

Practice Question Set For A-Level  
**Subject : Physics**  
**Paper-1 Topic : 2 (Mechanics)**

**Name of the Student:** \_\_\_\_\_

**Max. Marks : 25 Marks**

**Time : 25 Minutes**

**Q1.**

Dentists often use a white composite material for fillings for teeth. This material is applied as a liquid and then hardened using blue light.

The photograph shows a light gun, used by dentists, that emits the blue light.



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(a) The light gun emits light of radiation flux  $8000 \text{ W m}^{-2}$ .

A particular tooth needs a filling of cross-sectional area  $1.5 \times 10^{-5} \text{ m}^2$ . It requires 2.3 J of incident light energy to harden the filling.

Calculate the time for which the light must be applied.

(3)

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Time = .....

(b) The light gun is supplied with a rechargeable battery of capacity 1.4 amp hours. When in use, the output potential difference of the battery is 3.7 V.

(i) Assuming the potential difference is constant, show that the maximum energy supplied by the battery is about 20 000 J.

(2)

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(ii) Assuming each filling requires 2.3 J of incident light energy, a fully charged battery can be used to power the light gun to harden 210 fillings.  
Calculate the efficiency of the light gun at supplying the energy stored in the battery to the fillings.

(3)

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Efficiency = .....

**(Total for question = 8 marks)**

**Q2.**

An electric kettle is used to heat water from room temperature to boiling point.

(a) (i) Calculate the electrical power used by the kettle.

potential difference = 230 V

current = 12.5 A

(2)

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Electrical power = .....

(ii) The kettle is switched on for 140 s.

Calculate the total energy supplied to the kettle.

(2)

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Total energy supplied = .....

(iii) The amount of thermal energy transferred to the water is calculated to be 351 000 J.

Calculate the efficiency of the kettle at heating the water.

(2)

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Efficiency = .....

(b) A student suggests that the useful energy required is thermal and the kettle only produces thermal energy, so it should be 100 % efficient.

Discuss this suggestion.

(2)

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**(Total for question = 8 marks)**

**Q3.**

The photograph shows an athlete performing a long jump.



At take-off his horizontal speed is  $8.0 \text{ m s}^{-1}$  and his vertical speed is  $2.8 \text{ m s}^{-1}$ .

(a) Show that the total time the athlete spends in the air is about 0.6 s.

Assume that his centre of gravity is at the same height at take-off and landing.

(3)

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(b) Calculate the horizontal distance jumped by the athlete.

(2)

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Horizontal distance = .....

(c) In reality, when the athlete lands his centre of gravity is 50 cm lower than its position at take-off.

Calculate the extra horizontal distance this enables the athlete to jump.

(4)

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Extra horizontal distance = .....

**(Total for Question = 9 marks)**