STUDENT NUMBER:

2024 Physics

YEAR 11 EXAMINATION

PART A – Multiple Choice

General Instructions
- Reading time - 5 minutes
- Working time - 2 hours
- Board-approved calculators may be used
- A data sheet, formulae sheets and Periodic Table are provided
- Multiple choice answer sheet is provided at the front of Part B

Write your student number on:

1) Part A
2) Multiple-choice answer sheet/Part B cover page

Extra writing space is provided at the end of Part B. If you use this, please indicate clearly which question you are answering.

Total marks – 70
This paper has two parts, Part A and Part B

Part A – 15 marks
- Attempt Questions 1-15
- Allow about 25 minutes for this part
- Answer on the multiple choice answer sheet provided at the back of Part B

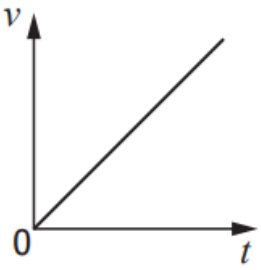
Part B – 55 marks
- Attempt Questions 16 – 30
- Allow about 1 hour and 35 minutes for this part
- Answer in the spaces provided

Part A: Multiple choice - 15 marks

- **Attempt Questions 1–15**
- **Use the multiple-choice answer sheet found at the front of Part B to answer Questions 1-15**

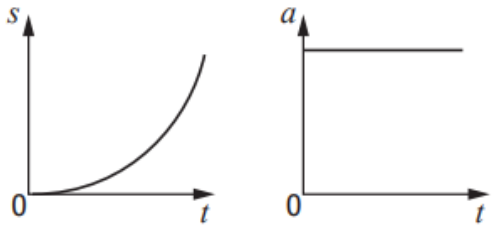
Question 1

A cyclist is travelling along a straight, level road. A velocity-time (v-t) graph of the motion of the cyclist is shown below:

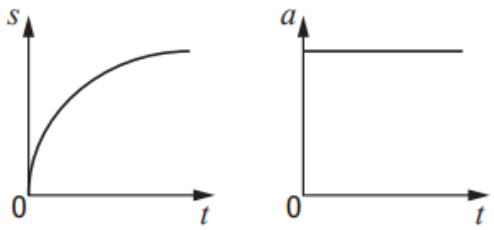


Which pair of displacement-time (s-t) and acceleration-time (a-t) graphs represent the motion of the cyclist?

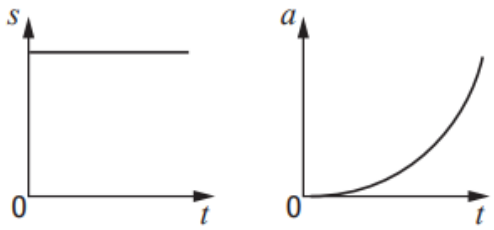
A



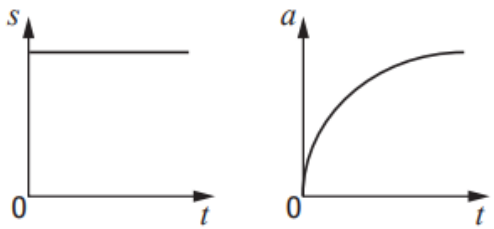
B



C

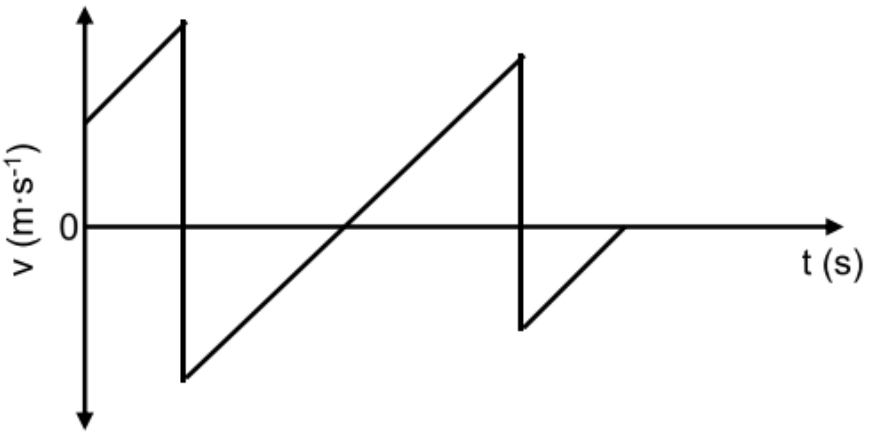


D



Question 2

The motion of an object which bounces off the floor multiple times is represented through the velocity versus time graph below.



A student made four statements about the motion:

Statement 1: "Initially the object goes upwards"
Statement 2: "The object bounces twice off the floor"
Statement 3: "The initial velocity of the object is zero"
Statement 4: "Upward motion was taken as positive"

Which of the statements are INCORRECT about the vertical motion of the object?

A. Statements 1 and 2 only
B. Statements 1, 2, 3 and 4
C. Statements 1, 3 and 4 only
D. Statements 2, 3 and 4 only

Question 3

Stone **X** is thrown vertically upwards with speed v from the top of a building. At the same time, a second stone, **Y**, is thrown vertically downwards with the same speed v from the top of the same building. Air resistance is negligible. Which one of the following statements is true about the speeds at which the stones hit the ground?

A. The speed of stone **X** is equal to the speed of stone **Y**.
B. The speed of stone **X** is greater than the speed of stone **Y**.
C. The speed of stone **Y** is greater than the speed of stone **X**.
D. The speed of stone **X** can only be compared to the speed of stone **Y** when the height of the building is known.

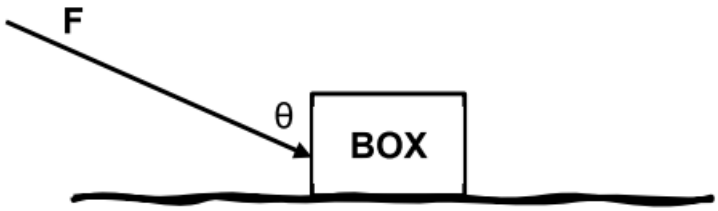
Question 4

A frisbee is thrown into the air with an initial velocity of 50 ms^{-1} at an angle of 65° above the horizontal. Which of the following is the correct horizontal component of the initial velocity?

A. 50 m s^{-1}
B. 50 × sin(65) m s^{-1}
C. 50 × cos(65) m s^{-1}
D. 50 × tan(65) m s^{-1}

Question 5

The diagram below shows the box being pushed along a rough horizontal surface by the force **F** which makes an angle of θ with the vertical.



What is the correct expression for calculating the weight of the box?

A. $F_N + F\cos\theta$
B. $F_N - F\cos\theta$
C. $F_N + F\sin\theta$
D. $F_N - F\sin\theta$

Question 6

How long would it take for a 2 kW hairdryer to use 79 MJ of energy?

