SECONDARY SCHOOL ANNUAL EXAMINATIONS 2007

Educational Assessment Unit - Education Division

FORM 5 | **PHYSICS** | **TIME: 1 hr 45 min**

NAME: _____ **CLASS:** _____

Answer ALL questions in the spaces provided on the Exam Paper.
All working must be shown. The use of a calculator is allowed.
Where necessary take the acceleration due to gravity, g = 10 m/s^2.

Equations for Annual Exam Physics

Density	$m = \rho V$	
Pressure	$P = h \rho g$	$P = F/A$
Energy and Work	$PE = m g h$	$KE = \frac{1}{2} m v^2$
	$E \text{ (or } W) = P t$	$W \text{ (or WD)} = F s$
Force	$F = m a$	$W = m g$
Motion	$\text{average speed} = \frac{\text{total distance}}{\text{total time}}$	$v = u + a t^2$
	$s = \frac{(u + v) t}{2}$	$s = \frac{1}{2} a t^2$
	momentum = m v	
Electricity	$Q = I t$	$W = Q V$
	$V = I R$	$R = R_1 + R_2 + R_3$
	$P = I V = I^2 R = \frac{V^2}{R}$	$R \alpha \frac{\text{length}}{\text{area}}$
Electromagnetism	$\frac{N_1}{N_2} = \frac{V_1}{V_2}$	
Heat	$H = m c \Delta\theta$	
Waves	$c = f \lambda$	

Marks Grid: For the Examiners' use ONLY

Question	1	2	3	4	5	6	7	8	Theory	Practical	Total
Max. Mark	8	8	8	8	8	15	15	15	85	15	100
Score											

Section A. **This Section carries 40 marks**

1. An empty measuring cylinder has a mass of 75 g. Its mass increases to 100 g when some olive oil is poured into it. The volume occupied by the olive oil in the measuring cylinder is 30 cm^3 (0.00003 m^3).

a. Calculate:

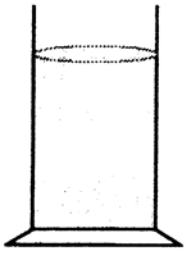
i. the **mass** of the olive oil in the measuring cylinder in **g,** **1**

ii. the **density** of this sample of olive oil in **g/cm^3,** **1**

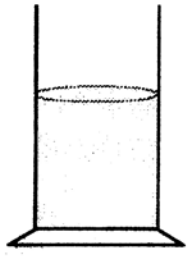
iii. the **mass** of the olive oil in the measuring cylinder in **kg,** **1**

iv. the **density** of this sample of olive oil in **kg/m^3**. **2**

b. It is noticed that when this sample of olive oil in the measuring cylinder is placed in a refrigerator and cooled to 5 °C, the level of the olive oil in the measuring cylinder gets lower as shown in the figures below.



The level of the olive oil sample at 20 °C



The level of the olive oil sample at 5 °C

State the effect (if any) of this cooling on the value of the:

i. **mass** of the olive oil in the measuring cylinder, _____ **1**

ii. **volume** of the olive oil in the measuring cylinder, _____ **1**

iii. **density** of the olive oil in the measuring cylinder. _____ **1**

2. a. Complete the following statements:

i. A transverse wave is a wave in which the vibrations are at _____ ° to the direction of wave travel. **1**

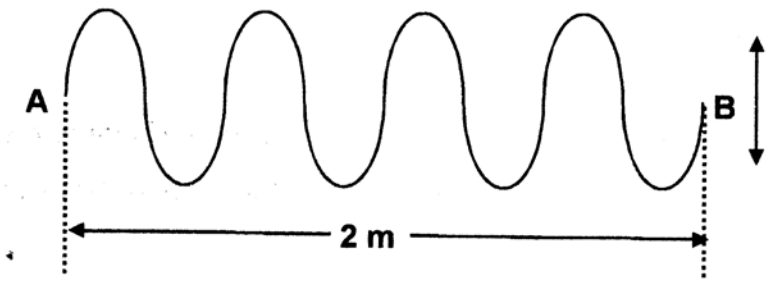
ii. A longitudinal wave is a wave in which the vibrations are at _____° to the direction of wave travel. **1**

iii. The quantity of energy transferred by both kinds of waves depends on the _____ of the wave. **1**

iv. The velocity of both kinds of waves depends only on the _____ through which the wave travels. **1**

v. Sound waves cannot travel through a _____. **1**

b. The figure below represents a transverse wave travelling through a rope held firmly at end A and moved up and down at end B.



