

# Progressive Exam Resources

**Sample**

## **2** **CONCEPT BUILDING EXERCISE**

- Two types of exercises:
  - Exercise for **Learning** helps students learn a new concept
  - Exercise for **Consolidation** compares several previously learned concepts for consolidation
- **Word files** available on OUP web:





# Concept building exercise (sample)

There are two types of exercise in this Booklet to help students build their concepts:

- 1 Exercise for **Learning**: It helps students learn a new concept.
- 2 Exercise for **Consolidation**: It compares several previously learned concepts for consolidation

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Determining final temperature of mixture (Learning)

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Projectile motion (Learning)

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Seeing things, seeing images (Consolidation)

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### Book E4

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## Book 3A

## More on drawing ray diagrams of lenses (Ch 3)

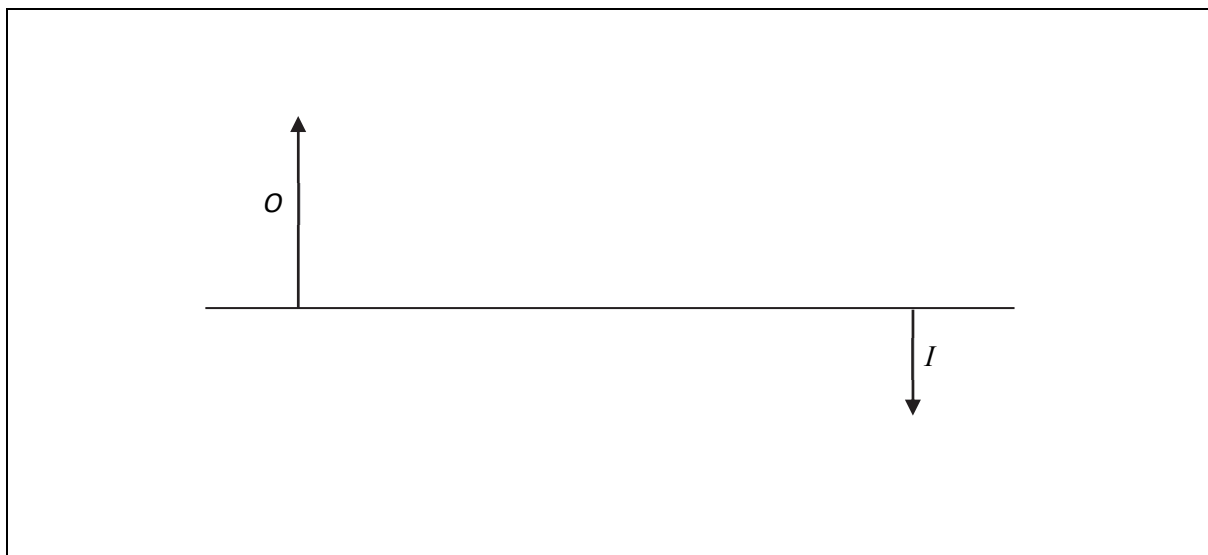
## Consolidation after completing Ch 3

**Aim:** To complete ray diagrams of lenses in unfamiliar situations

You know how to draw standard ray diagrams to find the image formed by a convex or concave lens. In this Exercise, you will draw ray diagrams of lenses in unfamiliar situations (no new knowledge is required!).

**Task 1:** In each of the following, the object  $O$  and the image  $I$  are given. Draw the lens and its foci.

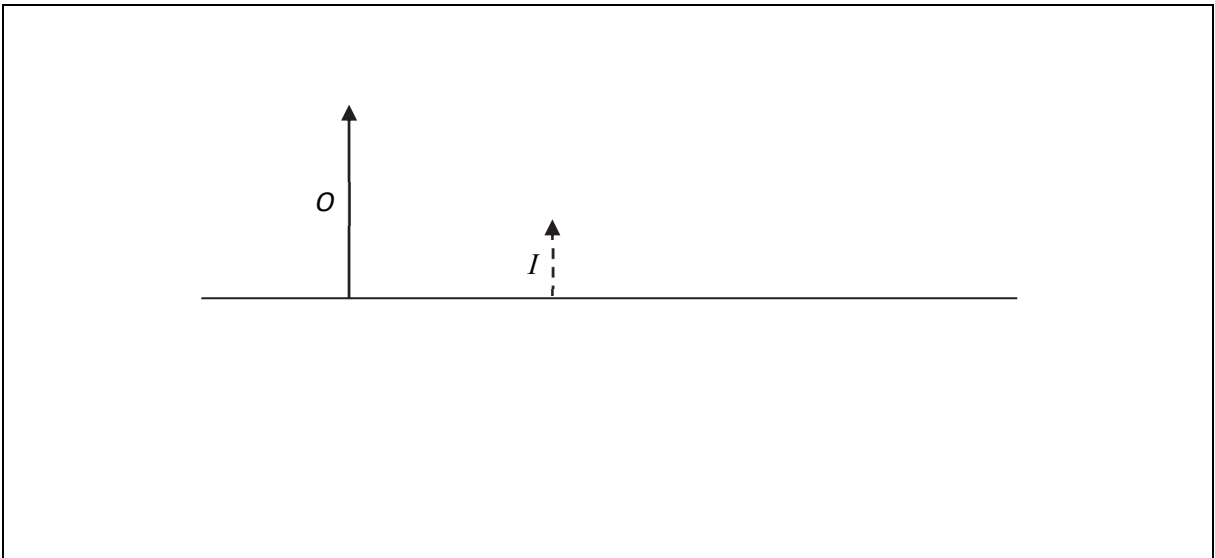
(a)



