PRESIDENT'S OFFICE

REGIONAL ADMINSTRATION AND LOCAL GOVERNMENT.

ARUSHA REGION TERMINAL EXAMINATIONS.

FORM THREE MARKING SCHEME JUNE 2020.

PHYSICS FORM THREE.

MARKING SCHEME.

SECTION A. 15 MARKS.

QUESTION ONE (1). @1 MARKS = 10 MARKS.

I	II	III	IV	V	VI	VII	VIII	IX	X
J	K	J	K	J	K	J	K	J	K

QUESTION TWO (2). @1 MARKS = 5 MARKS.

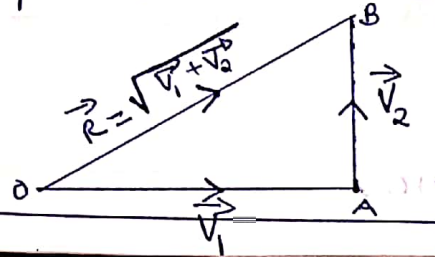
I	II	III	IV	V
E	F	G	H	J

SECTION B. 60 MARKS.

3 @ (i) SCALAR QUANTITY. Are those physical quantities which have only magnitude or size without direction. Examples of scalare are Density, distance and etc. (1 Marks).

(ii) VECTOR QUANTITY: Are those physical quantities which have both magnitude and direction only. Example are Velocity, Acceleration etc. (1 MARKS)

(B). TRIANGLE LAW STATE THAT ". If two sides of a triangle completelly represent two Vectors both in magnitude and direction taken in the same order, then the third side taken in opposite order represents the resultant of these two Vectors". (2 MARKS)



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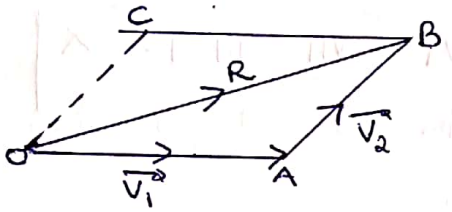
3(B)(ii) PARALLELOGRAM LAW STATE THAT." When two vectors are represented by two adjacent sides of a parallelogram by direction and magnitude then the resultants of these vectors is represented in magnitude and directions by the diagonal of the parallelogram starting from the same point.



$\vec{OB} = \sqrt{\vec{OA} + \vec{AB}}$

$\vec{R} = \sqrt{\vec{V_1} + \vec{V_2}}$

(2 MARKS).

3(C). DATA GIVEN.

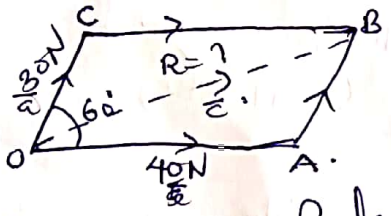
Force F_1 = 30N

Force F_2 = 40N

Inclined angle to Each other = 60°. (½ Marks)

Resultant force (R) = ?

DIAGRAM.



(½ Marks)

By cosine Rule.

$(OB)^2 = R^2 = (OA)^2 + (AB)^2 - 2(OA)(AB)\cos\hat{C}$ (½ Marks)

$R^2 = (30N)^2 + (40N)^2 - 2(30N \times 40N)\cos(180-60)$ (½ Marks)

$R^2 = 900N^2 + 1600N^2 - 2400N^2 \cos 120$ (Note) $\cos 120 = -0.5$

$R^2 = 2500N^2 - 2400N^2 * -\frac{1}{2}$ (1200N²)

$R^2 = 2500N^2 + 1200N^2$

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3(c) $R^2 = 3700N^2$

$\sqrt{R^2} = \sqrt{3700N^2}$ (½ Marks)

$R = \sqrt{3700}N = 60.83N.$

The resultant force is 60.83N.

BY SINE RULE.

$\frac{\sin\hat{a}}{A} = \frac{\sin\hat{b}}{B} = \frac{\sin\hat{c}}{C}$ ——— (i) (½ Marks)

$\frac{\sin\hat{a}}{A} = \frac{\sin\hat{c}}{C}$ (ii) or $\frac{\sin\hat{b}}{B} = \frac{\sin\hat{c}}{C}$ ——— (iii) (½ Marks)

$\frac{\sin\hat{b}}{B} = \frac{\sin\hat{c}}{C}$ where $c = R$.

