JUNIOR LYCEUM ANNUAL EXAMINATIONS 2008
DIRECTORATE FOR QUALITY AND STANDARDS IN EDUCATION
Educational Assessment Unit

FORM 4 **PHYSICS** **TIME: 1h 30min**

Name: _____ **Class: _____**

Answer all questions.
All working must be shown. The use of a calculator is allowed.
Where necessary take acceleration due to gravity g = 10m/s^2.

You might find the following list of formulae useful.

Pressure	$P = \rho gh$	$F = PA$
Force	$F = ma$	$W = mg$
Motion	Momentum = mv	$s = \frac{1}{2} at^2$
	Impulse = Change in Momentum	$v = u + at$
Electricity	$Q = It$	$W = QV$
	$V = IR$	$R = R_1 + R_2 + R_3$
	$P = IV = I^2R = \frac{V^2}{R}$	$R \alpha \frac{1}{A}$ $R \alpha L$
Heat	$H = mc\Delta\theta$	$E = Pt$

For office use only.

Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
Max Mark	**8**	**8**	**8**	**8**	**8**	**15**	**15**	**15**	**85**
Actual Mark									

	Total Theory	**Total Practical**	**Final Mark**
Actual Mark			
Maximum Mark	85	15	100

Section A

Answer ALL questions.

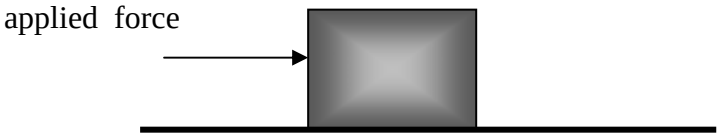
This section carries 40 marks.

1. Fill in the table below:

Quantity (to be measured)	**Unit** (symbols can be used)	**Instrument** (used to measure quantity)
Electrical resistance		Resistance meter
	kg	
	kWh	joulemeter
weight		
atmospheric pressure		barometer
frictional force		air track

[8]

2. An object of mass 3 kg is at rest on a smooth horizontal surface. A force of 15N is applied on the object for 3 seconds.



a. Add to the diagram another force **W** that represents the weight of the object. [1]

b. What is the numerical value of **W** ? _____ [2]

c. What is the initial velocity of the object just before the force is applied ? _____ [1]

d. The applied force causes the object to move with _____ [1]

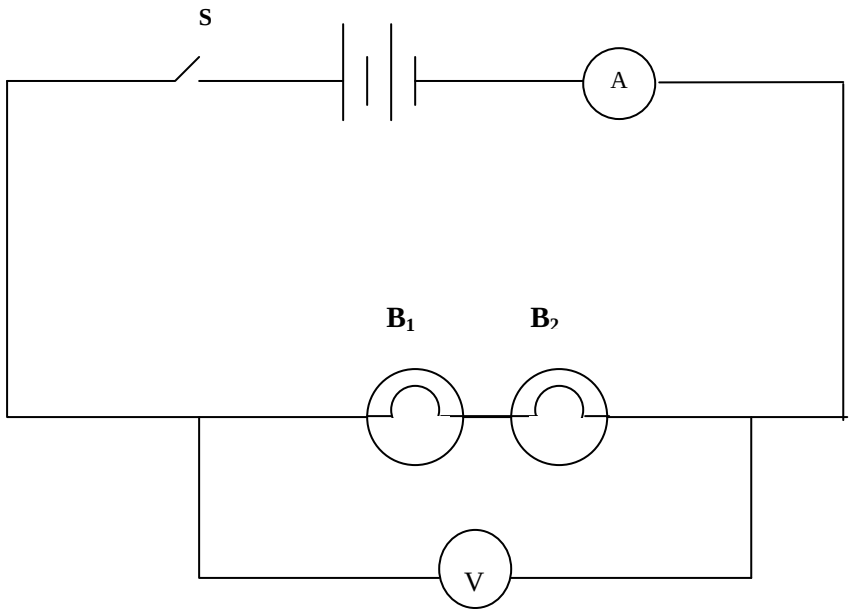
e. Calculate the velocity of the object after 3 seconds.

.....

.....

..... [3]

3. The diagram shows a simple electrical circuit:



a. —(A)— is an _____and measures current in _____

b. **B_1** and **B_2** are _____ connected in _____

c. **S** is a switch that allows a _____to pass through the circuit when it is _____

d. —(V)— is a _____ and measures the potential difference in _____ across the ends of **B_1** and **B_2** [8]

4. An aluminium container without a lid contains boiling water.

a. Heat is transferred from the water through the aluminium by _____ [1]

b. In the water, heat is transferred by _____ [1]

c. The water cools from 100 ^{o} C to 60 ^{o} C in 10 minutes.

(i) what is the temperature change ? _____ [2]

(ii) if 600 kJ (600 000 J) of heat are lost in 10 minutes, how much heat is lost in one second? _____ [2]

(iii) state two ways to reduce heat losses.

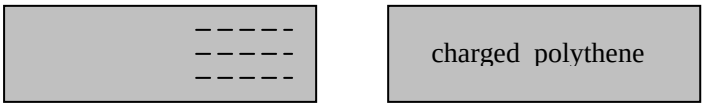
_____ _____ [2]

5. a. An uncharged polythene rod contains an _____ amount of negative and positive charges. [1]

b. The polythene rod becomes _____ charged when rubbed against a woollen duster. [1]

c. If the charged polythene rod is earthed, _____ charges flow to earth so that the polythene rod becomes again _____ . [2]

d. A negatively-charged rod is brought **near** the charged polythene rod .



