IGCSE Physics: Topic 1-5 Test

Priority Learning

Test

Name: _____ **Date**: _____

Question:	1	2	3	4	5	6
Marks:	9	13	14	12	19	13
Score:						

Question:	7	8	9	10	11	Total
Marks:	7	7	15	4	7	120
Score:						

TIME ALLOWED: 2 HOURS

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$$\text{Energy transferred} = \text{current} \times \text{voltage} \times \text{time} \qquad E = IVt$$

$$\text{Frequency} = \frac{1}{\text{time period}} \qquad f = \frac{1}{T}$$

$$\text{Power} = \frac{\text{work done}}{\text{time taken}} \qquad P = \frac{W}{t}$$

$$\text{Power} = \frac{\text{energy transferred}}{\text{time taken}} \qquad P = \frac{W}{t}$$

$$\text{Orbital speed} = \frac{2\pi \times \text{orbital radius}}{\text{time period}} \qquad v = \frac{2\pi r}{t}$$

$$(\text{Final speed})^2 = (\text{initial speed})^2 + (2 \times \text{acceleration} \times \text{distance moved}) \qquad v^2 = u^2 + 2as$$

$$\text{Pressure} \times \text{volume} = \text{constant} \qquad p_1 \times v_1 = p_2 \times v_2$$

$$\frac{\text{Pressure}}{\text{temperature}} = \text{constant} \qquad \frac{p_1}{T_1} = \frac{p_2}{T_2}$$

$$\text{Force} = \frac{\text{change in momentum}}{\text{time taken}} \qquad F = \frac{mv - mu}{t}$$

$$\frac{\text{change of wavelength}}{\text{wavelength}} = \frac{\text{velocity of a galaxy}}{\text{speed of light}} \qquad \frac{\lambda - \lambda_0}{\lambda_0} = \frac{\Delta\lambda}{\lambda_0} = \frac{v}{c}$$

$$\text{Change in thermal energy} = \text{mass} \times \text{specific heat capacity} \times \text{change in temperature} \qquad \Delta Q = m \times c \times \Delta T$$

Assume the acceleration of free fall, $g = 10\text{ms}^{-2}$

1. (a) The table below shows some types of electromagnetic radiation and uses. Complete the table. (2 marks)

Radiowaves	
Gamma Rays	
	TV remotes
Ultraviolet	
	Optical fibre cables

(b) Microwaves are used to heat food, describe in terms of particles how this happens. (3 marks)

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(c) The astronauts that visited the moon left mirrors there, this allows scientists on Earth to fire lasers at the moon to determine it's distance from Earth. Describe how they can calculate this. (4 marks)

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2. Figure 1 Shows the velocity time graph for a car on the motorway. Each line to the right is worth 5 minutes and each line upwards is worth 10km/h.

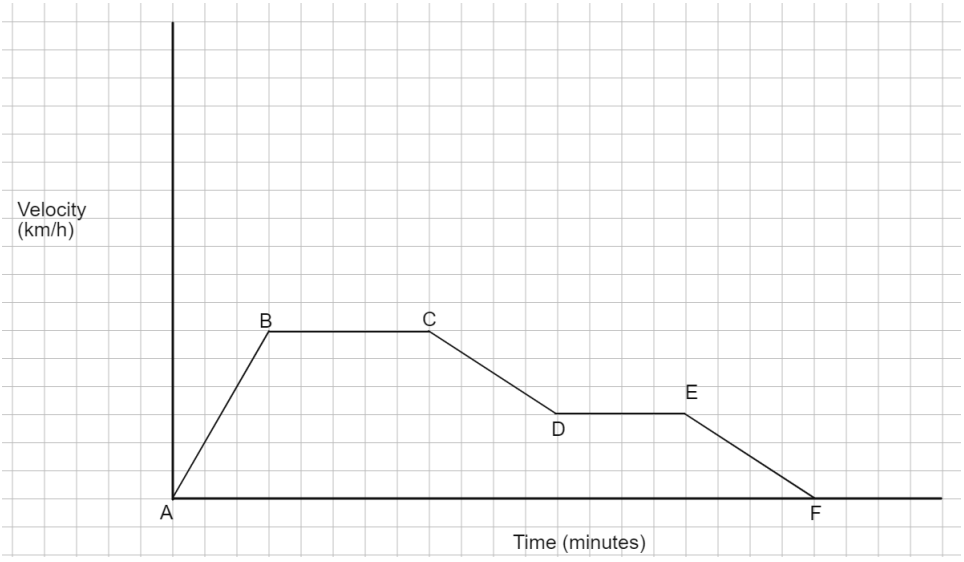

Figure 1:

