3 **(a)** A mass is undergoing simple harmonic motion with amplitude x_0. The maximum velocity of the mass has magnitude v_0.

On Fig. 3.1, show the variation with displacement x of the velocity v of the mass.

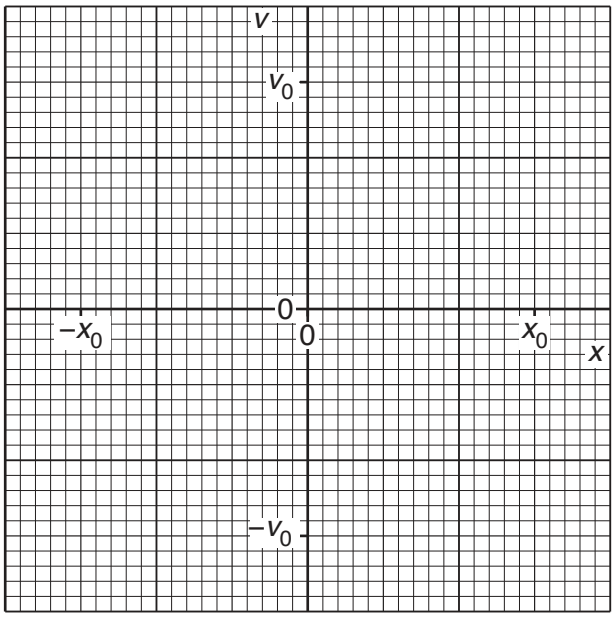

Fig. 3.1

[2]

(b) A straight stiff wire carries a constant current in a region of uniform magnetic flux density.

The angle θ between the direction of the current and the direction of the magnetic field is varied. The maximum force on the wire is F_0.

On Fig. 3.2, show the variation with angle θ of the force F on the wire for values of θ between 0° and 90°.

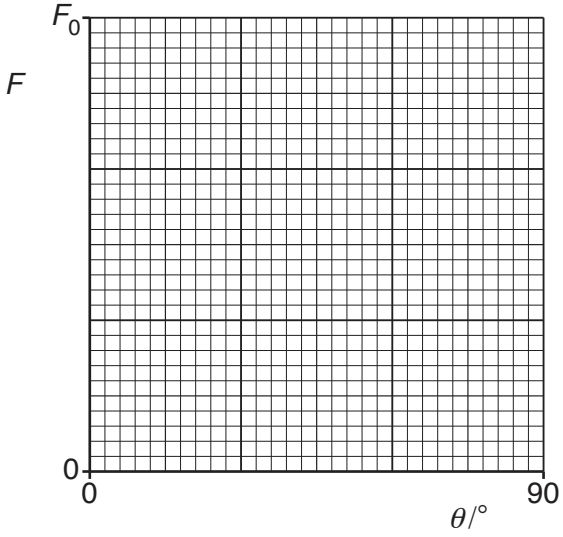

Fig. 3.2

[2]

(c) A sinusoidal supply has frequency 250 Hz and r.m.s. potential difference 2.8 V.

On the axes of Fig. 3.3, show quantitatively the variation with time t of the voltage V for one cycle of the varying voltage.

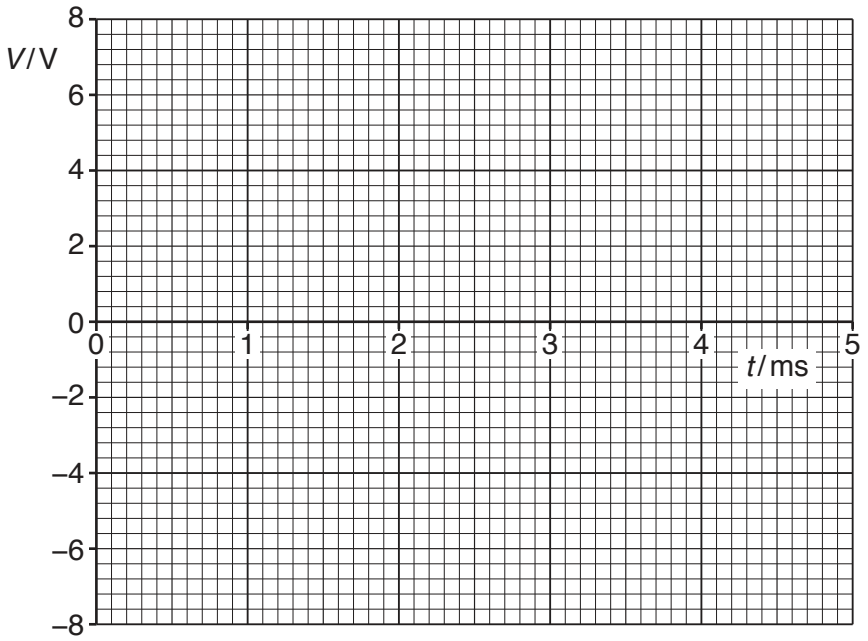

Fig. 3.3

[2]

(d) One particular fission reaction may be represented by the equation

$$^{235}_{92}\mathrm{U} + ^{1}_{0}\mathrm{n} \rightarrow ^{141}_{56}\mathrm{Ba} + ^{92}_{36}\mathrm{Kr} + 3^{1}_{0}\mathrm{n}$$

The variation with nucleon number A of the binding energy per nucleon B_E is shown in Fig. 3.4.

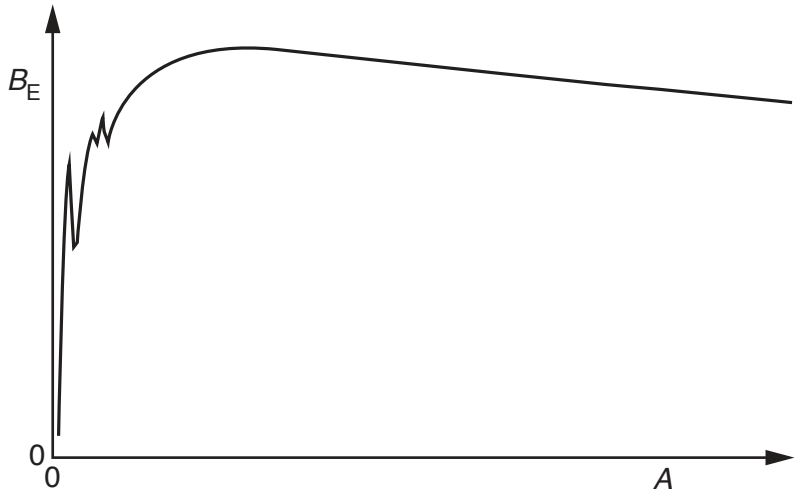

Fig. 3.4

On Fig. 3.4, mark on the line the position of

(i) the nucleus $^{235}_{92}\mathrm{U}$ (label this point U),

(ii) the nucleus $^{141}_{56}\mathrm{Ba}$ (label this point Ba),

(iii) the nucleus $^{92}_{36}\mathrm{Kr}$ (label this point Kr).

[2]

[Total: 8]