$\frac{\sin 60^\circ}{40N} = \frac{\sin 120^\circ}{60.83R}$.

$\frac{\sin 60^\circ}{40N} = \frac{\sin 120^\circ}{R}$ (½ Marks)

$\frac{R\sin 60^\circ}{\sin 60^\circ} = \frac{40N \times \sin 120^\circ}{\sin 60^\circ}$

$R = \frac{40N \times 0.86}{0.86} = 40N.$

or.

$\frac{\sin\hat{a}}{A} = \frac{\sin\hat{c}}{C} = \frac{\sin 60^\circ}{30N} = \frac{\sin 120^\circ}{R}$

$\frac{R\sin 60^\circ}{\sin 60^\circ} = \frac{30N \times \sin 120^\circ}{\sin 60^\circ} = 30N$ (½ Marks)

The resultant is 30N. (Total 4 Marks).

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4 (i) PRINCIPAL FOCUS: Is the point at which at which all rays parallel to the principal axis converge after reflection from a concave mirror or seem to diverge from this point after reflection from a convex mirror. (1 Marks)

OR.

Is the midpoint of radius of curvature.

(ii) PRINCIPLE AXIS: Is the Immaginary line which joins the poles, principal fcus, and Centre of curvature. (1 MARKS)

(B) $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$, ——— (I) ($\frac{1}{2}$ Marks)

$M = \frac{v}{u}$ ——— (II)

show $u = \frac{(m+1)f}{m}$ ———(III)

soln.

$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$. Make v the subject ($\frac{1}{2}$ Marks)

$\frac{1}{v} + \frac{1}{u} - \frac{1}{u} = \frac{1}{f} - \frac{1}{u}$.

$\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$ ——— (IV)

$\frac{1}{v} = \frac{u - f}{fu}$ ——— (V) ($\frac{1}{2}$ Marks)

$\frac{v(u-f)}{u-f} = \frac{fu}{u-f}$

$V = \frac{fu}{u-f}$ ——— (VI). ($\frac{1}{2}$ Marks)

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$$v = \frac{fu}{u-f} \quad \text{——— (VI)}$$

substitute eqn (VI) to eqn (II)

$$M = \frac{v}{u} \quad \text{where} \quad v = \frac{fu}{u-f}.$$

$$m = \frac{fu}{u-f} \times \frac{1}{u} = \frac{f}{u-f}. \quad \text{- - - - (VII) (½ Marks)}$$

$$\frac{M}{1} = \frac{f}{u-f}$$

$$M(u-f) = f$$

$$Mu - MF = F \quad \text{- - - (VIII) } \left(\tfrac{1}{2} \text{ Marks}\right)$$

$$Mu - \cancel{MF} + \cancel{MF} = MF + F$$

$$\frac{Mu}{M} = \frac{MF + F}{M} \quad \text{- - - - (IX)} \quad (\tfrac{1}{2} \text{ Marks})$$

$$u = \frac{F(M+1)}{M} \quad \text{- - - (X)}$$

$$u = \frac{(M+1)F}{M} \quad (\tfrac{1}{2} \text{ Marks})$$

Hence shown.

Total (4 Marks).

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4(c) DATA GIVEN.

Focal length (f) = 200mm.

Magnification = 1.5 — 1 (Marks)

V = Image distance = ?

u = object distance = ?

From the formullar.

$u = \frac{(m+1)f}{M}$ where F = +200mm.
m = 1.5.

$u = \frac{(1.5+1) \times 200mm}{1.5}$

$u = \frac{2.5 \times 200mm}{1.5}$

$u = \frac{500mm}{1.5} = 333.3\ mm.$ or $\frac{1000}{3}$ mm.

(1 Marks)

The value of object distance = (u) = 333.3mm.

From

$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}.$ — 1 (Marks)

$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{u-f}{fu}$

$V = \frac{fu}{u-f} = \frac{200mm \times 333.3mm}{333.3mm - 200mm} = \frac{(200 \times 333.3)\ mm^2}{133.3\ mm}$

$V = \frac{200 \times 333.3}{133.3}\ mm = 499.95\ MM.$ (1 Marks)

Therefor the Image distance from the mirror V = 499.95 MM

total (4 Marks.)