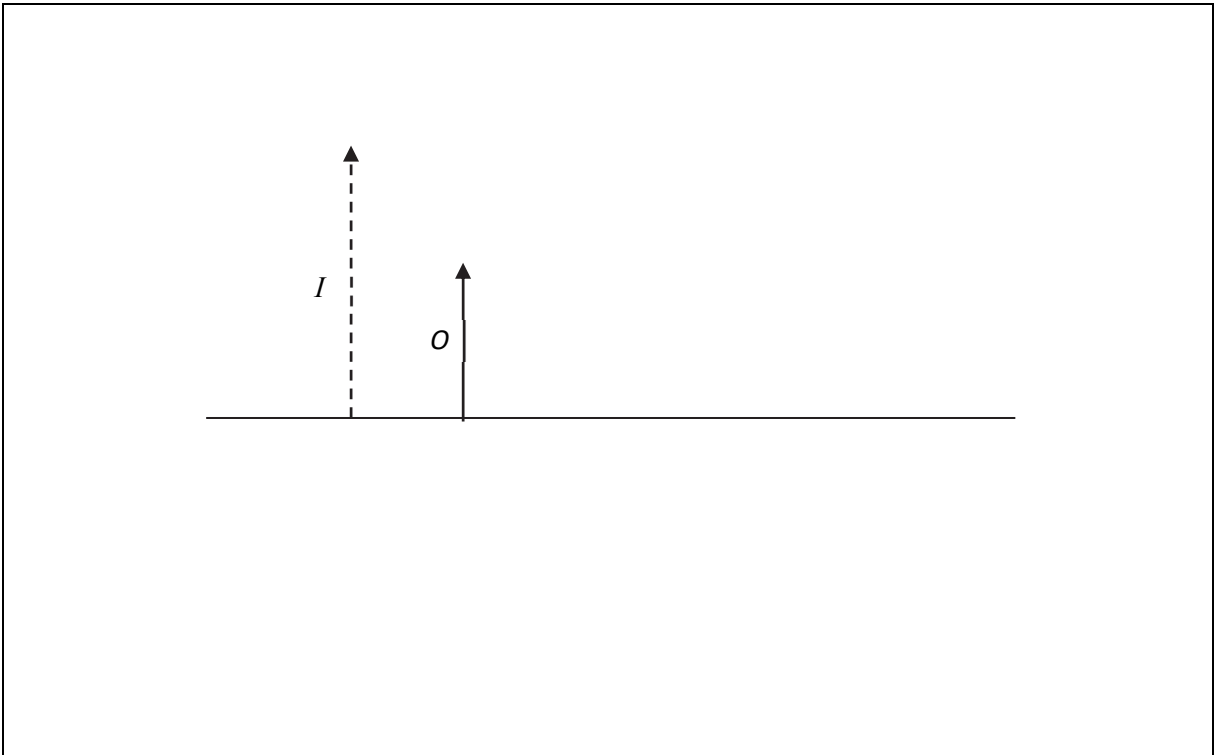
Try to draw a ray from the tip of object to the tip of the image. Where is the lens? Is it convex or concave? Locate the foci of the lens using the construction rules.



(b)

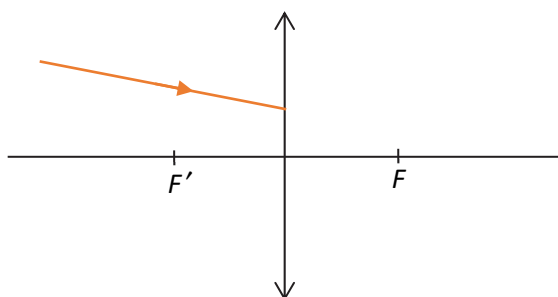


(c)

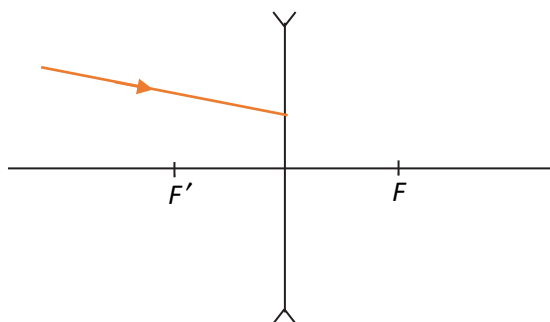


**Task 2:** In each of the following, an arbitrary ray is incident on a lens. Draw the ray after it passes through the lens.