A. 1 hour
B. 11 hours
C. 40 hours
D. 40000 hours

Question 7

A spacecraft is moving at a constant velocity. What is the net force acting on the spacecraft?

A. Zero.
B. Constant.
C. Increasing.
D. Decreasing.

Question 8

The momentum of an object of mass 5.0 kg is 30 kg m s^{-1}. What is the kinetic energy of the object?

A. 50 J
B. 90 J
C. 150 J
D. 180 J

Question 9

Noise cancelling headphones function by receiving and then re-emitting background noise into the headphones in order to cancel the background noise.

Which principle is this an example of?

A. reflection
B. refraction
C. superposition
D. diffraction

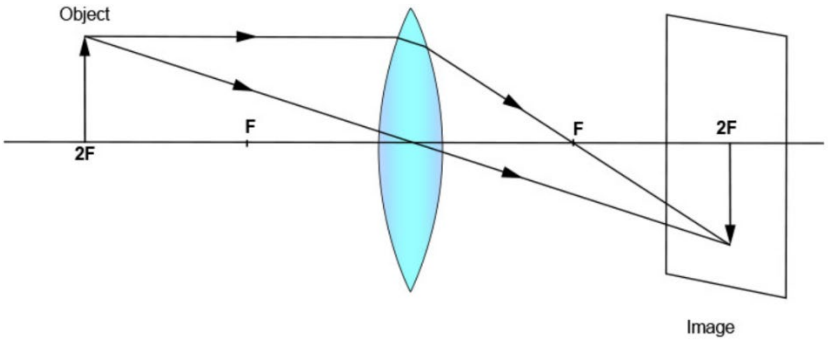
Question 10

The intensity of light from a source is **I** at a distance **d**. What is the intensity at distance **4d** from the source?

A. I/16
B. I/8
C. I/4
D. I/2

Question 11

The diagram below shows the image formed when an object is placed in front of a lens at twice the focal length.

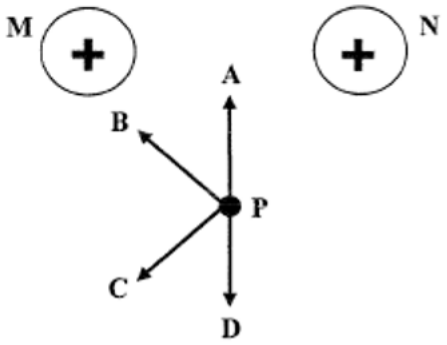


Which of the following is correct regarding this scenario?

A. The lens is convex and the image formed is virtual.
B. The image is inverted and the same size as the object.
C. The lens is concave and the image formed is magnified.
D. The image is real and virtual.

Question 12

The diagram below shows two spheres, M and N, which are both given the same quantity of electric charge. P is a point equidistant from M and N.



In which direction (A, B, C or D) does the electric field act at the point P?

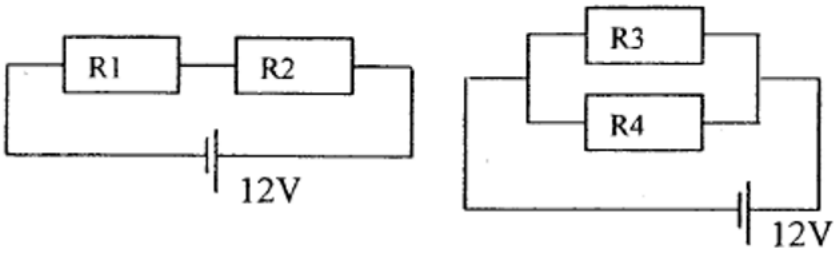
Question 13

What are the units of electric field strength?

A. Newtons per coulomb
B. Coulombs per newton
C. Coulombs per joule
D. Joules per coulomb

Question 14

The diagrams below show two different circuits. All resistors are identical.

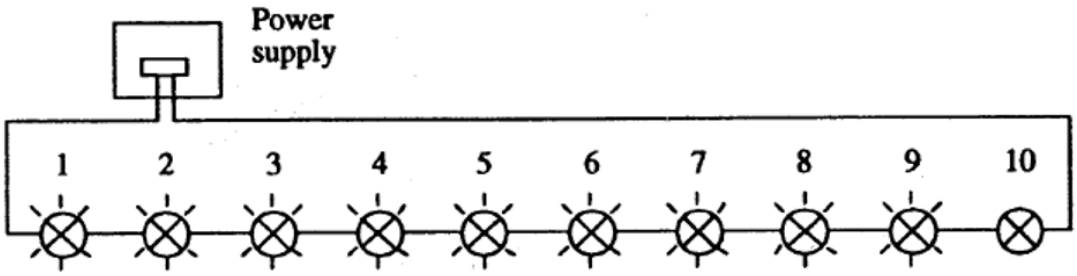


Which statement about the currents flowing in the resistors is correct?

A. The current in all resistors is the same.
B. The currents in R1 and R2 are one quarter the currents in R3 and R4
C. The currents in R1 and R2 are twice the currents in R3 and R4
D. The currents in R1 and R2 are half the currents in R3 and R4

Question 15

A set of Christmas lights contains ten lamps connected in series as shown in the diagram:



When the lamps are plugged in and switched on, it is found that lamps 1 to 9 glow brightly, but lamp 10 does not.

Which of the following statements best explains why lamp 10 is not glowing brightly?

A. The filament of lamp 10 is broken.
B. There is a break in the wire leading to lamp 10.
C. The lamps 1 to 9 are blocking the current from lamp 10.
D. The resistance of lamp 10 is too low.

~ End of Part A ~

STUDENT NUMBER:

2024 Physics

YEAR 11 EXAMINATION

Multiple Choice Answer sheet

and

PART B – Extended Response

General Instructions
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- Working time - 2 hours
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- A data sheet, formulae sheets and Periodic Table are provided

Write your student number on:

1) Part A
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Extra writing space is provided at the end of Part B. If you use this, please indicate clearly which question you are answering.

Total marks – 70
This paper has two parts, Part A and Part B

Part A – 15 marks
- Attempt Questions 1-15
- Allow about 25 minutes for this part
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Part B – 55 marks
- Attempt Questions 16 – 30
- Allow about 1 hour and 35 minutes for this part
- Answer in the spaces provided

ANSWER SHEET: PART A

2024 PHYSICS YEAR 11 EXAMINATION

MULTIPLE CHOICE

Instructions:

1) Fill in the single oval that corresponds to your answer for each question.
2) If you make a mistake, clearly put a cross over the incorrect answer and fill in the correct answer.
3) If you change your mind again, circle the correct answer and clearly mark it with an arrow and the label "correct answer".