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5 @ (i) CAPACITANCE: Is the ratio between the charge of a Conductor Capacitor and potential differences (p.d) across The plate of The Conductor

or.

Is The Amount of charge In plate

$\frac{Q}{V} = \frac{CV}{V}$, $C = \frac{Q}{V}$. (1 Marks)

(ii) WAYS WHICH CAPACITANCE MAY INCREASED.

1- The area of the plate.
2. The Dielectric Materials. 1@ Marks.
3. The distance between the plate.

5(B) (i) CAPACITOR IN SERIES.



If V_1 and V_2 are potential difference developed btn the various plates Then The total potential difference

$V_T = V_1 + V_2$.

when capacitor Inseries there is equall distribution of charge on the plate.

$\frac{Q_T}{C_T} = \frac{Q_1}{C_1} + \frac{Q_2}{C_2}$ but $Q_1 = Q_1 = Q_2 = Q$

$\frac{Q}{C_T} = \frac{Q}{C_1} + \frac{Q}{C_2}$ (1 1/2 Marks)

$\frac{Q}{C_T} = Q\left(\frac{1}{C_1} + \frac{1}{C_2}\right)$

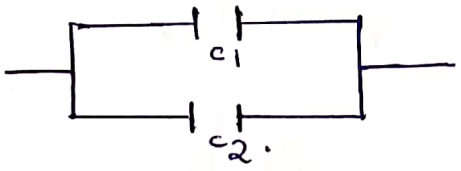
$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2}$.

$\frac{1}{C_T} = \frac{C_2 + C_1}{C_1 C_2}$

$C_T = \frac{C_1 C_2}{C_2 + C_1}$. In series.

(1/2) 3 Marks)

(ii) CAPACITOR IN PARALLEL.



$Q_T = Q_1 + Q_2$

$C_T V_T = C_1 V_1 + C_2 V_2$

but $V_T = V_1 = V_2 = V$

$C_T V = C_1 V + C_2 V$.

$C_T V = (C_1 + C_2) V$

$C_T = C_1 + C_2$.

For parallel Connection The Effective Capacitance Is

$C_T = C_1 + C_2$. (1 1/2 Marks)

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5 (c) i- Why cloud are white?

REASONS: A cloud is composed of large sized dust particles and water molecules so when sunlight hit them all colour within are light are scattered nearly equally and merge together to give us sensation of white. Hence clouds appears white (grey if shadomed). (2 Marks)

(ii) polythene is an Insulator or where as Copper is a good Conductor?

REASON: Conductor and Insulator are used in reference to both electricity and heat and occasionally other things Therefie polythene is an electrical Insulator but not are very good heat Conductor, where Copper is a good electrical conductor which developed to produced positive charge while polythene produce negative charge. (2 Marks)

6 @ LAW OF FLOATATION STATE THAT; "A floating body displaces its own weight of the fluid in which it floats".
(2 Marks)

(B) DATA GIVEN.

Mass of empty bottle (M_0) = 20g.

Mass of empty bottle with full of water (M_1) = 70g.

Mass of empty bottle + full of liquid (M_2) = 60g.

From The Formullar

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Relative density of liquid = $\frac{\text{Weight of displaced liquid}}{\text{weight of displaced water}}$

R.D. = $\frac{\text{Apparent loss of weight in liquid}}{\text{Apparent loss of weight in water.}}$

R.D. = $\frac{(M_2 - M_0)g}{(M_1 - M_0)g} = \frac{(60-20)\cancel{g}}{(70-20)\cancel{g}}$

R.D. = $\frac{40}{50} = \frac{4}{5}$. total (2 Marks)

Therefore Relative density of liquid = 0.8

(ii) From

R.D of a substance = $\frac{\text{density of substance}}{\text{density of water.}}$

where density of water = $1 g/cm^3$

Relative density = 0.8.

density of substance = ?

density of liquid/substance = R.D × $1 g/cm^3$

= $0.8 \times 1 g/cm^3$. total

density of liquid = $0.8 g/cm^3$. (2 Marks)

6(c)(i) ARCHIMEDES PRINCIPLE state that " When a body is partially or totally Immersed In a fluid, it experiences an upthrust which equals to the weight of the fluid displaced." total (2 Marks).

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(ii) DATA GIVEN

Weight of body In air = 500N
Apparent weight of object In liquid (alcohol) = 340N.
upthrust = ?