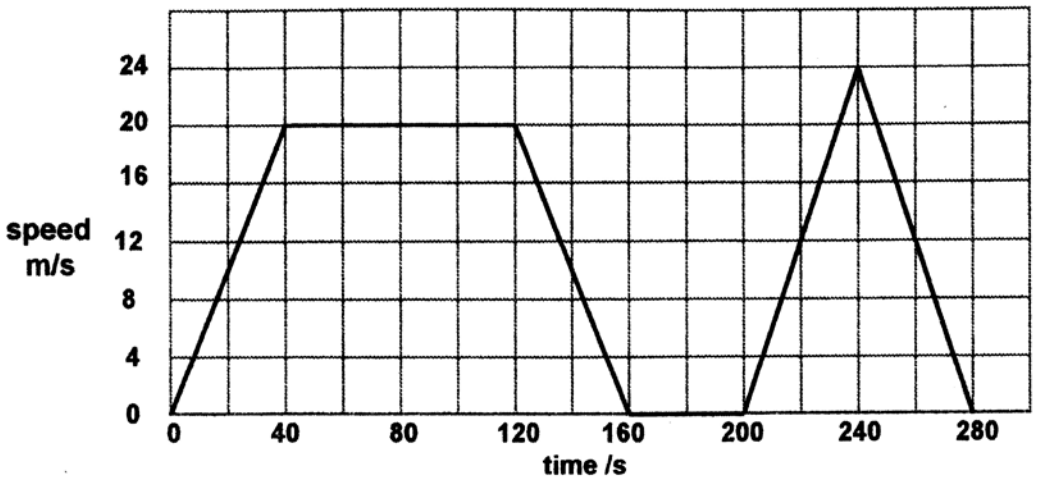
Use the above figure to calculate:

i. the **number of complete waves**, _____. **1**

ii. the **wavelength** λ in m, **1**

iii. the **velocity of the wave** through the rope in m/s, given that the frequency of the vibration is 2 Hz **1**

3. Maria drives from her home to the supermarket. The graph below shows how her speed changes throughout the **whole** journey.



a. From the graph find:

i. her **highest speed** in m/s, _____ m/s **1**

ii. the **speed** in m/s while she travels at constant velocity, _____ m/s **1**

iii. the **acceleration** in m/s^2 during the first 40 s of her journey. _____ m/s^2 **1**

b. Maria stops at the traffic lights. How long does she wait at the traffic lights? _____ s **1**

c. Use the graph to find the **distance** in meters Maria covers during the **last 80 s** of her journey. **2**

d. Calculate:

i. the **momentum** in kgm/s when Maria is travelling at **24 m/s** given that the total mass of the car and Maria is 5000 kg. **1**

ii. the average **braking force F** in N of Maria's car during the **last 40 s** of her journey given that the braking force F = change in momentum/time. **1**

4. The list below consists of some electrical components that might be found in an electric circuit:

switch, filament lamp, diode, rheostat, light dependent resistor (LDR), short connecting wire, thermistor.

a. Which of the above electrical components:

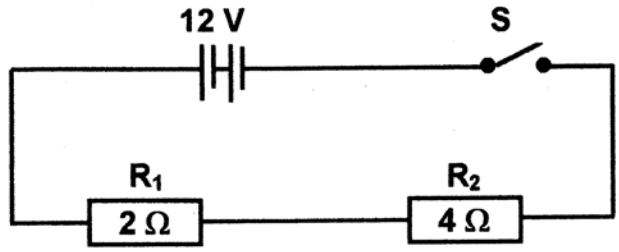
i. has negligible resistance, _____ **1**

ii. causes a break in the circuit cutting current flow, _____ **1**

iii. has a resistance dropping rapidly when its temperature rises, _____ **1**

iv. has a high resistance in the dark. _____ **1**

b. The following circuit diagram shows two resistors R_1 and R_2 connected in series to a 12-Volt car battery.