(a)



(b)

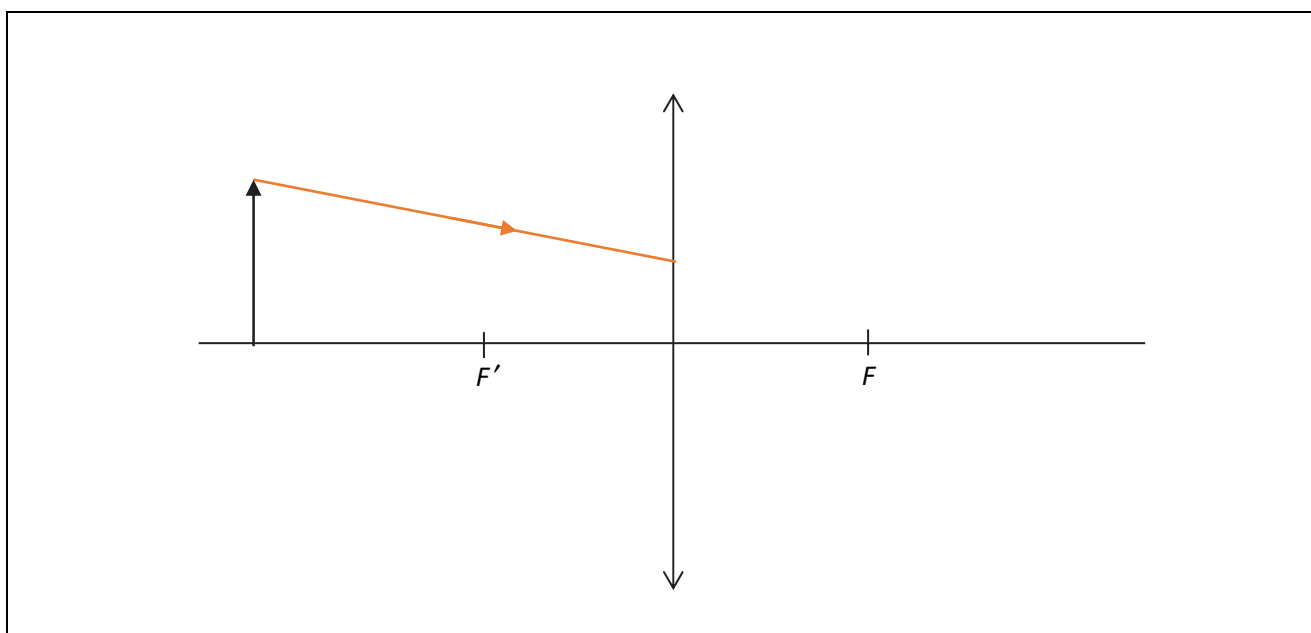


This type of questions can be answered in different ways. Try the following two methods to answer (a).

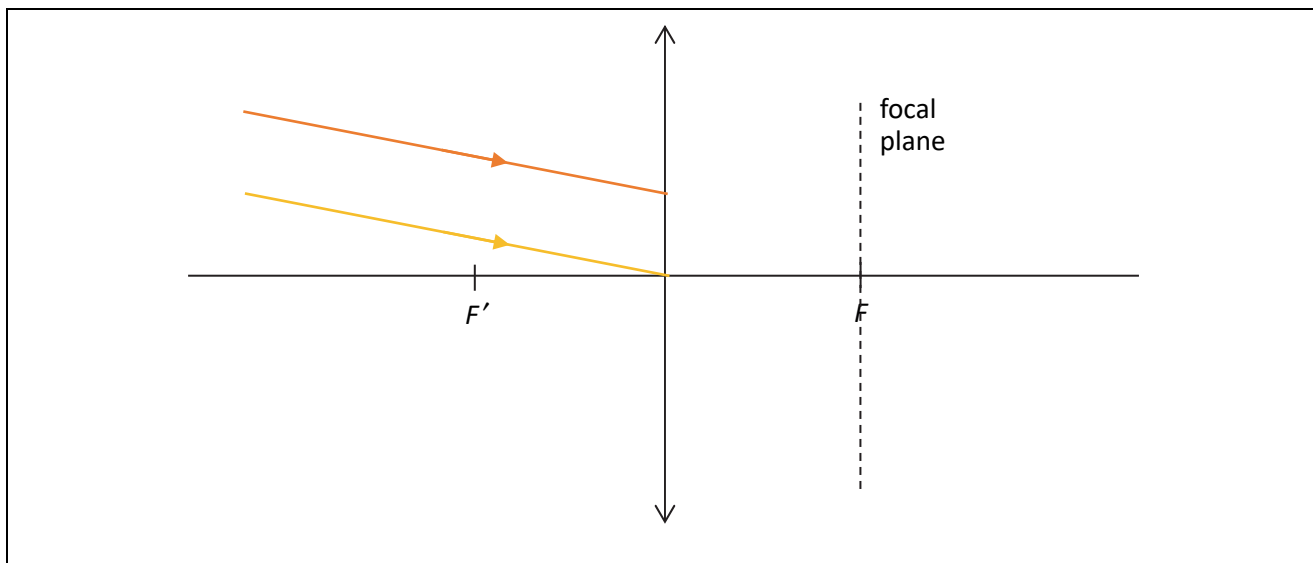


(a)

