Let the mind manage the body
Que l'esprit gère le corps

MAURITIUS
EXAMINATIONS
SYNDICATE

NCE 2024

Science (Physics)

Subject code: N530

EXAMINERS' REPORT

April 2025

INTRODUCTION

This report highlights the common mistakes and difficulties which candidates encountered in the National Certificate of Education (NCE) Physics assessment 2024. The Physics assessment is based on the learning outcomes of the *Science Teaching and learning Syllabus* set at Grade 9. It aims at gauging the extent to which candidates achieve the three Assessment Objectives (AOs) listed in Table 1.

Table 1: Weighting of the Assessment Objectives

	Assessment Objective	Weighting (%)
AO1	Knowledge with understanding	45 – 50
AO2	Application	25 - 35
AO3	Scientific Inquiry	20 - 25

GENERAL COMMENTS

The overall performance of candidates in the Physics Assessment 2024 is satisfactory. A mean score of 28.0 out of a total of 50 marks was attained. While this mean is slightly less than the mean attained in 2023, it remains comparable.

The Physics assessment was designed to evaluate candidates' understanding of key introductory concepts learned and their ability to apply their understanding in specific situations. The results offer valuable insights into candidates' mastery of the learning material and opportunities for targeted support as detailed in this report.

Overall, the results indicate broad engagement with the subject across the cohort. The Physics question paper appeared well graded with a gradual increase in the level of difficulty of the questions. This corroborates with the gradual decrease in the number of candidates who answered questions 1 to 6 correctly. Candidates fared least well in questions 5 and 6.

Most candidates scored between 11 and 30 marks in the assessment. This indicates that candidates acquired a fairly good understanding of the basic concepts. Targeted support and reinforcement of these concepts in class is likely to further improve performance in the future. About a third of the candidates achieved between 31 and 50 marks which signals a significant group having a firm grasp of the concepts.

A few points that need to be reiterated nonetheless are:

- to insist that students show all their working at all times
- to assist students in overcoming language difficulties
- to encourage students to write their answers on the answer lines
- to indicate to students how to strike off any working they deem incorrect in a clear and legible manner
- to encourage students to show replaced working/answers clearly using arrows

SPECIFIC COMMENTS

Question 1

Question 1 comprised 10 Multiple-Choice Questions. Candidates performed well in this question in general. The mean mark attained was 7 out of 10.

The most accessible multiple-choice items in Qu. 1 were items (a), (b), (f) and (h).
Items (g) and (i) were the multiple-choice items on which candidates fared least well.

Table 2 lists the answers to the items in Question 1.

Table 2: Answer key to the items in Question 1

Item Number	Key	Item Number	Key
(a)	**B**	(f)	**A**
(b)	**B**	(g)	**D**
(c)	**C**	(h)	**A**
(d)	**D**	(i)	**A**
(e)	**B**	(j)	**C**

Item (a)

(a) Which of the following is a unit of **temperature**?

A centimetre (cm)

B kelvin (K)

C gram (g)

D metre (m)

This item was among the most well answered item in Question 1. Candidates readily recognised the Kelvin as the unit of temperature.

Item (b)

(b) A ruler is used to measure the length of an object as shown in Fig. 1.1.

In Fig. 1.1, circle the letter which shows the correct position of the eye to avoid parallax error.

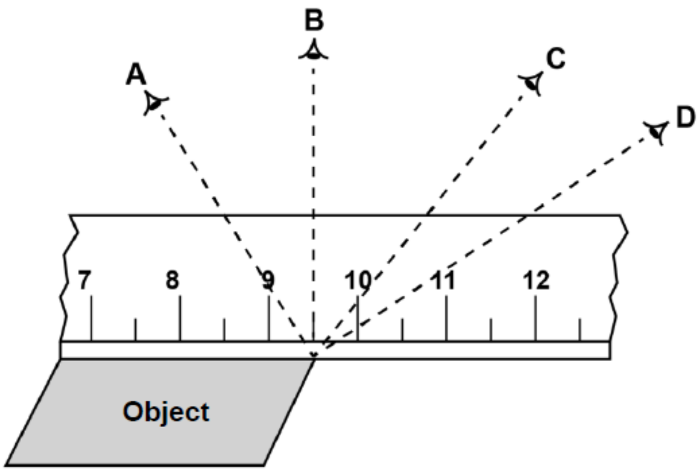


Fig. 1.1

Performance in this question was very good. Candidates successfully identified the correct position of the eye. It is to be noted that candidates are exposed to similar diagrams in their textbook. The fact that they were able to recall the correct position of the eye on a diagram does not necessarily imply that they know how to avoid parallax error in practice. Small group class activities where students need to measure objects in real life is, therefore, strongly encouraged.