The switch S is closed. Calculate the:

i. **total resistance R** in ohms of the circuit. **1**

ii. **current I** in amperes flowing through the circuit, **1**

iii. **power P** of the circuit in Watts. **1**

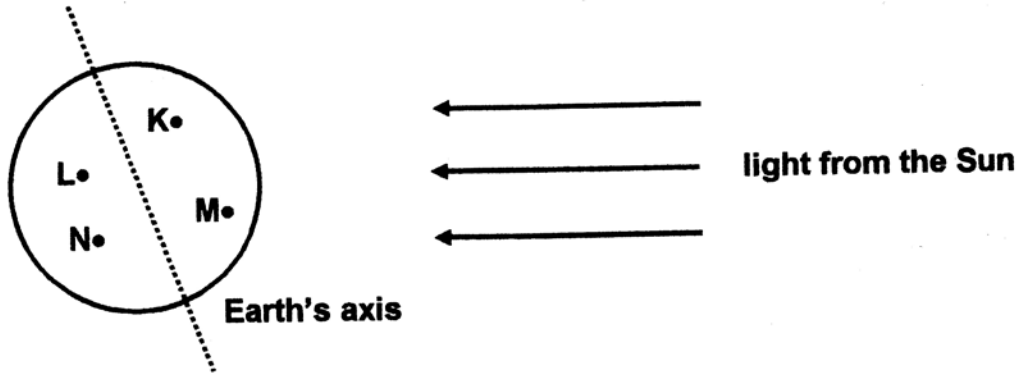
c. Five different fuses of values: 2 A, 3 A, 5 A, 7 A, and 13 A are available. Which is the best fuse which may be added to the circuit? _____ **1**

5. The following terms are associated with the study of the universe:

solar system, planet, galaxy.

a. Place the terms in the list above, starting from the **smallest:** **1**

b. The diagram shows Earth and four cities **K, L, M, N** on the Earth's surface.



State:

i. which cities are in daylight , _____ **1**

ii. which cities are in night-time, _____ **1**

iii. how long does it take **city M** to return to the same place again as Earth spins on its axis, _____ **1**

iv. how long does it take Earth to complete one orbit around the Sun. _____ **1**

c. A communications satellite orbits around the earth in high orbit.

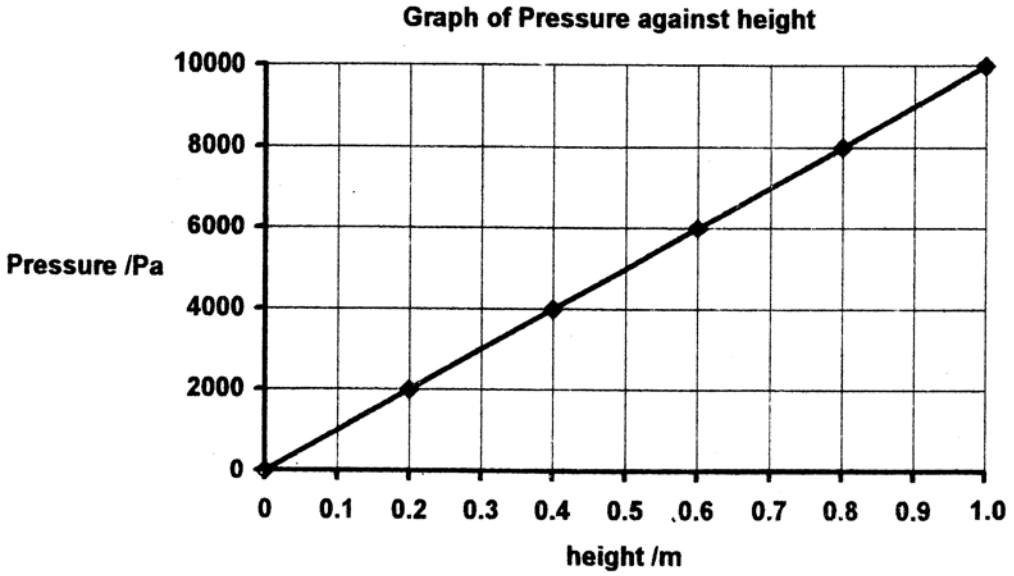
i. The _____ force keeps the satellite from escaping its orbit. **1**

ii. Explain why the geostationary satellite appears stationary from the Earth. **2**

