Candidate Name:.....

St Swithun's

Physics

Sixth Form Academic Assessment

Past Paper

Time allowed: 1 hour

Instructions to Candidates

Candidates should answer all questions

Further Information

* Answer all questions on file paper
* Graph paper is needed for question 3
* Show **all working** in your answers
* Marks are awarded for **clear, logical** answers
* A list of formulae is provided
* Calculators are allowed

Use your knowledge of Physics to answer the following questions as fully as you can. Some of the questions are open-ended. This means that there could be more than one way to answer the question. Use diagrams to illustrate your answers where appropriate. Marks will mainly be awarded for sensible, clear, logical answers.

1. a) Why does a thin metal wire get hot when an electric current is passed through it?
   b) If the current flowing through such a wire is 2.7 A and the pd across it is 12 V calculate
      i) the resistance of the wire.
      ii) the rate at which heat energy is dissipated in the wire.

2. A girl is standing by a swimming pool and sees a coin on the bottom of the pool. The coin appears to be closer to her than it actually is. Explain why this is so.

3. A student is investigating how the time period (T/s) of a simple pendulum varies with its length (l/m). The time period is the time taken for 1 complete oscillation or swing of the pendulum. The student times 10 oscillations for 6 different pendulum lengths and then repeats her measurements. The student's results are shown in the table.

Pendulum length l/m	Time for 10 oscillations, T_{10}/s			Time period T/s	Time period squared T^2/s^2
	1st try	2nd try	average		
0.300	11.0	11.2			
0.400	12.5	12.9			
0.500	13.8	14.0			
0.600	15.5	15.5			
0.700	16.7	16.9			

   a) Complete the table quoting the missing values to 3 significant figures.
   b) Plot a graph of T^2/s^2 against l/m and draw the line of best fit.
   c) Which reading is slightly anomalous?
   d) Why are 10 oscillations timed rather than 1?
   e) What conclusion can you draw about the relationship between the time period of a simple pendulum and its length?
   f) Find the gradient of the graph.

4. Radio 1 broadcasts at a frequency of 98.2 MHz. Calculate the wave length of the transmitted radio waves.

5. You are asked to measure the speed of a toy car rolling down a ramp in a laboratory.
   a) Describe how you could do this as accurately as possible to minimise possible errors.
   b) State the measurements you would need to make and explain how you would use your measurements to calculate the speed of the trolley.

6. Objects are sometimes described as being stable or unstable. Which is more stable, an empty wineglass or a full wineglass? Explain your answer.

7. By referring to Newton's Laws and the concept of momentum explain how a rocket is able to move through space.

8. How fast would a raindrop be travelling if it fell a vertical distance of 100 m? State any assumptions that you make.

9. Is space exploration a waste of time and money?

End of questions

LIST OF FORMULAE

The following information may be useful

1. *Density* $= \frac{mass}{Volume}$

2. *Pressure* $= \frac{force}{area}$ $\quad P = \frac{F}{A}$

3. *Force* $=$ *mass x acceleration* $\quad F = ma$

4. *The Earth's gravitational field strength (g)* $= 10$ *N/kg*

5. *Speed of electromagnetic waves in a vacuum* $= 3.0 \times 10^8$ *m/s*

6. *Weight* $=$ *mass x gravitational field strength* $\quad W = mg$

7. *Relationships between initial velocity (u), constant acceleration (a), final velocity (v), and distance travelled (s) after time (t):*

$$a = \left[\frac{v-u}{t}\right] \qquad v^2 = u^2 + 2as$$

$$\text{Average velocity} = \left[\frac{u+v}{2}\right] \qquad s = ut + \tfrac{1}{2}at^2$$

$$s = \text{average velocity x time} = \left(\frac{u+v}{2}\right)$$

8. *For a body of mass m moving with velocity v, kinetic energy* $= \frac{1}{2}mv^2$

9. *For a body of mass m raised through a height h, gravitational potential energy* $= mgh$

10. *Work done* $=$ *force x distance moved along line of action of force*

11. *Power* $= \frac{\text{energy transformed}}{\text{time taken}} = \frac{\text{work done}}{\text{time taken}}$

12. *The efficiency of a machine or system* $= \frac{\text{useful output}}{\text{energy}} = \frac{\text{useful output power}}{\text{total input power}}$

13. *The moment of a force about a pivot* $=$ *force x perpendicular distance from force to pivot*

14. *Wave speed* $=$ *frequency x wavelength* $\quad v = f\lambda$

15. *For waves travelling from medium 1 to medium 2,* $\frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2} =$ *refractive index*

16. *Frequency* $= \frac{1}{Period}$

17. *Resistance* $= \frac{\text{potential difference}}{\text{Current}}$ $R = \frac{V}{I}$

18. *Electrical power = potential difference x current* $P = VI = I^2R = \frac{V^2}{R}$

19. *Electrical energy (kWh) = power (kW) x time (h)*

20. *Linear magnification* $= \frac{\text{height of image}}{\text{height of object}}$

20. *The lens equation is:* $1/f = 1/u + 1/v$