

Question 18**(20 marks)**

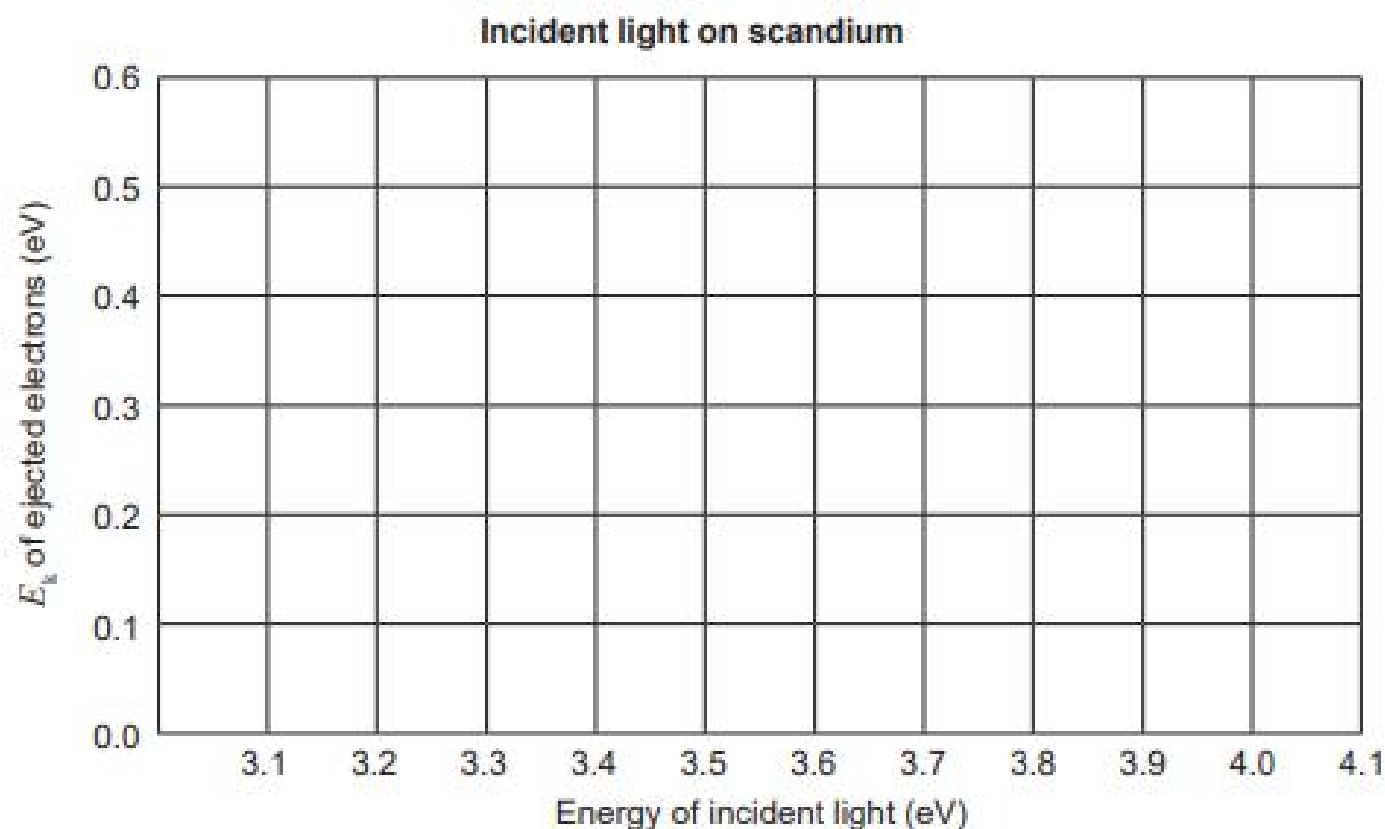
Three light sources are used to determine the photoelectric properties of an elemental material surface; ultraviolet (338 nm), violet (386 nm) and yellow (585 nm). These light sources can be used to help determine the work functions given in the following table.

Element	Symbol	Work function (eV)
Potassium	K	2.29
Calcium	Ca	2.87
Scandium	Sc	3.50
Titanium	Ti	4.33
Chromium	Cr	4.50
Cobalt	Co	5.00

- (a) Explain what is meant by the term 'work function' as it relates to the photoelectric effect. (2 marks)

- (b) (i) Calculate the maximum kinetic energy, in electron volts of an ejected photoelectron when ultraviolet light is used on a scandium surface. (4 marks)

- (ii) Sketch a graph of the kinetic energies of photoelectrons versus the energy of light incident on a scandium surface. (2 marks)



- (c) When the violet light is used on an unknown material, a stopping potential difference of 0.350 V reduces the photocurrent to zero.

- (i) Calculate the work function of this material. (4 marks)

Answer _____ eV

- (ii) From the table on page 26, determine the possible element in the material. (1 mark)

Answer _____

- (iii) Explain what happens when the yellow (585 nm) light is incident on the unknown surface. Include a calculation to support your answer. (4 marks)

- (d) Explain how the photoelectric effect demonstrates one of the properties of light. (3 marks)
