Year 12 Physics

Test 3

Time Allowed: 30 minutes

Total Marks: 27

02 May 2021

Calculator Allowed

Full Name of Student:

NB Tutors Ltd, Unit 79, Capital Business Centre, 22 Carlton Road, South Croydon, CR2 OBS

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- 1.
 - (a) Explain the term centre of gravity of an object.

(b) Fig. 2.1 shows a lawn mower which is carried by two people.

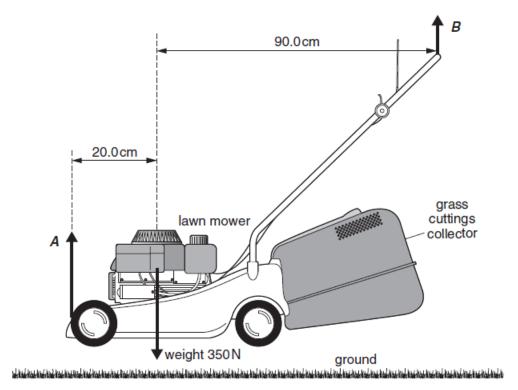


Fig. 2.1

- (i) The two people apply forces *A* and *B* at each end of the lawn mower. The weight of the lawn mower is 350 N.
 - 1 Explain why the weight of the lawn mower does not act in the middle of the lawn mower, that is 55 cm from each end.

[1]

2 Use the principle of moments to show that the force **B** is 64 N.

3 Determine the force A.

A =N [1]

(ii) State and explain what happens to the forces *A* and *B* if the person that applies force *B* moves his hands along the handle towards the middle of the lawn mower.

[Total for Question 1 = 8 marks]

2.

(a) State what property of electromagnetic radiation is demonstrated by the photoelectric effect.

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- (b) Define each of the following terms
 - (i) photon

(ii) threshold frequency.

- (c) An argon-laser emits electromagnetic radiation of wavelength 5.1 x 10⁻⁷ m. The radiation is directed onto the surface of a caesium plate. The work function energy for caesium is 1.9 eV.
 - (i) Name the region of the electromagnetic radiation emitted by the laser.

(ii) Show that the work function energy of caesium is 3.0×10^{-19} J.

[1]

(iii) Calculate

1 the energy of a single photon

energy = J [2]

2 the maximum kinetic energy of an electron emitted from the surface of caesium.

kinetic energy =J [3]

(iv) State and explain what change, if any, occurs to the maximum kinetic energy of an emitted electron if the intensity of the laser light is reduced.

(v) The power of the laser beam is 80 mW. Calculate the number of electrons emitted per second from the caesium plate assuming that only 7.0% of the incident photons interact with the surface electrons.

number = s⁻¹ [2]

[Total for Question 2 = 14 marks]

Fig. 6.1 shows a zinc plate attached to a charged gold-leaf electroscope. The arrangement is used to demonstrate the photoelectric effect.

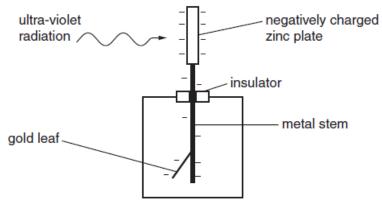


Fig. 6.1

The zinc plate, metal stem and gold leaf have an excess of electrons. This causes the leaf to deflect away from the stem.

When the zinc plate is exposed to high frequency ultra-violet radiation, it loses electrons from its surface and consequently the gold leaf falls rapidly. If the demonstration is repeated with visible light, the leaf does not fall.

Use the photoelectric effect to describe how the ultra-violet radiation interacts with the surface electrons of the zinc plate. Explain why visible light, no matter how intense, does not release electrons from the zinc plate.

 [5]

[Total for Question 3 = 5 marks]

- End of Test -