
Subtotal	/11

5. For thousands of years, navigators have used compasses to determine their direction.
- List **three** essential elements of a simple compass.
 - Explain how a compass works.

Description	Marks
(a) a magnetised needle, a pivot for it to rotate around, north pole marked	1–3
(b) the magnetised needle aligns with the Earth's magnetic field	1
so north can be determined	1
your bearing can be taken from north	1
Subtotal	/6

6. Draw at least **five** magnetic field lines on each diagram.

Description	Marks
1 mark for lines in each diagram (no lines crossed)	1–3
1 mark for correct pattern in each diagram	1–3
1 mark for correct arrows on each diagram	1–3
Subtotal	/9

7. (a) Explain how electricity can be produced using magnets and wires.
 (b) Describe **three** ways of increasing the amount of electricity produced.
 (c) Most electric power stations burn gas or coal to produce steam. Electricity can be produced by wind turbines without the need to produce heat. Describe how this happens.
 (d) Describe **one** advantage and **one** disadvantage of wind turbines compared with oil-fired power stations.

Description	Marks
(a) when a wire cuts through a magnetic field line	1
charge moves in the conductor	1
so move a coil of wire past a magnet or move a magnet past a wire	1
(b) move wire faster	1–3
use more coils of wire	
use a stronger magnet	
(c) the steam is used to turn the turbine	1
in wind turbines, the wind provides the movement of coils in magnetic field	1
(d) advantage: no pollution, cheap after setup, no need for transport of fuel, etc.	1
disadvantage: irregular production, perceived effect on birds, noise, etc.	1
Subtotal	/10
Accept other relevant answers	

8. (a) Calculate the current that this clothes dryer would use.
 (b) A washing machine has a power rating of 500 watts. How would the cost of running the washing machine compare with running the clothes dryer in part (a)?

Description	Marks
(a) $P = VI$ $5000 = 240 \times I$ $I = 20.8 \text{ A}$ 1 mark for working, 1 for answer, 1 for unit	1–3
(b) since power is 1/10 of dryer	
cost would be 1/10 (1 mark only for 'less')	1
Subtotal	/5
Test total	/54