

Introductory Electronics

Question Paper

Level	O Level
Subject	Physics
Exam Board	Cambridge International Examinations
Unit	Electricity and Magnetism
Topic	Introductory Electronics
Booklet	Question Paper

Time Allowed: 64 minutes

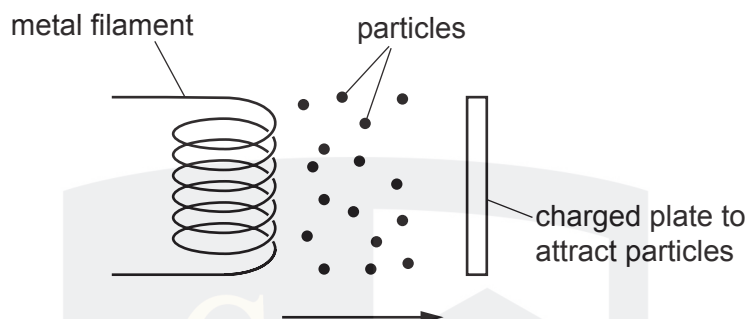
Score: /53

Percentage: /100

Grade Boundaries:

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- 1 The diagram represents thermionic emission from a metal filament.



The particles are attracted by a charged plate.

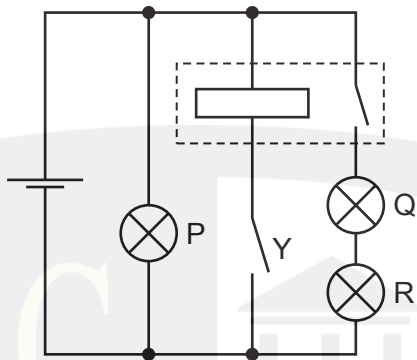
Which row shows the charge on the plate, and the temperature of the metal filament?

	charge on plate	temperature of metal filament
A	negative	high
B	negative	low
C	positive	high
D	positive	low

- 2 Which particles are emitted by the hot filament of a cathode-ray oscilloscope (c.r.o.) and which type of field is used to accelerate them?

	particles	type of field
A	electrons	electric
B	electrons	magnetic
C	protons	electric
D	protons	magnetic

- 3 In the circuit shown, all lamps are identical. Lamp P lights with normal brightness.

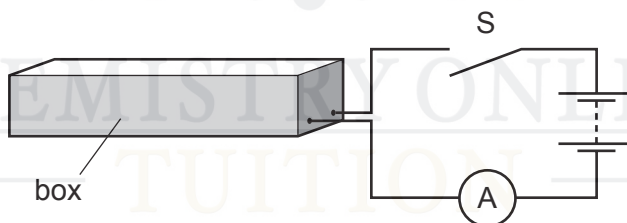


Switch Y is closed and lamps come on.

Which row indicates the brightness of the lamps?

	P	Q	R
A	dim	dim	dim
B	normal	dim	dim
C	normal	off	off
D	off	normal	normal

- 4 A single electrical component is placed inside a box. Two leads from the component emerge from the box. These leads are connected in series to an open switch S, a battery and an ammeter.

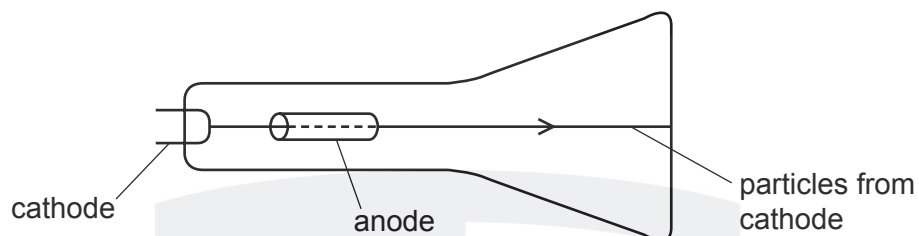


The switch S is closed and the ammeter registers a current. For a few minutes, the size of the current gradually increases.

What is the component inside the box?

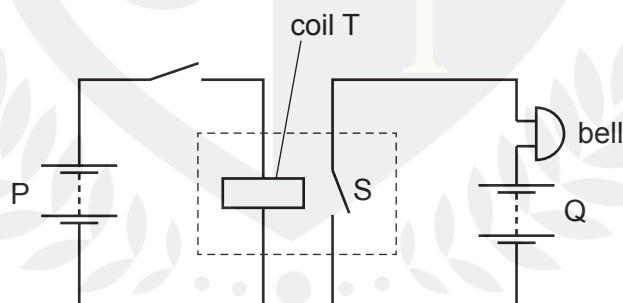
- A** a capacitor
- B** a filament lamp
- C** a fixed resistor
- D** a thermistor

- 5 The diagram shows part of a cathode-ray oscilloscope.



Which particles are emitted by the cathode?

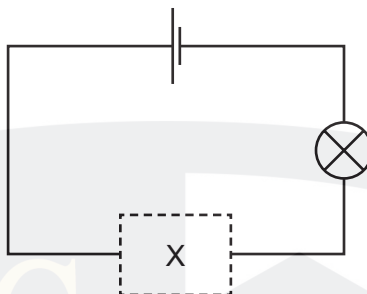
- A electrons
 - B helium nuclei
 - C neutrons
 - D protons
- 6 A relay is used in a circuit containing a bell.



How can the apparatus be altered to make the sound of the bell louder?

- A increase the number of turns on coil T
 - B increase the voltage of battery P
 - C increase the voltage of battery Q
 - D move the coil closer to switch S
- 7 What are emitted by the hot filament inside a cathode-ray tube?
- A alpha-particles
 - B atoms
 - C electrons
 - D protons

- 8 With component X placed in the circuit below, the brightness of the lamp can be gradually reduced until it goes out.