Item (c)

(c) To see in the dark, we switch on light bulbs.
This is because light bulbs

A absorb light.

B block light.

C emit light.

D reflect light.

About 7 out of 10 candidates answered this item correctly. Option **D** was a popular distractor in this case. It suggests that the difference between terms such as 'reflect' and 'emit' may need to be clarified and/or emphasised to students.

Item (d)

(d) A man runs a distance of 100 m in 20 s.

What is the average **speed** of the man?

A 200 m/s

B 120 m/s

C 80 m/s

D 5 m/s

Performance on item (d) was comparable to that on item (b). A large number of candidates found the average speed of the man. It appeared that candidates had a firm grasp of how to go about calculating the average speed given the distance travelled and the time taken.

Item (e)

(e) Fig. 1.2 shows three beams of light labelled ***X***, ***Y*** and ***Z*** respectively.

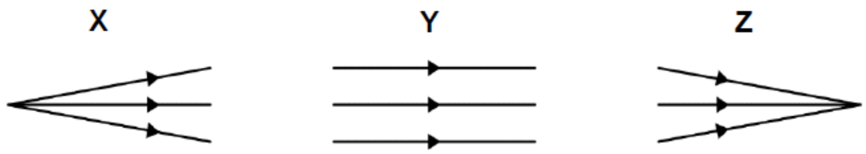


Fig. 1.2

Which of the following shows both the **parallel** and the **convergent** beams?

	Parallel beam	Convergent beam
A	Z	X
B	Y	Z
C	Y	X
D	X	Z

Performance in item (e) was satisfactory. However, it is to be noted that option **C** attracted a good number of candidates. It indicates the common confusion among some candidates which arises from the apparent similitude between the visual representations of convergent and divergent beams of light. Unless students' attention is drawn to the subtle difference between the two, this confusion may persist in the future.

Item (f)

(f) A student determines the volume of a stone using the set-up shown in Fig. 1.3 (a) and Fig. 1.3 (b).

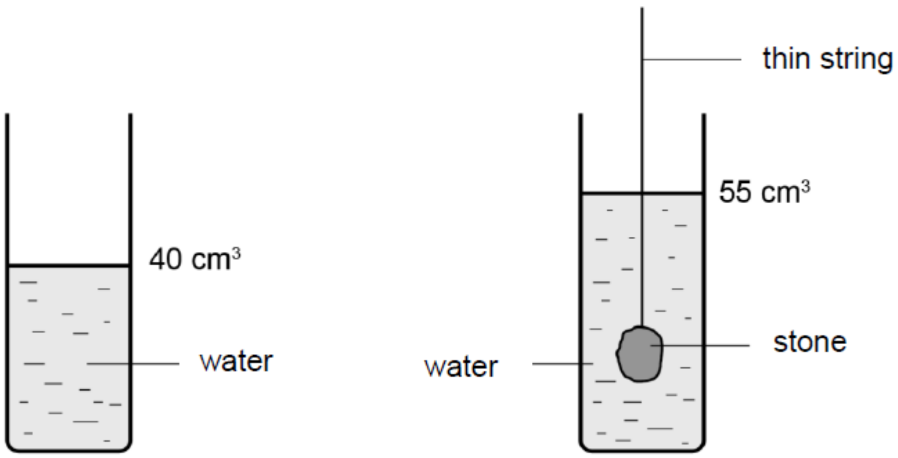


Fig. 1.3 (a) **Fig. 1.3 (b)**

What is the **volume of the stone**?

A 15 cm^3 **B** 40 cm^3

C 55 cm^3 **D** 95 cm^3

Candidates responded well to item (f) in general. The majority of candidates seemed to understand that the volume of the stone is equivalent to the amount of water displaced.

Item (g)

(g) Fig 1.4 shows a stopwatch.

