MUHANGA DISTRICT

PHYSICS' MARKING GUIDE FOR S1

SECTION A: Attempt all question

1) (i) Distance is the total length of the path followed by an object. 01

(ii) Displacement is the distance covered by an object in particular direction. 01

25/25

(iii) Speed = $\frac{\text{Distance covered}}{\text{time}}$. 01

(iv) Velocity = $\frac{\text{Displacement}}{\text{time taken}}$. 01

(v) ACCeleration = $\frac{\text{change in velocity}}{\text{time taken}}$. 01

2) a) A science is a systematic study that uses observations and expermentation to describe and explain natural phenomena. 11

3/3

b) (i) Natural sciences deal with the study of natural phenomena like lighting, motion, earthquakes, ... Ex: physics, chemistry and biology. 11

(ii) Social sciences deal with the study of human behavior and society.

Ex: psychology, sociology. 11

3) a) A force is a push or pull of an object. /1
The S.I Unit of force is Newton (N). /1

(4/4) b)

Contact forces /1	Non-contact forces /1
Frictional forces, tension, action and reaction forces, air resistance and upthrust	Gravitational force, electrostatic force and magnetic force.

4)
- Mechanics ✓
- Thermodynamics ✓ (3/3)
- optics ✓
- Electronics ✓
- Accoustics ✓
- Atomic physics ✓

5)

Instrument	quantity measurement
1. Metre rule	c. Length in mm, cm, m ✓
2. Thermometer	d. Temperature ✓
3. Vernier callipers (3/3)	f. Diameters of object ✓
4. Beam balance	e. Mass ✓
5. Stop watch	a. Time ✓
6. Burette	b. Small volume ✓

6) A fundamental (base) quantity is a quantity that is not defined in terms of other quantities. /1
Ex: length, mass and time /1

A derived quantity is a quantity which is defined in terms of fundamental quantities. /1

4/4

Ex: Velocity, acceleration, displacement, force, weight, ... /1

7) • Force can change the state of motion of a body. /1
• Force can distort or change the shape of an object. /1
• Force can cause turning effect. /1
• Force can cause rotation in the bodies. /1

8) (V) physics generates fundamental knowledge needed for the future technological advances that will continue to drive the economic engines of the world. /1

(VI) physics contributes to the technological infrastructure and provides trained personnel needed to take advantage of scientific advances and discoveries. /1

3/3

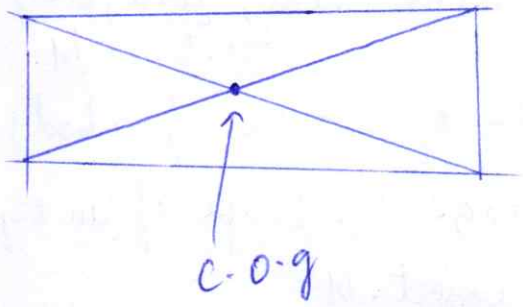
(VII) physics is an exciting intellectual adventure that inspires young people and expands the frontiers of our knowledge about nature. /1 ....

9) a) - Make a hole on one edge of the body
- suspend by hanging the mass attached on the thread to stand.
- Trace the vertical line
- Make a hole on the other side of the edge of the body
- suspend it by hanging the mass again on the stand.
- Trace the second vertical line

/2.5

- The intersection of the two lines gives the center of gravity.

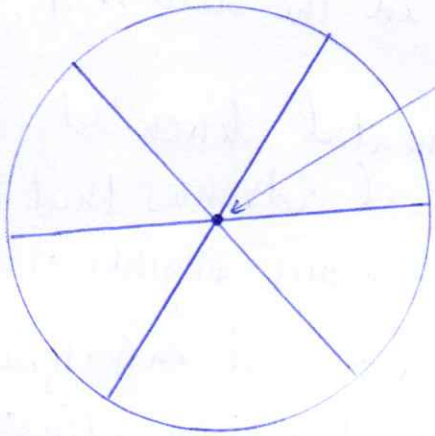
b) (i)