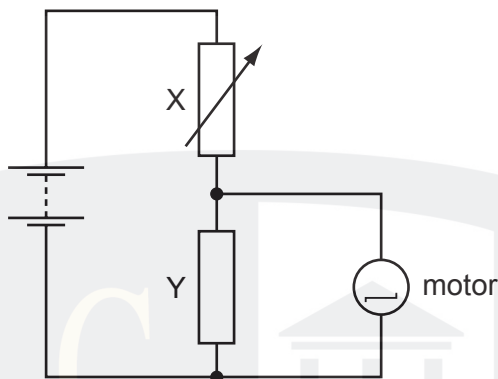


What is component X?

- A a reed relay
 - B a switch
 - C a transformer
 - D a variable resistor
- 9 An electric current flows through a thin metal filament in a vacuum. The filament emits particles.
- Which particle is emitted and what is its charge?

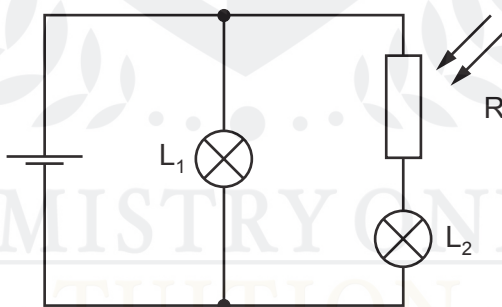
	particle	charge
A	electron	negative
B	proton	negative
C	electron	positive
D	proton	positive

- 10 In the circuit shown, resistors X and Y act as a potential divider to control the speed of a motor.



What is the reason for the potential divider?

- A** to vary the direction of the current in X
 - B** to vary the e.m.f. of the battery
 - C** to vary the potential difference across the motor
 - D** to vary the resistance of the motor
- 11 In the circuit shown, R is a light-dependent resistor. Its resistance decreases when the intensity of the light shining on it increases.



The light intensity on R increases.

What happens to the brightness of the two lamps L_1 and L_2 ?

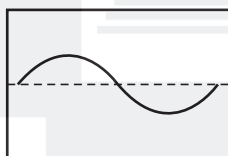
	L_1	L_2
A	decreases	decreases
B	decreases	increases
C	stays the same	decreases
D	stays the same	increases

12 Why is a reed relay used in a switching circuit?

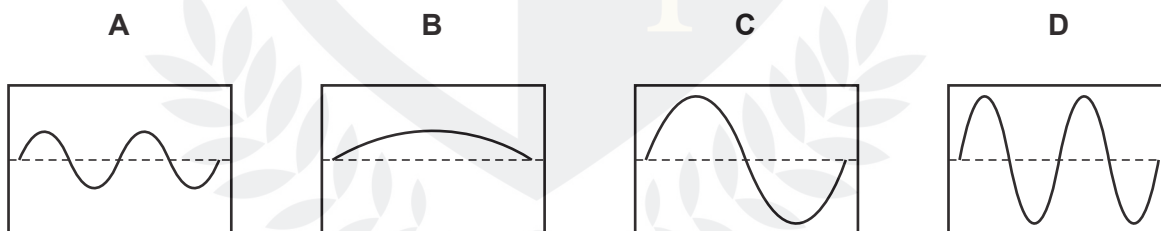
- A** to switch on a small current using a large current
- B** to switch on a small voltage using a large voltage
- C** to switch on a large current using a small current
- D** to switch on a large voltage using a large current

13 The coil of an a.c. generator is rotated and the output is displayed on the screen of a cathode-ray oscilloscope (c.r.o.).

The diagram shows the trace on the screen.



Which trace appears on the screen when the speed of rotation of the coil is doubled but the settings on the c.r.o. are unaltered?



14 Two leads emerging from a box are connected to a sensitive ammeter.

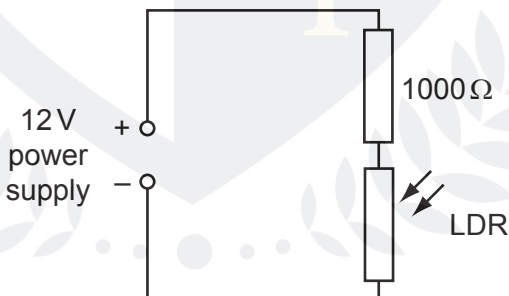


When a bar magnet moves towards the open end of the box, the needle of the ammeter deflects to the right. When the bar magnet stops, the needle returns to zero.

What is inside the box?

- A** a coil alone
- B** a coil connected in series with a cell
- C** a light-dependent resistor (LDR) alone
- D** an LDR in series with a cell

- 15 What is used in a cathode-ray oscilloscope to cause the vertical movement of the trace?
- A a horizontal electric field
 - B a horizontal magnetic field
 - C a vertical electric field
 - D a vertical magnetic field
- 16 Which component stores energy in a time-delay circuit?
- A capacitor
 - B circuit breaker
 - C light-dependent resistor
 - D thermistor
- 17 In a darkened room, a $1000\ \Omega$ resistor and a light-dependent resistor (LDR) are connected in series with a 12 V power supply.



The curtains are opened and light falls on the LDR.

What happens to the voltage across the LDR?

