Motion

Q1.(2018)

A ✓

Q2.(2018)

C ✓

Q3.(2018)

two lines of correct scale length drawn ✓	**3**	3 x 2.1	**ALLOW** any two correct length lines by sight or proportion e.g. lines of 5 cm and 3 cm / lines of 10cm and 6 cm / lines of 5 inches and 3 inches **ALLOW** a stated scale if length not clear **IGNORE** arrows
the two lines connected at 90° to each other ✓			**ALLOW** 90° by sight
resultant is 5.8 (N) ✓			**ALLOW** resultant in the inclusive range 5.6 - 6.0 (N) **ALLOW** correct resultant ✓✓✓

Q4.(2019)

D

Q5.(2019)

B

Q6.a(2019)

Evidence for use of area under line / distance = area under v-t graph / Area ≈ 62 × 20 = 1240 m ✓	**2**	**2×1.2**	**ALLOW** area from1200 to 1240 (m) **DO NOT ALLOW** a calculation of 62 x 40 on its own or 2480 on its own
BUT Total distance = 1240 + 750 = 1990 (m) ✓✓			**ALLOW** total distance calculated from 1950 to 1990 (m) ✓✓ **DO NOT ALLOW** answer of (approximately) 2000 with no workings

Q6.b(2019)

FIRST CHECK THE ANSWER ON ANSWER LINE **If answer = 50 (m / s) award 3 marks**	**3**		
(speed =) distance travelled / time taken ✓		**1.2**	
(s =) 2000 / 40 ✓		**2.1**	
= 50 (m / s) ✓		**2.1**	**ALLOW** the candidate's value of distance from **(a):** If value from **(a)** is 1990 then answer is 49.75 or 49.7 or 49.8 or 50 (m / s) ✓✓✓✓ If value from **(a)** is 1950 then answer is 48.75 or 48.8 (m / s) ✓✓✓✓

Q7.(2020)

FIRST CHECK THE ANSWER ON ANSWER LINE
If answer = 26 (m/s) award 3 marks

Distance = area under the graph / AW ✓
(0.5 × 10 × v) + (10 × v) = 390 **OR** 15v = 390 ✓
v = 26 (m/s) ✓

Q8.a(2020)

Section X: Uniform speed/velocity ✓ Dots equally spaced ✓	**4**	**1.1** **1.2**	**ALLOW** constant speed/velocity/motion
Section Y: Acceleration / increasing speed ✓ Dots getting further apart ✓		**1.1** **1.2**	**IGNORE** just motion is increasing / comparisons with X or tapes e.g. faster than X **DO NOT ACCEPT** it changes direction

Q8.b(2020)

FIRST CHECK THE ANSWER ON ANSWER LINE
If answer = 1.4 (m/s) award 3 marks

Rearrangement: s = d / t ✓
s = 0.028 ÷ 0.02 ✓
s = 1.4 (m / s) ✓

Q8.c(2020)

FIRST CHECK THE ANSWER ON ANSWER LINE **If answer = 3 (m / s^2) award 3 marks**	**3**	**3 × 2.1**	
Realises 5 gaps = time between 2 speeds. **OR** Time = 5 × 0.02 = 0.1 s ✓ a = (1.3 – 1.0) ÷ 0.1 ✓ a = 3 (m / s^2) ✓			**ALLOW** 2 marks for using 6 gaps Time would be 0.12 s giving a = 2.5 (m / s^2). **IGNORE** sign / -

Q8.d(2020)

Decrease height of ramp / decrease slope of ramp / AW ✓	**1**	**3.3b**	**ALLOW** use a longer ramp (at the same height)

Q9.(2021)

D ✓

Q10.(2021)

C ✓

Q11.(2021)

Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** Detailed evaluation of statements in terms of distance, displacements and velocity. **AND** Calculations included to explain answer. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Detailed evaluation of statements in terms of distance, displacements and velocity. **OR** Outline evaluation of statements in terms of distance, displacements and velocity. **AND** An attempt to include calculations to explain answer. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** Evaluation of statements in terms of distance OR displacements OR velocity. **OR** Calculations included to explain answer. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0 marks** *No response or no response worthy of credit.*	**6**	**2 × 1.1** **4 × 3.1b**	**AO3.1b – Analyses information to evaluate speed and velocity** • Distance = 90 m • Displacement = 18 m • S = distance / time = 90/120 = 0.75 m/s • V = displacement / time = 18/120 = 0.15 m/s • Velocity < speed • Displacement < distance • Therefore, the statements are false **AO1.1 – Demonstrates knowledge of vector and scalar distinction as it applies to speed, velocity, distance, displacement** • Velocity = displacement / time • Speed = distance / time • Displacement = shortest distance between 2 points in a certain direction • Velocity and displacement are vectors as they have direction

Q12.(2022)

D ✓

Q13.a(2022)

A accelerating / velocity increasing / speed increasing ✓ C constant velocity / constant speed ✓	**2**	**2 × 1.1**	**ALLOW** initial constant speed and then a higher constant speed / slow start then speeds up / constant speed then acceleration / increases pace **IGNORE** change in acceleration / acceleration increases **ALLOW** zero acceleration / stay at same pace / speady speed / maximum speed **IGNORE** acceleration at constant speed / just 'constant / numerical answers