/1 Mark

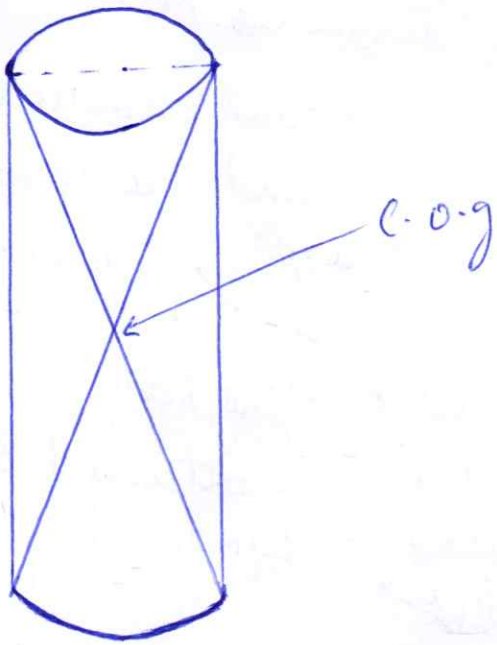
6/5

(ii)



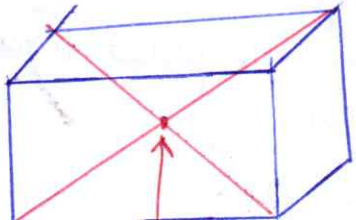
/1 Mark

(iii)



/1 Mark

(iv)



/1 Mark

10) a) A rotten egg floats on water because it is less denser than water (its density is less than the density of water). 1 Mark

3/3 b) Given that; $\rho_{air} = 1.293\ kg/m^3$

$V_{air} = 5m \times 10m \times 10m = 500\ m^3$ 1 Mark

then, $m = \rho_{air} \times V_{air} = 500\ m^3 \times 1.293\ kg/m^3 = 646.5\ kg$ 1 Mark

11) a) Given that;

$u = 0m/s$, $v = 20m/s$ and $t = 4s$

3/3 $a = \frac{\Delta V}{t} = \frac{v-u}{t} = \frac{20m/s - 0m/s}{4s} = 5m/s^2$ ✓

b) $s = \frac{1}{2}(\text{speed} \times \text{time}) = \left[\frac{1}{2}(4)(20)\right]m = 40m$ 1

(0✓ for the formula, 0✓ for the substitution)

12) a) Given that;

$u = 180m/s$, $v = 0m/s$ and $t = 10s$

3/3 $a = \frac{\Delta V}{t} = \frac{v-u}{t} = \frac{0m/s - 180m/s}{10s} = -18m/s$

b) or deceleration of $18m/s^2$ 1

$s = \frac{1}{2}(\text{Speed} \times \text{time}) = \left[\frac{1}{2}(10)(180)\right]m = 900m$ 1

(0✓ for the formula, 0✓ for the substitution)

13) a)

Mass	Weight
• Quantity of matter in a body. • S.I Unit is kilogram (kg) • Constant everywhere • Scalar quantity • Measured using a beam balance.	• Pull of gravity on a body. • S.I Unit is Newton (N). • Changes from place to place • Vector quantity • Measured using a spring balance.

at least 2 for each / 2 Marks

(9f)

b) Given that;

$g = 10N/kg$

(i) $m = 300g = 0.3kg$

$W = mg = 0.3kg \times 10N/kg = 3N$ /1

(ii) $m = 700kg$

$W = mg = 700kg \times 10N/kg = 7000N$ /1

(iii) $m = 0.05mg = 5 \times 10^{-8}kg$

$W = 5 \times 10^{-8}kg \times 10N/kg = 5 \times 10^{-7}N$ /1

14) a) By applying the painciple of moments

$750x = 250(2-x)$

$\Leftrightarrow 750x = 500 - 250x$

$\Leftrightarrow 1000x = 500$ or $x = \frac{500}{1000} = 0.5m$

/1

b) (i) $V.R = \frac{\text{Effort distance}}{\text{load distance}} = \frac{1.5}{0.5} = 3$ /1

4/4 (ii) $M.A = \frac{\text{load}}{\text{Effort}} = \frac{750N}{250N} = 3$ /1

(iii) $\eta = \frac{M.A}{V.R} \times 100\% = \frac{3}{3} \times 100\% = 100\%$ /1

c) We have assumed that there is no friction and that the crowbar is weightless.

