National Examination Paper:
Physics I

Level: S3

NESA NATIONAL EXAMINATION AND SCHOOL INSPECTION AUTHORITY

MOCK FOR THE 2024/2025 NATIONAL EXAMINATIONS

QUESTION PAPER

COMBINATIONS/ OPTION/TRADE:	**Ordinary level (O'L)**

CANDIDATE NAMES: .....

INDEX NUMBER: .....

DURATION: 3 HOURS

INSTRUCTIONS TO CANDIDATES:

1. **Read and understand** all instructions before answering.
2. For multiple-choice questions, **choose only one correct answer** and clearly **circle the letter or number**.
3. **Erasing or altering** answers is strictly prohibited and will lead to **zero mark** for the affected question.
4. All answers for **open-Ended questions** must be written in the spaces provided herein.
5. Use **only blue or black ink pens** (no pencils or colored pens)

May 2025

SECTION A: ATTEMPT ALL QUESTIONS (55 MARKS)

1) Identify the choice that best completes each of the statements below.

I) The upthrust/buoyant force exerted on a body immersed in a liquid is equal to the.....

a) weight of the liquid.
b) weight of the liquid displaced.
c) mass of the liquid displaced.
d) density of the liquid.

(1mark)

II) The pressure exerted by liquid.....

a) increases with depth.
b) decreases with depth.
c) doesn't change with depth.
d) is different in different directions at the same depth.

(1mark)

III) Archimedes' principle holds for.....

a) liquid only.
b) gas only.
c) both liquid and gas.
d) both liquid and solid.

(1mark)

2) State whether the following statement is **true** or **false.**

a) Paint spraying is an application of electrostatics. **(1mark)**

b) In a thunderstorm accompanied by lightning, it is safest to run near a tree or open ground rather than sitting inside a car. **(1mark)**

c) The charge distribution is dependent on the shape of the conductor.

(1mark)

d) Electric potential is the amount of work needed to move a unit charge from a reference point to a specific point against an electric field.

(1mark)

3) Select and circle the letter corresponding to the correct answer from the proposed alternatives.

(I) What is the role of the 'channel' in communication?

a) It is the medium through which the message travels

b) It provides feedback to the sender

c) It decodes the message

d) It eliminates noise

(1 mark)

(II) In the communication process, who is responsible for encoding the message?

a) Receiver

b) Sender

c) Channel

d) Feedback

(1 mark)

(III) An analog signal is.....

a) Continuous in nature

b) Discrete in nature

c) Made of only 0s and 1s

d) Used only in computers

(1 mark)

(IV) What is the main advantage of digital signals over analog signals?

a) They require less bandwidth

b) They have infinite precision

c) They are less affected by noise and interference

d) They are always continuous

(1 mark)

4) Fill in the blanks using appropriate terms from the box.

Resistance	RI	Electric current
Potential difference	$\frac{U^2}{R}$	time

Write only the missing term for each sub question. The symbols have their usual meanings.

a) The formula to calculate electric power is P = ...**(1mark)**

b) Two factors on which the electric energy consumed by an electric appliance depends on are the .....of the appliance and the ..... for which the appliance is used. **(2 marks)**

c)Ohm's law states that the .....across a conductor is directly proportional to the electric current flowing through it, provided all physical conditions and temperature remain constants. **(1mark)**

5) Match the types of energy used in your home with their corresponding sources in the table below.

Types of energy	**Corresponding source of energy**
I) Thermal energy/Heat for cooking, heating water etc.	a) Sun electricity, heating oil/diesel, wood, candles, biogas
II) Light energy	b) Sun, hydropower plant, battery, cells
III) Solar energy for drying clothes	c) Wood , electricity, natural gas, Heating oil, Sun, biomass, biogas, charcoal
IV) Electric energy	d) Sun

(4 marks)

6) Match the items given in column **I** suitably with those given in column **II**.

Column I	**Column II**
a) Stable equilibrium	i) When an object in this state of equilibrium has a disturbing force applied, the centre of

	gravity remains at the same height and the object does not move when the disturbing force is removed.
b) Isosceles triangle lamina	*ii) Its centre of gravity lies at point of intersection of the medians.*
c) Rectangular lamina	iii) In this state of equilibrium, the centre of gravity of a body is at lowest point. When the body is slightly tilted, its centre of gravity rises but the body come back to its original equilibrium position.
d) Neutral equilibrium	iv) Its centre of gravity lies at the point of intersection of its diagonals.

