11.1 Current & Potential Difference

Question Paper

Course	CIE A Level Physics (9702) 2019-2021
Section	11. Current of Electricity
Topic	11.1 Current & Potential Difference
Difficulty	Hard

Time allowed: **10**

Score: **/10**

Percentage: **/100**

Question 1

An electron beam of current 50 μA flows in a cathode-ray oscilloscope. The time-base causes the beam to sweep horizontally across the screen at 1.0×10^4 cm s^{-1}

What is the number of electrons arriving at the screen in one centimetre length of the horizontal trace?

A 3.1×10^{10}

B 3.1×10^{13}

C 1.3×10^{13}

D 8.0×10^{14}

[1 mark]

Question 2

A high potential is applied between the electrodes of an ionised gas. The gas carries a current of 8.16 mA and the number of electrons passing any point in the gas per unit time is 2.58×10^{16} s^{-1}

If the charge on each positive particle is 3.2×10^{-19} C, what is the number of positively charged particles passing any point in the gas per unit time?

A 1.26×10^{16} s^{-1}

B 2.58×10^{16} s^{-1}

C 3.84×10^{16} s^{-1}

D 10.3×10^{16} s^{-1}

[1 mark]

Question 3

The Atlantic torpedo is a large electric fish capable of generating a voltage of 220 V between its tail and its head. This drives a pulse of current of 15 A lasting for a time of 2.0 ms. The fish produces 200 pulses per second.

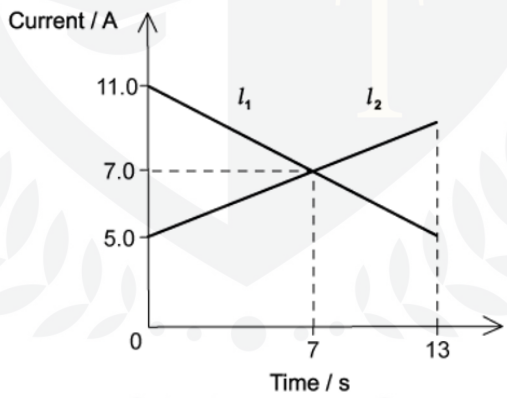
What is the average power output of the fish?

A 33 W **B** 1.3 kW **C** 3.3 kW **D** 6.6 kW

[1 mark]

Question 4

I_1 and I_2 are currents flowing through two different circuits, as shown in the diagram below.



Calculate the difference in the total charge that flows through the two circuits in the first 7 seconds.

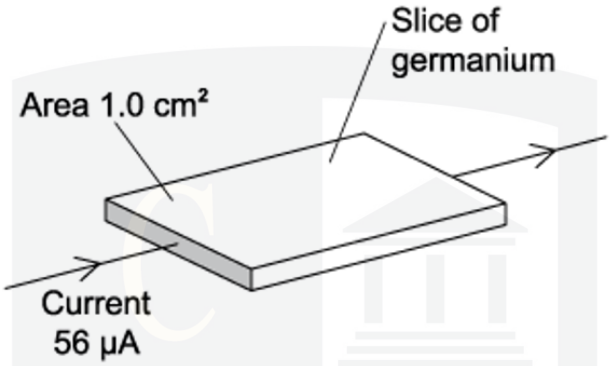
A 0 C **B** 21 C **C** 42 C **D** 49 C

[1 mark]

Question 5

A slice of germanium of cross-sectional area 1.0 cm^2 carries a current of 56 μA. The number density of charge carriers in the germanium is 2.0×10^{13} cm^{-3}.

Each charge carrier has a charge equal to the charge on an electron.



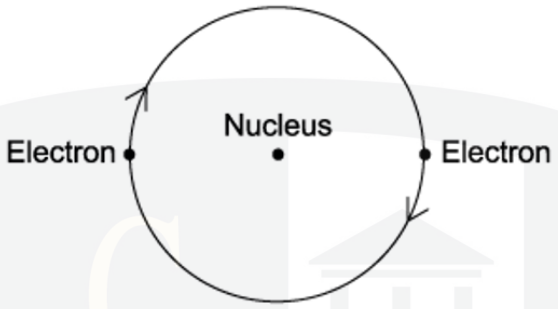
What is the average drift velocity of the charge carriers in the germanium?

A 0.18 m s^{-1} **B** 18 m s^{-1} **C** 180 m s^{-1} **D** 1800 m s^{-1}

[1 mark]

Question 6

The diagram shows a model of an atom in which two electrons move round a circular orbit. The electrons complete 1.0×10^{15} revolutions around the nucleus every second



What is the current caused by the motion of the electrons in the orbit?

A 1.6×10^{-34} A

B 3.2×10^{-34} A

C 1.6×10^{-4} A

D 3.2×10^{-4} A

[1 mark]

Question 7

A parallel beam of protons, each with charge ***e***, travel at uniform velocity *v*. This results in current *I* being formed.

What is the number of protons present in a unit length of the beam?

A $\frac{I}{e}$ **B** $\frac{I}{ev}$ **C** $\frac{Iv}{e}$ **D** $\frac{I}{v}$

[1 mark]

Question 8

The ratings of two lamps are as follows:

X	230 V, 100 W
Y	230 V, 60 W

During normal operation, which of the lamps will have larger current and resistance?

A $I_X > I_Y$ and $R_X > R_Y$

B $I_X > I_Y$ and $R_X < R_Y$

C $I_X < I_Y$ and $R_X > R_Y$

D $I_X < I_Y$ and $R_X < R_Y$

[1 mark]

Question 9

The amount of energy transferred when 10 C of charge passes through a p.d. of 20 V is the same as the energy needed to raise a 2 kg mass through a distance *x*.

Take gravitational field strength to be 10 N kg^{-1}.

What is the value of *x*?

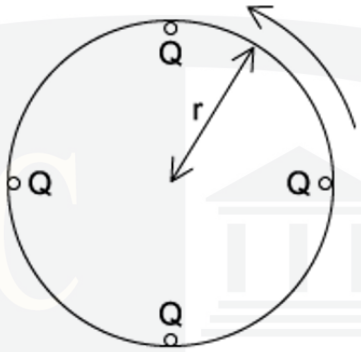
A 0.1 m **B** 1.0 m **C** 10 m **D** 100 m

[1 mark]

Question 10

Four point charges, each of charge *Q*, are placed on the edge of an insulating disc of radius *r*.

The frequency of rotation of the disc is *f*.



What is the equivalent electric current at the edge of the disc?

A $4Qf$ **B** $\frac{4Q}{f}$ **C** $8\pi rQf$ **D** $\frac{2Qf}{\pi r}$

[1 mark]