15) Fig 1

Effort = 150N

load = 200N

V.R = 2

a) V.R = 2 /1 Marks

6/6 b) $M.A = \frac{\text{load}}{\text{Effort}} = \frac{200N}{150N} = 1.33$ /1

c) $\eta = \frac{M.A}{V.R} \times 100\% = \frac{1.33}{2} \times 100\% = 66.667\%$ /1

Fig 2

Effort = 60N

load = 210N

a) V.R = 6 /1

b) $M.A = \frac{\text{load}}{\text{Effort}} = \frac{210N}{60N} = 3.5$ /1

c) $\eta = \frac{M.A}{V.R} \times 100\% = \frac{3.5}{6} \times 100\% = 58.33\%$ /1

SECTION B: Attempt any three questions

16) a) The newton's second laws of motion states that "The acceleration (a) of an object is directly proportional to the net (resultant) force (F) acting on it and inversely proportional to its mass; and the acceleration takes in the direction of the resultant force". /2 Marks

b) $a \propto \frac{F}{m}$, this means, $a = k\frac{F}{m}$ where k is a constant

Experiments have shown that the value of $k = 1$,

Hence $a = \frac{F}{m}$

By cross multiplication we get $F = ma$ /2 Marks

10/10

c) Newton is the force that will accelerate a mass of 1kg at the rate of $1 m/s^2$.

$1N = 1 kgm/s^2$ /1 Marks

d) • A person jumping from a boat.
• A person with skating shoes pushes a rigid wall.
• Propulsion of Jets and rockets.
• Rotation of the garden sprinklers.
• When a gun is fired.
• When running or walking, a person exerts a backward force on the ground.

3 applications
1 Mark for each
/3 Marks

e) When the goalkeeper pulls back the hands while catching hand ball the velocity of the ball is reduced gradually thus reducing the impact of the ball on the goalkeeper. 12 Marks

17) a) The law of conservation of energy states that "The energy can not be created or destroyed but is simply converted from one form into another". /2 Marks

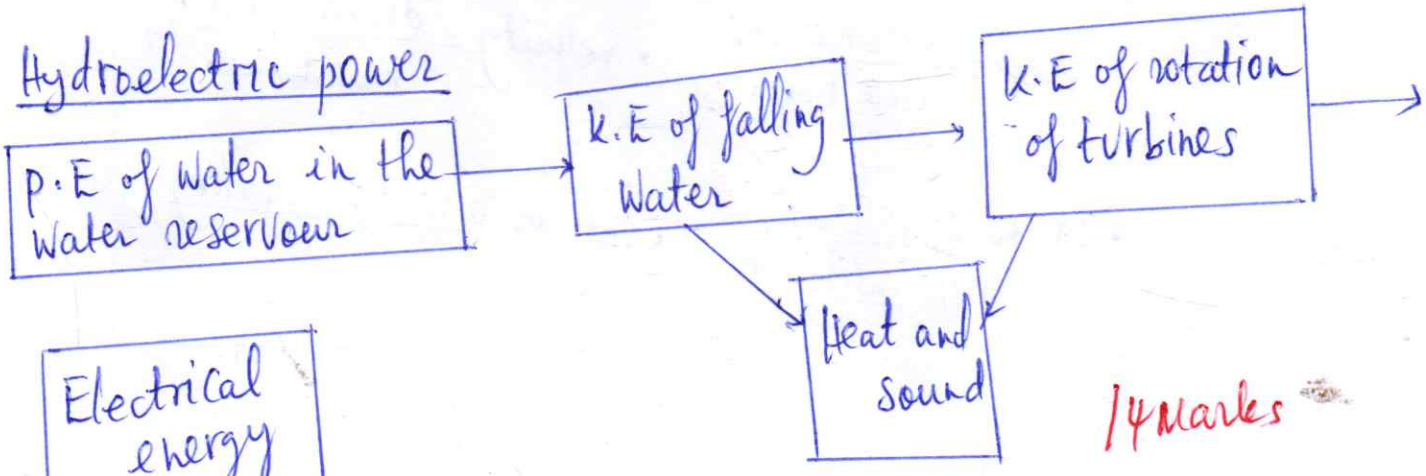
b)