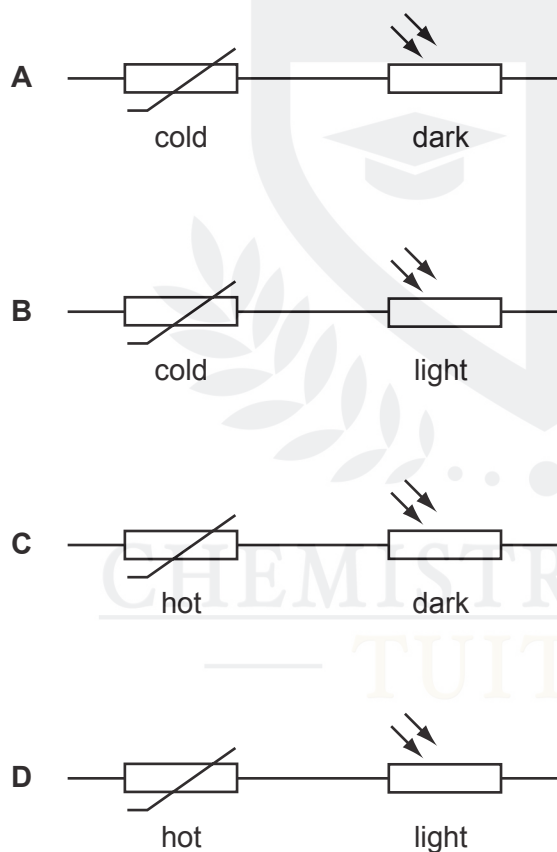
- A It decreases.
- B It increases.
- C It remains at 0 V.
- D It remains at 12 V.

18 Which particles are emitted in the process of thermionic emission?

- A electrons
- B ions
- C neutrons
- D protons

19 A thermistor and a light-dependent resistor are connected in series.

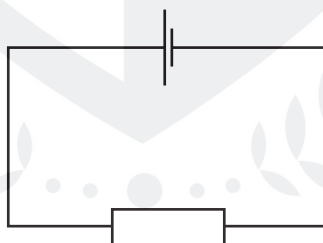
Which conditions give the largest resistance?



- 20 There is a bright spot on the screen of a cathode-ray oscilloscope (c.r.o.). This is caused by fast-moving particles.

What are these particles?

- A alpha-particles
 - B electrons
 - C neutrons
 - D protons
- 21 Which electrical component is used to store charge?
- A capacitor
 - B relay
 - C resistor
 - D thermistor
- 22 The electrical circuit shown consists of a cell connected to a resistor.



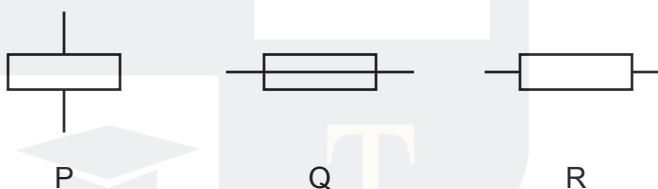
What are the directions of the electron flow and of the conventional current in the **resistor**?

	electron flow	conventional current
A	→	→
B	→	←
C	←	←
D	←	→

23 What is required to operate a reed relay in a switching circuit?

- A** a capacitor
- B** an electric field
- C** a magnetic field
- D** a transformer

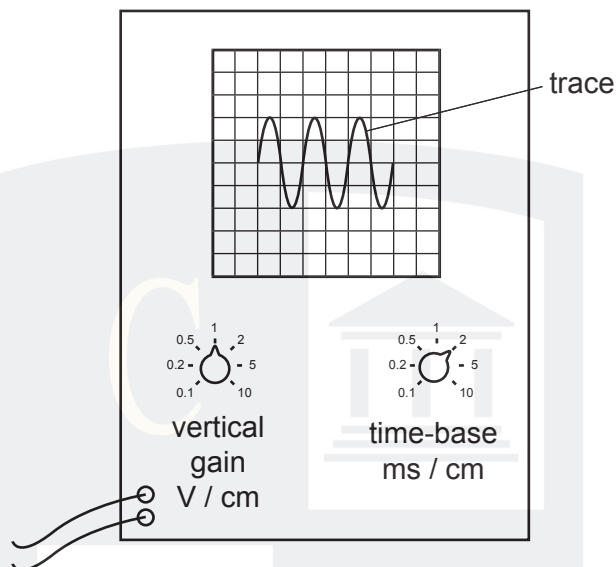
24 P, Q and R are electrical symbols.



What do these symbols represent?

	P	Q	R
A	fuse	resistor	relay coil
B	relay coil	fuse	resistor
C	relay coil	resistor	fuse
D	resistor	fuse	relay coil

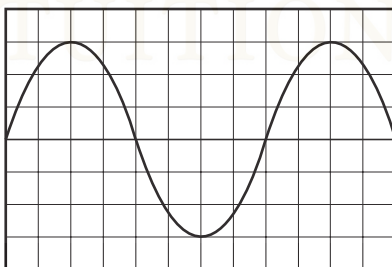
- 25 The trace of a waveform is seen on the screen of a cathode-ray oscilloscope.



Which statement about the controls is correct?

- A** The amplitude of the trace is changed by adjusting the time-base.
 - B** The amplitude of the trace is changed by adjusting the vertical gain.
 - C** The whole trace is moved to the right by adjusting the time-base.
 - D** The whole trace is moved upwards by adjusting the vertical gain.
- 26 An alternating voltage of frequency 0.5 Hz is applied to the Y-plates of a cathode-ray oscilloscope (c.r.o.).

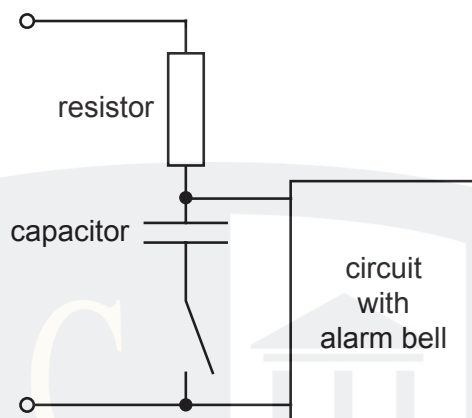
The diagram shows the screen of the c.r.o.