(4 marks)

7) Complete the statement below with the correct type of simple machine.

a) A .....**(1mark)**is a bar that pivots around a fixed point called a fulcrum, like a seesaw.

b) A .....**(1mark)** uses a wheel and a rope to lift heavy objects, such as a flagpole.

c) An ..... **(1mark)** is a sloped surface that helps move objects with less effort, such as a ramp.

d) A.....**(1mark)** is used for cutting or splitting objects, like a knife.

8) Identify the best choice that answer the questions below from the proposed alternatives?

I) Can a stationary magnet induce electromotive force in a coil at rest?

a) Yes, always

b) No, never

c) Only if the coil has a current

d) Only if the magnetic field changes

(1 mark)

II) In Faraday's law of electromagnetic induction, what does N represent in the equation:

$$\varepsilon = -\frac{N\Delta\Phi}{\Delta t}$$

a) Number of turns in the coil
b) Net current in the circuit
c) Normal component of the magnetic field
d) Neutral position of the coil

(1mark)

III)How can the induced electromotive force (emf) from an AC generator be increased?

a) Decreasing the number of turns in the coil
b) Using a weaker magnetic field
c) Rotating the coil faster
d) Reducing the rate of change of magnetic flux

(1mark)

9) State whether the statement is True or false.

a) Newton's second law in vector form is $\vec{F} = m\vec{a}$, where F is the net force vector, m is the mass (a scalar), and a is the acceleration vector. ..... **(1 mark)**
b) b) The acceleration due to gravity vary with the mass of the object being accelerated. ..... **(1 mark)**
c) We exert the same force on Earth as Earth exerts on us? .....

(1 mark)

10) The magnification produced by a spherical mirror is -3(minus 3). State whether the characteristics deduced from this are true or false:

a) The negative sign of the magnification indicates that the image is inverted relative to the object..... .**(1mark)**
b) The negative sign shows that the image must be a virtual image, as real images are always erected when formed by spherical mirrors.....

..... **(1mark)**

c) The absolute value of the magnification is greater than 1, the image is three times larger than the actual object..... **(1 mark)**

d) It is a concave mirror, and the object is placed between the focus and the centre of curvature of the mirror. .....**(1 mark)**

11) Choose the answer that best answer the question or complete the statement below?

(I) What is the primary difference between work and power?

a) Work is the rate of doing power.

b) Power is the rate at which work is done.

c) Work and power are the same.

d) Power is the force applied over a distance.

(1mark)

(II) What is the SI unit of work?

a) Newton

b) Joule

c) Watt

d) Pascal

(1 mark)

(III) If the velocity of an object is doubled, its kinetic energy will.....

a) Remain the same

b) Double

c) Become four times

d) Become half

(1 mark)

12) Select the best alternative that best answer the following question?

(I) What is the pressure exerted by water at a depth of 8 meters in a lake? Density of water = 1000 kg/m^3, Acceleration due to gravity = 9.81 m/s^2)

a) 78.48 Pa

b) 8000 Pa

c) 9810 Pa

d) 78480 Pa

(2 marks)

II) What force must be applied to a surface area of 0.2 m^2 to create a pressure of 150 Pa?

a) 75 N
b) 300 N
c) 30 N
d) 15 N

(2 marks)

13) The velocity of a body of mass 10 kg increases from 4 m/s to 8 m/s when a force acts on it. Choose the alternative that best answer the following question. What is the impulse applied to the object?

a) 20 Ns
b) 40 Ns
c) 80 Ns
d) 10 N

(2 marks)

14) In a house electrical installation, choose the correct alternative that best answer the questions below?