DO NOT detach this page

Start here:

1.	A ⬭	B ⬭	C ⬭	D ⬭
2.	A ⬭	B ⬭	C ⬭	D ⬭
3.	A ⬭	B ⬭	C ⬭	D ⬭
4.	A ⬭	B ⬭	C ⬭	D ⬭
5.	A ⬭	B ⬭	C ⬭	D ⬭
6.	A ⬭	B ⬭	C ⬭	D ⬭
7.	A ⬭	B ⬭	C ⬭	D ⬭
8.	A ⬭	B ⬭	C ⬭	D ⬭
9.	A ⬭	B ⬭	C ⬭	D ⬭
10.	A ⬭	B ⬭	C ⬭	D ⬭
11.	A ⬭	B ⬭	C ⬭	D ⬭
12.	A ⬭	B ⬭	C ⬭	D ⬭
13.	A ⬭	B ⬭	C ⬭	D ⬭
14.	A ⬭	B ⬭	C ⬭	D ⬭
15.	A ⬭	B ⬭	C ⬭	D ⬭

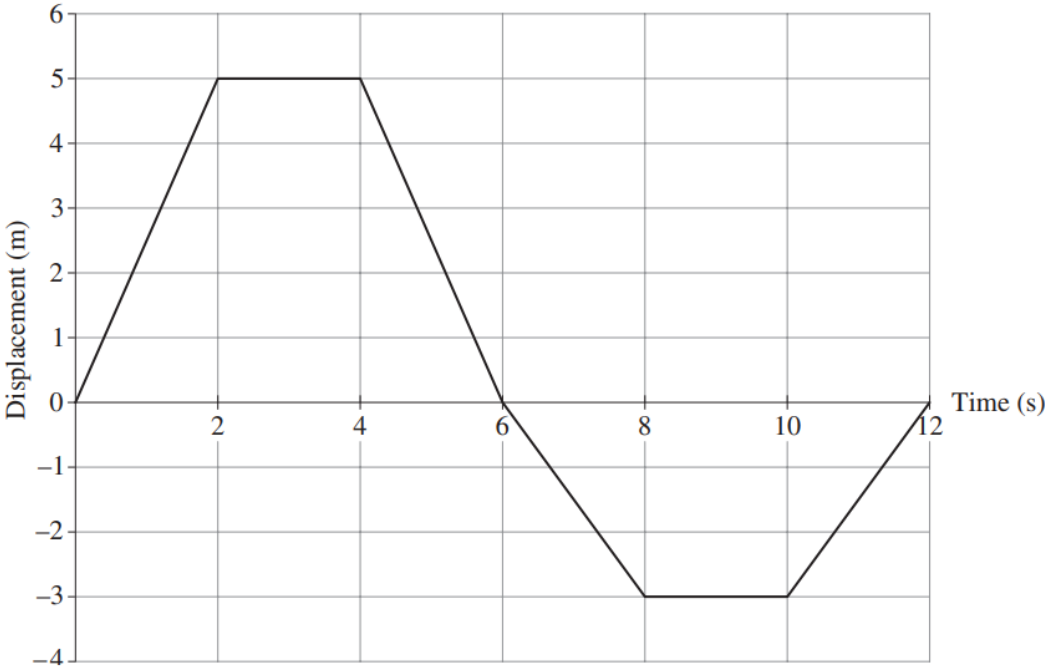
Part B Questions 16 - 30 (55 marks)

- **Answer in the spaces provided.**
- **Extra Writing Space is provided at the end of this section (please indicate clearly that you are continuing on the extra writing space).**

Marks

Question 16 (3 marks)

The displacement-time graph below shows the linear motion of a toy train.



(a) What is the toy train's displacement from its starting position at 8 seconds? **1**

(b) Calculate the toy train's average speed for the second half of its journey. **2**

Marks

Question 17 (3 marks)

A hot air balloon is moving vertically. At a height of 50 m a sandbag is dropped from the balloon and falls freely to the ground. The sandbag takes 3.0 s to reach the ground.

Calculate the velocity of the balloon at the moment the sandbag is dropped (ignore air resistance). **3**

Question 18 (4 marks)

A 600 g dynamics trolley is travelling at a constant speed of 5.5 m s^{-1}. A constant net force of 3.0 N is then applied to the dynamics trolley in its direction of travel for 1.5 s.

Calculate the change in kinetic energy of the dynamics trolley. **4**

Marks

Question 19 (4 marks)

In the sport of baseball, players wear padded gloves and catch the ball with a relaxed arm. As the ball collides with the glove, the ball, hand and glove all move back a little.

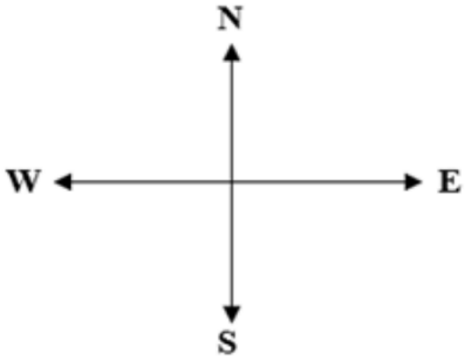
Use physics principles to explain the advantage of catching a ball using a padded glove and a relaxed arm. **4**

Marks

Question 20 (4 marks)

A plane is flying at 300 km h^{-1} in a N35°E direction.

(a) On the diagram below, draw a labelled vector to represent the plane's velocity (note: use of a protractor is not required). **2**



(b) How long would it take for the plane to move 80 km to the east? **2**

Question 21 (4 marks)

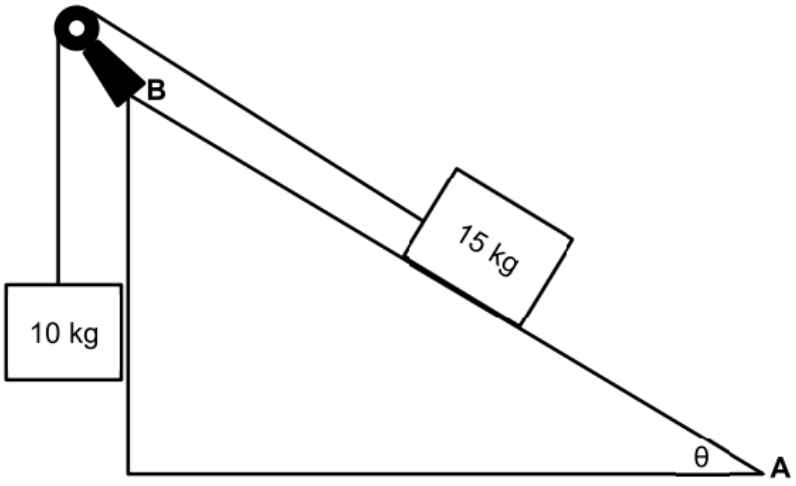
When cars are equipped with flexible bumpers, they will bounce off each other during low-speed collisions, thus causing less damage. In one such collision, car A with mass 1750 kg, travelling to the right at 1.5 ms^{-1}, collides with car B of mass 1450 kg, travelling to the left at 1.1 ms^{-1}. Measurements show that the speed of car A after the collision is 0.25 ms^{-1} in its original direction.