What is the time taken for the spot to cross the screen?

- A** 3 s **B** 6 s **C** 15 s **D** 30 s

27 In the circuit shown, the alarm bell will only start ringing some time after the switch is closed.

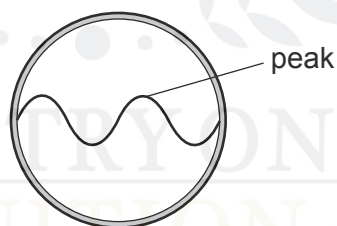


What causes the time delay?

- A the capacitor charging
- B the capacitor discharging
- C the resistor cooling down
- D the resistor heating up

28 A cathode-ray oscilloscope is connected to an a.c. generator.

A wave is seen on the screen of the oscilloscope.

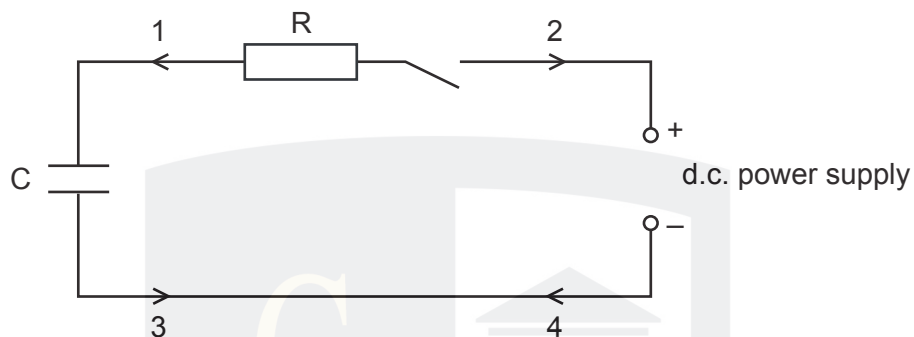


The speed of rotation of the generator is doubled.

What is the effect on the wave?

	number of peaks on the screen	amplitude of wave on the screen
A	doubled	doubled
B	doubled	same
C	same	doubled
D	same	same

29 A capacitor C charges when it is connected to a d.c. power supply.



Which arrows show the direction of the conventional current when the capacitor is charging?

- A** 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

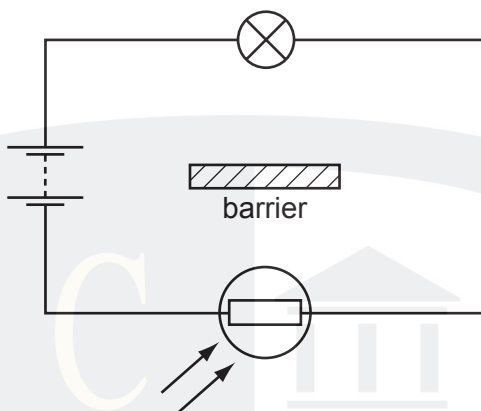
30 The diagram shows a beam of electrons entering a magnetic field. The direction of the magnetic field is downwards, towards the bottom of the page.



In which direction does the deflection of the electrons occur?

- A** into the page
B out of the page
C towards the bottom of the page
D towards the top of the page

- 31 A lamp is connected in series with a light-dependent resistor (LDR) and a battery. The barrier shields the LDR from the lamp.



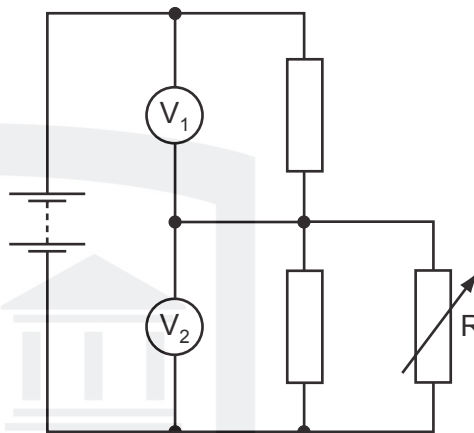
When low intensity light falls on the LDR, the lamp glows dimly.

If the light intensity on the LDR increases, what happens to the lamp?

- A It gets brighter.
- B It gets dimmer but does not go out.
- C It goes out.
- D It stays the same.

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

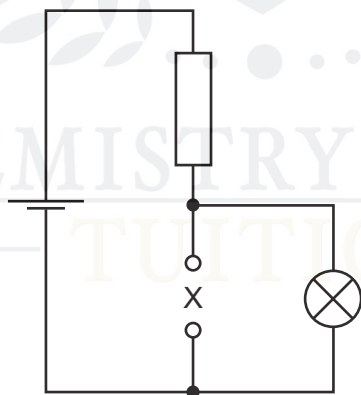


The resistance of R increases.

What happens to the two voltmeter readings?

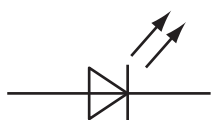
	reading on V_1	reading on V_2
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 33 The diagram is a circuit designed to switch on a lamp when it gets dark.

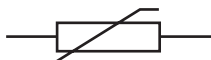


Which component is used as the sensor at X?