Section B. **This section carries 45 marks**

6. This question is about pressure

A storage tank contains a **liquid.** The graph below shows how the pressure in Pa **due to the liquid only** changes with its height in the tank.



a. Choose the appropriate word to complete the sentence below from the following list: ***origin, height, straight, pressure*** **4**

The graph is a _____ line passing through the _____. This shows that the _____ due to the liquid is directly proportional to its _____.

b. Using the graph find:

i. the **depth** of the liquid when the pressure due to the liquid is 9000 Pa. _____ **2**

ii. the pressure **due to the liquid** at a depth of 0.5 m, _____ **2**

iii. the **total pressure** in Pa at a liquid depth of 0.5 m, given that atmospheric pressure is 100 000 Pa. **2**

c. What is the **pressure** at the surface of the liquid? _____ **2**

d. The storage tank containing the liquid rests on a concrete roof. The base area of the storage tank is 4 m^2. Calculate the pressure exerted on the roof when the tank is completely filled with the liquid given that the total weight of the tank and the liquid is 8000 N. **3**

7. This question is about the transformation of heat energy

The table below shows the **rise in temperature** which takes place when a lump of lead of mass of 2 kg hits the ground after it has been dropped from **different heights h,** assuming no energy losses.

rise in temperature / °C	0	1.0	2.0	3.0	4.0	5.0
height / m	0	13	26	39	52	65

6

a. On the graph paper provided, plot a graph, of rise in temperature (y-axis) against the height (x-axis). **1**

b. From **your** graph find the: **2**

i. **rise** in temperature when the lead lump is dropped from a height of 45 m, _____

ii. **the temperature** of the lead lump after being dropped from a height of 45 m given that the temperature of the surroundings is 20 °C,

2

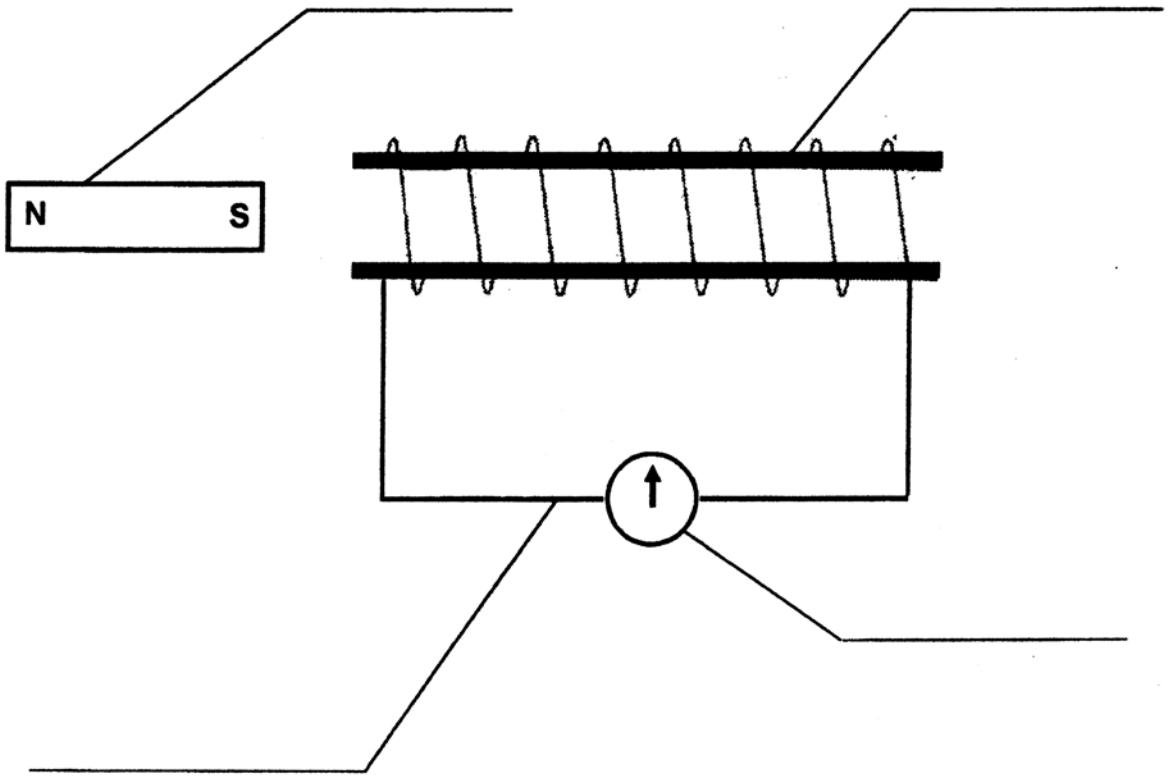
c. Calculate the **potential energy** when the 2 kg lump of lead is dropped from a height of 60 m