(a) State the difference between a scalar quantity and a vector quantity. (2 marks)

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(b) During which part of the cars journey is it's acceleration greatest? Explain your answer. (2 marks)

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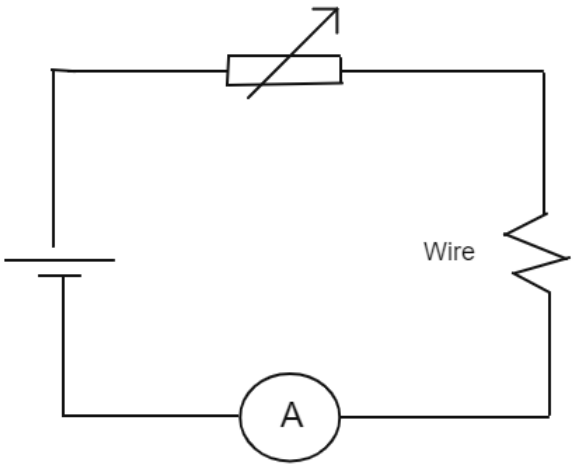
(c) Calculate the cars acceleration between the points E and F. Give appropriate units in your answer. (3 marks)

(d) Calculate the distance travelled by the car. (3 marks)

(e) Calculate the average speed of the car in miles per hour. (3 marks)

3. A student wanted to see how the length of a piece of metal wire effected it's total resistance. He set up the circuit below.



(a) Add a component to the circuit diagram that would allow the student to record the voltage across the wire. (1 mark)

(b) State what each type of variable is in this experiment.

i. Independent variable. (1 mark)

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ii. Dependent variable. (1 mark)

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iii. Control variable. (1 mark)

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The student obtained the following table of results.

Length of wire (cm)	Current (mA)	Voltage (V)	Resistance
1.0	10.2	0.031	
2.5	9.8	0.074	
3.2	9.4	0.091	
4.5	9.0	0.122	
6.0	8.3	0.174	
8.0	8.2	0.197	

(c) State 2 mistakes the student has made in the table.

i. (1 mark)

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ii. (1 mark)

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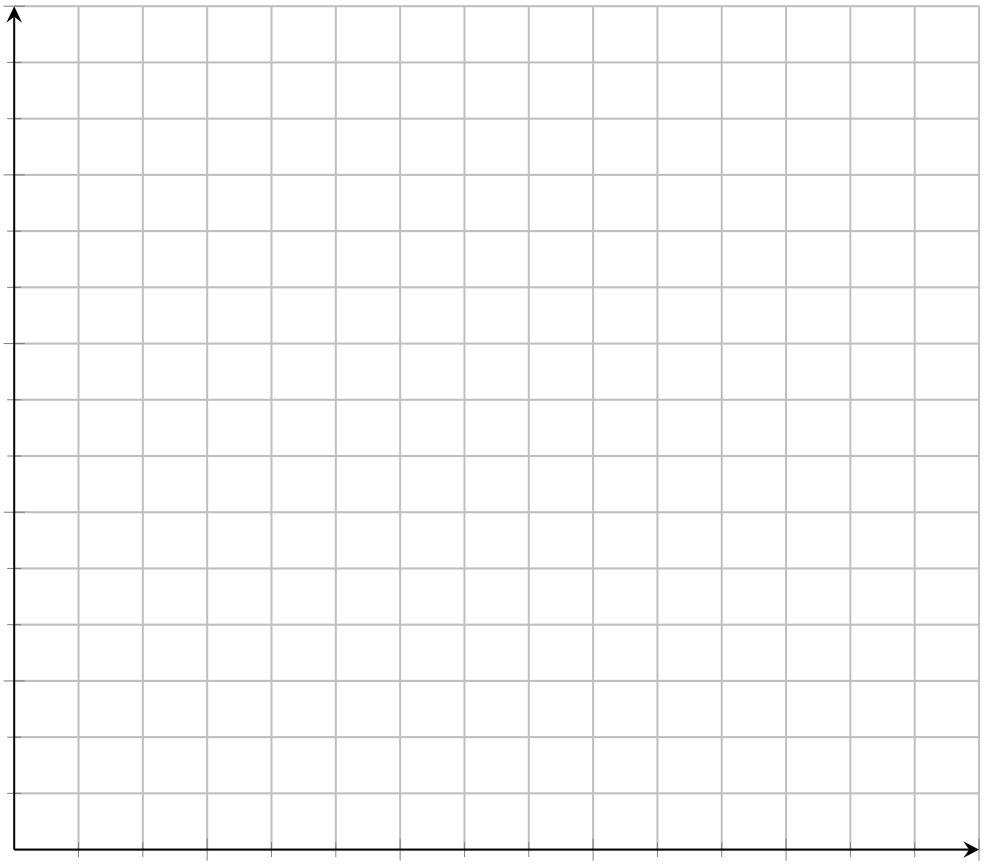
(d) Complete the column for resistance. (2 marks)