A



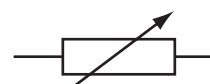
B



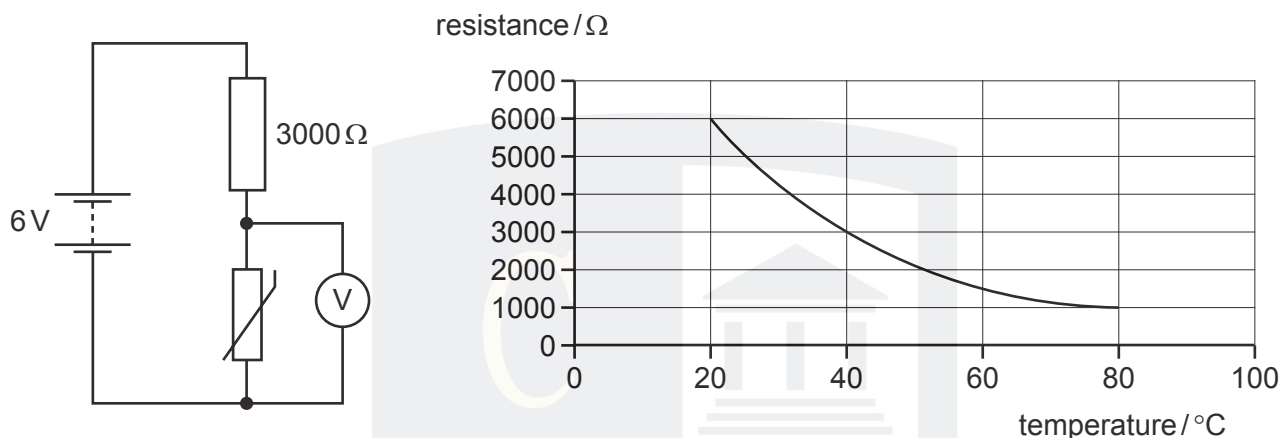
C



D

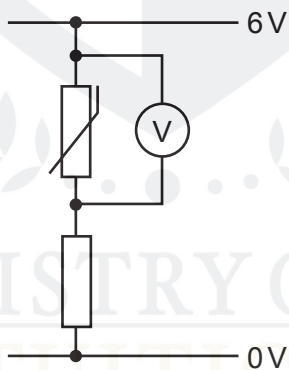


- 34 A thermistor is connected in a circuit with a 6 V battery, a $3000\ \Omega$ resistor and a voltmeter, as shown. The graph shows how the resistance of the thermistor varies with temperature.



What is the temperature of the thermistor when the voltmeter reads 2 V?

- A 20°C B 40°C C 60°C D 80°C
- 35 The diagram shows a thermistor connected in a potential divider circuit.

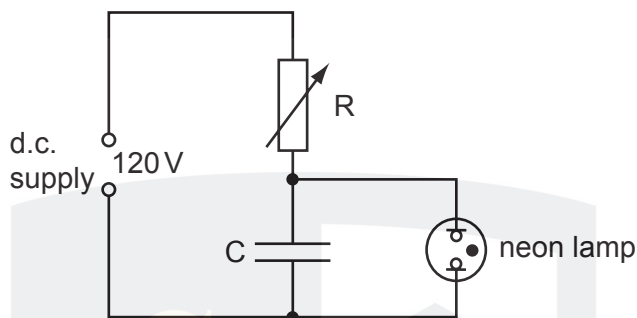


The resistance of the thermistor decreases when its temperature rises. The thermistor is heated.

What happens to the potential difference across the thermistor as it is heated?

- A It decreases but not to zero.
 B It decreases to zero.
 C It increases.
 D It stays the same.

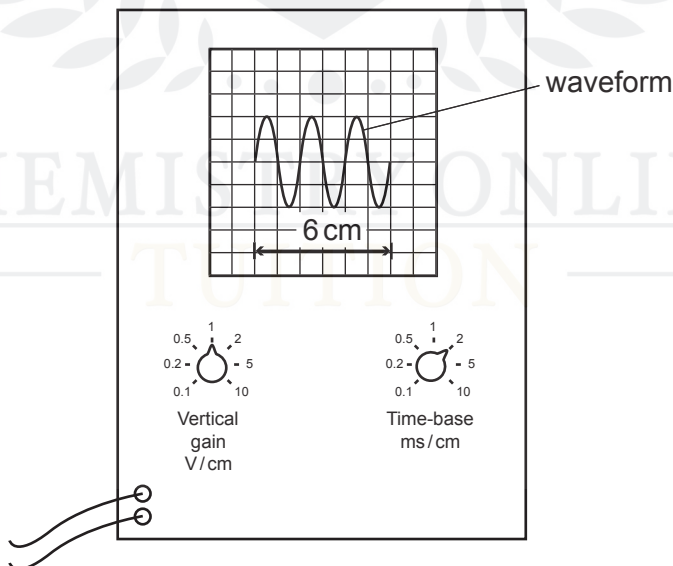
- 36 The electric circuit shown is used to study the charging of capacitor C.



The neon lamp lights when the p.d. across the capacitor C reaches 110 V. C then discharges through the neon lamp. When C has discharged, the lamp goes out and the p.d. across C slowly increases once more.

What is the effect of increasing the resistance of R?

- A The lamp lights up and goes out at the same rate.
 - B The lamp lights up and goes out less frequently.
 - C The lamp lights up and goes out more frequently.
 - D The lamp will not go out at all.
- 37 A waveform is displayed on a cathode-ray oscilloscope. The length of three cycles of the waveform is 6 cm. The vertical gain and the time-base settings are shown on the diagram.



What is the time taken for one cycle of the waveform?

- A 1 ms
- B 2 ms
- C 4 ms
- D 6 ms

- 38 The diagram shows a beam of electrons entering a magnetic field. The direction of the field is into the page.



In which direction are the electrons deflected?