**Method 1:** Imagine the ray as coming from the tip of an object



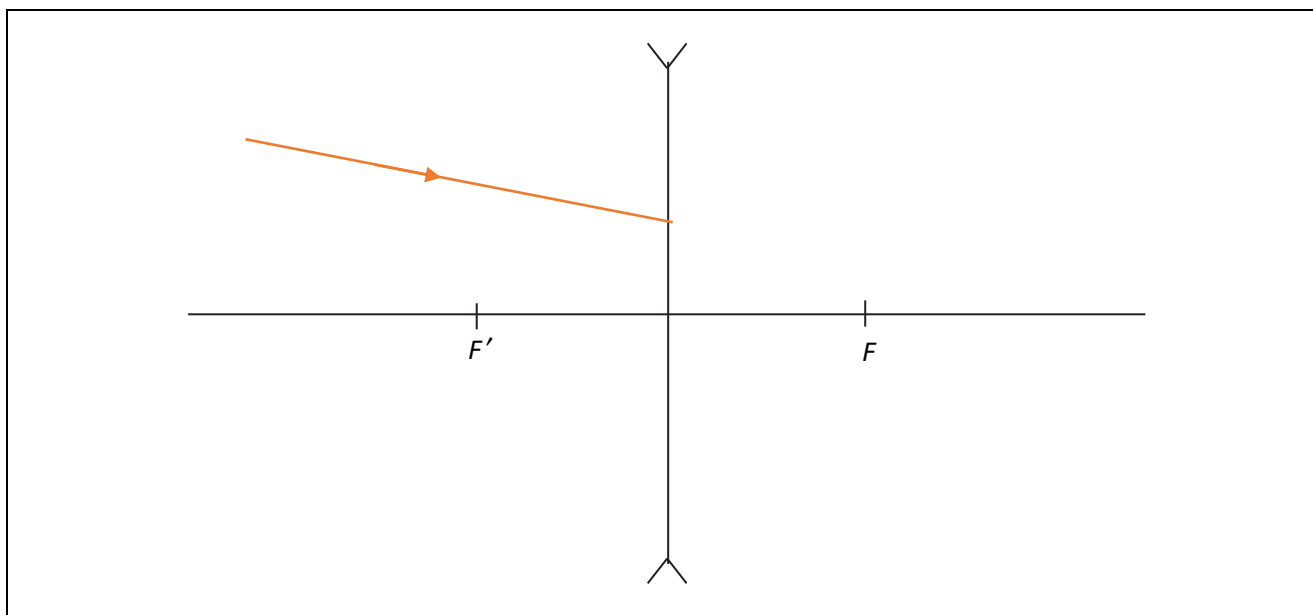
**Method 2:** Imagine the ray as one of the parallel rays



Do these methods give the same answer?



**(b)** Use the way you prefer to complete the ray diagram.



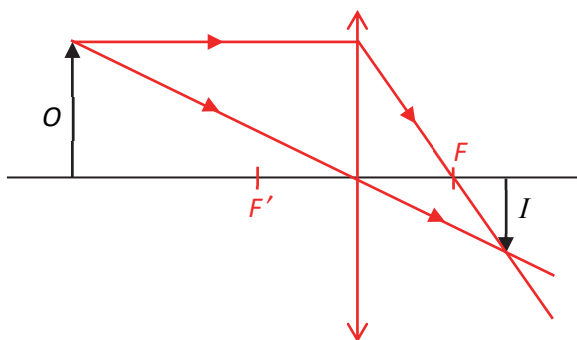
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## Answers and Notes

### Task 1

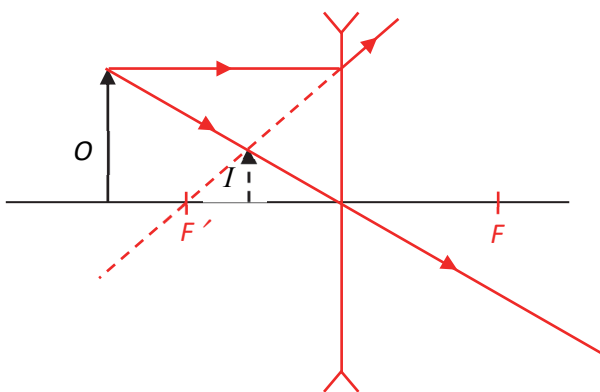
(a)