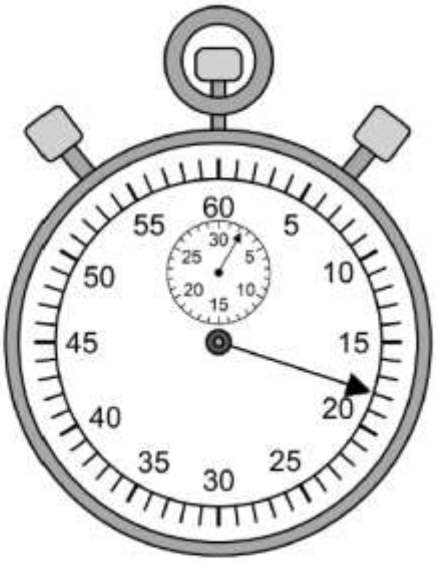
What is the reading shown on the stopwatch?

A 18 s

B 32 s

C 1 min 15 s

D 2 min 18 s



About half of the candidates correctly identified option **D** as the answer. Option **A** was a powerful distractor. A considerable number of candidates overlooked the reading shown by the minute hand on the stopwatch. Encouraging hands-on activities where students are required to measure time using analogue stopwatches is bound to enhance students' skills of reading time from such stopwatches.

Item (h)

(h) What **form** of energy is stored in a dry cell?

A Chemical

B Heat

C Light

D Sound

Item (h) was accessible to the vast majority of candidates. A handful of candidates nevertheless chose option **B** as their answer.

Item (i)

(i) A boy walks from **P** to **Q** to **R** and back to **P** as shown in Fig. 1.5.

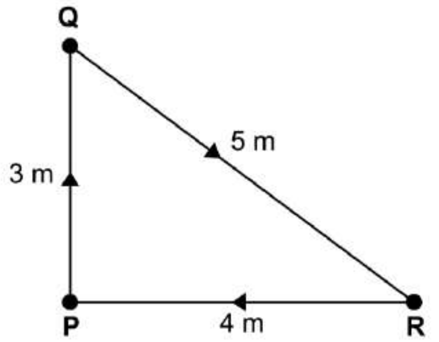


Fig. 1.5

What is his **total displacement**?

A 0 m   **B** 8 m

C 12 m   **D** 16 m

Item (i) was the least well-answered multiple-choice item. Many calculated the total distance travelled instead of the total displacement.

Item (j)

(j) According to the law of conservation of energy, which of the following statements is **true**?

A Energy can be created.

B Energy can be destroyed.

C Energy can change from one form to another.

D Energy can either be renewable or non-renewable.

Performance on item (j) was satisfactory suggesting that the law of conservation of energy was known to a good number of candidates.

Question 2

Question 2 carried a total of 5 marks. It was a matching question that assessed whether candidates can recognise the different parts of a ray diagram showing the reflection of a ray of light in a plane mirror. Candidates fared quite well in this question. They achieved a mean score of 3 marks out of 5.

Fig. 2.1 shows a ray of light striking the surface of a plane mirror **MN**.

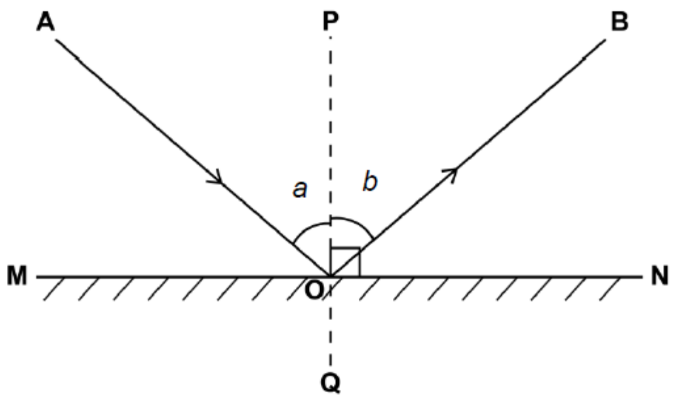


Fig. 2.1

Match each item in **Column A** with its correct label in **Column B**.

Column A	Column B
(a) Reflected ray •	• *b*
(b) Angle of incidence •	• **PQ**
(c) Angle of reflection •	• **AO**
(d) The normal at the point of incidence •	• **ON**
(e) Incident ray •	• *a*
	• **OB**

The fact that many could identify the angle of incidence but not the angle of reflection suggests some misunderstanding on the part of candidates. The normal at the point of incidence (ON) was readily recognised by many. Some, however, wrongly considered ON or AO as the reflected ray.