Q13.b(2022)

FIRST CHECK THE ANSWER ON ANSWER LINE **If answer = 2.1 (m / s^2) award 4 marks**	**4**		
Acceleration = $\frac{(\text{final velocity})^2 - (\text{initial velocity})^2}{2 \times \text{distance}}$ ✓		**1.2**	**ALLOW** symbol equation / equation in any form
Acceleration = $(11.5^2 - 0) \div (2 \times 32)$ ✓		**2.1**	
Acceleration = 2.07 (m / s^2) ✓		**2.1**	
Acceleration = 2.1 (m / s^2) to 2 sf ✓		**1.2**	**ECF** for any 2 sf but must be a change from one figure to another e.g. 4.23 changed to 4.2 = 1 mark but 92 (changed) to 92 = 0 marks **AWARD** 4 marks for alternative method Acceleration = $\frac{\text{change in velocity}}{\text{time}}$ ✓ 11.5 ÷ 4 ✓ 2.875 or 2.88 ✓ 2.9 (m / s^2) (2 sf) ✓

Q14.(2022)

(Momentum =) mass × velocity ✓	**1**	**1.1**	**ALLOW** symbol equation

Q15.(2022)

Momentum before = momentum after (provided there are no external forces acting) / AW ✓	**1**	**1.1**	**ALLOW** momentum cannot be created or destroyed / momentum cannot be lost or gained / momentum is maintained / total momentum is constant (in a closed system) **IGNORE** momentum cannot be changed / momentum is kept / momentum ia saved

Q16.a(2022)

FIRST CHECK THE ANSWER ON ANSWER LINE **If answer = 1.05 (kgm / s) award 3 marks**	**3**		
Mass = 7 × 10^{-3} kg **OR** 0.007 kg ✓		**1.2**	
Momentum = 0.007 ×150 ✓		**2.1**	
Momentum = 1.05 (kgm / s) ✓		**2.1**	**ALLOW** 1 or 1.1 (kgm / s) **ECF** for incorrect or no conversion of 7 g e.g 1100 or 1050 = 2 marks (used g not kg) 11 or 10.5 = 2 marks (7 g converted to 0.07)

Q16.b(2022)

FIRST CHECK THE ANSWER ON ANSWER LINE **If answer = 11 (m / s) award 3 marks**	**3**		
Velocity = momentum / (total) mass ✓		**1.2**	**ALLOW** symbol equation / equation in any form
Velocity = 1.1 / 0.1 ✓		**2.1**	
Velocity = 11 (m / s) ✓		**2.1**	**ALLOW** total mass = 0.1 (kg) for 1 mark if no other mark awarded for question

Q17.(2023)

A

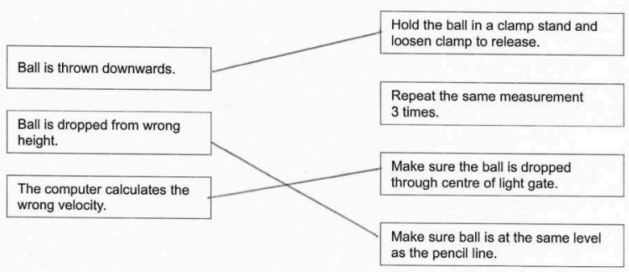
Q18.(2023)

A

Q19.a(2023)

4
2
1
5
3
✓

Q19.b(2023)



✓✓

2	**2 × 3.3b**	All 3 correct = 2 marks 1 or 2 correct = 1 mark If **two** lines from **one** source of error and **one** is incorrect = 0 marks for that source of error

Q19.c(2023)

Diameter of ball / width of ball / length of ball ✓	1	3.3a	**ALLOW** size of ball **IGNORE** height of ball / height it was dropped from / distance ball dropped from / distance ball travelled / distance of the ball **DO NOT ALLOW** other quantities e.g., acceleration / velocity / speed / time / mass

Q19.d(2023)

First check the answer on answer line **If answer = 9.6 (m / s^2) award 3 marks**	**3**		
(Acceleration =) $\frac{(\text{final velocity})^2 - (\text{initial velocity})^2}{(2 \times \text{distance})}$ **OR** (Acceleration =) $\frac{7.2^2 - 0}{2 \times 2.7}$ **OR** (Acceleration =) $\frac{7.2^2}{2 \times 2.7}$ ✓		**1.2**	**ALLOW** substitution into unrearranged equation e.g., $7.2^2 - 0 = 2 \times a \times 2.7$ or $7.2^2 = 2 \times a \times 2.7$
(Acceleration =) $\frac{51.84}{5.4}$ ✓		**2 × 2.1**	
(Acceleration =) 9.6 (m / s^2) ✓			If no other marks awarded **ALLOW** for 1 mark any of the following numbers seen: 51.84 or 51.8 or 5.4

Q20.(2024)

B

Q21.(2024)

A