LEVEL 2

WJEC Level 2 Additional Mathematics

Approved by Qualifications Wales

Sample Assessment Materials

Unit 5: Mechanics

Teaching from 2026
For award from 2027

This Qualifications Wales regulated qualification is not available to centres in England.

Made for Wales.
Ready for the world.

WJEC would like to thank the students and teachers of Fitzalan High School, Cardiff and Llanwern High School, Newport for their participation in the creation of these covers.

Contents

Surname	Centre number	Candidate number
First name(s)		0

Level 2

5322U5

Additional Mathematics – Unit 5 Mechanics

50 minutes

SAMPLE ASSESSMENT MATERIALS

Additional materials

The use of a calculator will be required for this examination.

Instructions to candidates

Use black ink or black ball-point pen. Do **not** use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces provided at the top of this page.

Answer **all** the questions in the spaces provided.

Write your answers in the spaces provided in this booklet. If you need more space, use the additional page(s) at the back of this booklet, taking care to number the question(s) correctly.

For examiner's use only		
Question	**Maximum mark**	**Mark awarded**
1.	**3**	
2.	**2**	
3.	**5**	
4.	**10**	
5.	**8**	
6.	**7**	
7.	**5**	
Total	**40**	

Information for candidates

The number of marks is given in brackets at the end of each question or part-question.

In question **4(b)**, the assessment will take into account the quality of your mathematical organisation, communication and accuracy in writing.

Formula List – Unit 5 Mechanics

Newton's second law

$F = ma$ (resultant force = mass × acceleration)

Constant acceleration

$v = u + at$

$s = ut + \frac{1}{2}at^2$

$v^2 = u^2 + 2as$

$s = \frac{1}{2}(u + v)t$

Answer **all** questions.

Examiner only

1. (a) Some physical quantities are completely defined by their magnitude.
What is the name given to these quantities? [1]

……

(b) A vector quantity has both magnitude and direction.
Circle all the vector quantities in the list below. [2]

Speed Velocity Weight

Mass Force Distance Displacement

Examiner only

2. (a) A car is travelling at a constant speed on the motorway between Cardiff and Swansea.
The car's engine applies a force, F, propelling the car forward.
A resistive force, R, opposes the forward motion of the car.

Compare the magnitudes of forces F and R. [1]

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(b) A particle, *A*, is subjected to four forces as shown in the diagram below.
All the forces act in either a vertical or horizontal direction.

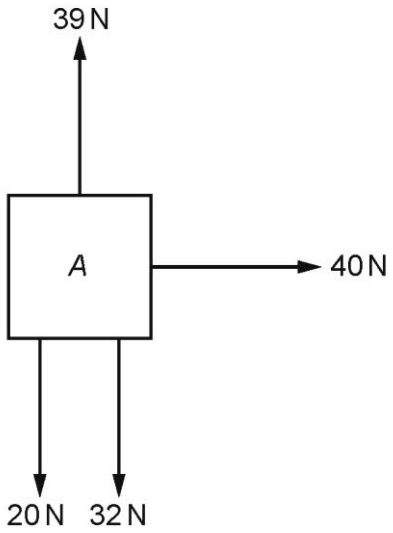

Diagram not drawn to scale

Calculate the resultant force in the vertical direction.
You must give the size and direction of the resultant force. [1]

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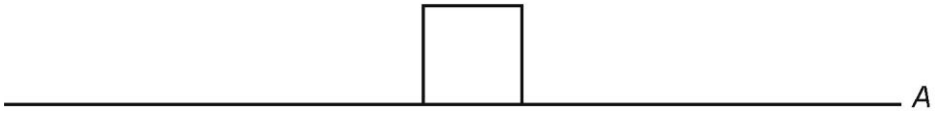
Examiner only

3. A particle of mass 5 kg is initially at rest on a smooth table as shown in the diagram below.



(a) A constant force of 28 N is applied to the particle.
This force is parallel to the table and in the direction of *A*.
A force of 10 N opposes the motion of the particle.

On the diagram above, show **all** the forces that are acting on the particle. [2]

(b) The particle accelerates towards *A*.
Calculate this acceleration. [3]

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Examiner only

4. A train, starting from rest at a point *A*, travels along a straight horizontal track towards a point *B*. The distance between points *A* and *B* is 6 km.

Initially, the train accelerates at a rate of $2\,ms^{-2}$ until it reaches a speed of $48\,ms^{-1}$. The train then continues at $48\,ms^{-1}$ until it passes the point *B*.

(a) Show that the train travels 576 m while accelerating. [2]

(b) *In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

Calculate the total time taken by the train to travel from point *A* to point *B.* [6 + 2 OCW]

You must show all your working.

Examiner only

5. A ball is thrown vertically upwards with an initial velocity of $27\,ms^{-1}$.

(a) After the ball is released, what is the main force acting on the ball? [1]

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(b) Calculate the velocity of the ball after 2 seconds. [2]

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(c) Calculate the **times** at which the ball is 4 m above the point where it was thrown.

