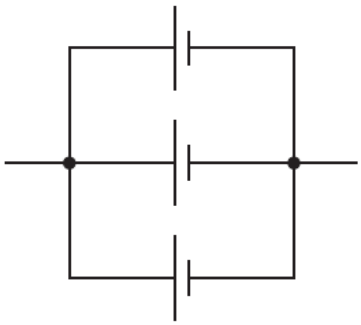
Electricity – 2023 June O Level 5054

1. June/2023/Paper_ 5054/11/No.29

The diagram shows a battery of three 1.5 V cells.



What is an advantage of this arrangement of cells?

A The battery can supply a current for a longer time than a single 1.5 V cell.

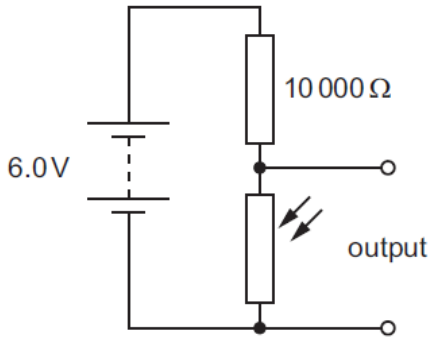
B The battery can supply any e.m.f. between 0 V and 4.5 V.

C The battery supplies more energy to each coulomb of charge than a single 1.5 V cell.

D The e.m.f. of the battery is 4.5 V.

2. June/2023/Paper_ 5054/11/No.30

A potential divider consists of a light-dependent resistor (LDR) and a resistor connected to a 6.0 V battery.



The output is 3.0 V.

What is the resistance of the LDR?

A 0

B between 0 and 10 000 Ω

C 10 000 Ω

D more than 10 000 Ω

3. June/2023/Paper_ 5054/11/No.31

Three students each suggest a consequence of wiring lamps in parallel rather than in series.

student 1 If one lamp breaks, the other lamps stay lit.

student 2 The lamps can be switched on and off separately.

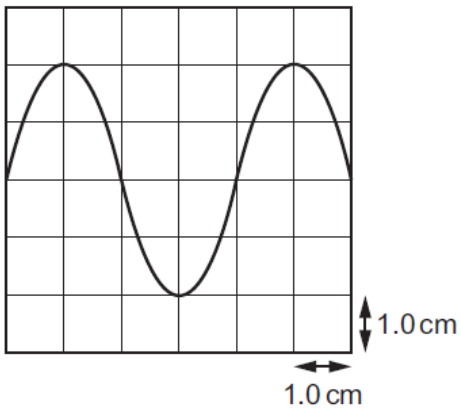
student 3 The p.d. across each lamp is equal to the p.d. across the supply.

Which students are correct?

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

4. June/2023/Paper_ 5054/11/No.33

An a.c. voltage is displayed on an oscilloscope screen. The Y-gain is set at 2.0 V / cm.



What is the maximum value of the voltage?

A 2.0 V **B** 4.0 V **C** 8.0 V **D** 12 V

5. June/2023/Paper_ 5054/12/No.27

A metal conductor is connected between the positive and negative terminals of a battery.

Which row gives the direction of movement of the particles that flow in the conductor and their name?

	direction of movement	name of particles
A	from positive terminal to negative terminal	protons
B	from positive terminal to negative terminal	electrons
C	from negative terminal to positive terminal	protons
D	from negative terminal to positive terminal	electrons

6. June/2023/Paper_ 5054/12/No.28

Three identical cells are connected in parallel to a resistor.

What is the advantage of using three cells in parallel rather than using a single cell?

A Each cell produces more energy.

B Each cell supplies more charge.

C Each cell takes longer to discharge.

D The e.m.f. is greater than that of a single cell.

7. June/2023/Paper_ 5054/12/No.29

A student has three 15 Ω resistors.

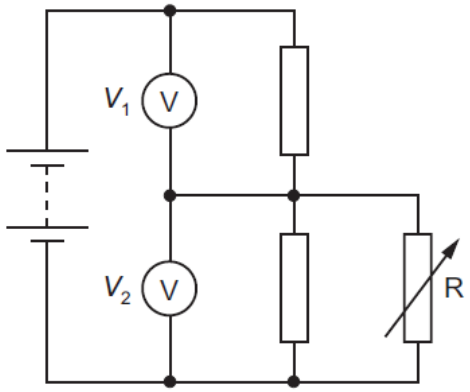
She connects the resistors together in different arrangements.

What is the minimum resistance and what is the maximum resistance of the arrangements that the student can produce?

	minimum resistance / Ω	maximum resistance / Ω
A	5.0	15
B	5.0	45
C	15	30
D	15	45

8. June/2023/Paper_ 5054/12/No.30

The circuit diagram shows a variable resistor R connected in parallel to the lower section of a potential divider.



The resistance of R increases.

What happens to the two voltmeter readings V_1 and V_2?