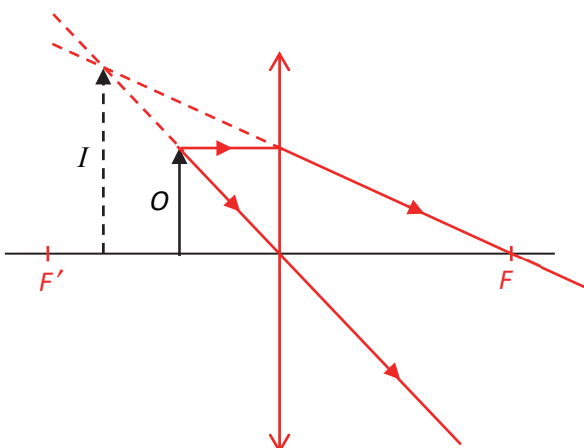
**Note to teachers:**

This question is similar to *Learn by practice 5 Q2* (p. 115).

(b)



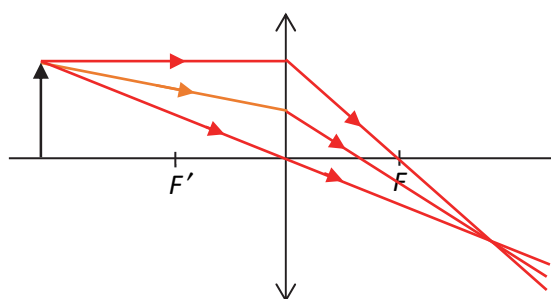
(c)



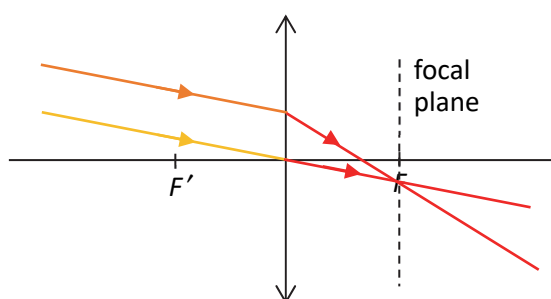
### Task 2

(a)

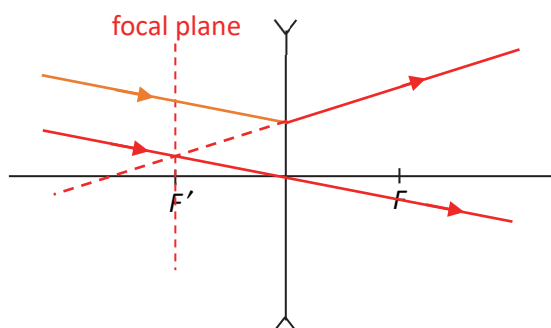
#### Method 1



#### Method 2



(b)



**Concluding remark:**

Remind Ss that all questions in this exercise do not involve any new knowledge. They can be completed using the three construction rules and the fact that parallel rays converge to (or seem to diverge from) a point on the focal plane.

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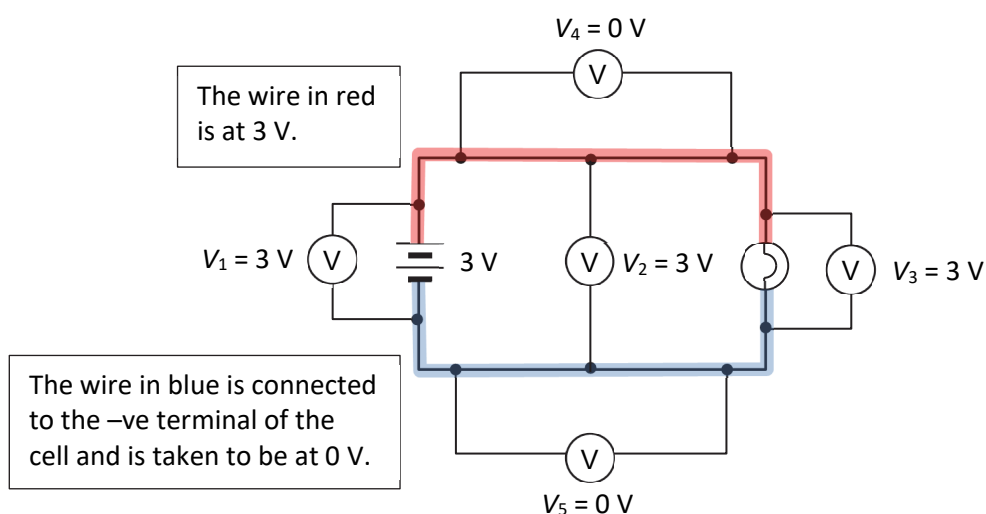
Book 4

