

Name of the Student: _____

Max. Marks : 19 Marks

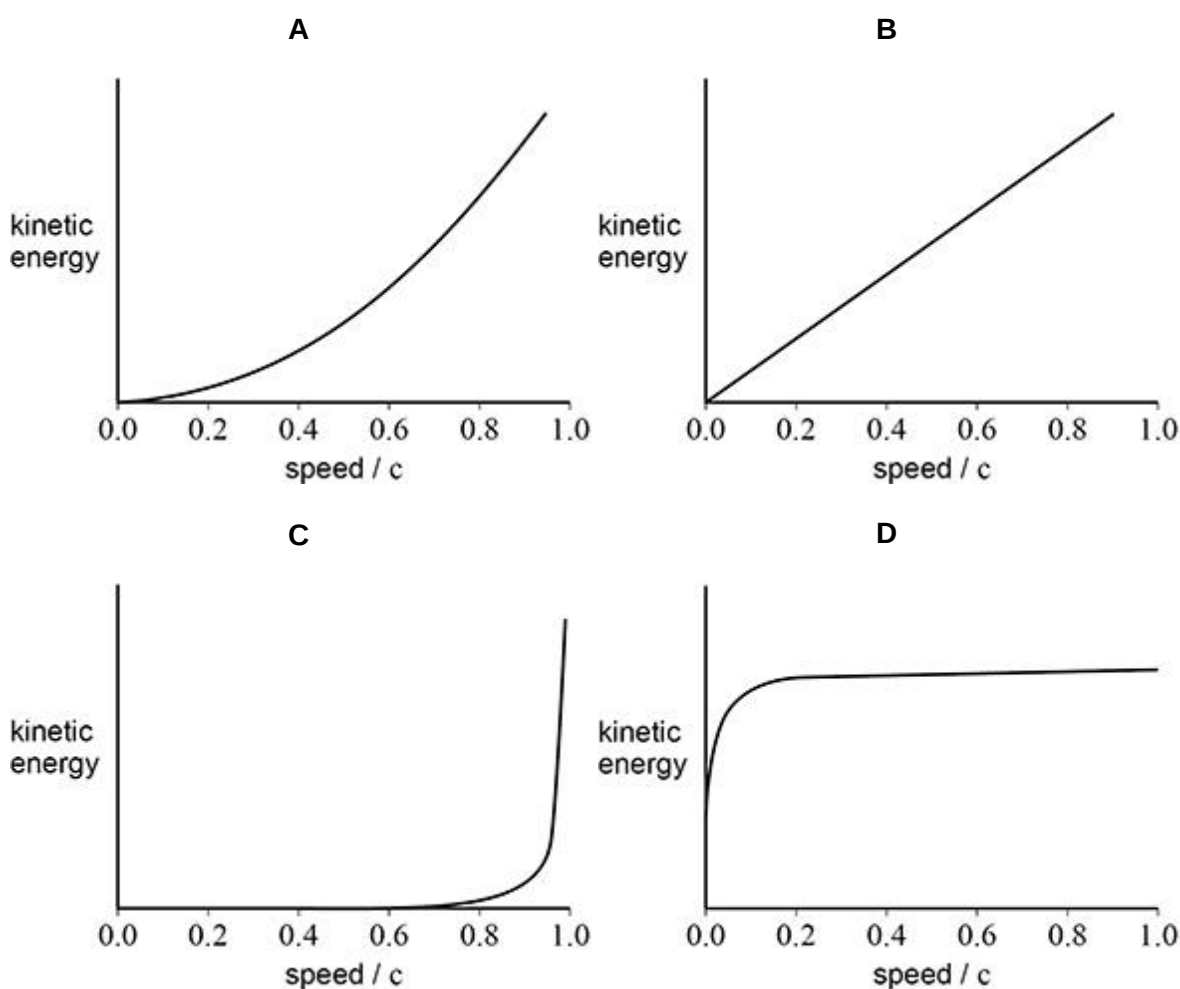
Time : 19 Minutes

Q1.

- (a) Bertozzi investigated how the kinetic energy of electrons varies with speed.

Which graph shows the variation of kinetic energy with speed?

Tick (✓) **one** box.



A ☐

B ☐

C ☐

D



(1)

- (b) Calculate the speed of a particle when its kinetic energy is equal to its rest energy.

speed = _____ m s^{-1}

(3)

- (c) Discuss the change in the observed mass of a spring when it is stretched.

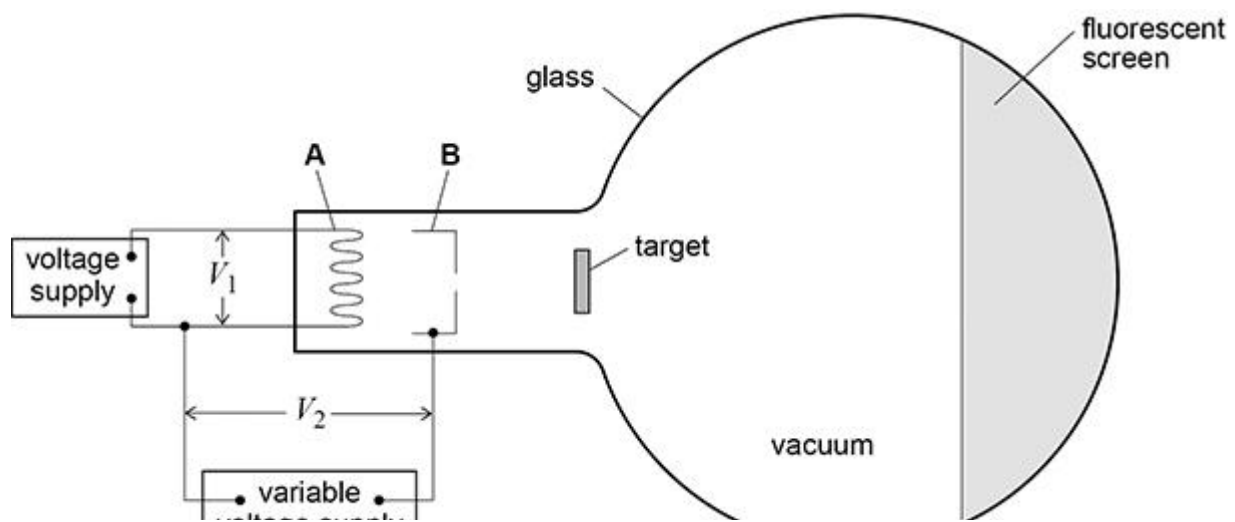
(2)

(Total 6 marks)

Q2.

Figure 1 shows the apparatus used in an experiment to investigate electron diffraction and the de Broglie hypothesis.

Figure 1



- (a) Explain how high-speed electrons are produced in the apparatus in **Figure 1**.

In your answer you should:

- name parts **A** and **B**
- discuss the purposes of potential differences V_1 and V_2 .

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(4)

- (b) In the experiment, electrons are incident on a target made of a crystalline material. The electron wavelengths need to be about 50% the size of an atom to produce a diffraction pattern on the screen.

Suggest a suitable value for V_2 .

Support your answer with a calculation.

$$V_2 = \underline{\hspace{2cm}} \text{ V}$$

Moving electrons can be deflected by a magnetic field.	Moving electrons can be deflected by a magnetic field.	☐
Moving electrons can be deflected by a magnetic field.	Moving electrons can cross a potential barrier.	☐
Moving electrons can cross a potential barrier.	Moving electrons can cross a potential barrier.	☐

(1)
(Total 13 marks)