	V_1	V_2
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

9. June/2023/Paper_ 5054/12/No.31

The power consumption of a microwave oven is 1500 W.

The cost of 1.0 kW h of electrical energy is 24 cents.

What is the cost of using the microwave oven for 10 minutes?

A 6 cents

B 36 cents

C 60 cents

D 360 cents

10. June/2023/Paper_ 5054/21/No.3

Fig. 3.1 shows a circuit containing three resistors, a 12 V power supply and an ammeter.

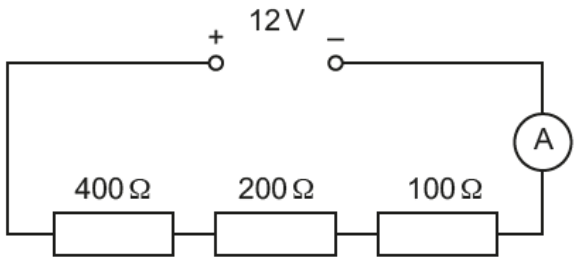


Fig. 3.1

(a) Calculate the current in the 400 Ω resistor.

current = ... A [2]

(b) Calculate the power produced in the 400 Ω resistor.

power = ... W [2]

(c) A student uses all of the components shown in Fig. 3.1 in another circuit.

She connects them so that there is the largest possible current in each resistor.

The current in one of the resistors is larger than the current in the other two resistors. The student connects the ammeter into the circuit to measure the current in this resistor.

Draw the circuit diagram of the arrangement. Label each resistor with the value of its resistance.

[2]

[Total: 6]

11. June/2023/Paper_ 5054/21/No.7

A water wave in a ripple tank diffracts as it passes through the gap in a barrier.

Fig. 7.1 shows a drawing made by a student of the crests in the pattern.

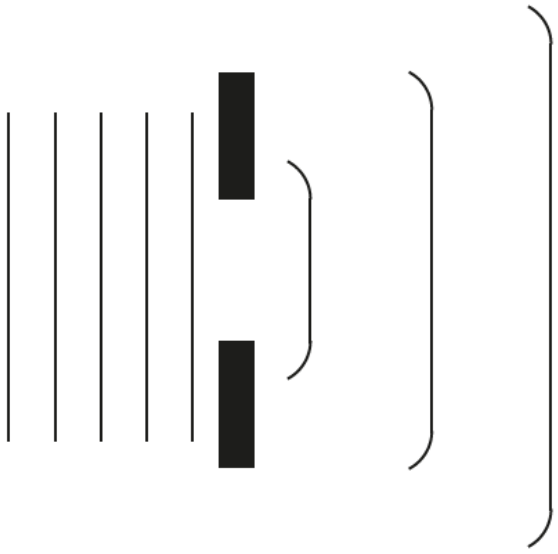


Fig. 7.1

(a) State **one** way in which the student's drawing of the crests is wrong.

.....

..... [1]

(b) The gap in the barrier is now made smaller than the wavelength, as shown in Fig. 7.2.

Complete Fig. 7.2 with at least three crests to show the new diffraction pattern.

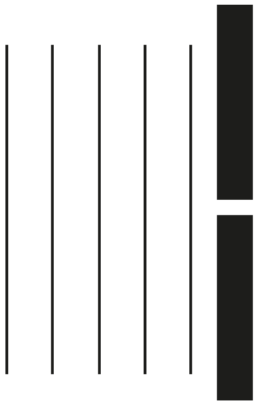


Fig. 7.2

[2]

(c) In one part of the ripple tank, the water wave has a speed of 6.0 cm/s and a wavelength of 2.0 cm.

The wave then passes into a shallower region of the tank.

The speed of the wave in the shallow region is 4.0 cm/s.

(i) Define the term 'wavelength'.

.....

..... [1]

(ii) Calculate the frequency of the wave.

frequency = ... Hz [2]

(iii) Calculate the wavelength of the wave in the shallow part of the tank.

wavelength = ... cm [1]

[Total: 7]

12. June/2023/Paper_ 5054/22/No.6

Fig. 6.1 shows an electric circuit containing a filament lamp, a resistor R, a 12 V battery and five meters.