## Potentials in colours (Ch 2)

### Learning the concept of potential and voltage

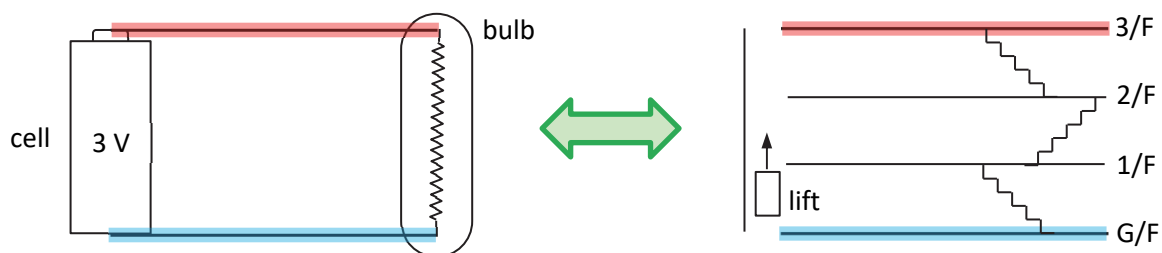
**Aim:** Learn the concept of potential and voltage with the aid of different colours

All parts of a connecting wire are at the same electric potential. We may use the same colour to highlight the wires at the same potential. This may help us visualize how a circuit works.



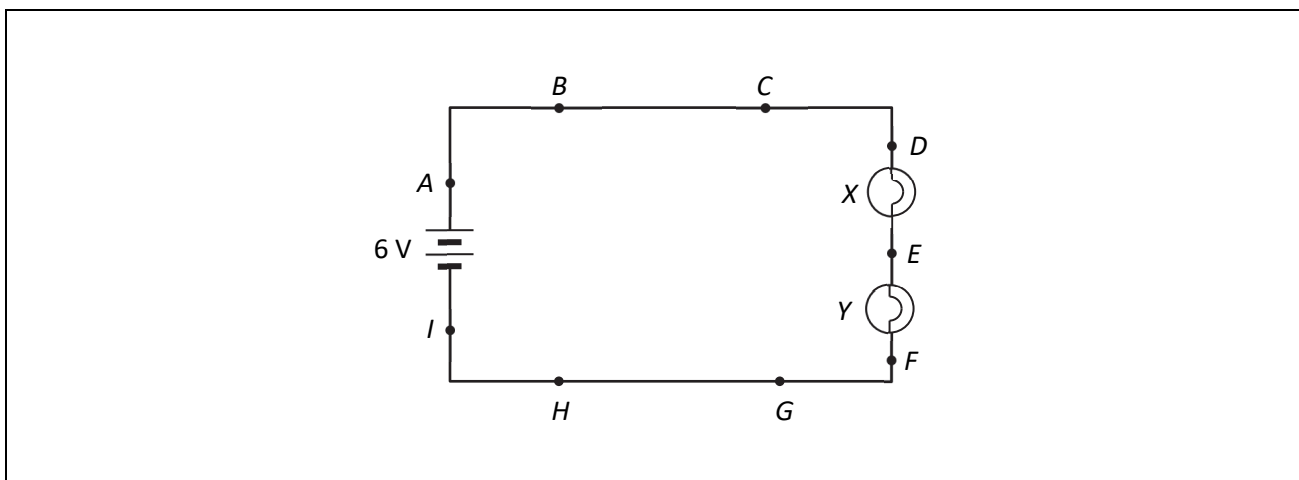
Note the following:

- 1 Two wires of different colours are at different potentials.
  - ➔ Voltmeter across points on the two wires gives the same non-zero reading, e.g.  $V_1$ ,  $V_2$  and  $V_3$  all give a reading of 3 V. This means a voltage (potential difference) of 3 V.
- 2 Different points on a wire of a single colour are at the same potential.
  - ➔ Voltmeter across any two points on the wires gives zero reading (even though current may flow along the wire), e.g.  $V_4$  and  $V_5$  give zero reading.
- 3 You may think potential as height. Points at the same potential are at the same height.



In the questions below, take the –ve terminal of the battery as 0 V.

1 The figure below shows a circuit. The voltage across bulb *Y* is 2 V.



- (a) Highlight different parts of circuit with different colours: 0 V (connected to the –ve terminal of the battery) in blue, 6 V in red and 2 V in green.
- (b) What is the voltmeter reading when a voltmeter is connected across each of the following pairs of points (*A* to *I*)? Complete the following table. Some of them have been done for you.

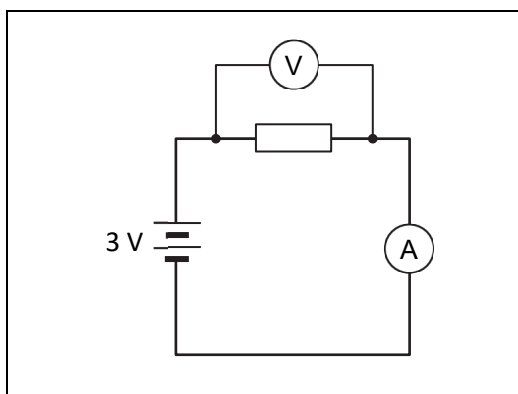
Voltage across / V	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>	<i>I</i>
<i>A</i>		0							
<i>B</i>									
<i>C</i>									
<i>D</i>									
<i>E</i>						2			
<i>F</i>									
<i>G</i>									
<i>H</i>									
<i>I</i>									

2 In each of the following circuits, parts having the same potential are highlighted with the same colour. Fill in the blanks.