Calculate the velocity of car B immediately after the collision. **4**

Marks

Question 22 (5 marks)

Two blocks, 10 kg and 15 kg are attached to each other with a light inextensible string moving over a frictionless pulley as shown in the diagram below. Slope AB has a frictionless surface and makes an angle θ with the horizontal. Both blocks are stationary.



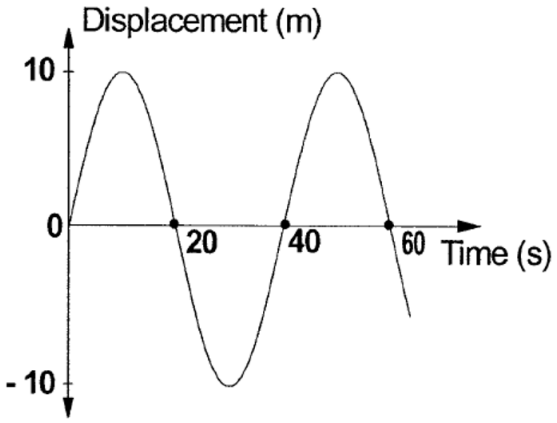
(a) Draw a free-body diagram showing all the forces acting on the 15 kg block. **2**

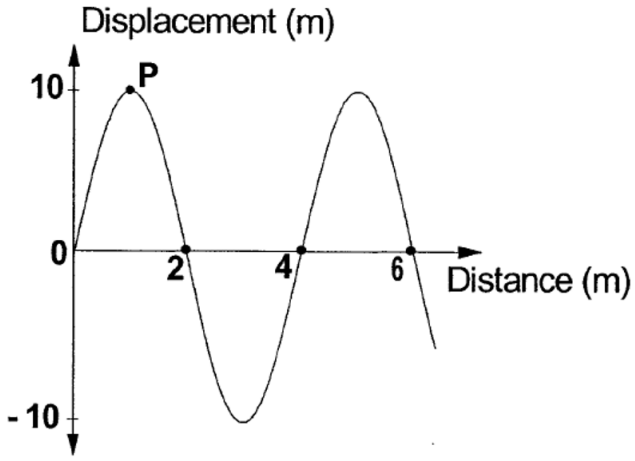
(b) Calculate angle θ **3**

Marks

Question 23 (4 marks)

The graphs below describe the same transverse wave.





For this transverse wave, determine the:

(a) Wavelength: _____ **1**

(b) Amplitude: _____ **1**

(c) Frequency: _____ **1**

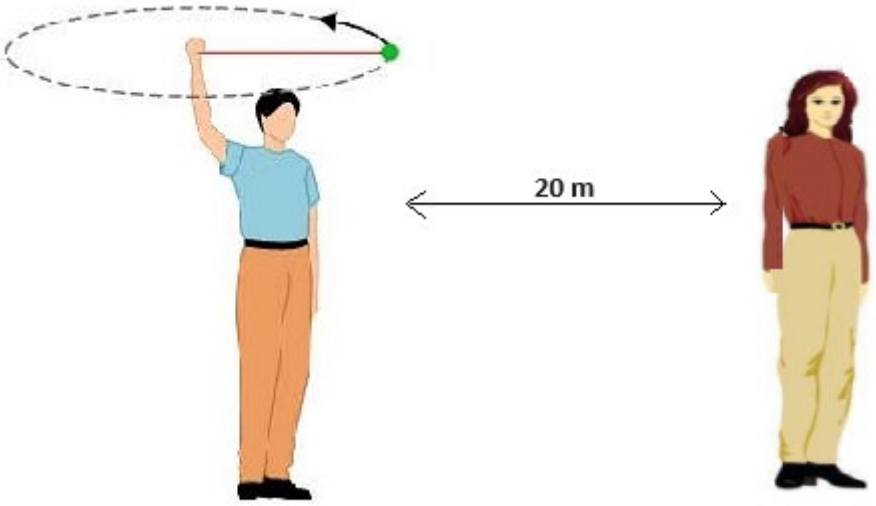
(d) Vertical displacement of point P, 20s later than the time shown above. **1**

_____

Marks

Question 24 (3 Marks)

A person spins a buzzer in a circle over their head as shown in the diagram below. The buzzer emits a sound of frequency 1.1 kHz, and the buzzer is moving at a speed 13 ms^{-1}. An observer stands 20 m away, as shown in the diagram.



(Diagram not to scale)

Calculate the maximum and minimum frequency of the sound detected by the observer. **3**

Marks

Question 25 (6 marks)

(a) Describe the conditions necessary for total internal reflection to occur. **2**

(b) A ray of light travelling in air enters a transparent substance which halves the speed of the light.

(i) Calculate the refractive index of the transparent substance. **2**

(ii) If the incidence of the ray of light is 30°, find the angle of refraction. **2**

Marks

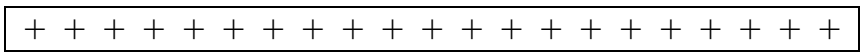
Question 26 (2 marks)

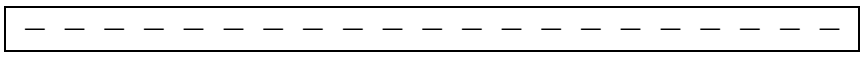
The following diagram shows two positive point charges of equal magnitude. Draw field lines on the diagram to represent the electric field that would be present. **2**

• **Q** • **Q**

Question 27 (3 marks)

The diagram below shows two charged, parallel, plates:





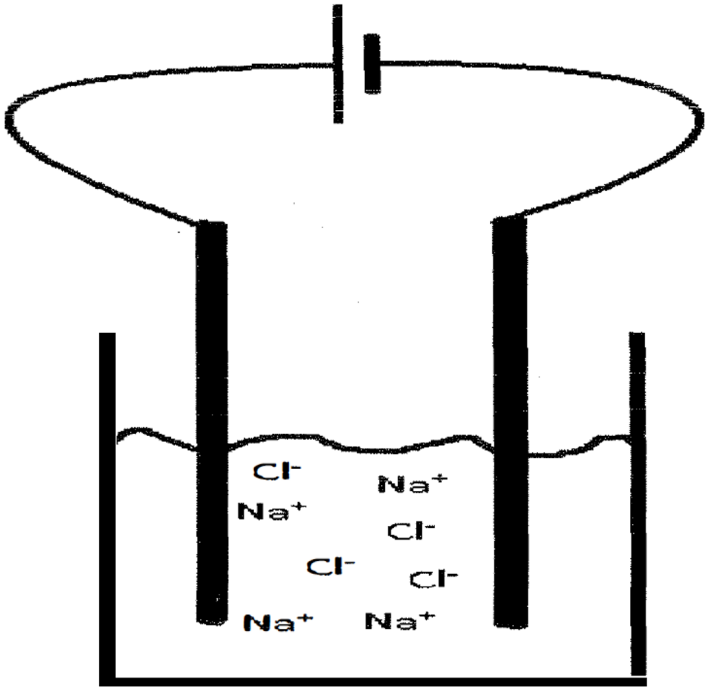
(a) On the diagram above, draw the electric field between the two plates. **1**

(b) If the electric field strength between the plates was 200 V m^{-1}, determine the magnitude and direction of the electric force that would be exerted upon a charge of -2.0×10^{-6} C placed between the plates. **2**

Marks

Question 28 (3 Marks)

The diagram below depicts a Sodium Chloride solution in a beaker. Two electrodes are dipped into the beaker and connected to a cell as shown. The positive Na ions and the negative Cl ions are free to move.



