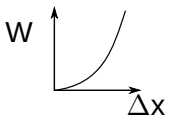
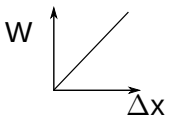
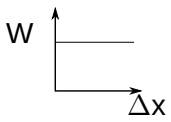
5 Worksheet: Maths in Physics

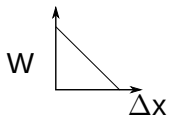
QUESTION 1

1.1 A car moves from rest in a straight line under the influence of a constant net force. Which ONE of the following graphs best represents the net work done (W) on the car in relation to its displacement (Δx)? (Limpopo Sep 2014 no. 1.5)

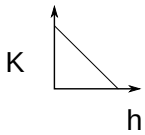
A


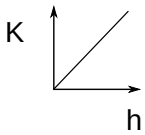
B


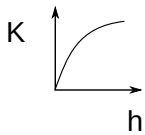
C


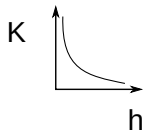
D


1.2 An object is dropped from a certain height above ground level. Ignore the effects of air resistance. Which ONE of the following graphs BEST represents the relationship between the kinetic energy **K** and the height **h** above ground level.
(Limpopo Sep 2018 no.1.5)

A


B


C


D


1.3 A net force F which acts on a body of mass m causes an acceleration a. If the same net force F is applied to a body of mass 2m, the acceleration of the body will be . . .
(Supp 2016 no. 1.1)

A $\frac{1}{4}$a B $\frac{1}{2}$a C 2a D 4a

1.4 The work done by a constant force F applied to an object to increase the object's speed from v to 2v is W.

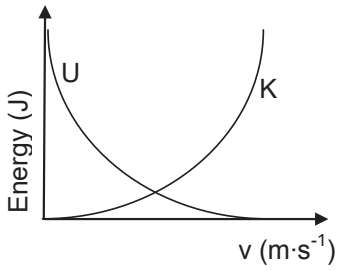
The work done by the same force to increase the speed of the object from 0 to v will be . . . (Supp 2016 no. 1.5)

A $\frac{1}{3}$W B $\frac{1}{2}$W C 2W D 3W

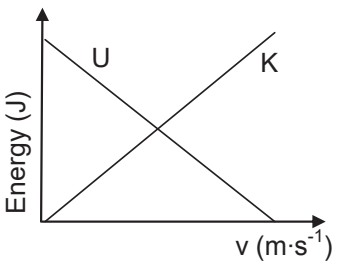
1.5 A small stone is dropped from rest and undergoes free fall. **(DOE Jun 2019)**

Which ONE of the graphs below shows the CORRECT relationship between the gravitational potential energy (U) and speed *v* and the kinetic energy (K) and speed *v*, respectively, for the stone? The graphs are NOT drawn to scale.

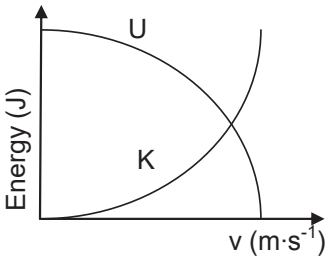
A



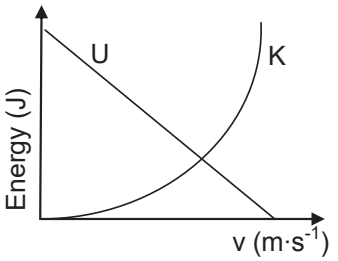
B



C

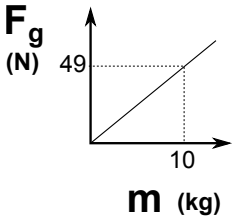


D



(2)

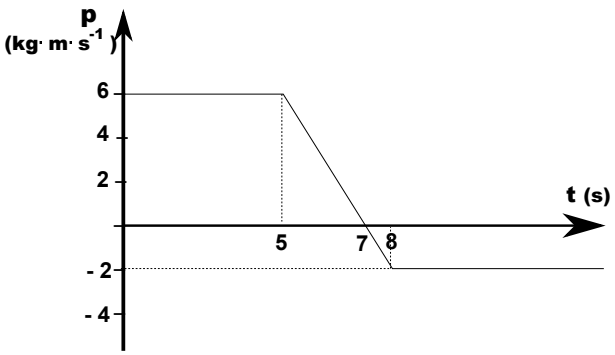
1.6 The graph represents the weight of objects on planet X versus their masses.



a. Use the graph to calculate the gravitational acceleration on planet X.

b. If the radius of planet X is the same as the radius of the earth, how does the mass of planet X compare to the mass of earth?

