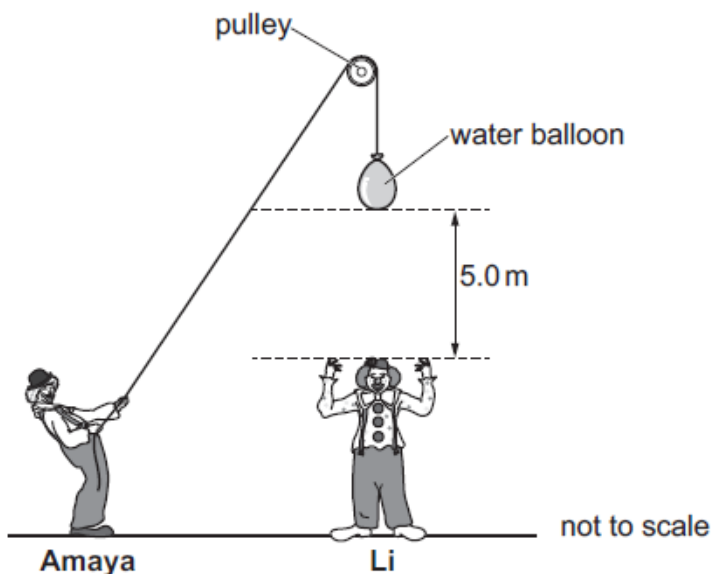


GCSE Physics B (Twenty First Century Science)
J259/03 Depth in physics (Higher Tier)

Question Set 23

1 Amaya and Li are clowns in a circus. They are preparing a new show.

In the show, a water balloon will be dropped on Li's head from different heights. Amaya lifts the water balloon to a height 5.0 m above Li's head using a pulley.



(a) Describe all the **changes** in the way energy is stored, starting from before Amaya starts to lift the water balloon, and finishing after the water balloon has hit Li.

In your answer you should clearly state what is happening to the water balloon as the energy is transferred between each of the stores.

[3]

(b) The mass of the water balloon is 1.6 kg.

(i) Calculate the minimum work that must be done by Amaya to lift the water balloon a height of 5.0 m.

Gravitational field strength = 10 N/kg

Work done =J

[2]

(ii) Use your answer to (b)(i) to calculate the maximum possible speed of the water balloon when it hits Li.

Speed =m/s

[3]

Total Marks for Question Set 23: 8

Mark scheme

The breakdown of Assessment Objectives for GCSE (9-1) Physics B:

	Assessment Objective
AO1	Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
()	Words which are not essential to gain credit
—	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

Question		Answer	Marks	AO element	Guidance
1	(a)	chemical to gravitational ✓ gravitational to kinetic in falling ✓ kinetic to thermal ✓	3	1.1 × 3	ALLOW kinetic to heat energy If no other mark award one mark for a correct sequence of energy transfer e.g. chemical to thermal IGNORE sound / elastic
	(b)	(i) <p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 80 (J) award 2 marks</p> recall $W = Fd$ and $F = mg$ ✓ $1.6 \times 10 \times 5.0 = 80$ (J) ✓	2	1.2 2.1	ALLOW GPE = mgh
		(ii) <p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 10 (m/s) award 3 marks</p> recall and rearrange the KE equation to give $v = \sqrt{(2E/m)}$ ✓ $v = \sqrt{(2 \times 80 / 1.6)}$ ✓ $= 10$ (m/s) ✓	3	1.2 2.1 × 2	ALLOW ECF from (b)(i) ALLOW rearranged $v^2 - u^2 = 2as$ to give $v = \sqrt{2as}$ ALLOW g or a = 9.8 (gives 9.9 (m/s) = 3mks)

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