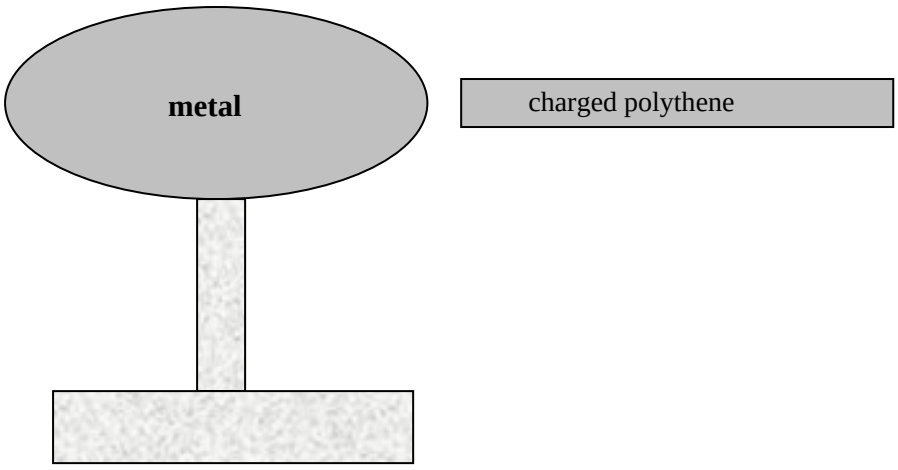
Tick the box next to the correct statement.

(i) There is no force at all. ☐

(ii) There is a force of repulsion. ☐

(iii) There is a force of attraction. ☐ [1]

e.



positively charged metal conductor on insulating base

Put + and − signs to show the charge on the :

(i) positively-charged metal conductor.

(ii) charged polythene rod. [2]

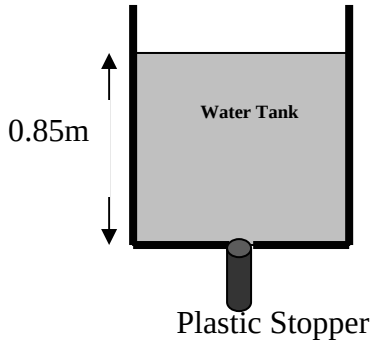
f. The diagram in question e above shows that _____ charges attract. [1]

Section B

Answer ALL questions.

This section carries 45 marks.

6. The diagram shows a water tank that has an opening in the base. This opening is closed by means of a plastic stopper that can withstand the water pressure when the height of water in the tank is **equal** or **less** than 0.85m.



a. Calculate the **pressure** exerted by the water on the plastic stopper when the depth of the water in the tank is 0.85m. (Density of water = 1000 kg/m^3)

_____

_____

_____ [5]

b. The area of the opening at the base of the tank is 0.0012 m^2 . Calculate the **force** exerted by the water on the plastic stopper.

_____

_____

_____ [5]

c. The plastic stopper is replaced by a rubber stopper that can withstand a pressure of 10 kPa (10 000 Pa) before the opening starts to leak.
Calculate the maximum height of water in the tank before the rubber stopper starts to leak.

_____

_____

_____ [5]

7. Emma investigated how the resistance of a wire varied with its length.
She tabulated her results as shown below:

Length of wire (m)	0	0.20	0.40	0.60	0.80	1.00
Resistance (ohms)	0	1.20	2.40	3.50	4.80	6.10

a. On the graph paper on page 7 of this question paper, plot a graph of resistance on the y-axis against length on the x-axis.
Draw the best straight line through the points. [7]

b. From your graph find:
(i) The length of wire that has a resistance of 1 ohm. _____ [1]
(ii) The resistance of a 0.5m length of wire. _____ [1]

c. The graph shows that the resistance of a wire and its length are
_____ _____ [2]

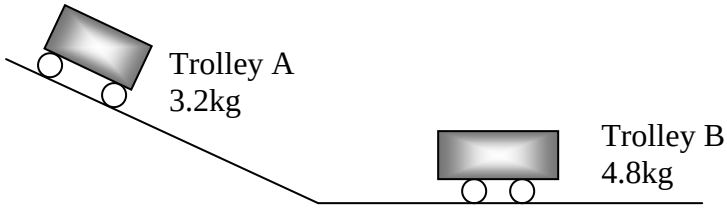
d. Emma repeated the same experiment using a
(i) 1m length of thicker wire of the same material.
(ii) 1m length of thinner wire of the same material.
Tick the box next to the correct statements:

(i) For a 1m length of thicker wire the resistance: is larger than 6.10 ohms. ☐
is also 6.10 ohms. ☐
is less than 6.10 ohms. ☐
[2]

(ii) For a 1m length of thinner wire the resistance: is larger than 6.10 ohms. ☐
is also 6.10 ohms. ☐
is less than 6.10 ohms. ☐ [2]

Use a graph paper for this page

8. In an experiment about momentum, a trolley A of mass 3.2kg is allowed to roll down a steep ramp before it collides with a stationary trolley B of mass 4.8kg. Just before the collision, trolley A is moving with a velocity of 5m/s.



a. The velocity of trolley B **before** the collision is _____ and its momentum is therefore also _____ [2]

b. Calculate the momentum of trolley A just **before** the collision.

_____ [2]

c. On collision, the trolleys stick together and move forward.

i) What is the mass of the combined trolleys ?

_____ [2]

ii) What is the momentum of the combined trolleys just **after** the collision ?

_____ [2]

iii) Calculate the velocity of the combined trolleys just **after** the collision.

_____

_____ [3]

d. This experiment is repeated using a ramp that is **less** steep.

State whether each of the following **increases**, **decreases** or **remains unchanged**.

i) the velocity of trolley A before the collision. _____

ii) the momentum of trolley A just before the collision. _____

iii) the mass of the combined trolleys _____

iv) the velocity of the combined trolleys just after the collision. _____ [4]