Electricity Sensing Waves and Quantum

1. A current of 3.0 µA flows through a resistor in 1.5 minutes.

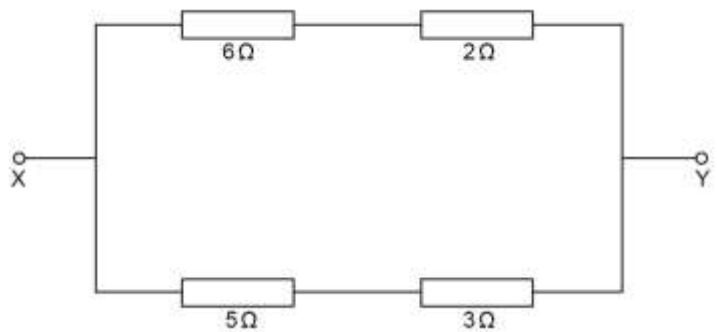How much charge flows through the resistor in this time?

 A 4.5×10^{-6} C

 B 2.7×10^{-4} C

 C 4.5×10^{-3} C

 D 2.7×10^{-1} C

Your answer   ☐

2. In the circuit shown, a potential difference of 3V is applied across **XY**.

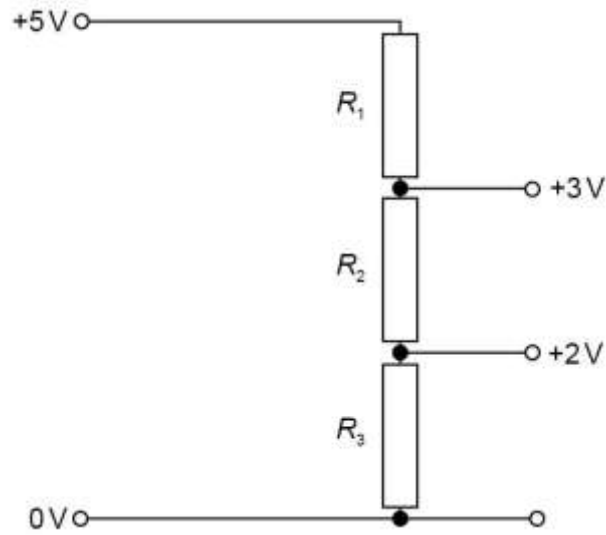What is the current in the 5 Ω resistor?

 A $\dfrac{15}{8}$ A

 B $\dfrac{3}{4}$ A

 C $\dfrac{3}{5}$ A

 D $\dfrac{3}{8}$ A

Your answer   ☐

3. A potential divider is used to give outputs of 2 V and 3 V from a 5 V source as shown..
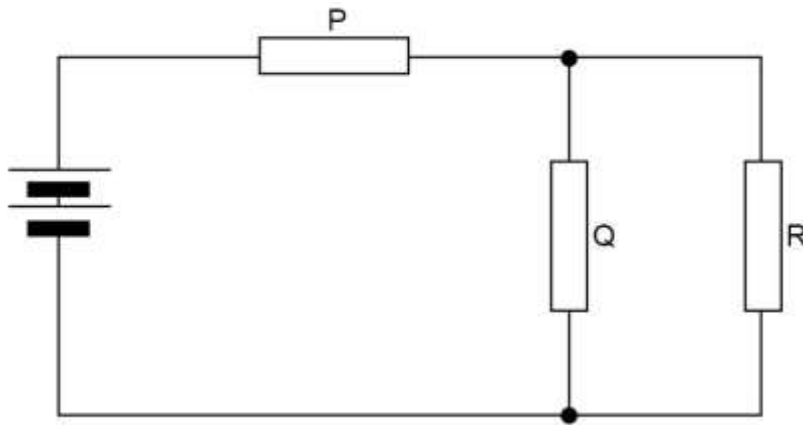

Which combination of resistors R_1, R_2, R_3, gives the correct voltages?