Give your answers correct to 2 decimal places. [5]

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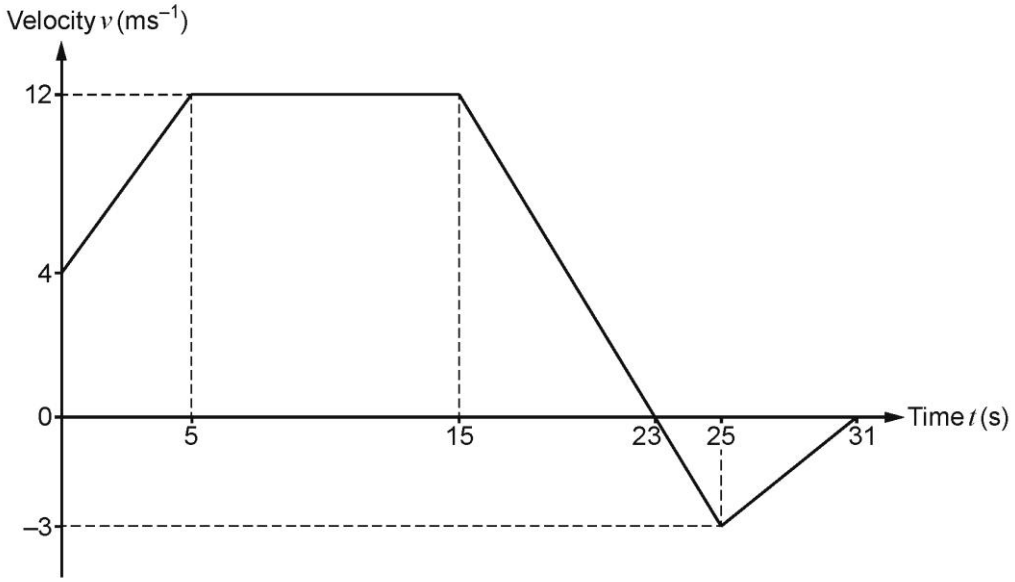
Examiner only

6. A particle, which is initially at the point *A*, travels in a straight line during the interval $0 \leq t \leq 31$, where t is the time in seconds.
The particle reaches the point *B* after 23 seconds.
The diagram below shows a velocity-time graph for the motion of the particle.



(a) Calculate the acceleration of the particle during the first 5 seconds. [2]

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(b) How far is the point *B* from the point *A*? [3]

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(c) Calculate the **distance** travelled by the particle after 31 seconds. [2]

Examiner only

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Examiner only

7. Helen is cycling to her friend's house. She starts her journey from rest outside her house and travels along a straight horizontal road. The distance between her house and her friend's house is 1000 m.

Initially, she accelerates uniformly for 20 seconds until she reaches a speed of $8\,ms^{-1}$. She then continues at $8\,ms^{-1}$ until she reaches her friend's house.

(a) Show that Helen travels 80 m while she is accelerating. [2]

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(b) Sketch a displacement-time graph for Helen's journey between her house and her friend's house.
Clearly indicate the time at which Helen reaches her friend's house. [3]

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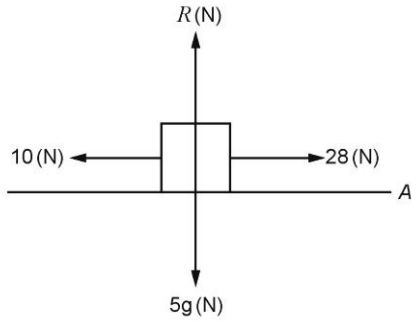
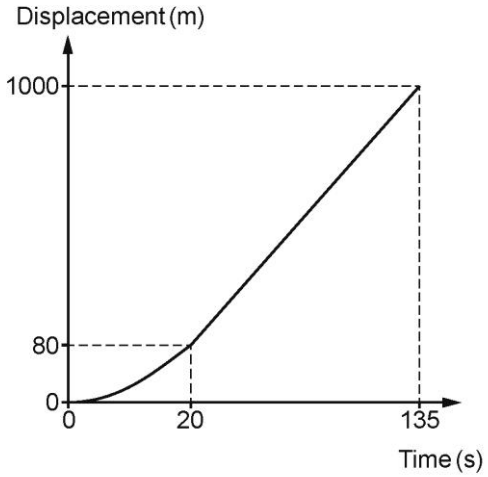
END OF QUESTIONS