Renewable energy sources /2 marks	Non-renewable energy sources /2 marks
• It can be used again and again throughout its life.	• It can not be used again and again but one day it will be exhausted
• These are the energy resources which can not be exhausted	• They are the energy resources which can be exhausted one day
• It has low carbon emission and hence environment friendly	• It has high carbon emmission and hence not environment friendly.
• It is present in unlimited quantity.	• It is present in limited quantity and vanishes oneday
EX: Solar energy, wind energy tidal energy, ...	EX: Coal, petroleum, natural gases, ...

at least two points for each

10/10

c) Hydroelectric power



/4 Marks

18) a) (i) Neutral equilibrium occurs when a simple object is placed in such as a position that any slight disturbance would not change the level of its centre of mass. 1/1

(ii) Stable equilibrium occurs when a simple object is placed in such a position that any slight disturbance effort would raise its centre of mass. 1/1

10/10 (iii) Unstable equilibrium occurs when a simple object is placed in such a position that any slight disturbance effort would lower its centre of mass. 1/1

b) A is stable equilibrium 1/1

B is unstable equilibrium 1/1

C is neutral equilibrium 1/1

c) 1. A 1/1 2. C 1/1 3. B 1/1

Because, A body is more stable if the area of the base is as large as possible. 1/1

19) a)

Speed	Velocity
• Speed = $\frac{\text{distance covered}}{\text{time taken}}$ 1/1	• Velocity = $\frac{\text{displacement}}{\text{time taken}}$ 1/1
• It is a scalar quantity 1/1	• It is a vector quantity 1/1

b) (i) Average speed = $\frac{\text{Total distance}}{\text{time taken}}$

Total distance = 200 km + 150 km = 350 km
= 350,000 m 01

Total time = 3h + 2h = 5h = (5 × 3600s)
= 18,000s 01

10/10

then $Speed_{Av} = \frac{350\,km}{5h} = 70\,km/h$ /1

In m/s → $speed_{Av} = \frac{350000\,m}{18000\,s} = 19.4\,m/s$ /1

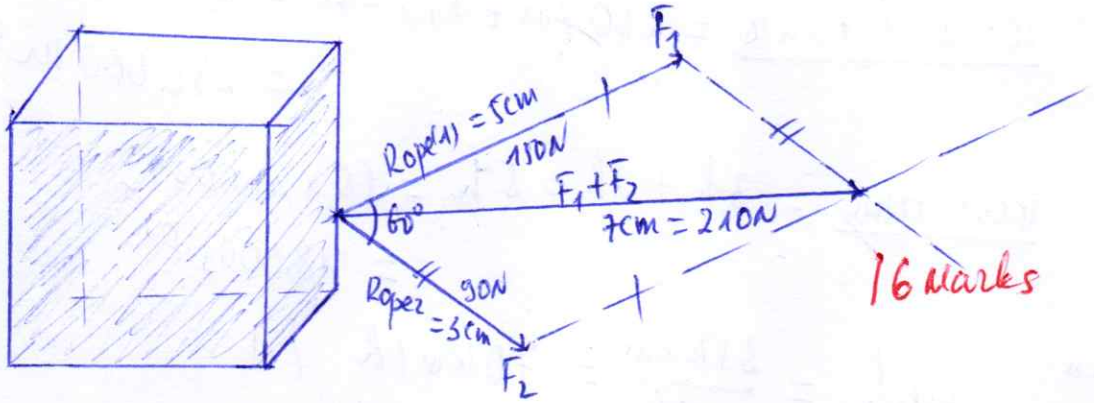
(ii) Displacement = $\sqrt{(200)^2 + (150)^2}$ km = $\sqrt{40,000 + 22500}$ km
= $\sqrt{62500}$ km = 250 km = 250000 m /1

then, $Velocity_{Av} = \frac{\text{Displacement}}{\text{time taken}} = \frac{250\,km}{5h} = 50\,km/h$ /1