Carrying out a practical experiment or a live demo in class to show how a ray of light is actually reflected by a plane mirror may help students better understand reflection. Engaging them in measuring the angles of incidence and reflection may further reinforce their understanding and retaining power.

Question 3

Performance in Qu. 3 was rather fair. Candidates managed to score 2.5 marks out of a total of 5 marks on average. The question was based on the speed-time graph shown below. It assessed candidates' ability to interpret the graph.

Fig. 3.1 shows the speed-time graph of a car moving along a straight line.

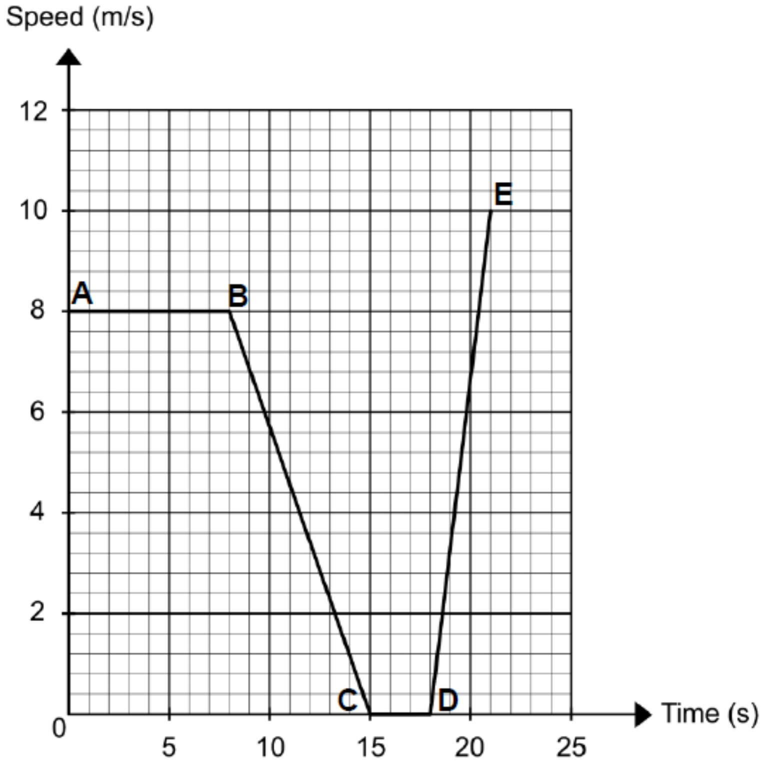


Fig. 3.1

Question 3 (a)

(a)	(i)	For how long does the car move at a uniform speed of 8 m/s?	
		…………………………………………………..	[1]
	(ii)	What is the **maximum** speed reached by the car on its journey?	
		…………………………………………………..	[1]

A good number of candidates correctly identified both, the length of time during which the car moved with a constant speed and the maximum speed of the car. This indicates that quite many were able to extract basic information from a speed-time graph with confidence. In some cases, instead of giving a value, candidates wrote the letter corresponding to the time or speed.

Answers: ***(a)(i)*** *8 s*, ***(a)(ii)*** *10 m/s*

Question 3 (b)

(b)	Fully describe the motion of the car between		
	(i)	C and D.	
		…………………………………………………………………………………………	[1]
	(ii)	B and C.	
		…………………………………………………………………………………………	
		…………………………………………………………………………………………	
		…………………………………………………………………………………………	[2]

Candidates showed much less confidence in answering part (b) which suggests that, while they can extract information from a graph, they are less competent at interpreting and describing the motion shown on a speed-time graph. Very often, descriptions given were inadequate or flawed.

In part (b)(i) for instance, less than half of the candidates realised that the car was at rest for a period of 5 s between C and D when its speed remained at 0 m/s.

Candidates had even greater difficulties to fully describe the motion of the car between B and C. About 20% of the candidates specified that the car decelerated uniformly from 8 m/s to 0 m/s in 7 s with accuracy. Quite many statements written by candidates were contradictory. Some examples were:

- **Moving at rest*
- **Accelerating with constant speed*
- *Uniform but decreasing acceleration

This points out the shallow understanding of a good number of candidates who used key terms related to the topic in a random way.

Question 4

Candidates fared quite well in this question which comprised mostly objective-type questions. Out of a total of 10 marks, candidates managed to get 6.5 marks on average.