	R_1/ kΩ	R_2/ kΩ	R_3/ kΩ
A	1	1	2
B	2	1	2
C	3	2	2
D	3	2	3

Your answer ☐

4.   The resistors **P**, **Q** and **R** in the circuit have equal resistance.

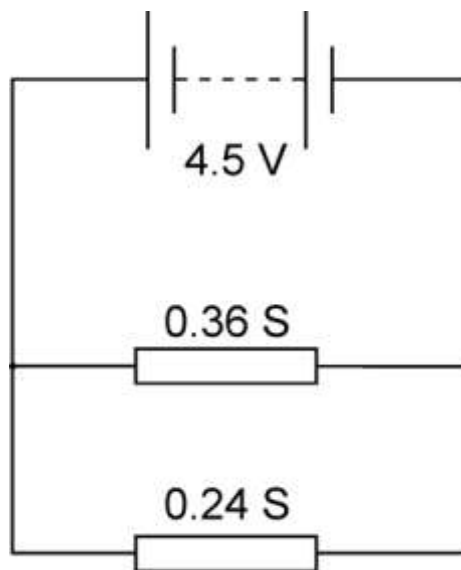

The battery, of negligible internal resistance, supplies a total power of 12W.

What is the power dissipated in resistor R?

A   2 W

B   3 W

C   4 W

D   5 W

Your answer [   ]

5. Two conductors, of conductances 0.24 S and 0.36 S, are connected in parallel to a 4.5 V battery of negligible internal resistance as shown below.

4.5 V

0.36 S

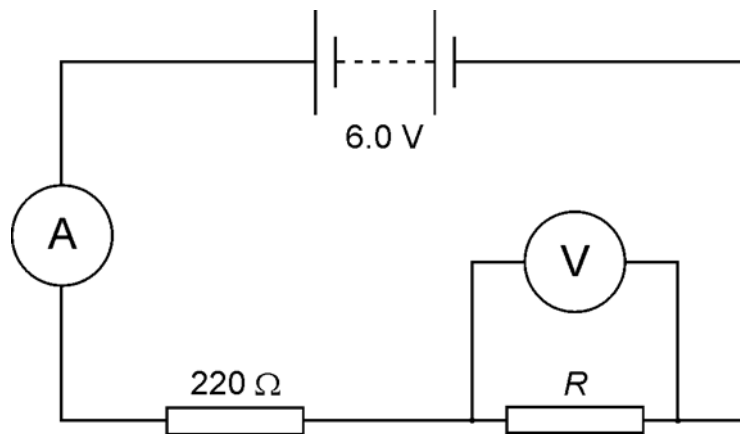What is the total power   0.24 S   dissipated in the two
conductors?

A   2.9 W

B   4.9 W

C   7.3 W

D   12 W

Your answer ☐

6. An unknown resistor R and a 220 Ω resistor are connected to a 6.0 V battery of negligible internal resistance as shown in the diagram below.

6.0 V

A

V

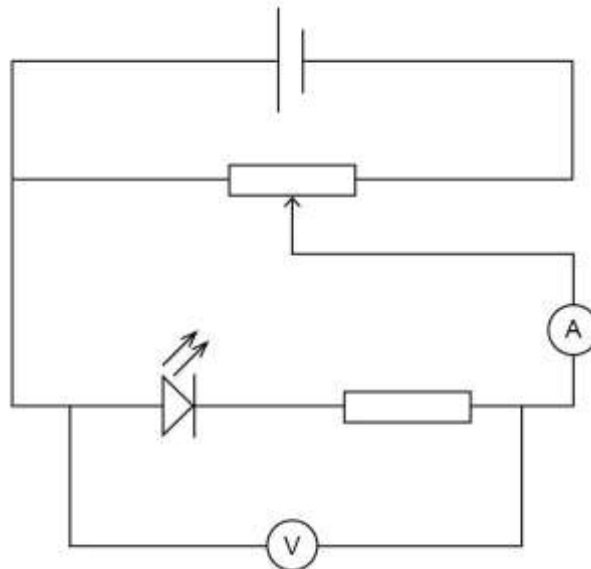The reading 4.1 V.   220 Ω R on the voltmeter is

What is the reading on the ammeter?