(a) In which direction(s) will the Na^+ and Cl^- ions move? Circle the option that completes each sentence correctly. **1**

The Sodium Ions (Na^+) will move to the: Right / Left (circle one)

The Chloride ions (Cl^-) will move to the: Right / Left (circle one)

(b) Which way will the conventional current flow *in the beaker?* Explain your answer. **2**

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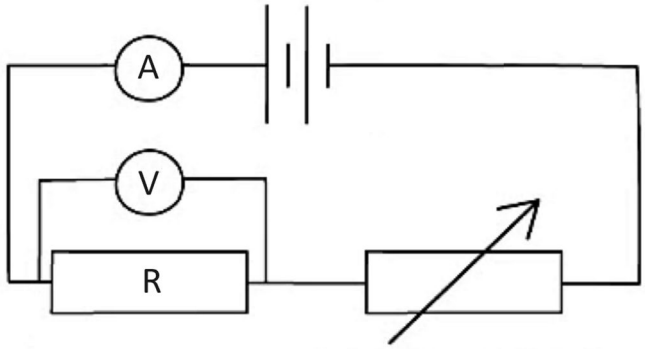
Marks

Question 29 (5 marks)

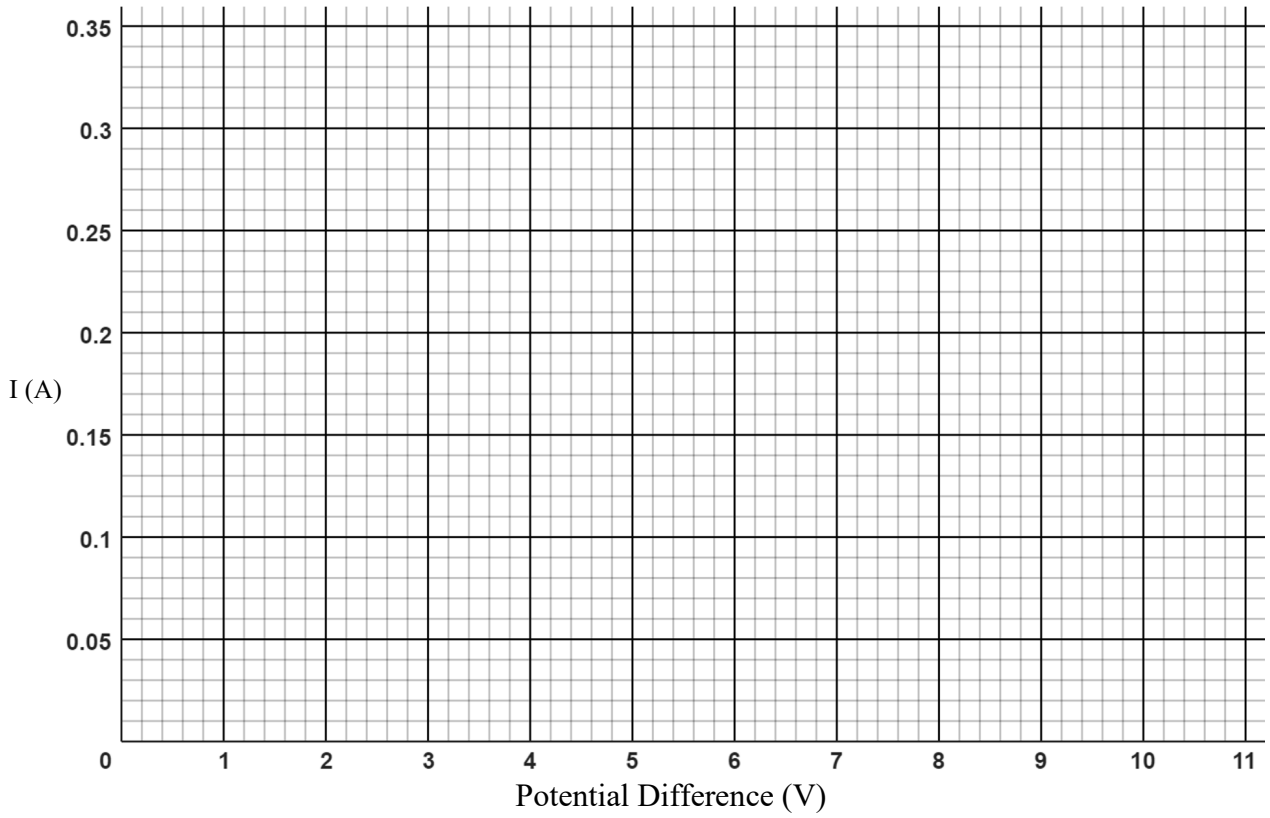
A student constructs the following circuit in order to measure the resistance of a resistor R and collects the data shown in the table.



V (V)	I (A)
2.0	0.090
4.0	0.14
6.0	0.21
8.0	0.27
10.0	0.28

Plot the data on the axes below and use your graph to calculate the value of resistor R (show working on the graph). **5**

Plot of Current against Potential Difference for resistor R



Marks

Question 30 (2 marks)

A student completed an investigation to determine the maximum speed of a toy train. Whilst the toy train was operating at its maximum speed, the student measured the distance it travelled in 2 seconds.

The student collected the following data:

Time (s)	Distance (m)
2	20

They calculated that the maximum speed of the toy train was 10 m s^{-1}.

Explain how the student could modify the investigation so that they can assess its reliability. **2**

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~ END OF EXAM ~

Extra Writing Space (please indicate clearly which question you are continuing in this space)

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Pymble Ladies College, Year 11 Physics Exam, 2024

Multiple Choice:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	C	A	C	B	B	A	B	C	A	B	D	A	D	D

Question 16a (1 mark)

Criteria	Marks
Correct displacement	1

Sample answer:

-3 m

Marker's Notes:

Displacement has a direction. Direction is 'negative' in this case – accepted if wrote 'left'/'behind'/'opposite' etc. (significant number of students did this), though stimulus only gave 'positive' and 'negative' directions. Accepted answers without units, though almost all students included.