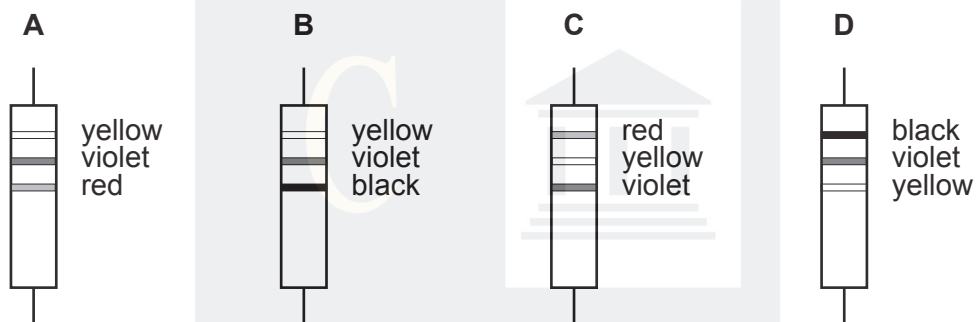
- A into the page
 - B out of the page
 - C towards the bottom of the page
 - D towards the top of the page
- 39 Which single-coil motor will have the largest turning effect?

	current in coil	number of turns in coil	iron core
A	6 A	100	no
B	10 A	200	no
C	6 A	100	yes
D	10 A	200	yes

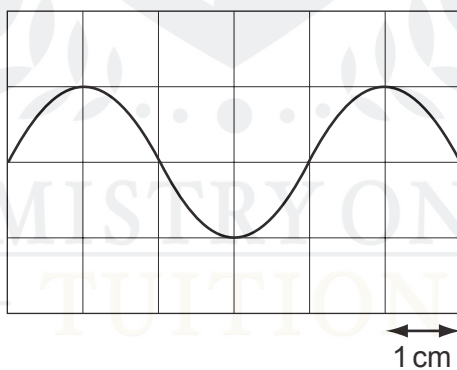
- 40 The table shows part of the colour code for resistors.

black	brown	red	orange	yellow	green	blue	violet
0	1	2	3	4	5	6	7

Which resistor has a value of $4700\ \Omega$?



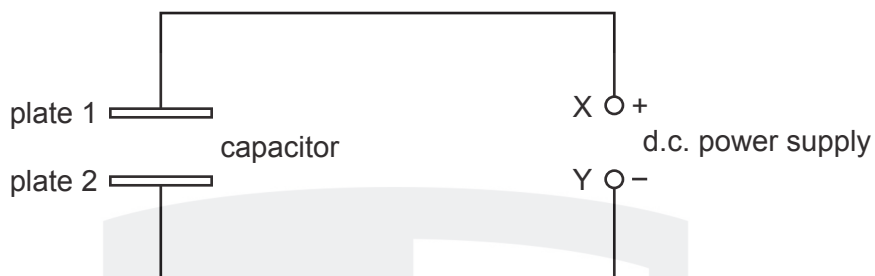
- 41 The diagram shows the output waveform of an a.c. generator as displayed on a cathode-ray oscilloscope. The horizontal scale is 5 ms/cm .



What is the time for one complete rotation of the coil of the generator?

- A** 5 ms **B** 10 ms **C** 20 ms **D** 30 ms

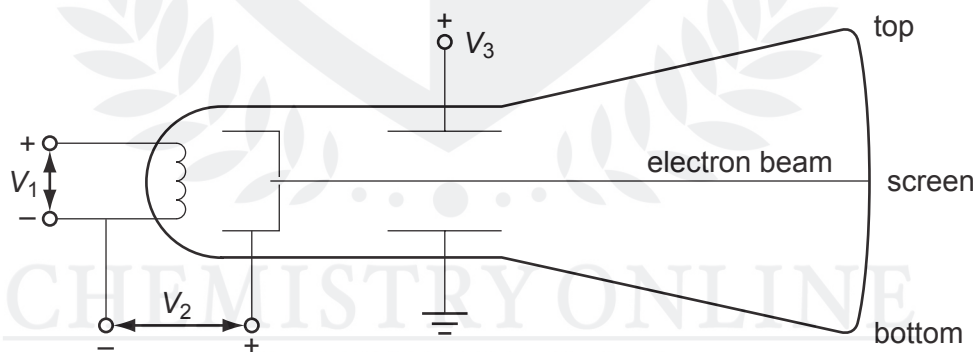
42 A capacitor can be made to store energy by connecting it to a d.c. power supply.



Along which paths do electrons flow as the capacitor starts to charge?

- A** from X to plate 1 only
- B** from X to plate 1 and from plate 2 to Y
- C** from Y to plate 2 and from plate 1 to X
- D** from Y to plate 2 only

43 The diagram shows some of the important parts of the tube of a cathode-ray oscilloscope.



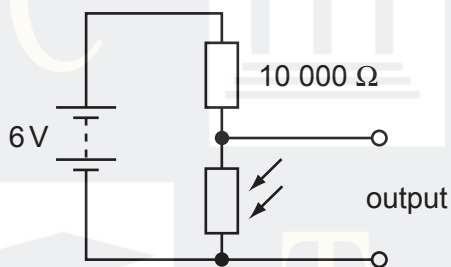
Which change in voltage results in the position of the spot on the screen moving towards the top?

- A** decreasing V_1
- B** decreasing V_3
- C** increasing V_2
- D** increasing V_3

44 Why is a reed relay used in a switching circuit?

- A** to switch on a small current using a large current
- B** to switch on a small voltage using a large voltage
- C** to switch on a large current using a small current
- D** to switch on a large voltage using a large current

45 A potential divider consists of an LDR and a resistor connected to a 6 V battery.

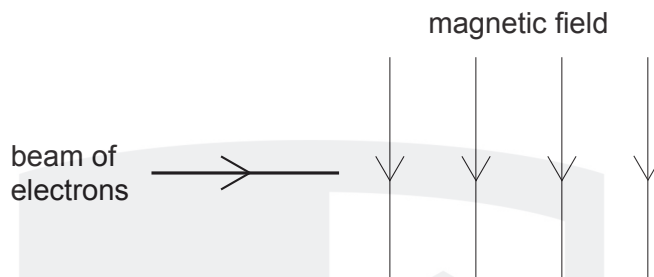


What should be the resistance of the LDR for the output to be 3 V?