From.

Upthrust = Weight of body In air − Apparent weight of body.

Upthrust = 500N − 340N.

Upthrust = 160N (2 Marks).

7@. SIMPLE MICROSCOPE: Is the one which uses one convex lens as a simple magnifying glass WHILE. COMPOUND MICROSCOPE: Is the one which uses two or more convex lens. (4 Marks)

(B). PROJECTION LANTERN: Is a device used to project magnified, virtual Image on a screen. WHILE. ASTRONOMICAL TELESCOPE: Is the device used to observe heavenly bodies to establish their distances, brightness, structures and compositions. 4(Marks)

(C). HUMAN EYE: Is a living organ that uses a single convex lens like a camera to form Images on the retina WHILE. LENS CAMERA: Use one lens to collect light from an object. (2 Marks)

(Total 10 Marks)

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8. 8 @. 1. All Incident rays that are parallel to the principal axis, on striking the mirror are reflected to pass through the principal focus.

2. All Incident rays of light which seem to originate from the principal focus, on striking the mirror are reflected to travel parallel to the principal axis.

3. All Incident rays of light which seem to be Comming from the Centre of Curvature, on striking the mirror, are reflected to travel back through the Centre of Curvature.

2@ Marks := 6 Marks.

8(B). SIMILLARITIES.

EYE.	CAMERA.
1. Eye forms real, Inverted and diminished Images.	1. Camera forms Real, Inverted, and Diminished Images.
11. Eye Use Convex lens to form Images.	11. A camera Uses Convex lens to form Image.

(0.5 @ 2 Marks = 2 Marks)

DIFFERENCE.

EYE.	CAMERA.
1. Eye Is living Matter	1. Camera Is made up of non-living materials.
11. Retina does not store Images for further reference.	11. Camera stores Images on the film for further Use or refeence.

(0.5@ Marks = 2 Marks)

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SECTION C. 25 MARKS.

9@. LAW OF FRICTION.

(i). Frictional force is directly proportional to the normally force between the two surface in contact.

(ii) Friction force depend on the nature of surface in contacts.

(iii.) Friction force does not depend on the area of contact.

(iv). The ratio of limiting friction over normally reaction is contact

(v) Coefficient of static friction is slightly greater than the Coefficient of kinetic friction.

0.5@ Marks = (2.5 Marks)

(b) (i) 4 ADVANTAGE OF FRICTION.

→ Allows Walking
→ Writting
→ Better driving
→ Enable match stick to be lit.

0.5@ Marks. = 2 Marks

4. DISADVANTAGE OF FRICTION.

→ Wear and tears
→ Noise
→ Low efficiency of machine.
→ Friction causes heat which can cause pain.

0.5@ Marks = (2 Marks)

(ii) THREE WAYS OF REDUCING FRICTION

→ Use of ball bearings.
→ Use of Lubricants.
→ Use of Rollers.

1@ Marks = (3 Marks)

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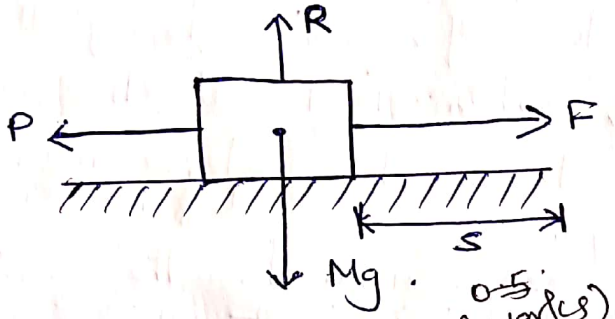
9(e). DATA GIVEN

Velocity of concrete surface = 6m/s.
Coefficient of Friction of two surface = 0.4.
Distance travel before coming to rest = ?

} 0.5 Marks

Soln.

Consider The Illustration:



0.5 (1 Marks)

Where.
s = The distance cover of.
R = Normal reaction
F = Frictional force
P = Sliding force
mg = Weight of brick (1 Marks)

From

$\mu = \frac{F_{max}}{R}$ where $F_{max} = ma$, $R = mg$

$\mu = \frac{ma}{mg} = \frac{a}{g}$, $g = 10m/s^2$ (1) Marks.