1.7 The following graph shows the momentum versus time for a ball (3 kg) that rolls east, collides with a wall and bounces back.



a. Calculate the impulse on the ball.

b. Calculate the average force that the wall exerts on the ball.

c. What is the average force that the ball exerts on the wall.

QUESTION 11 **(Nov 2015)**

In an experiment to demonstrate the photoelectric effect, light of different wavelengths was shone onto a metal surface of a photoelectric cell. The maximum kinetic energy of the emitted electrons was determined for the various wavelengths and recorded in the table below.

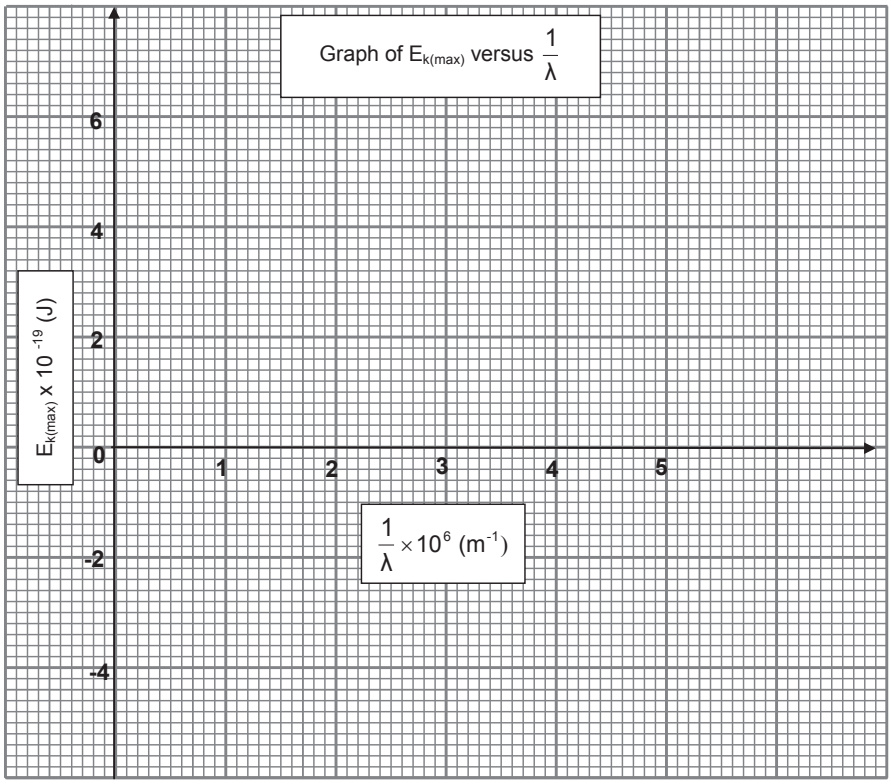
INVERSE OF WAVELENGTH $\frac{1}{\lambda}$ ($\times 10^6$ m^{-1})	MAXIMUM KINETIC ENERGY $E_{k(max)}$ ($\times 10^{-19}$ J)
5,00	6,60
3,30	3,30
2,50	1,70
2,00	0,70