- A** 0
- B** between 0 and $10\,000\,\Omega$
- C** $10\,000\,\Omega$
- D** more than $10\,000\,\Omega$

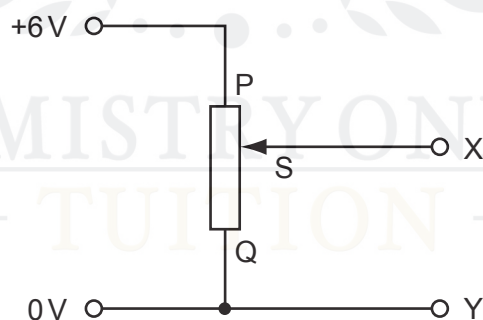
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- 46 The diagram shows a beam of electrons entering a magnetic field.



What is the effect of the magnetic field on the electrons?

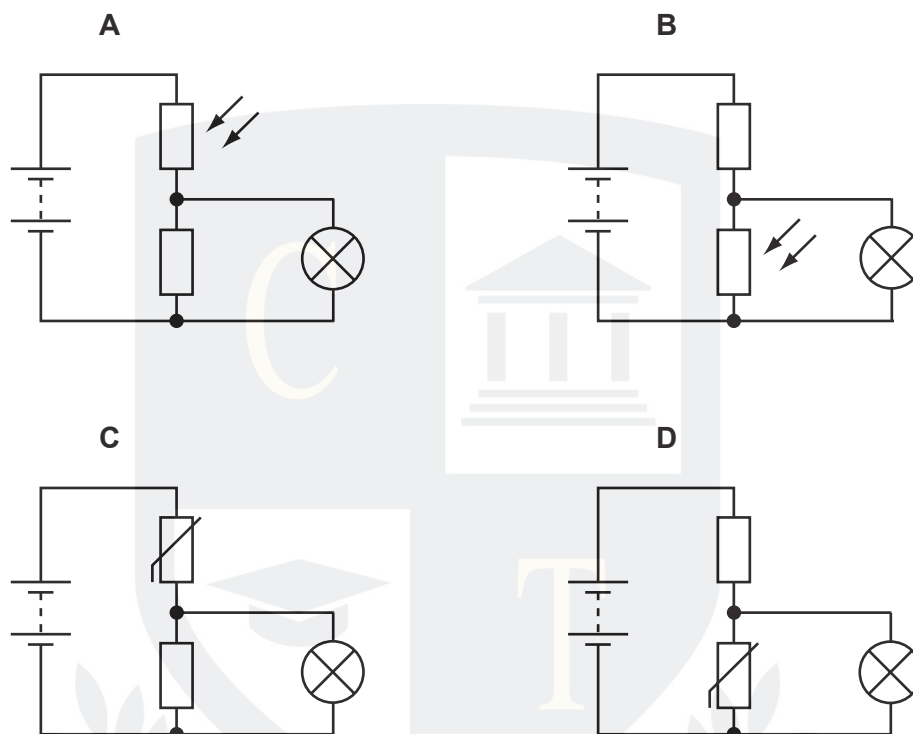
- A** They are deflected into the plane of the diagram.
 - B** They are deflected out of the plane of the diagram.
 - C** They are deflected towards the bottom of the diagram.
 - D** They are deflected towards the top of the diagram.
- 47 A variable potential divider has a sliding contact S that can be moved between end P and end Q. It is connected to a constant 6 V power supply, as shown below.



What happens to the p.d. between X and Y as S moves down from P to Q?

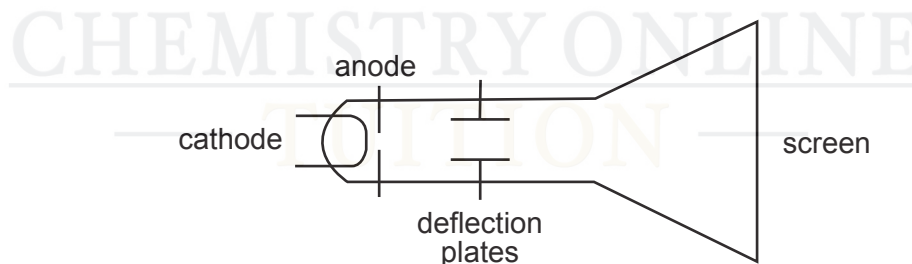
- A** It decreases gradually from 6 V to 0 V.
- B** It rises gradually from 0 V to 6 V.
- C** It stays constant at 0 V.
- D** It stays constant at 6 V.

- 48 In which circuit will a lamp glow more brightly when less light shines on a light-dependent resistor?



- 49 The diagram shows the design of a cathode-ray oscilloscope tube.

There is a constant potential difference across the deflection plates.



Which change increases the deflection of the spot on the screen?