I) What is the function of plug sockets in a house electrical system?

a) To measure electrical energy consumption
b) To provide a connection point for electrical devices
c) To break the circuit in case of faults
d) To control the current flow automatically

(2 marks)

II) Which device in a house electrical system is responsible for limiting excess current to prevent damage?

a) Electric meter
b) Incandescent light bulb
c) Fuse
d) Plug socket

(1 mark)

III) Why are circuit breakers preferred over fuses in modern home electrical installations?

a) They are more expensive

b) They provide better protection and can be reset

c) They require frequent replacement

d) They do not protect against short circuits

(1 mark)

IV) Why is tungsten used in incandescent light bulbs?

a) It has a high melting point and high resistivity

b) It is the cheapest metal available

c) It is a good conductor with low resistivity

d) It does not produce heat when current flows through it

(1 mark)

15) Fill in the blank space with the correct term from the box below to make the statement meaningful?

Carbon dioxide, water, yellow, photosynthesis, minerals, oxygen, green

I) Plants make their own food through a process called ..... where they use light energy from the sun, ...from the air, and water from the soil to produce food. **(2marks)**

II) If plants are left in a dark area for a long time, they will become weak, turn .....and eventually die due to the lack of sunlight needed for photosynthesis. **(1mark)**

III) Water is an essential element to transport.....and other substances in plants as they lack a circulatory system. **(1mark)**

SECTION B: ATTEMPT ANY THREE QUESTIONS (30 MARKS)

16) A 1cm high object is placed 5cm away from a 15cm focal length converging lens. Choose the alternative that best answer the following questions.

I) Where is the image located?

a)-15cm b) 7.5cm c) -7.5cm d) 15cm

(3 marks)

II) What is the magnification of the image?

a) -3 b) +1.5 c) -1.5 d) 3

(2 marks)

III) What is the height of the image?

a) -3cm b) +1.5cm c) -1.5cm d) +3cm

(2 marks)

IV) What are the properties of the image?

a) Real, inverted, greater than the object
b) Virtual, upright, greater than the object
c) Real, upright, greater than the object
d) Virtual, inverted, greater than the object

(3 marks)

17) A learner cycles to school. The graph (figure1) shows the stages A to G of the journey.

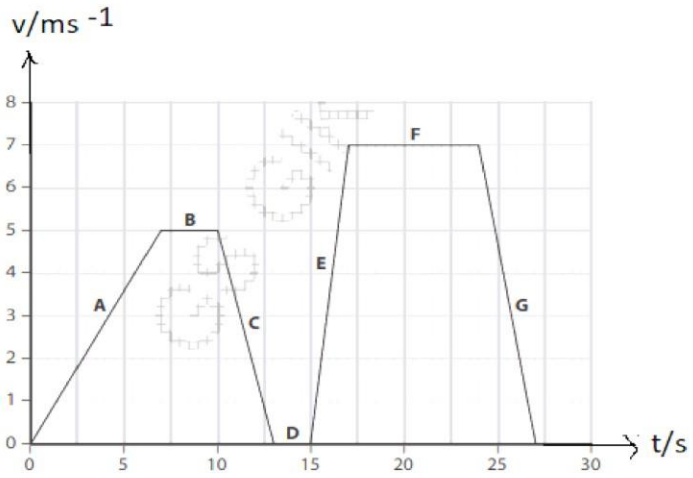


Figure 1

Analyse the graph and answer the following sub questions by choosing the correct alternatives that best answer the question or complete the statement.

I) During stage B, the student is .....

a) at rest
b) in motion with a constant velocity/speed of 5m/s
c) in uniform circular motion with a constant speed of 5m/s
d) in motion with a constant acceleration .

(1 mark)

II) During stage D, the student is

a) at rest

b) in motion with a constant speed of 5m/s

c) in uniform circular motion with a constant speed of 5m/s

d) in motion with a constant acceleration

(1 mark)

III) the acceleration of the student during the stage A is

a) 0.7 m/s^2

b) 0 m/s^2

c) 5 m/s^2

d) 35 m/s^2

(2 marks)

IV) The distance that the learner travels in the first 10 s is

a) 17.5 m

b) 15 m

c) 32.5 m

d) 2.5 m

(4 marks)

V) The total distance travelled by the student is 106.5 m what is the average speed of the student during the journey?

a) 4 m/s

b) 6 m/s

c) 1 m/s

d) 12 m/s

(2 marks)

18) Select the choice that best complete the statement or answer the questions below:

I) A student ties two balloons to a support with some string. The student rubs both balloons with a dry cloth which gives the balloons a negative charge. The diagram (figure 2) shows the balloons after they were rubbed.