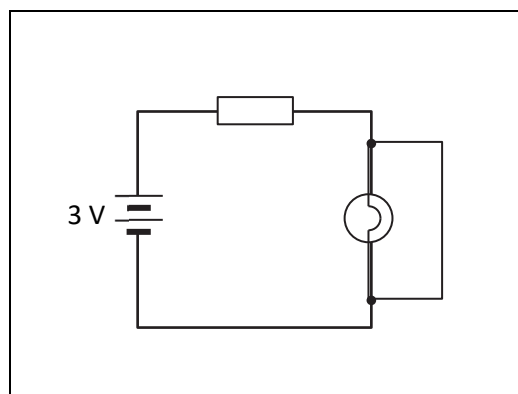
<p><b>(a)</b></p>	<p>Given: <math>V_{AB} = 2 \text{ V}</math></p> <p><b>(i)</b> The potential of the green wire = _____</p> <p><b>(ii)</b> <math>V_{AC} =</math> _____</p> <p><b>(iii)</b> <math>V_{CD} =</math> _____</p> <p><b>(iv)</b> <math>V_{CE} =</math> _____</p> <p><b>(v)</b> <math>V_{AD} =</math> _____</p> <p><b>(vi)</b> <math>V_{AE} =</math> _____</p>
<p><b>(b)</b></p>	<p>Given: <math>V_{EF} = 1 \text{ V}</math></p> <p><b>(i)</b> <math>V_{AC} =</math> _____</p> <p><b>(ii)</b> <math>V_{CD} =</math> _____</p> <p><b>(iii)</b> The potential of <math>F =</math> _____</p> <p><b>(iv)</b> <math>V_{FG} =</math> _____</p> <p><b>(v)</b> <math>V_{BG} =</math> _____</p> <p><b>(vi)</b> <math>V_{AH} =</math> _____</p>
<p><b>(c)</b></p>	<p>Given: <math>V_{AB} = 2 \text{ V}</math>, <math>V_{DE} = 0.6 \text{ V}</math></p> <p><b>(i)</b> <math>V_{AC} =</math> _____</p> <p><b>(ii)</b> <math>V_{CE} =</math> _____</p> <p><b>(iii)</b> <math>V_{CD} =</math> _____</p> <p><b>(iv)</b> <math>V_{AD} =</math> _____</p> <p><b>(v)</b> <math>V_{BF} =</math> _____</p> <p><b>(vi)</b> <math>V_{AF} =</math> _____</p>

3 In each of the following circuits, highlight the part(s) at 3 V in red and the part(s) at 0 V in blue.

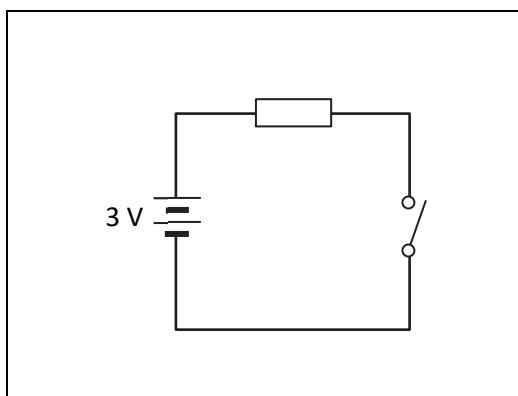
(a) Circuit with an ammeter and a voltmeter



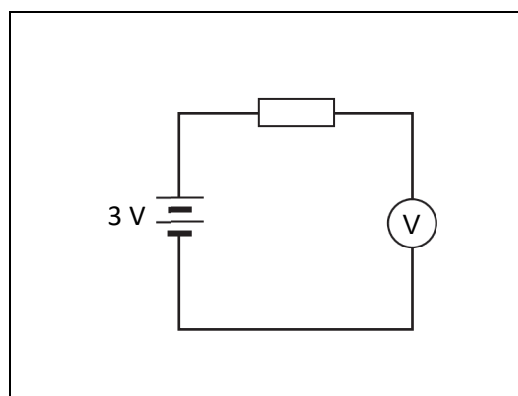
(b) Circuit with a wire across the bulb (short circuit)