(e) Plot a graph of resistance against length of wire on the axes below and draw a line of best fit. (3 marks)



(f) Circle the anomalous reading. (1 mark)

(g) State 2 ways the student could improve the reliability of their experiment.

i. (1 mark)

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ii. (1 mark)

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4. A car accelerates from rest with a driving force of 2.7kN. The friction between the tyres and road is 200N and the mass of the car is 800kg.

(a) State the equation linking force, mass and acceleration. (1 mark)

(b) Calculate the acceleration of the car the instant after it sets off. Give appropriate units in your answer. (3 marks)

(c) The car maintains a constant driving force of 2.7kN and the friction between the tyres and road stays a constant 200N. With reference to all the forces acting on the car, explain what will happen to the acceleration of the car as it's velocity increases. (4 marks)

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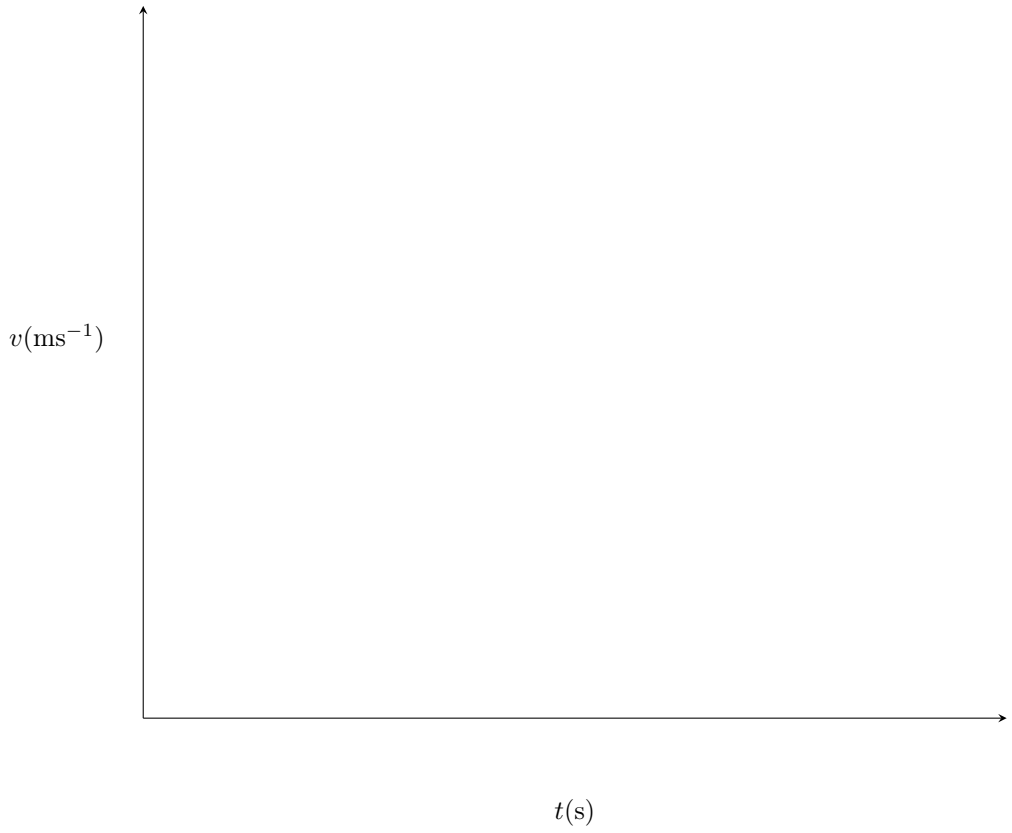
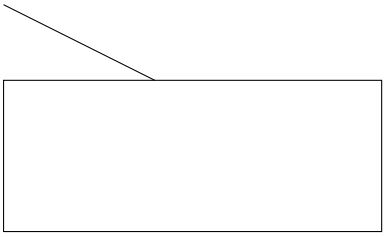
(d) Sketch a velocity time graph for the motion of the car as you described above. (2 marks)