In m/s → $Velocity_{Av} = \frac{250,000\,m}{18,000\,s} = 13.89\,m/s$ /1

20) a) let 1cm = 30N
3cm = 90N /2 Marks
5cm = 110N

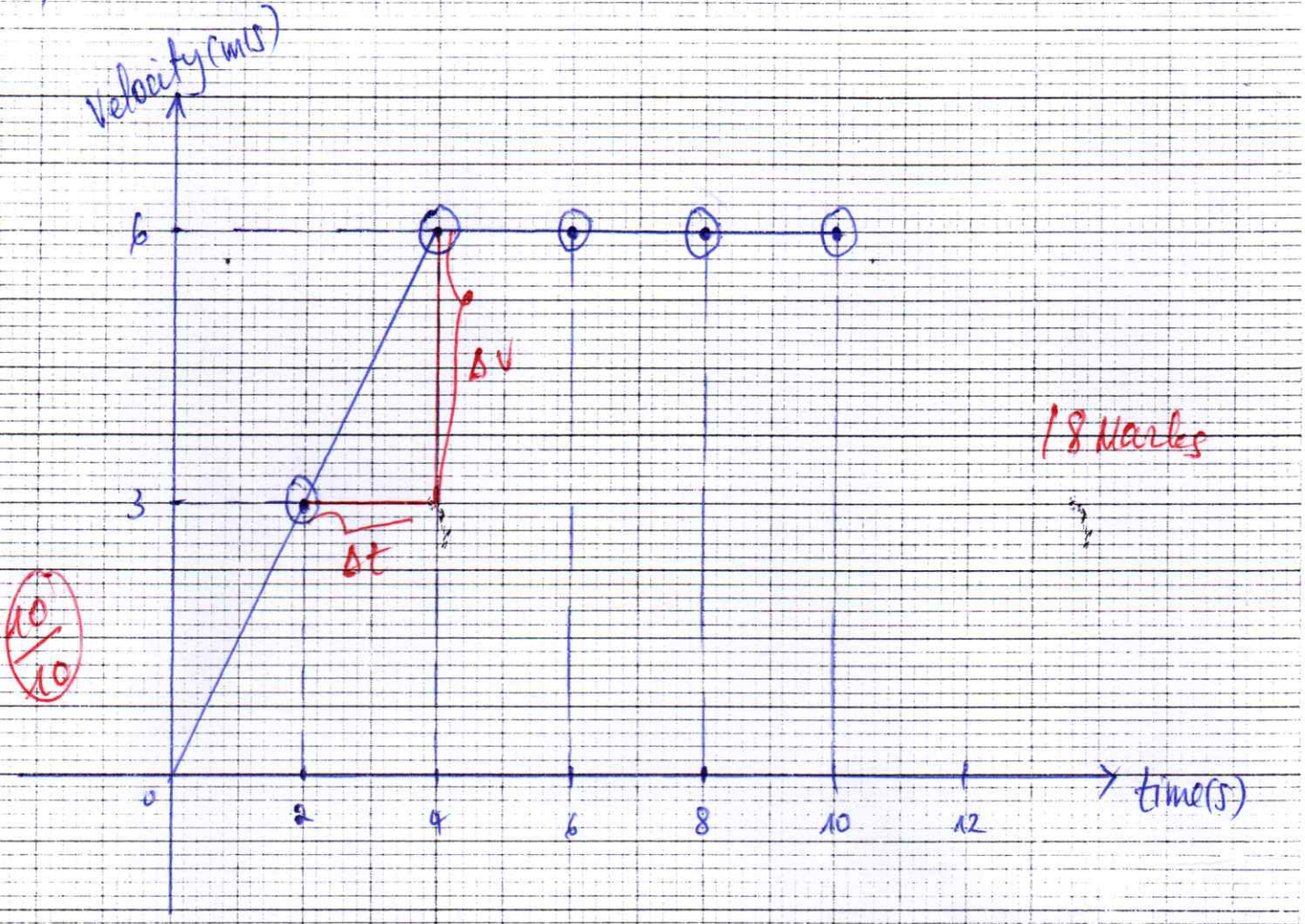
10/10



16 Marks

b) The resultant forward force is 210N
(since 1cm = 30N, 7cm = 210N). 12 Marks

24) a)