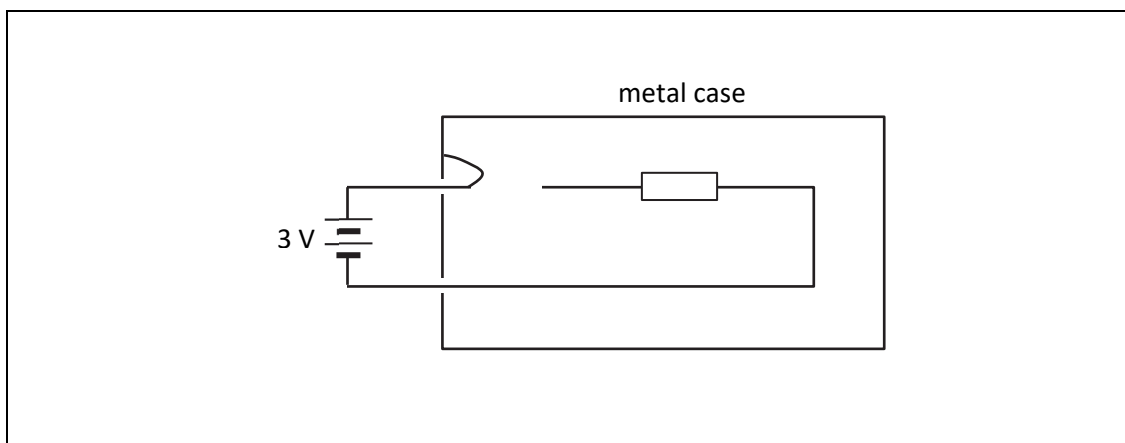
(c) Open circuit



(d) Voltmeter connected incorrectly in series to a resistor



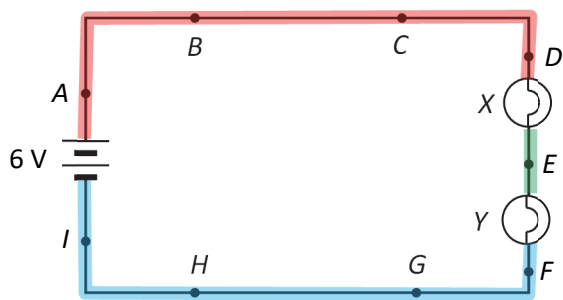
(e) The wire touching the metal case instead of connecting to the resistor



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### Answers and Notes

1 (a)



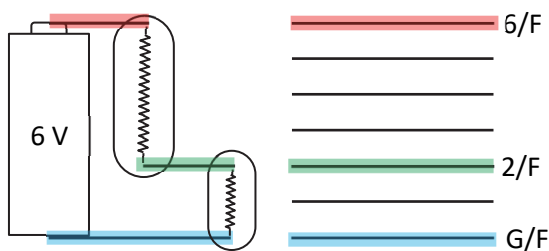
(b)

V/V	A	B	C	D	E	F	G	H	I
A		0	0	0	4	6	6	6	6
B			0	0	4	6	6	6	6
C				0	4	6	6	6	6
D					4	6	6	6	6
E						2	2	2	2
F							0	0	0
G								0	0
H									0
I									

#### Notes to teachers:

1 Ss may have difficulty in realizing that  $V_{AI}$  (voltage across the cell) and  $V_{DF}$  (voltage across the bulbs) are physically the same in terms of change in energy. Highlighting the wires may help them understand this.

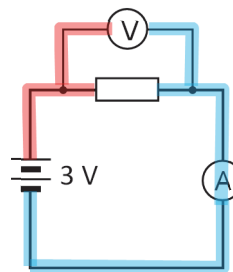
2 It may be useful to relate the circuit to a building:



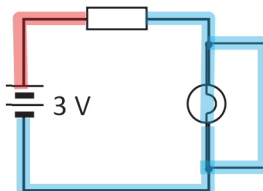
There is no difference in your height when you are moving on the 6/F.

- 2 (a) (i) 1 V (ii) 2 V  
 (iii) 1 V (iv) 1 V  
 (v) 3 V (vi) 3 V  
 (b) (i) 0 V (ii) 3 V  
 (iii) 2 V (iv) 2 V  
 (v) 3 V (vi) 3 V  
 (c) (i) 2 V (ii) 1 V  
 (iii) 0.4 V (iv) 2.4 V  
 (v) 1 V (vi) 3 V

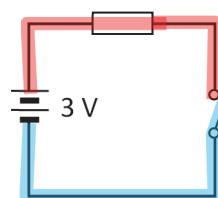
3 (a)



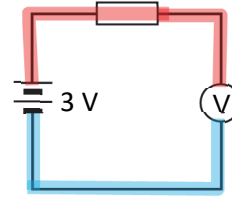
(b)



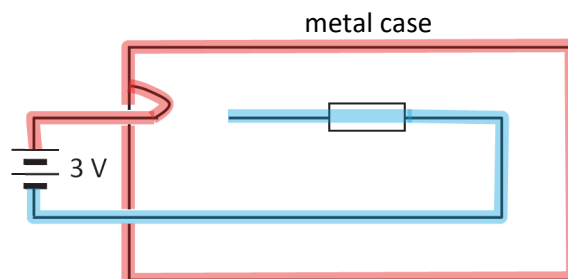
(c)



(d)



(e)



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