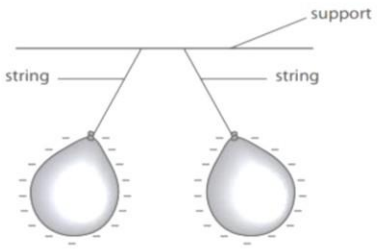


Figure 2

I)Identify terms from the box below that best complete the following statements.

attract	electric charge	electrons	repel
negative	friction	positive	protons

a) The balloons .....each other because they have the same ..... **(2 marks)**

b) The cloth is left with a.....electric charge. **(1mark)**

c) The charged particles that are transferred from the cloth to the balloons are called ..... These balloons are charged by ..... **(2marks)**

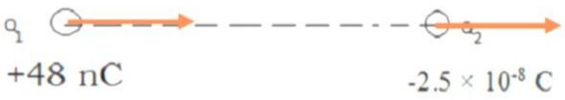
d) If somebody touches one of the balls, it becomes discharged and the balls will.....each other. **(1 mark)**

II) Two charged balloons of +48 nC and -2.5 × 10^{-8} C are separated by 0.8 m as shown not to scale (figure 3).

Figure 3

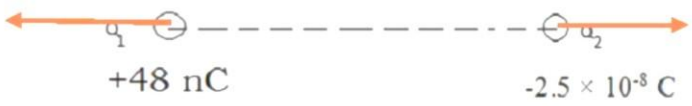
Choose the option that best indicates the direction of the electrostatic force experienced by Q_1 due to Q_2 and by Q_2 due to Q_1.

a)



b)

c)



d)

(1 mark)

III) Choose and circle the letter corresponding to the correct scientific notation to express $48\,nC$ in C.

a) $48x10^{-7}C$

b) $48x10^{-8}C$

c) $48x10^{-9}C$

d) $48x10^{-10}C$

(1mark)

IV) Use Coulomb's law to determine the electrostatic force between two charged balloons. Coulomb's constant $k = 9x10^{9}Nm^{2}C^{-2}$.

a) $1.69x10^{-5}$ N

b) 2.45×10^{-5} N

c) 3.12×10^{-5} N

d) 4.05×10^{-5} N

(1 mark)

V) Calculate the electrical potential at a point due to an electric charge of -2.5×10^{-8} C located at 9×10^{-2} m away from it.

a) 27778 V

b) -2.5 kV

c) 1687 V

d) -24500 V

(1 mark)

19) Select the alternatives that best answer the questions below.

I) The specific latent heat of fusion of ice water is 80kcal/kg, if converted in Joules/kg, it becomes.....

a) 33,472 J/kg

b) 334,720 J/kg

c) 3,347,200 J/kg

d) 41,840 J/kg

(1mark)

II) The following figure 4 shows the main parts of a cooling curve of 0.3kg water vapour raised at 120°C. Analyse the curve below and choose the best alternative to answer the following questions:

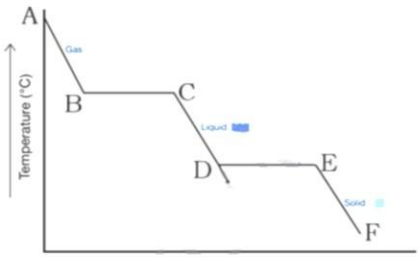


Figure 4

a)To obtain this curve, the heat was .....

i)Added to the system ii) removed to the system

(1mark)

b) The phase BC is .....

i)Vaporization ii) condensation iii) freezing iv) fusion

(1mark)

c)At what temperature the above phase occurs if the experiment is carried out at sea level?

i) 0°C

ii) 100°C

iii) 60°C

iv) None of the above

(1 mark)

d)How is called the phase DE?

i)Vaporization ii) condensation iii) freezing iv) fusion

(1mark)

e)At what temperature the phase DE is happening?

i) 0°C
ii) 100°C
iii) 60°C
iv) None of the above

(1mark)

f) The heat exchanged during the phase AB. The specific heat capacity of water vapour as 1.9J/g^{0}C.

i)-11,400J

ii)-125,520 J

iv)-136,920 J

v)-141 200 J

(2marks)

g) The heat exchanged between B and C. The latent heat of vaporization of water is 2260 J/g

i)11,400J

ii)-125,520J

iii)-678,000 J

iv)-747 200 J

(2marks)

20) A circuit consists of 60 Ω and 30 Ω in parallel arrangement and a dry cell of electromotive force 3V and negligible internal resistance is

connected across the whole circuit as shown in figure 6.