- A** decreasing the distance from the deflection plates to the screen
- B** increasing the length of the deflection plates
- C** increasing the potential difference between cathode and anode
- D** increasing the separation of the deflection plates

50 Diagram 1 shows the oscilloscope trace produced by an input of 2 V at 50 Hz.

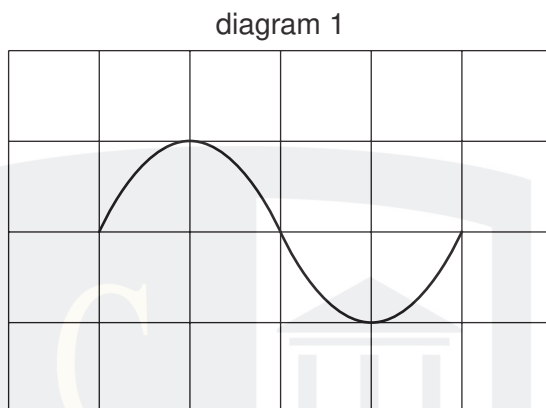
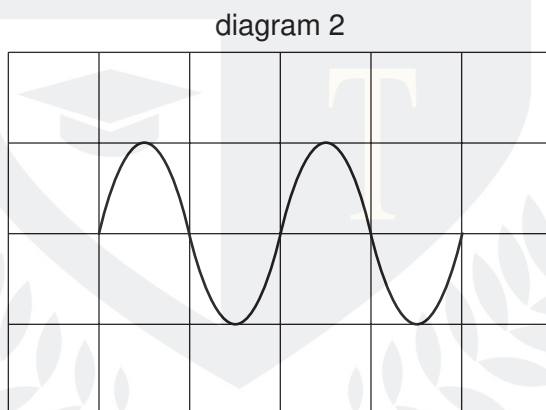


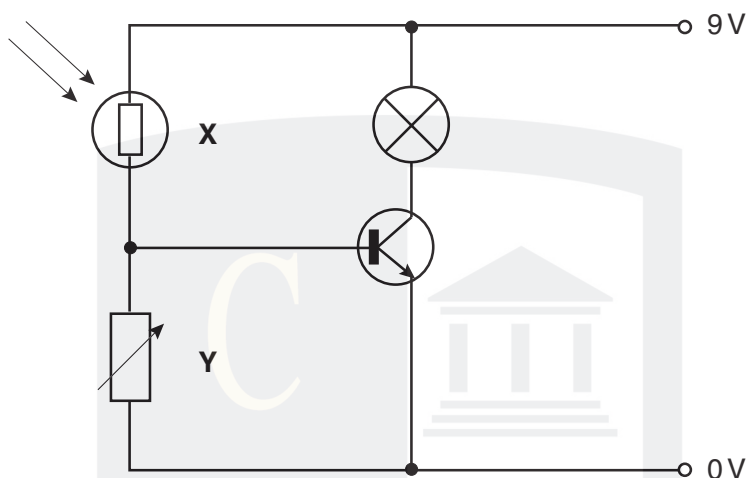
Diagram 2 shows the trace from a different input on the same oscilloscope.



What is the value of the new input?

- A** 1 V at 50 Hz
- B** 2 V at 25 Hz
- C** 2 V at 100 Hz
- D** 4 V at 50 Hz

51 The diagram shows a circuit.

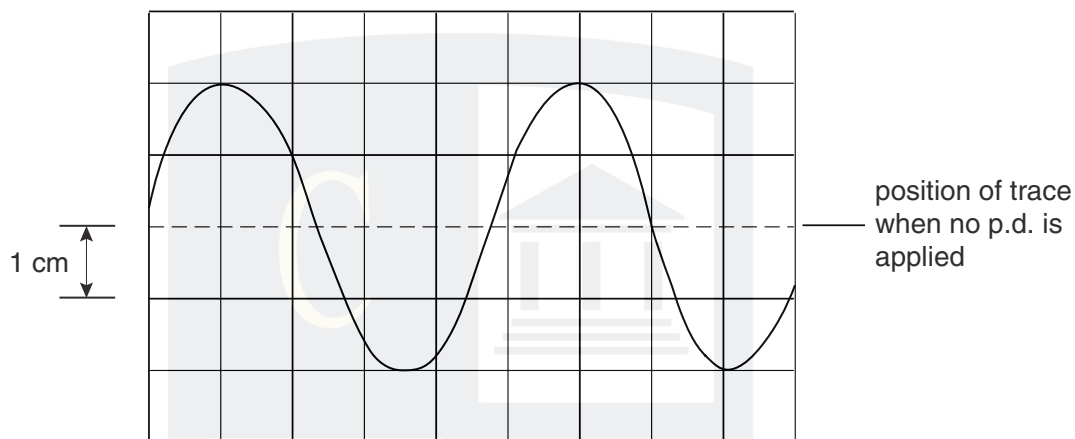


What are the components **X** and **Y**?

	X	Y
A	fuse	resistor
B	lamp	variable resistor
C	light-dependent resistor	light-emitting diode
D	light-dependent resistor	variable resistor

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- 52 The following trace is shown on the screen of an oscilloscope when it is connected to a transformer. The scale is set at 5 V per centimetre.

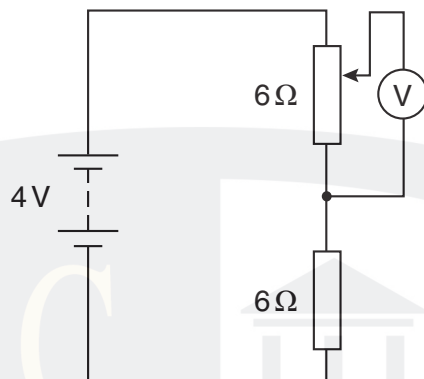


What is the value of the peak voltage?

- A 4 V
- B 5 V
- C 10 V
- D 20 V

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53 The diagram shows a circuit with a potential divider joined in series with a fixed resistor.



What are the minimum and maximum readings that can be obtained on the voltmeter when the potential divider is adjusted?

	minimum reading / V	maximum reading / V
A	0	2
B	0	6
C	2	4
D	6	12

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