Question 4 (a)

(a) Complete the following sentences with the correct word from the given list.

kinetic **light** **non-renewable** **potential**

renewable **chemical**

[**Note**: there is one extra word in the list]

(i) In a thermal power station, ……………………… energy stored in coal is converted into electrical energy.

(ii) A ball found on the roof of a house has ……………………… energy.

(iii) Wind is a ……………………… source of energy.

(iv) A thermal power station uses the ……………………… energy of steam to turn a turbine.

(v) A disadvantage of using coal to produce electricity is that it is a ……………………… source of energy.

In this part question, candidates were required to use their knowledge of the topic *Energy* to fill-in-the blanks. The question was accessible to the majority. Nevertheless, some were unsure whether the terms *renewable* and *non-renewable* would fit statements (iii) and (v) or vice versa. A few others had a similar issue with deciding where to place the terms *kinetic* and *chemical*.

Answers: ***(a)(i)*** *chemical*, ***(a)(ii)*** *potential*, ***(a)(iii)*** *renewable*,
(a)(iv) *kinetic*, ***(a)(v)*** *non-renewable*

Question 4 (b)(i)

(b) (i) Which **two** quantities from the list below are vector quantities?

Tick (✓) the **two** correct boxes.

- [ ] Distance
- [ ] Displacement
- [ ] Speed
- [ ] Velocity
- [ ] Mass

Candidates' performance in part (b)(i) was below expectation. Many identified a single vector quantity from the list given for which they secured a partial mark. It is to be noted that *distance* and *speed* were often considered as vector quantities. In a good number of cases, candidates indicated two scalar quantities instead of two vector quantities. This suggests that they had either not read the question carefully or they mistook scalar for vector quantities. The difficulty to tell apart scalar from vector quantities persists.

Answers: ***(b)(i)*** *Displacement, Velocity*

Question 4 (b)(ii)

(ii)	A car moving along a straight line accelerates uniformly from a speed of 10 m/s to 20 m/s in 2 s. Calculate the **acceleration** of the car. Show all your workings.

Candidates did not fare very well in this part question. Marks were often lost because candidates did not show their working. It is important to highlight inconsistencies in writing the formula to calculate acceleration. For example, candidates wrote: $a = \frac{u - v}{t}$. Yet, when they substituted the values into the equation, they wrote a = (20 – 10)/2. Students should be encouraged to write formulae in words (even if these are in an abbreviated form) rather than using symbols unless conventional symbols are used. There were quite many instances where candidates used the letters *d* or *s* to represent velocity. The use of such unconventional symbols usually leads to multiple interpretations by examiners which may result in loss of marks.

Answer: ***(b)(ii)*** *5 m/s*^{2}

Question 5

Question 5 was based on the sub-topic *Conservation of Energy*. Candidates' performance in this question revealed a number of misconceptions that needs to be addressed.

Question 5 (a)

In this part question, candidates had to calculate the gravitational potential energy of a ball when it is at its highest point above the ground. Despite the fact that calculators are allowed in the NCE Physics Assessment, a considerable number of candidates had difficulties working with the decimal numbers. Incidentally, in finding the gravitational potential energy, some candidates wrote the formula to calculate kinetic energy (1/2 mv^2) instead and took the value of v to be equal to the value of g, the acceleration due to gravity.

A ball attached to the lower end of a string is set swinging freely between positions **A** and **C** as shown in Fig. 5.1.

When the ball is at position **B**, it is just above the ground.

When it is at positions **A** and **C**, it is at a height of 0.6 m above the ground.

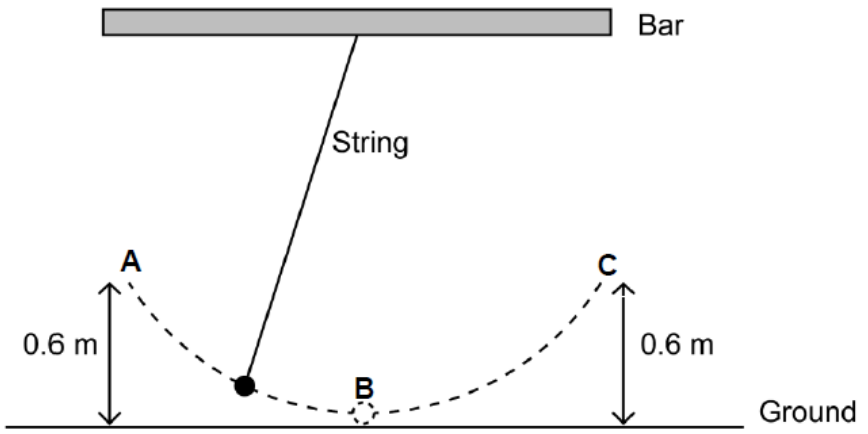


Fig. 5.1

(a) The ball has a mass of 0.5 kg.