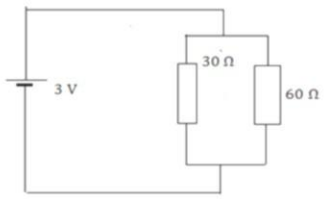


Figure 5

Analyse the given electric circuit and then find

I) The equivalent resistance of this parallel network:

a) 30 Ω b) 60 Ω c) 20 Ω d)90 Ω **(2 marks)**

II) The total electric current I in the circuit.

a) 0.1A b) 0.05A c) 0.15A d) 0.03A **(2 marks)**

III) The electric current I_1 through the 60 Ω resistor.

a) 0.05A b)0.1A c) 0.15A d) 0.06A **(2 marks)**

IV) The electric current I_2 through the 30 Ω resistor.

a) 0.05 b)0.1A c) 0.15A d) 0.2A **(2 marks)**

V) Compare the total electric current and individual electric currents in the two parallel branches.

a) $I = I_1 = I_2$ b) $I = I_1 + I_2$ c) $I = I_1 x I_2$ d) $I = I_1/I_2$ **(2 marks)**

SECTION C: COMPULSORY QUESTION (15 MARKS)

21) Investigation of the variation of the atmospheric pressure with altitude has been made. The table below shows the pressure P at selected altitudes h above sea level.

Table of results

h/km	$P/10^{-2}$ atm
0	100
5	50
10	25
15	12
20	6

25	2

a) Plot a graph of P(y-axis) against h(x-axis). Draw a curve of the best fit.

You are advised to use a graph paper. **(6 marks)**

b) From your graph, estimate the altitude when P= 75 $x10^{-2}$ atm. **(1 mark)**

c) Use the table of results or your graph to answer the following.

Decide which of the statements are true and which are false and support your answer.

i)The atmospheric pressure was measured using manometer. **(2 marks)**

ii)Atmospheric pressure decreases as altitude increases. **(2 marks)**

iii) Symbol of SI unit of altitude is km. **(2 marks)**

d) Do you think that atmospheric pressure is important?

Why do you think so? **(2 marks)**

END.

Write your answers in the space provided below

SECTION C

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NESA NATIONAL EXAMINATION AND SCHOOL INSPECTION AUTHORITY

MOCK FOR THE 2024/2025 NATIONAL EXAMINATIONS

MARKING GUIDE

COMBINATION/ OPTION/TRADE:	Ordinary level (O'L)

May 2025

SECTION A

1) a) (ii) **(1mark)** weight of the liquid displaced

b) (i) **(1mark)** increases with depth

c)(iii) **(1mark)** both liquid and gas

2)a) True **(1mark)** b) False **(1 mark)** c) True **(1 mark)** d) True **(1 mark)**

3) I) a) **(1mark),** II) b)**(1mark), III)** a))**(1mark)** c)**(1mark)**,

4)a) $P=U^2/R$ **(1mark)** b) resistance **(1mark)** and time**(1mark)** c) potential difference **(1mark)**

5)

Types of energy	Corresponding source of energy
I) Thermal energy/Heat (**1mark)** for cooking, heating water etc.	c)Wood**,** electricity, natural gas, Heating oil, Sun, biomass, biogas, charcoal
II) Light energy **(1mark)**	a)Sun**,** electricity, heating oil/diesel, wood, candles, biogas
III) Solar energy for drying clothes **(1mark)**	d)Sun
IV) Electric energy **(1mark)**	b)Sun, hydropower plant, battery, cells

6) a) corresponds to iii) **(1 mark)**

b) corresponds to ii) **(1mark)**

c)corresponds to iv) **(1mark)**

d) corresponds to i) **(1mark)**

7) a) level **(1mark)** b) Pulley **(1mark)** c) Inclined plane**(1mark)** d) wedge**(1mark)**