A   8.6 mA

B   13 mA

C   19 mA

D   27 mA

Your answer

7. A student wants to determine the threshold voltage of a light-emitting diode (LED). During the investigation the LED is lit. The student then attempts to draw the circuit he has used as shown below.
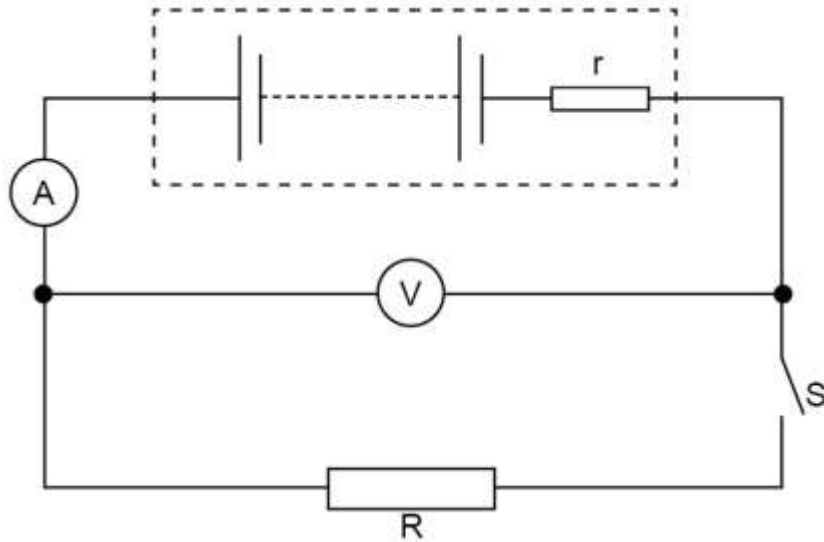

What mistake has the student has made in his circuit diagram?

A The ammeter should be before the LED and resistor.

B The fixed resistor should be in parallel with the LED.

C The LED is the incorrect way around.

D The voltmeter connections are incorrect.

Your answer ☐

8. A battery is connected across resistor **R** via a switch **S**.

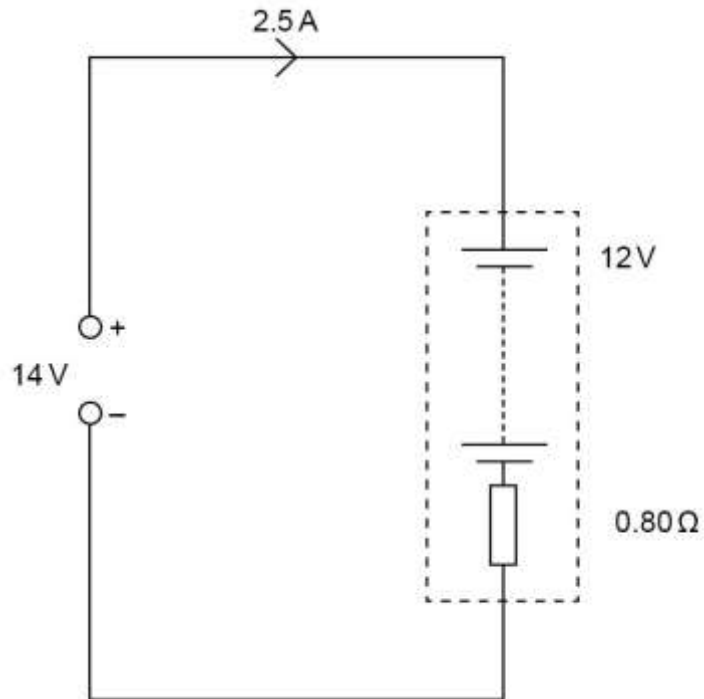The switch **S** is open. The voltmeter reading is 9.0 V and the ammeter reading is zero.

With **S** closed, the voltmeter reading is 6.0 V and ammeter reading is 2.0 A.

What is the internal resistance of the battery?

A   1.5 Ω

B   3.0 Ω

C   4.5 Ω

D   6.0 Ω

Your answer ☐

9. A 14 V d.c. supply is used to charge a 12 V car battery of internal resistance 0.80 Ω at a rate of 2.5 A for 6 hours.

How much electrical energy is provided by the charging supply?

A   13 kJ
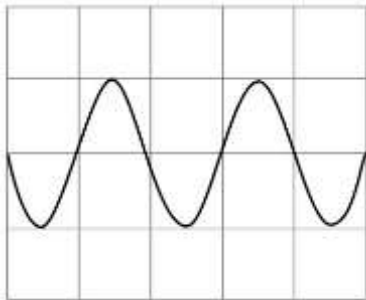
B   110 kJ

C   650 kJ

D   760 kJ

Your answer ☐

10. The y-input terminals of an oscilloscope are connected to a voltage supply of peak value 5.0 V and frequency 50 Hz.
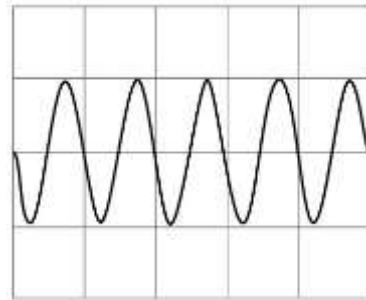
The time-base is set at 10 ms per division and the y axis is set at 5.0 V per division.