What is the gravitational potential energy of the ball at position **A**? [Take g=10 m/s^2].

Show all your workings.

Answers: ***(a)*** *3 J*

Question 5 (b)

Candidates fared better in parts (b)(i) and (b)(ii). A good number of candidates recognised that gravitational potential energy is dependent on height. However, quite many also wrongly considered that the mass of the ball would decrease when, in fact, it remains unchanged.

In part (b)(ii), it appeared to some candidates that as the gravitational potential energy decreases, the kinetic energy would also decrease. This suggests that although candidates could recall the law of conservation of energy (Qu. 1(j)), they had an inadequate understanding of what it means. While the energy in a closed system can be converted from one form to another, it remains constant. Therefore, a decrease in the gravitational potential energy necessarily meant that the kinetic energy would increase so that the total energy remains constant.as well.

(i) When the ball moves from **A** to **B**, its **gravitational potential energy** decreases.

This is because

☐ the mass of the ball decreases.

☐ the speed of the ball decreases.

☐ the height of the ball decreases.

[1]

(ii) What happens to the **kinetic energy** of the ball when it moves from **A** to **B**?

Tick (✓) the correct box.

☐ It decreases.

☐ It increases.

☐ It is unchanged.

[1]

Answer: ***(b)(i)*** *the height of the ball,* ***(b)(ii)*** *It increases*

Question 5 (c)

(c) Assuming there is no loss of energy, state the kinetic energy of the ball at position **B**. Kinetic energy = ... J [1]

Qu. 5(c) did not require any calculations. Rather it assessed whether candidates could join the dots and reason that if the total energy in a closed system is constant then the decrease in gravitational potential energy of the ball as it moves from **A** to **B** should be equal to the kinetic energy which it gained. A good number of candidates did not draw this conclusion. Some set out to calculate the kinetic energy using the formula KE = ½ mv^2 even when the velocity was unknown.

Answer: ***(c)*** *3 J*

Question 6

Question 6 was a fairly long question. It assessed the topic '*Electricity*'. It carried a total of 15 marks and was the least well-answered question in the paper. Candidates achieved a mean score of 5.8 in the question.

Question 6(a)

Parts (a)(i), (a)(ii) and (a)(iii) were meant to be scoring items, but they were not as accessible as expected. In part (a)(i), candidates were required to show the positive terminal of a cell by drawing a + sign. However, quite many were unsure where to place the + sign. Consequently, candidates often wrote the + sign in between the positive and negative terminals of the cell.

In part (a)(ii), candidates drew arrows all around the circuit whereas they were required to draw a single arrow at point **P**. Sometimes the direction of the arrow was shown pointing in the opposite direction, from the negative terminal to the positive terminal.

(a) Fig. 6.1 shows an electric circuit in which a current is flowing.

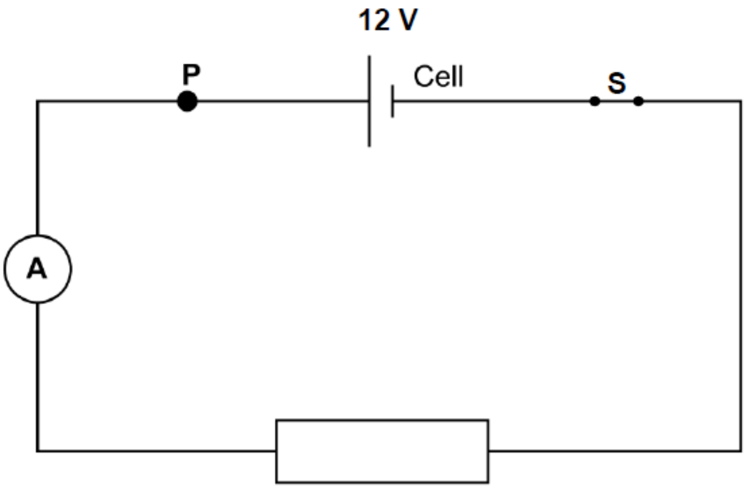


Fig. 6.1

(i) Indicate the positive terminal of the cell by drawing a **+** sign on Fig. 6.1. [1]

(ii) In Fig 6.1, draw an arrow to show the direction of current at point **P**. [1]

(iii) Give a reason why current flows in the circuit when the switch **S** is closed.