11.2 Draw a graph of $E_{k(max)}$ (y-axis) versus $\frac{1}{\lambda}$ (x-axis) ON THE ATTACHED ANSWER SHEET. (3)

11.3 USE THE GRAPH to determine:

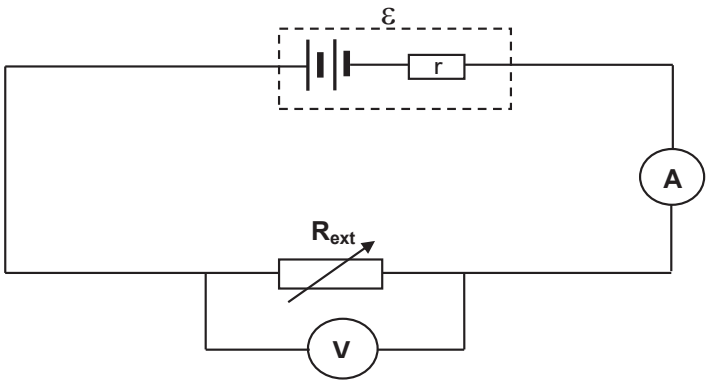
11.3.1 The threshold frequency of the metal in the photoelectric cell (4)

11.3.2 Planck's constant (4)



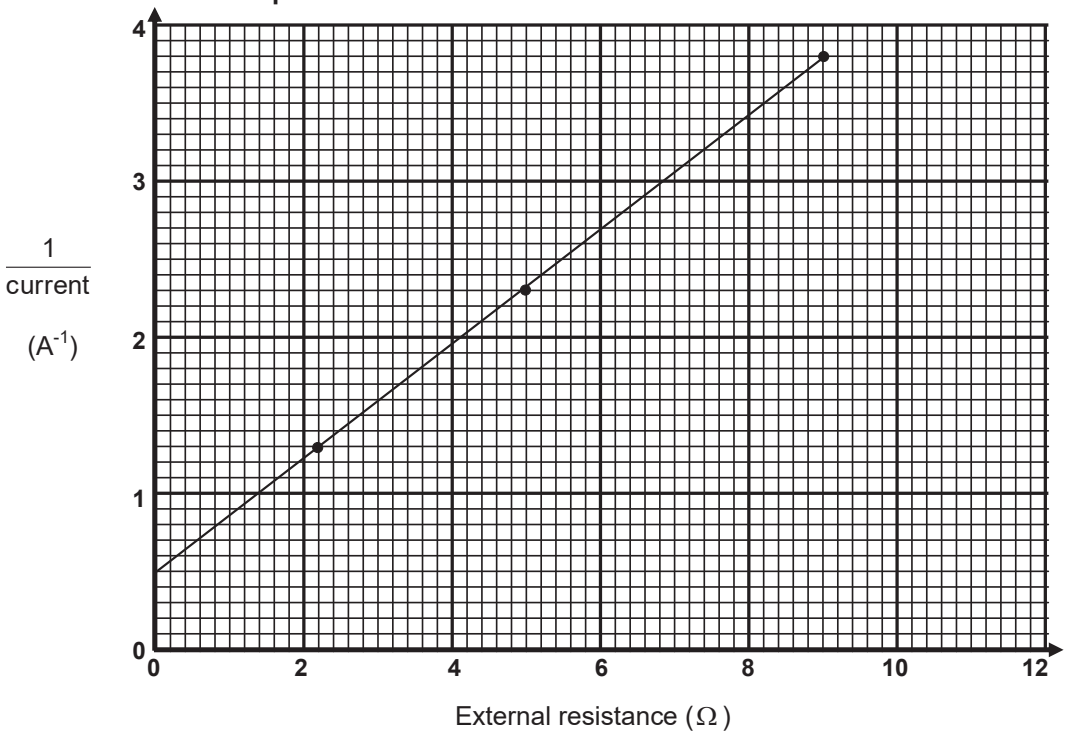
QUESTION 11

A learner set up the circuit shown below to measure the internal resistance of a battery.



She records the readings on the voltmeter and ammeter for different resistances of the rheostat. The graph below was obtained from the results.

Graph of inverse of current versus external resistance



11.1 Define the term *emf*. (2)

11.2 Calculate the gradient of the above graph. (3)

11.3 What is represented by the gradient in Question 11.2? (1)

11.4 Use the information on the graph to calculate the:

11.4.1 Emf of the battery (2)

11.4.2 Internal resistance of the battery (3)

(Gauteng Rekord 2016)