Question 16b (2 marks)

Criteria	Marks
Correct average speed	2
Provides some relevant working	1

Sample answer:

$v = \frac{d}{t} = \frac{6}{6} = 1$ m s^{-1}

Marker's Notes:

1 mark for relevant distance or displacement <u>over</u> time calculation. 1 mark for calculating area under graph (which is incorrect. v = d/t ≠ dt) for second half of journey.

Question 17 (3 marks)

Criteria	Marks
Correct initial velocity (magnitude and direction)	3
Correct initial speed OR Calculates initial velocity with minor error	2
Provides some relevant working	1

Sample answer:

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

$$-50 = u \times 3 + \frac{1}{2} \times -9.8 \times 3^2$$

$$u = \frac{-50 - 0.5 \times -9.8 \times 3^2}{3} = -1.97 \text{ m s}^{-1} = 1.97 \text{ m s}^{-1} \text{ downwards}$$

Marker's Notes:

Common errors -

Students correctly used -9.8 for acceleration, though incorrectly used 50 (not -50) for displacement, which gave them an incorrect initial velocity of 31.37 m/s upwards (2 marks).

Students used positive values for acceleration (9.8) and displacement (50), which gives them correct initial speed, but then said 'upwards' for direction (2 marks).

Students incorrectly stated u = 0, then calculated v (1 mark).

Students incorrectly stated v = 0, then calculated u (1 mark).

Students not recognising that a = -9.8 and attempting to calculate acceleration based on incorrect assumption that u = 0 (1 mark).

Students calculated average speed (incorrectly), using d/t (1 mark).

Question 18 (4 marks)

Criteria	Marks
Correct change in kinetic energy	4
Correct final kinetic energy OR Change in kinetic energy with minor error (e.g. missing g to kg conversion only)	3
Change in kinetic energy with minor errors OR Correct final velocity OR Correct acceleration and initial kinetic energy	2
Provides some relevant working	1

Sample answer:

$a = \frac{F}{m} = \frac{3.0}{0.6} = 5 \text{ m s}^{-2}$

$v = u + at = 5.5 + 5 \times 1.5 = 13 \text{ m s}^{-1}$

$\Delta K = \frac{1}{2}mv^2 - \frac{1}{2}mu^2 = \frac{1}{2} \times 0.6 \times 13^2 - \frac{1}{2} \times 0.6 \times 5.5^2 = 41.625 \text{ J}$

Marker's Notes:

Common errors –

Students calculated change in velocity (7.5) and used this value for final velocity instead of adding to initial velocity (5.5) to get actual final velocity (13), though went on to calculate change in K based on this error only (3 marks).

Students not converting to SI units: g to kg (maximum 3 marks - dependent on progress).

Significant number of students attained 4 marks.

Question 19 (4 marks)

Criteria	Marks
Explains advantage via impulse/change in momentum	4
Explains advantage via impulse/change in momentum with minor error/omission/contradiction	3
Identifies an advantage AND Outlines a <u>related</u> physics principle	2
Identifies an advantage OR Outlines a <u>related</u> physics principle	1

Sample answer:

When the ball collides with the padded glove, and the glove and relaxed arm move backward, the time it takes for the ball to come to a stop is increased. The impulse (change in momentum) of the ball remains constant, regardless of how long it takes for the ball to stop. Therefore, since impulse equals force multiplied by time ($\Delta p = F_{net}\Delta t$), this increased stopping time results in a smaller net force acting on the ball and the hand. Hence, the advantage of catching a ball using a padded glove and a relaxed arm is the reduction in impact force.

Marker's Notes:

Advantage is to reduce impact force (which leads to reduced injury, ball not bouncing out etc.)

Many students outlined <u>related</u> principles (Newton's 1st/3rd laws, conservation laws etc.) though these principles are not <u>directly applicable</u> given context of question (max. 2 marks). Newton's second law is directly applicable (impulse is derived from F = ma), though explicit linking of increased time of impact to reduction in acceleration and force required for 4 marks (no student did all of this, though one student attained 3 marks for linking second law to reduction in acceleration and force).

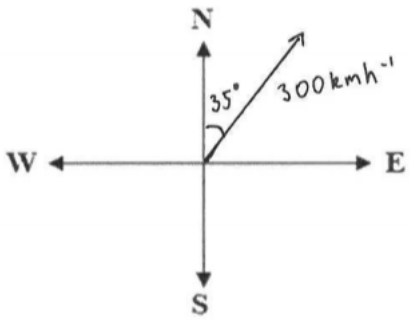
Some students mentioned energy dissipation, but this is only somewhat applicable to the padded glove (in addition to increasing impact time), not the relaxed arm (max. 2 marks).

Students incorrectly stating force or momentum is 'absorbed'. These aren't 'absorbed' in the way energy can be. Forces can be <u>reduced</u>, while momentum is <u>conserved</u> in a collision.

Question 20a (2 marks)

Criteria	Marks
Correctly drawn and labelled vector	2
Provides some relevant information	1

Sample answer:



Marker's Notes:

Angle does not need to be very accurate, though must be correctly labelled (55◦ label between vector and East accepted).

Question 20b (2 marks)

Criteria	Marks
Correct time, including units	2
Time calculated with minor error or missing units	1

Sample answer:

$t = \frac{d}{v} = \frac{80}{300sin35} = 0.46$ hours

Marker's Notes:

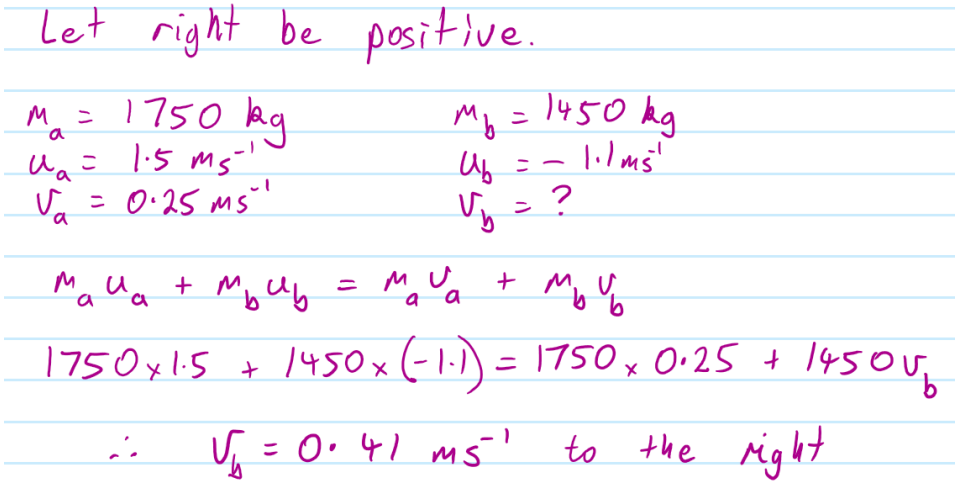
Accepted any appropriate time conversions, e.g. 28 minutes or 1700 seconds (note these particular values are rounded to 2 s.f.).