(e) Draw a dotted line on your graph which would represent the velocity time curve for a car with the same driving force, friction between the tyres and road and shape as the other car, but less mass. (2 marks)

5. The diagram below shows a ray of light entering a glass block from the air.



(a) Measure the angle of incidence with a protractor and label it. (1 mark)

(b) Complete the sentence using words from the box.

refracted, reflected, transmitted, towards, away from, absorbed, more, less

When the incident ray enters the glass block it is _____ _____ the normal because glass is a _____ dense medium than air. (3 marks)

(c) The refractive index of glass is 1.52, calculate the angle of the refracted ray. (4 marks)

(d) Complete the ray diagram, labelling all relevant angles. (3 marks)

(e) Explain what is meant by the critical angle. (2 marks)

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(f) Calculate the critical angle for this glass block. (3 marks)

(g) State one application of critical angles in modern technology and briefly explain how it works. (3 marks)

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6. Sandra blows up a balloon, she keeps blowing until the balloon bursts.

(a) Use your knowledge about particles to explain why the balloon expands and then bursts. (5 marks)

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(b) Just before the balloon bursts it is approximately the shape of a sphere.

i. State the formula relating density, mass and volume. (1 mark)

ii. The volume of a sphere is given by the formula $V = \frac{4}{3}\pi r^3$. where r is the radius of the sphere. Calculate the volume of the balloon if the radius 10cm. Give appropriate units in your answer. (2 marks)

iii. The density of air is 1.2kg/m^3. Using your answer to the previous part, calculate the mass of air inside the balloon when the radius is 10cm. (2 marks)

iv. The pressure inside the balloon just before it bursts is 108kPa, the temperature of the room is 23°C. Sandra then puts the balloon in the freezer for a few hours where the temperature is -20°C. What is the pressure inside the balloon now? (3 marks)

7. (a) On a hot summer day, Daisy says that she should wear white clothes rather than black clothes to keep cool. Is she right? Explain your answer. (4 marks)

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(b) She sweats causing her body temperature to decrease, explain how this happens. (3 marks)

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8. (a) State the equation linking moment, force and perpendicular distance from the pivot. (1 mark)

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(b) State the principle of moments. (2 marks)

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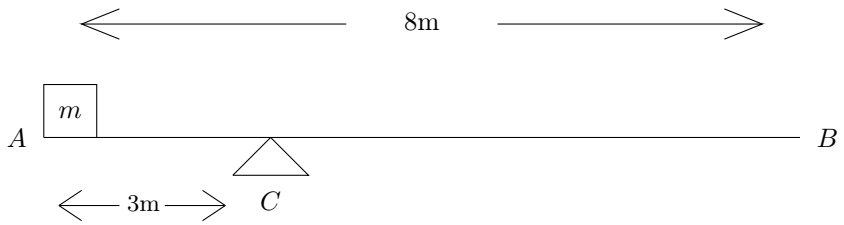
(c) A uniform rod AB, of length 8m and mass 16kg rests on a pivot at the point C, 3m away from A. A particle P is placed on the end A. The system is in equilibrium, what is the mass of P. (4 marks)



9. (a) A car of mass 1300kg is travelling along a wet road, the driver sees a log of mass 250kg in the road and applies the brakes but does not stop in time. It is travelling at 6m/s as it hits the log. After the collision the car and log travel as one object. At what speed do they travel? (3 marks)

(b) The car's crumple zone, crumples upon impact with the log.

i. Explain how this decreases the chance that the driver will be harmed during the collision. (3 marks)

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ii. The mass of the driver is 80kg. The time of the collision was 0.8 seconds, calculate the force exerted on the driver by the collision. (4 marks)

(c) State the equation linking stopping distance, braking distance and thinking distance. (1 mark)

(d) The wet road increases the drivers stopping distance. State 2 other factors that may increase the drivers stopping distance. (2 marks)

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(g) State 2 factors that may increase the drivers thinking distance. (2 marks)

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10. A potato cell produces 390J of energy per minute and an average current of 40mA. Show that the resistance of the potato is approximately 4kΩ. (4 marks)

11. Julie is filling her car with petrol.

(a) Explain how charge builds up, why it is dangerous and the safety measure that all fuel pumps must have. (4 marks)

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(b) Petrol is a fossil fuel, state 1 advantage and 1 disadvantage of burning fossil fuels to produce energy. (2 marks)

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(c) Wind turbines are a form of renewable energy. Name a type of renewable energy that does not use a turbine to generate electricity. (1 mark)

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