4

d. Choose the appropriate word to complete the sentence below from the following list: ***sound, potential, heat, kinetic.***

8. This question is about electromagnetic induction.

a. David carries out an experiment to show that a current is induced in a coil when it cuts lines of magnetic flux. The experimental set up includes a coil, a magnet, a zero-centre galvanometer and connecting wire



i. Fill in the missing labels in the above diagram. **4**

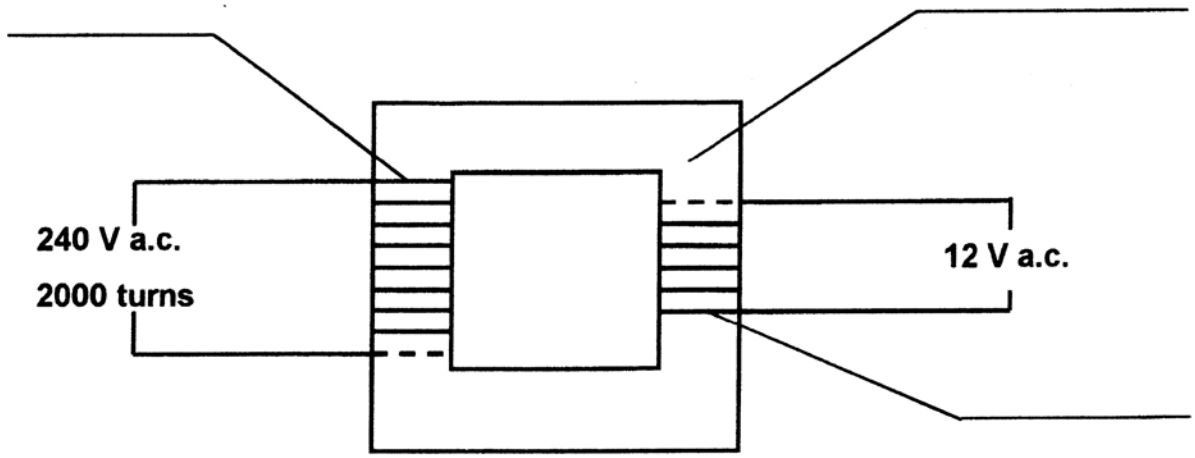
ii. Draw the magnetic field around the bar magnet. **2**

iii. State what happens while the magnet is pushed into the coil. **2**

iv. State what happens when the magnet is at rest inside the coil? **2**

PLEASE TURN OVER

b. One use of electromagnetic induction is in the transformer. The diagram below shows a step-down transformer.



i. Fill in the missing labels in the above diagram. **3**

ii. Calculate the **number of turns in the secondary coil** given that the number of turns in the primary coil is 2000 turns. **2**