Many students converted from hours to minutes or seconds. While converting to seconds (SI unit of time) is good practice, it was unnecessary for this question.

Question 21 (4 marks)

Criteria	Marks
Correct answer including direction	4
Correct method with single mistake or omission	3
Correct method with 2 mistakes or omissions	2
Provides any relevant information or calculation (eg, recognises $p_{init} = p_{final}$)	1

Sample answer:



Marker's Notes:

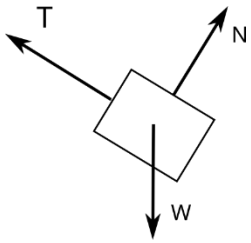
Be careful to give a direction. A negative or positve number, on it's own, is not enough unless you had previously definied which way was positive and negative.

Several people assumed kinetic energy was conserved (it's not) and tried to solve this as a conservation of energy problem.

Question 22a (2 marks)

Criteria	Marks
Correct free-body diagram with 3 correctly labelled forces in correct directions	2
Provides a diagram with any correct force in the correct direction OR An excess of additional mislabelled forces	1

Sample answer:



Marker's Notes:

A number of students rotated the object for the free body diagram. It is not recommended to do this.

Question 22b (3 marks)

Criteria	Marks
Correct determination of angle	3
Correct method with one or two mistakes or omissions	2
Provides any relevant information such as: identifying sum of forces equals zero, or appropriate force diagram, or correct calculation of one force	1

Sample answer:

$$\Sigma F = 0 = mgsin\theta - T$$

$$0 = 15 \times 9.8 sin\theta - 10 \times 9.8$$

$$\theta = 42^o$$

Question 23a (1 mark)

Criteria	Marks
Correct answer	1

Sample answer:

λ = 4 m

Question 23b (1 mark)

Criteria	Marks
Correct answer	1

Sample answer:

A = 10 m

Question 23c (1 mark)

Criteria	Marks
Correct answer	1

Sample answer:

Period (T) = 40 seconds

f =1/T

f = 1/40 = 0.025 Hz

Question 23d (1 mark)

Criteria	Marks
Correct answer	1

Sample answer:

s = - 10 m

Marker's Notes:

s = - 20 m or 20 m downwards was also accepted.

Question 24 (3 marks)

Criteria	Marks
Correct choice of model AND Correct substitution of values for both max and min	3
Correct choice of model AND Correct substitution of values for either max or min	2
Correct choice of model	1

Sample answer:

$$f' = f_o(\frac{v_w + v_o}{v_w - v_s})$$

For maximum, buzzer is travelling towards person at 13 ms^{-1}

$$f' = 1100(\frac{340 + 0}{340 - 13})$$

$$f' = 1144\ Hz$$

For minimum, buzzier is travelling away from person at 13 ms^{-1}

$$f' = 1100(\frac{340 + 0}{340 + 13})$$

$$f' = 1059\ Hz$$

Marker's Notes:

Maintaining an appropriate number of significant figures would have resulted in 1.1 kHz for both. Working was required if this was your answer.

Question 25a (2 marks)

Criteria	Marks
At least two appropriate conditions given and named specifically	2
Provides any relevant information	1

Sample answer:

The refractive index of the initial medium must be greater than the refractive index of the final medium.

The angle of incidence must be larger than the critical angle.

Marker's Notes:

Optical density (refractive index) and density are different quantities. There is some relationship between them for the same substance, but not for different substances.

Question 25b(i) (2 marks)

Criteria	Marks
Correct answer	2
Provides any relevant information or step of working	1

Sample answer:

$$n = \frac{c}{v}$$

$$n = \frac{c}{0.5\,c}$$

$$n = 2$$

Question 25b(ii) (2 marks)

Criteria	Marks
Correct answer (ECF is accepted)	2
Provides any relevant information or step of working	1

Sample answer:

$$n_1 sin\Theta_i = n_2 sin\Theta_r$$

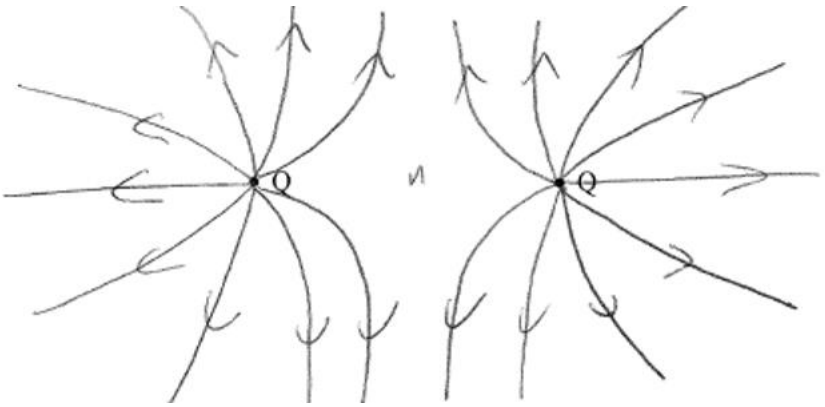
$$1.0 sin30 = 2 sin\Theta_r$$

$$\Theta_r = 14.5^o$$

Question 26 (2 marks)

Criteria	Marks
Includes: • Arrows away from positive charges • Curved lines in correct shape, showing deflection due to neighbouring charge • Space between lines increases as distance from charge increases	2
Any one of the above	1

Sample answer:



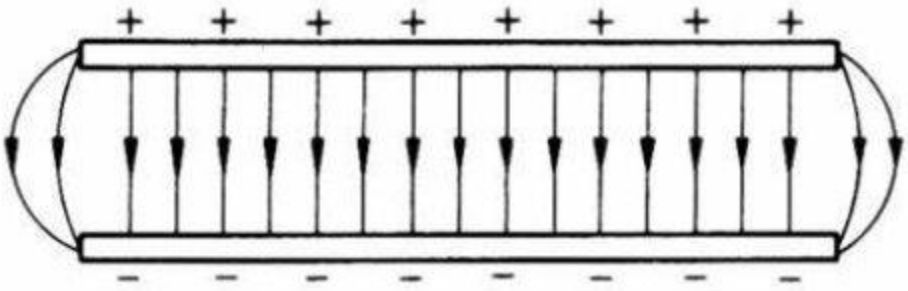
Marker's Notes:

A number of people drew diagrams that had parallel field lines, or lines that curved the wrong way eg, subtly towards the other charge instead of away from it (ie, the concavity was incorrect).