8) I) d)**(1mark)** Only if the magnetic field changes

II) a) Number of turns**(1mark)** of the coil used

III) c) increasing the speed of rotation/frequency **(1mark)** of the coil;

9) a) $\vec{F}=m\vec{a}$ **(1mark)** True

b) It doesn't depend on the mass being accelerated **(1mark)** False

$g = G\frac{M}{(R+h)^2}$ where M is the mass of the planet, radius of the planet, G universal gravitational constant, h altitude.

c)Yes or when the Earth exerts a gravitational force on you, you also exert an equal but opposite gravitational force on the Earth**(1mark)** True

10)a) True **(1mark)**

b) False **(1mark)**

c) True **(1mark).**

d) True **(1mark).**

11) I) b) **(1mark)**

II) b) **(1mark)**

III) c) **(1mark)**

12) I) d)

Water pressure P=ρgh

=1000 x9.81x8 Pa or N/m^2

= 74 480 Pa or N/m^2**(2marks)**

II) c)

Force F=PA

=150 x0.2 N

=30 N **(2 marks)**

13) Impulse I=Ft **(1mark)** or I=mΔv

=10 kg x(8-4) m/s=40 kg m/s=40Ns **(1mark)**

14) I) b) **(2 marks)** II) c) **(1mark)** III) b) **(1mark)** and IV) a) **(1mark)**

15) I) Plants make their own food through a process called **Photosynthesis**, **(1mark)** where they use light energy from the sun, **carbon dioxide (1mark)** from the air, and water from the soil to produce food.

I) If plants are left in a dark area for a long time, they will become weak, turn **yellow**, **(1mark)** and eventually die due to the lack of sunlight needed for photosynthesis

II) Water is an essential element to transport **minerals (1mark)** and other substances in plants as they lack a circulatory system.

SECTION B: 30 MARKS

16) I) c) -7.5 cm **(3marks)** II) b) 1.5 **(2marks)** III) b) +1.5cm **(2marks)** V) b) Virtual, upright, greater than the object **(3marks)**

17) I) b) **(1mark)** II) a) **(1mark)** III) a) **(2marks)** IV) c) **(4marks)**

V) a) **(2marks)**

b) Stage A: The acceleration $a = \frac{\Delta v}{\Delta t}$

$$a = \frac{5}{7} m/s^2 = 0.71 m/s^2$$

c) Stage A: Distance travelled $x_1 = \frac{1}{2} a t^2$

$$x_1 = \frac{1}{2} x \frac{5}{7} x 7^2 m = 17.5 m$$

Or area under the graph $x_1 = \frac{5x7}{2} m = 17.5\ m$

Stage B: Distance travelled $x_2 = vt$

=5 x3 m =15 m

Or area under the graph $x_2 = 3x5\ m = 15\ m$

Total distance X= 17.5 m+15 m=32.5 m

d)The average speed v= Total distance/total time

=106.5 m/27 s=3.94 m/s

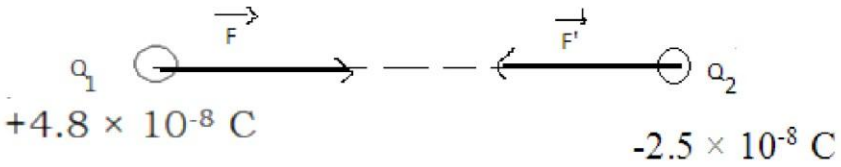
18)I) a)repel **(1 mark)** electric charge **(1 mark)**

b)positive **(1 mark)**

c)electrons **(1 mark)** .....friction **(1 mark)**

d)attract **(1 mark)**

II) a) **(1mark)**



III) c) 48 nC = 48x10^{-9} C **(1mark)**

IV) a) 1.69x10^{-5} N **(1mark)**

$$F = F' = k\frac{|Q_1 Q_2|}{d^2}$$

$$= 9 \times 10^9 \frac{4.8\times10^{-8}\times(-2.5\times10^{-8})}{0.8^2}\ \text{N} = 168.75 \times 10^{-7} N$$