Assuming that these diagrams are to scale, which trace will be obtained?
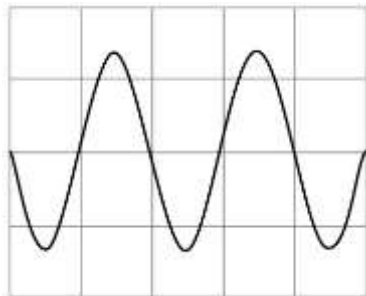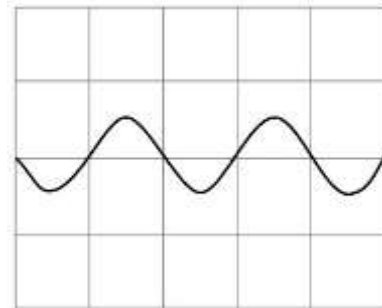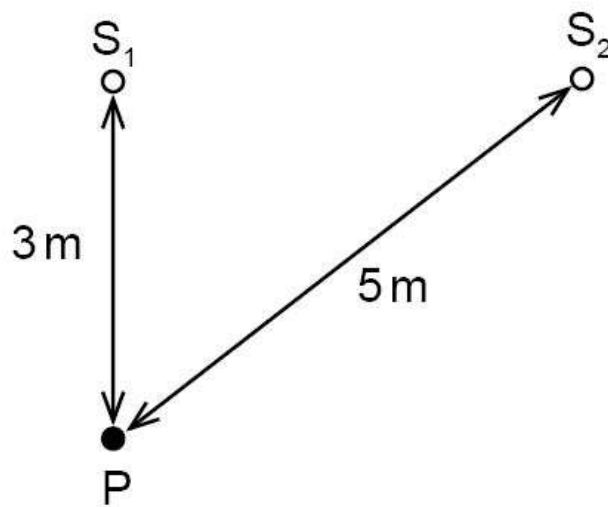
A

B

C

D

Your answer ☐

11. Water waves of wavelength 4 m are produced by two wave generators, S_1 and S_2, as shown.

Each generator, when operated by itself, produces waves which have an amplitude A at **P**, which is 3m from S_1 and 5m from S_2.

When the generators are operated in phase, what is the amplitude of oscillation at **P**?

S_1
S_2

3 m

5 m

P

A   0

B   ½ A

C A

D   2A

Your answer [ ]

12. Which group of electromagnetic waves is arranged in order of increasing frequency?

lowest frequency ————————————→ highest frequency

    A   gamma rays, ultra-violet rays, radio waves

    B   microwaves, ultra-violet rays, X-rays

    C   radio waves, visible light, infra-red radiation

    D   Visible light, infra-red radiation, microwaves

Your answer

13. In the diagram, **T** represents a transmitter of microwaves and **P** represents a metal plate.
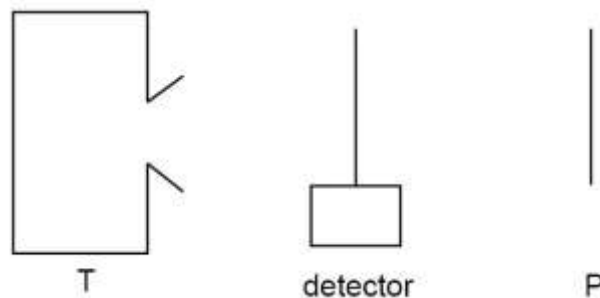
The detector is connected to a meter which gives a reading proportional to the signal strength at that point. The distance **TP** is much greater than the wavelength of the microwaves.

As the detector is moved from **T** to **P** what happens to the meter reading?

    A   It decreases steadily

    B   It reaches a maximum at **P**

    C   It reaches a maximum midway between **T** and **P**
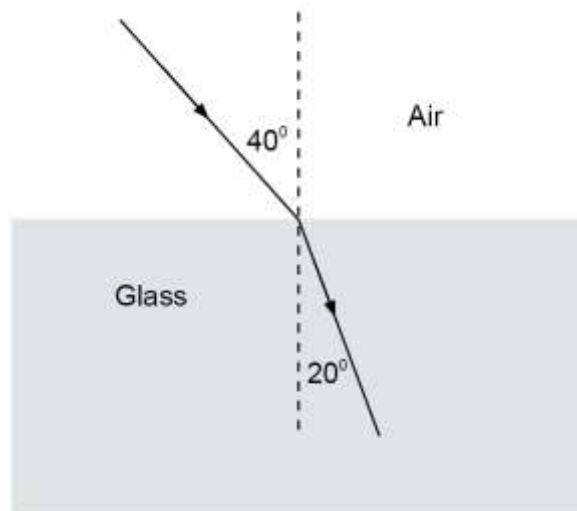
    D   It increases and decreases rapidly

Your answer

14. Light of wavelength 600 nm falls on a pair of slits, forming fringes 3.00 mm apart on a screen.

What would the fringe spacing become if the wavelength were 300 nm?