Question 27a (1 mark)

Criteria	Marks
Lines must be: • Equally spaced • Parallel • Arrows towards -ve plate • Touching both plates	1

Sample answer:



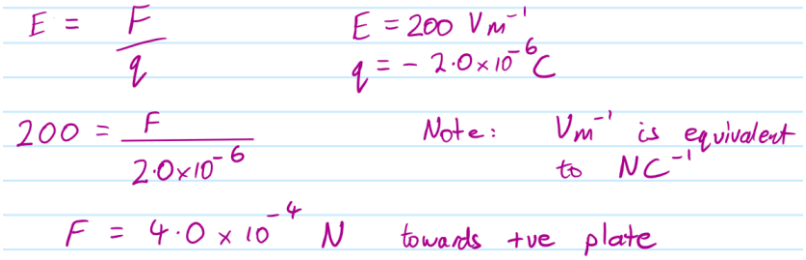
Marker's Notes:

- Any drawing of lines outside the plates was not marked in this instance (whether correct or not).
- There were several people who didn't pay attention to detail. Eg, you need to make the field lines touch the plates.

Question 27b (2 marks)

Criteria	Marks
Correct magnitude and direction (units not enforced)	2
Provides any relevant information, calculation or substitution	1

Sample answer:



Marker's Notes:

- A number of people got confused with their index notation, perhaps after doing a simple calculation in their head. Eg, saying 0.004 instead of 0.0004. Suggestion: use a calculator to avoid errors.
- A number of people tried to determine the direction from the sign of the answer given by the formula, but got it wrong. Eg, Some people wrote "-4.0×10^{-4} N towards positive plate". But the negative changes the direction of your answer. Suggestion: Make a habit of stating direction and magnitude separately. Ie, don't put a negative sign on front of number. Write direction after and separate to magnitude.

Question 28a (1 mark)

Criteria	Marks
Both correct	1

Sample answer:

- Sodium ions will move to the right
- Chlorine ions will move to the left

Question 28b (2 marks)

Criteria	Marks
Identifies correct direction with a valid explanation	2
Provides any relevant information	1

Sample answer:

The conventional current will flow to the right in the beaker. This is because conventional current is defined to flow in the direction a free positive ion would move in the circuit. Ie, positive to negative.

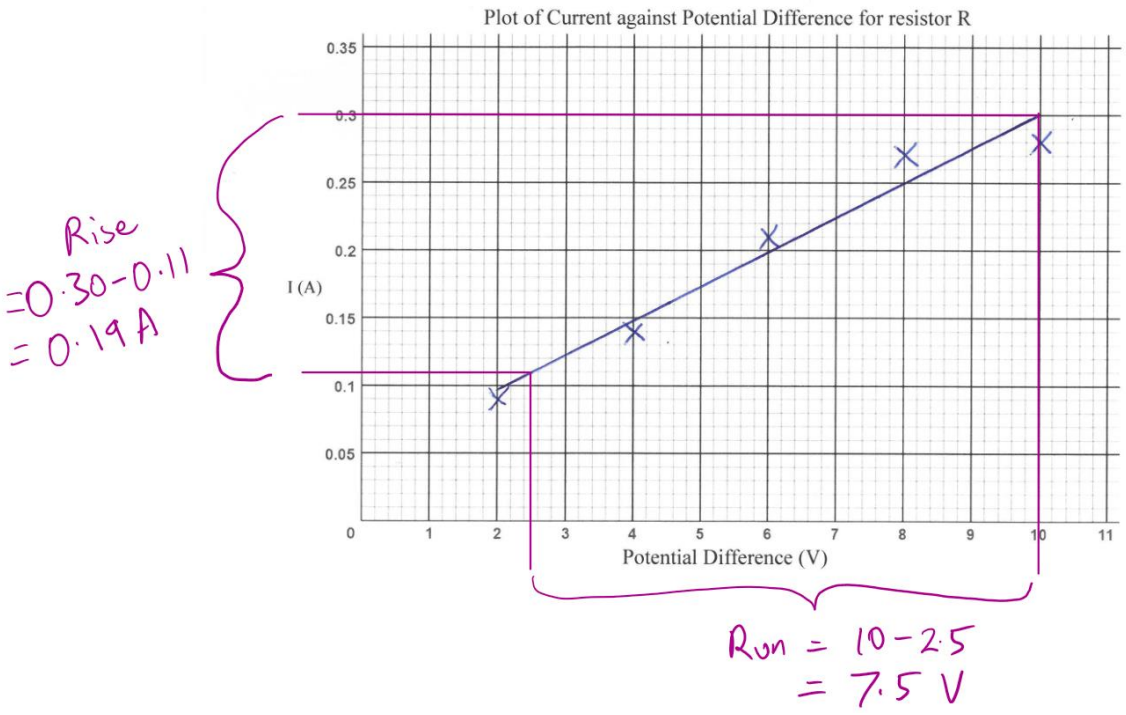
Marker's Notes:

- ECF if conventional current direction matched incorrect sodium ion direction.
- 1 mark was given for correct direction, even if 28a was incorrect.
- Remember context of this beaker! Ie, there _are_ positive charges moving in this case, we're not talking about 'imaginary' positive charges.
- There are no electrons flowing in the beaker, the charges that are moving are Sodium and Chlorine ions.

Question 29 (5 marks)

Criteria	Marks
Points plotted correctly AND Resistance correctly calculated using gradient, demonstrably determined from gradient of graph	5
Uses correct method to calculate resistance but with a single error in plotting, method or calculation	4
Attempts to use gradient of line of best fit to calculate resistance	3
Plots most points correctly and draws line of best fit OR Uses gradient of a line (drawn or implied) to calculate resistance	2
Plots any points correctly OR provides any relevant information	1

Sample answer:



$$\text{Gradient} = \frac{\text{Rise}}{\text{Run}} = \frac{0.19}{7.5} = 0.02533$$

$V = IR$

Rearranging to match general equation of straight line:

$$I = \frac{V}{R}$$

ie, $I = \frac{1}{R}V + 0$

$y = mx + b$

$\therefore \quad \frac{1}{R} = m$

$= 0.02533$

$R = 39\ \Omega$

Marker's Notes:

- Make sure you learn from each assessment. There was a similar question in Assessment 2, but people are making the same mistakes.
- When we say show working ***on*** the graph – we mean it! Many people didn't do this.
- Working on graph' means write numbers and calculations as appropriate, not just lines (although this was not enforced in this exam)
- Exams are scanned – don't draw super faint and thin lines or points (same on HSC exam)
- Last point is NOT an outlier. Only exclude outliers when you have a *very* good reason. With only 5 points it is impossible to say that any of them are outliers.
- Points used to calculate gradient should be far apart from each other.
- DON'T use any of the data points given to calculate the gradient. Pick another two points on the line of best fit.

Question 30 (2 marks)

Criteria	Marks
Identifies that repeats are needed. Identifies that results close together indicates reliability.	2
Provides any relevant information	1

Sample answer:

The student could complete the experiment several times and see how consistent the results are to determine whether the investigation is reliable. The closer the results are to each other, the more reliable the investigation.

Marker's Notes:

- Read the question carefully. The question didn't ask how to make it more reliable, the question asked *Explain* how to change it so you could *assess* reliability.
- Repeating doesn't *make* it reliable. But you need to repeat before you can *assess*.

End of Task