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.
	…… ……

MARK SCHEME

Level 2 Additional Mathematics Unit 5: Mechanics SAMs		Mark	Comments
1(a)	Scalar (quantity)	B1	
1(b)	Velocity Weight Force Displacement	B2	With no other quantities circled B1 for any 2 or 3 correct, with at most 1 incorrect quantity circled
2(a)	$F = R$ or equivalent	B1	
2(b)	13 (N) downward	B1	
3(a)		B2	Accept 49 (N) for 5g Accept 5g or 49 (N) for R B1 for any 2 correctly drawn forces
3(b)	$28 - 10 = 5a$ or equivalent $(a =)$ 3.6 (ms^{-2})	M2 A1	e.g. $18 = 5a$ or $\frac{28-10}{5} = a$ M1 for any one of the following: • $28 = 5a$ or equivalent (leads to $a = 5.6$) • $28–10=a$ or equivalent (leads to $a = 18$) • $10 = 5a$ or equivalent (leads to $a = 2$) Or equivalent. CAO
4(a)	$v^2 = u^2 + 2as$ $u = 0$, $v = 48$, $a = 2$ s = 576 (m)	M1 A1	Or equivalent full method
4(b)	Time accelerating $v = u + at$ or $s = \left(\frac{u+v}{2}\right)t$ or $s = ut + \frac{1}{2}at^2$ $u = 0$, $v = 48$ $a = 2$, $s = 576$ t = 24 (s) Distance travelled at 48 ms^{-1} (6000 – 576 =) 5424 (m) Time at constant speed $s = \left(\frac{u+v}{2}\right)t$ or $s = ut + \frac{1}{2}at^2$ $u = 48$, $v = 48$, $s = 5424$, $a = 0$ t = 113 (s) Total time (= 24 + 113) = 137 (s)	M1 A1 B1 M1 A1 A1	FT ‘their 5424’ but not 6000 FT ‘their 113’ + ‘their 24’

	Organisation and communication	OC1	For OC1, candidates will be expected to: • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanations and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means.
	Writing	W1	For W1, candidates will be expected to: • show all their working • use correct mathematical form in their working • use appropriate terminology, units, etc.
5(a)	Weight or Gravity	B1	
5(b)	$v = u + at$ u = 27, a = −9.8, t = 2 v = 7.4 (ms^{-1})	M1 A1	Or equivalent
5(c)	$s = ut + \frac{1}{2}at^2$ s=4, u=27, a= −9.8 $4.9t^2 - 27t + 4 = 0$ $(t =) \frac{27 \pm \sqrt{(-27)^2 - 4\times4.9\times4}}{2\times4.9}$ (t =) 0.15 and 5.36 (sec)	M1 A1 m1 A2	Or equivalent CAO FT their quadratic equation equated to 0 A1 for values not correctly rounded to 2dp
6(a)	Acceleration = $\frac{12-4}{5}$ = 1.6 (ms^{-2})	M1 A1	
6(b)	Distance = $\frac{(4+12)}{2} \times 5 + 12 \times 10 + \frac{8\times12}{2}$ = 208 (m)	M2 A1	M1 for the sight of any 2 correct terms CAO
6(c)	Distance = $208 + \frac{8\times3}{2}$ = 220 (m)	M1 A1	FT 'their 208' from (b) Allow use of −3
7(a)	$s = \left(\frac{u+v}{2}\right)t$ u = 0, v = 8, t = 20 = 80 (m)	M1 A1	

7(b)		B1 B1 B1	Correct shape for both parts Concave initial line followed by a straight line 135 seconds shown for the time Helen reaches her friend's house May be shown in workings, but needs to be convincing All other values shown on the graph with labels on the axes. Allow 0 to be omitted

How to read the mark scheme

- ‘M' marks are awarded for any correct method applied to appropriate working, even though a numerical error may be involved. Once earned they cannot be lost.
- ‘m’ marks are dependent method marks. They are only given if the relevant previous ‘M’ mark has been earned.
- ‘A' marks are given for a numerically correct stage, for a correct result or for an answer lying within a specified range. They are only given if the relevant M/m mark has been earned either explicitly or by inference from the correct answer.
- 'B' marks are independent of method and are usually awarded for an accurate result or statement.
- ‘S’ marks are awarded for strategy
- ‘E’ marks are awarded for explanation
- ‘U’ marks are awarded for units
- ‘P’ marks are awarded for plotting points
- ‘C’ marks are awarded for drawing curves
- ‘OC’ marks are awarded for ‘organising and communicating’, a strand of OCW (organising, communicating and writing accurately)
- ‘W’ marks are awarded for ‘writing accurately’, a strand of OCW (organising, communicating and writing accurately)
- ‘SC’ marks are awards for special cases
- CAO: correct answer only
- ISW: ignore subsequent working
- FT: follow through

Mapping grid

Question	Marks	Assessment objective			OCW
		AO1	AO2	AO3	
1(a)	1	1			
1(b)	2	2			
2(a)	1	1			
2(b)	1	1			
3(a)	2	2			
3(b)	3	3			
4(a)	2	2			
4(b)	8		8		*
5(a)	1	1			
5(b)	2	2			
5(c)	5			5	
6(a)	2	2			
6(b)	3	3			
6(c)	2			2	
7(a)	2	2			
7(b)	3			3	
Total	**40**	**22**	**8**	**10**	