A   0.75 mm

B   1.50 mm

C   3.00 mm

D   6.00 mm

Your answer [ ]

15. A ray of light passes from air into a rectangular glass block.

The refractive index of the glass is:

A   0.53

B   0.82

C   1.2

D   1.9

Your answer [ ]

16. A lamp is placed 0.50 m from a converging lens. The power of the lens is +5.0 D.

What is the distance from the lens to the focused image?

A   0.14 m

B   0.20 m

C   0.33 m

D   0.45 m

Your answer ☐

17. The diagram shows five energy levels of electrons within an atom. Five possible transitions between the levels are indicated. Each transition produces a photon of specific energy and frequency.

E₅
E₄
E₃

E₂
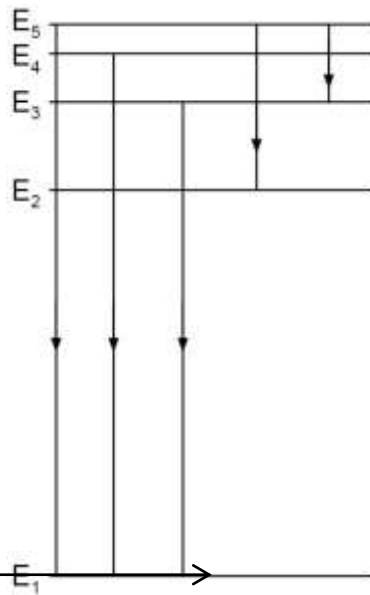
Which of the following spectra corresponds most closely to the transition shown?

increasing frequency

E₁

A

B

C

D

Your answer

18. The up quark (u) has charge + ⅔ e and the down quark (d) a charge of – ⅓ e.

What is the correct combination of quarks that make up the proton and the neutron?

	proton	**neutron**
A	ddd	uud
B	udd	uud
C	uud	udd
D	ddd	udd

Your answer ☐

19. An electron has a kinetic energy of 2.0×10^{-17} J.

The mass of an electron is 9.1×10^{-31} kg.
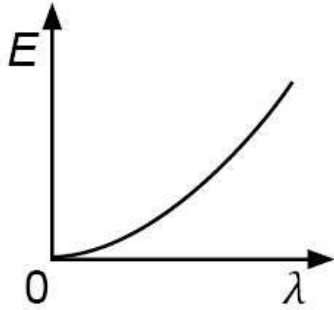
What is the value for the de Broglie wavelength of the electron?

A 1.1×10^{-10}

B 1.5×10^{-10} m

C 3.3×10^{-17} m

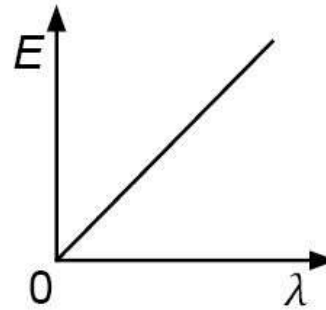D 6.6×10^{-17} m

Your answer ☐

20. Which curve shows the relationship between the energy *E* and the wavelength *λ* of a photon of electromagnetic radiation?
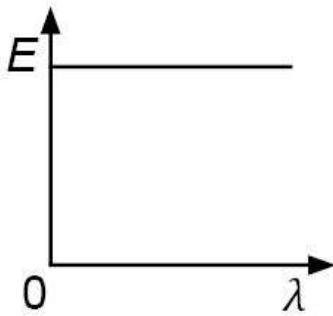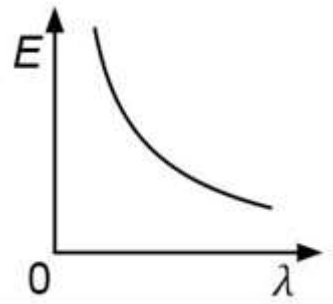
A

B

C

D

Your answer ☐