/8 Marks

10/10

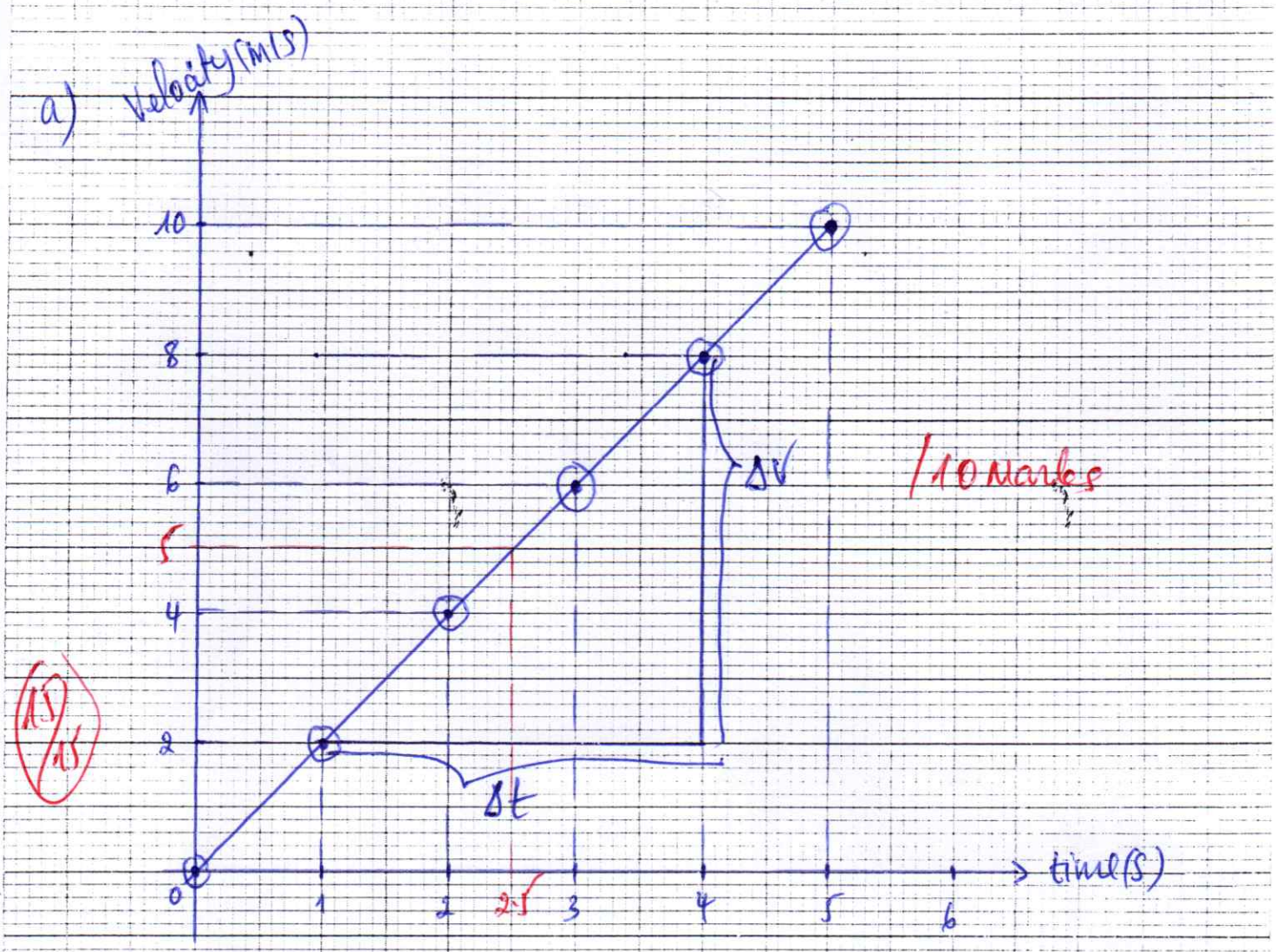
b) Acceleration = slope of the graph

$$= \frac{\Delta v}{\Delta t} = \frac{6\,m/s - 3\,m/s}{4s - 2s} = 1.5\,m/s^2$$

/2 Marks

SECTION C: Compulsory question

a)



/10 Marks

b) $\text{Slope} = \frac{\Delta v}{\Delta t} = \frac{8-2}{4-1} = \frac{6}{3} = 2\ m/s^2$ /3 Marks

c) The slope represents acceleration /1 Mark

d) If $t = 2.5s$ then $v = 5\ m/s$ /1 Mark