V) b) -2.5 kV **(1mark)**

The electric potential $U = k\frac{q}{d}$

$$= 9x10^9 x\frac{(-2.5x10^{-8})}{9x10^{-2}} V = -2.5x10^3 \text{V}$$

The electric potential is a scalar quantity, the negative sign is very important

19) I) b) 334,720 J/kg **(1mark)** as 1kcal =4184J

II) a) ii) removed to the system**(1mark)**

b) ii) condensation **(1mark)**

c) ii) 100°C**(1mark)**

d) Freezing**(1mark)**

e) i) 0°C**(1mark)**

f) -11 400J**(2 marks)**

g) -678,000 J **(2 marks)**

20) I) c) **(2 marks)** II) c) **(2 marks)** III) a) **(2 marks)** IV) b) **(2 marks)**

V) b) **(2 marks)**

i) Equivalent resistance $\frac{1}{R}=\frac{1}{R_1}+\frac{1}{R_2}$

R= (60 x30)/ (60+30) Ω=20Ω

ii)Total electric current I=E/R

= 3 V/20 Ω =0.15 A

iii)The electric current I_1= 3 V/60 Ω

=0.05 A

iv) The electric current I_2= 3 V/30 Ω

=0.10 A

d)I= I_1+I_2

The total current, I_T entering a parallel resistive circuit is the sum of all the individual currents flowing in all the parallel branches

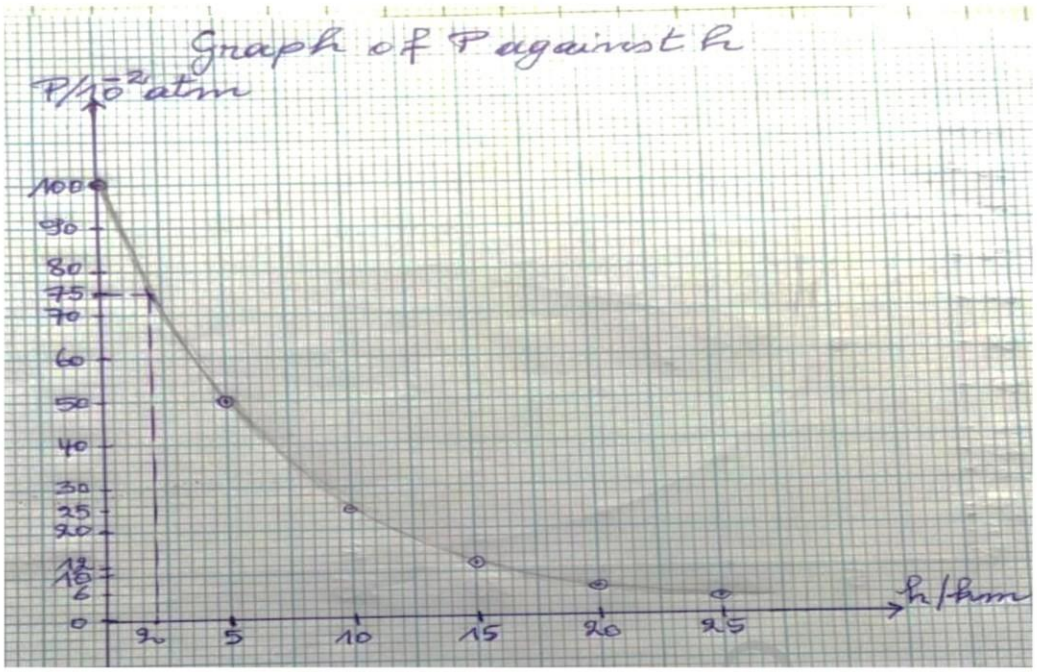
SECTION C :15 MARKS

21) a) Uniform scale :0.5 marks x2 =**1 mark**

Labelled axes with arrows :0.5 marks x2 =**1 mark**

6 plotted points: 0.5 marks x6 =**3 marks**

Graph :**1 mark**



b) h=2 km **(1mark)**

c) i) False **(1mark**) Barometer **(1mark)** was used

ii)True **(1mark)** for example at h=0 km, P= 1 atm

at h=10 km, P=0.25 atm **(1mark)**

iii)False **(1mark)** SI unit of altitude is m**(1mark)**

e) Yes **(1mark).** There are many applications of atmospheric pressure

Drinking straw **(1mark)** siphon, vacuum cleaner**,** syringe.

END