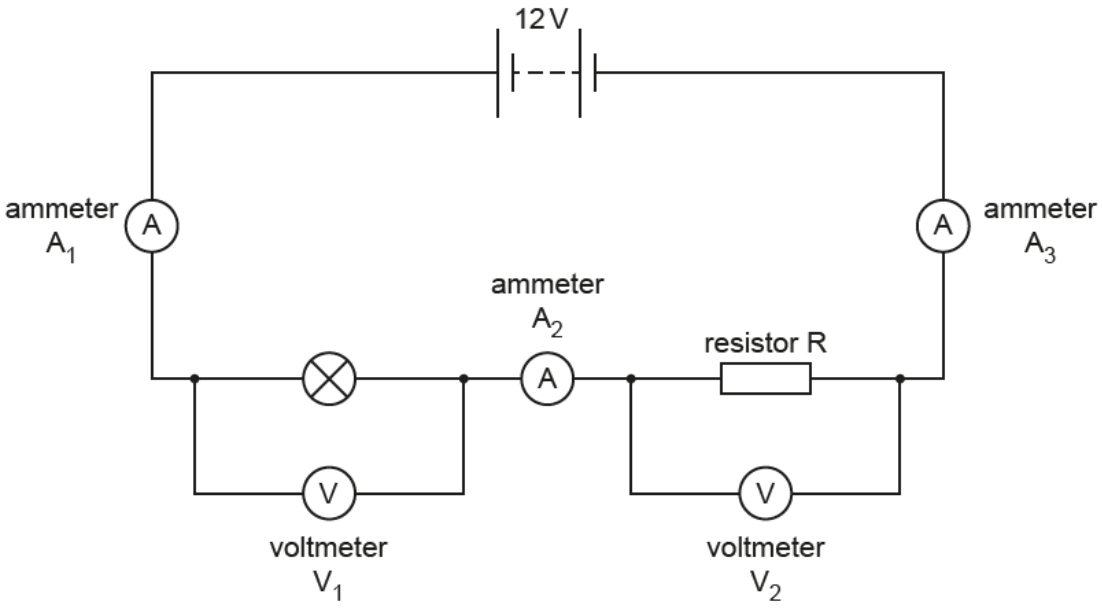


Fig. 6.1

(a) (i) The reading on ammeter A_1 is 0.25A.

The reading on voltmeter V_1 is 3.0 V.

Determine the readings on the other meters.

reading on ammeter A_2 = ... A

reading on ammeter A_3 = ... A

reading on voltmeter V_2 = ... V
[2]

(ii) Calculate the resistance of resistor R.

resistance of resistor R = ... Ω [2]

(iii) The resistor obeys Ohm's law.

State Ohm's law.

.....

.....

..... [2]

(b) Fig. 6.2 shows the current–voltage graph for the filament lamp.

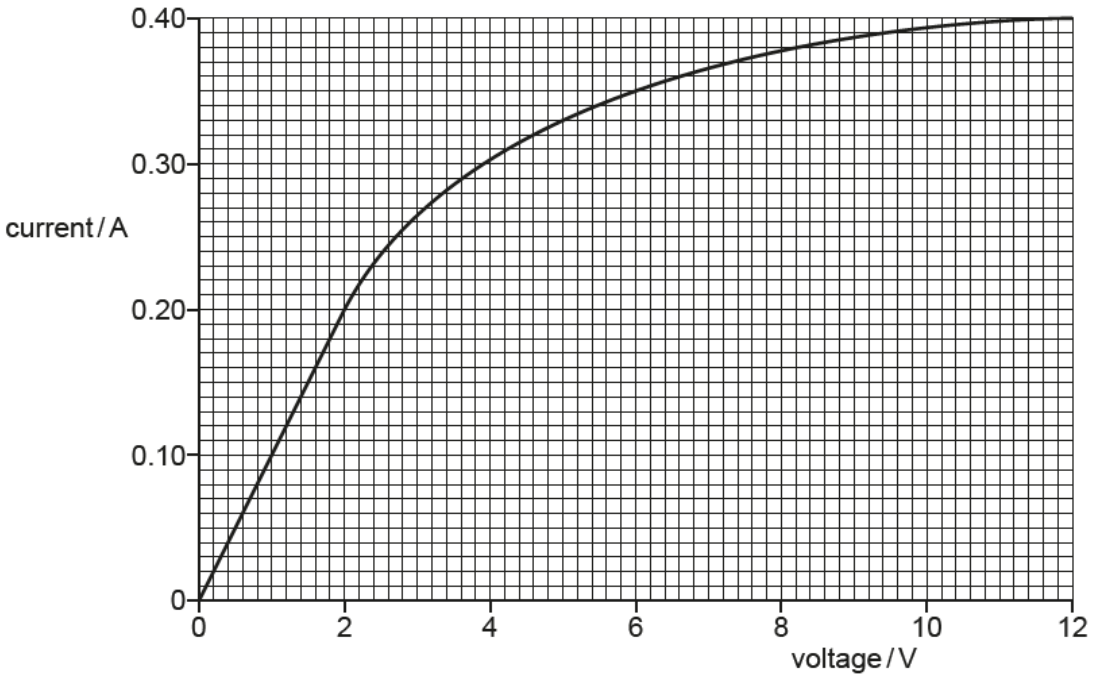


Fig. 6.2

The battery in Fig. 6.1 is replaced with a different battery which has a different e.m.f. (electromotive force).

The voltage across the lamp increases to 6.0 V.

Use data from the graph to determine the e.m.f. of the second battery.

Show your working.

e.m.f. = ... V [3]

[Total: 9]