.... [1]

(iv) 600 C of charge flows in the circuit in 120 s.
Calculate the current flowing in the circuit. Show all your workings.

Current = ... A [2]

(v) The e.m.f. of the cell is 12 V.

How much work is done to drive 600 C of charge around the whole circuit?

About half of the candidates successfully explained that current flows in the circuit when the switch is closed because it then formed a complete circuit.

Candidates' performance in part (a)(iv) was better than in parts (a)(i), (ii) and (iii). Quite many were able to recall and apply the formula to calculate current (I = Q/t). In contrast, fewer candidates acknowledged that the work done in moving 600 C of charge in the circuit is calculated using the formula W = QV in part (a)(v).

Answer: ***(a)(iv)*** *5 A*, ***(a)(v)*** *7200 J*,

Question 6 (b)

(b) Fig. 6.2 shows a **different** electric circuit.

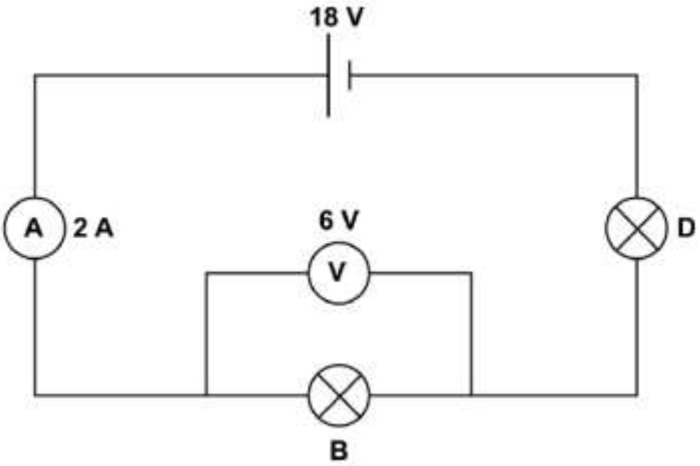


Fig. 6.2

(i) The e.m.f. of the cell is 18 V. The voltmeter reading is 6 V.
What is the potential difference across bulb **D**? Show all your workings.

Potential difference =.................. V [2]

(ii) The ammeter reading is 2 A.
Calculate the **resistance of bulb D**. Show all your workings.

Resistance = ... Ω [2]

(iii) Calculate the **total resistance** of the bulbs **B** and **D**.

Total resistance = ... Ω [2]

(iv) A third bulb is connected in series with bulbs **B** and **D**.

Describe **one** change you observe.

.... [1]

(v) Explain why this change happens.

....

.... [1]

Question 6(b) proved to be the most challenging question in the paper. It indicates inadequate exposure and practice in solving simple circuit problems in general.

In part (b)(i), few recognised that the sum of the potential differences across **B** and **D** is equal to the e.m.f. of the cell. Candidates tended to fiddle with the values given to find the potential difference across bulb **D**.

Performance in part (b)(ii) was slightly better than in part (b)(i). A good number of candidates correctly applied the formula V = IR and were awarded full marks even when their answer to part (b)(i) was incorrect.

In part (b)(iii), many candidates assumed that bulbs **B** and **D** had the same resistance. Consequently, instead of dividing 18 V by 2 A to get the total resistance of the circuit, candidates calculated the resistance of bulb **B** (6/2 = 3 Ω) which they then multiplied by 2. Thus, 6 Ω was a common incorrect answer seen.

Although not an uncommon question, few were able to state an observation that would be made if a third bulb were added to the circuit in part (b)(iv). In some cases, candidates stated that the total resistance of the circuit would increase. While this was a correct statement, it was not an observation that could have been made.

In part (b)(v), a handful of candidates successfully explained that an increase in the resistance of the circuit would lead to a decrease in the amount of current flowing and, thus, would cause brightness to decrease.

Answer: ***(b)(i)*** *12 V*, ***(b)(ii)*** *6* Ω, ***(b)(iii)*** *9* Ω

(b)(iv) *ammeter/voltmeter reading or brightness of the bulbs decreases*

(b)(v) *adding more bulbs increases total resistance and decreases the current*