$\frac{0.4}{1} = \frac{a}{10m/s^2}$

$a = 0.4 \times 10m/s^2 = 4m/s^2$. (01 Marks)

Acceleration of sliding body is $4m/s^2$.

From third law of motion in straight line

$v^2 = u^2 + 2as$, $u = 0$ $v = 6m/s$ $a = 4m/s^2$
$s = ?$

$\frac{v^2 - u^2}{2a} = \frac{2as}{2a}$

$S = \frac{6^2 - 0^2}{2 \times 4} = \frac{36}{8} m = 4.5m.$

Therefore distance covered by a sliding brick is 4.5 m. (1 Marks.)

(Total 5.5 Marks)

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10@ (i) REFRACTIVE INDEX:: Is the ratio of the angle of Incidence of light to the sine of the angle of refraction. It denoted by η.

$$\eta = \frac{\sin \theta_i}{\sin \theta_r}.$$

(2 Marks)

(ii) CRITICAL ANGLE: Is an angle of Incidence whose Cnesponed angle of refraction Is eguall to right angle 90°, when light travels from high dense medium to a low dense medium. (2 Marks)

(iii). TOTAL INTERNAL REFLECTION: Is the situation where by a beam of light travelling from high dense medium to low dense medium reflecte d fully into high dense medium at the line of separating medium. (2 Marks)

(B.) TWO CONDITION WHICH TOTAL INTERNAL REFLECTION MUST OECUR.

1. A light rays must be travelling from denseror high dense medium to low dense medium.

2. The angle of Incidence must be greater than the Critical angle.

$i > C$. (2 Marks)

(C). DATA GIVEN.

$\sin i = 0.4$

$\eta_g = 1.6$ (1 Marks)

$\sin r = ?$

From $\eta_g = \frac{\sin i}{\sin r}$

$1.6 = \frac{\sin 0.4 = 0.4}{\sin r}$

$1.6 \sin r = \sin 0.4 = 0.4$

$\frac{1.6 \sin r}{1.6} = \frac{\sin 0.4 = 0.4}{1.6}$

(1 Marks)

$\sin i = 0.4$

$\sin r = \frac{\sin 0.4 = 0.4}{1.6}$

$\sin r = \frac{0.4 - 3}{1.6}$

$\sin r = 0.25$ (2 Marks)

14

Total (4 marks) 5

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11. 11 @. THERMAL EXPANSION: Is the tendency of matter to change In volume In response to a change In temperature.

II. BIMETALLIC STRIP; Is a formed when when two metals with different thermal expansion coefficients are bonded together.

III. LINEAR EXPANSITIVITY: Is the ratio of Increase In length to Its original length per degree rise In temperature. (1@ Marks) = 3 marks total

B. ANOMALOUS EXPANSION OF WATER: Refer to the Unusuall behavior of water where Its volume decreases when the temperature rises from 0°C to 4°C and Increases when the temperatures falls from 4°C to 0°C. Generally all liquid expand on heating. But water behaves In a peculiar way when heated from 0°C up 4°C. on heating from 0°C to 4°C Its volume decreases, reaches a minimum at 4°C, such that the density of water Is maximum at 4°C. On heating further water behave like any other liquid simillarly during the cooling processes, the volume of water decrease up to 4°C, reaches a minimum at 4°C. If further cooled up to 0°C, Its volume Increase Instead of decreasing. Hence density of water at 0°C Is less than at 4°C

(2 Marks)

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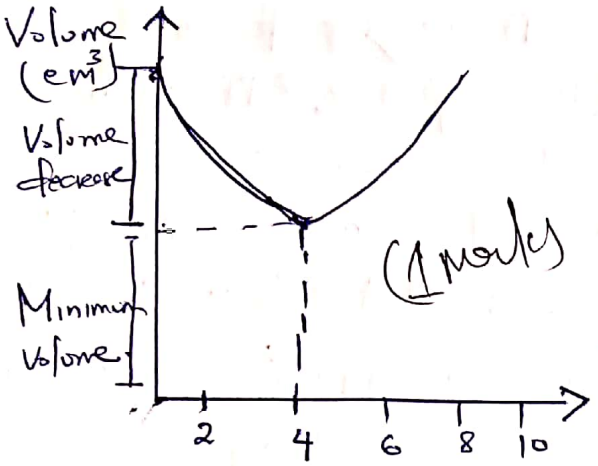
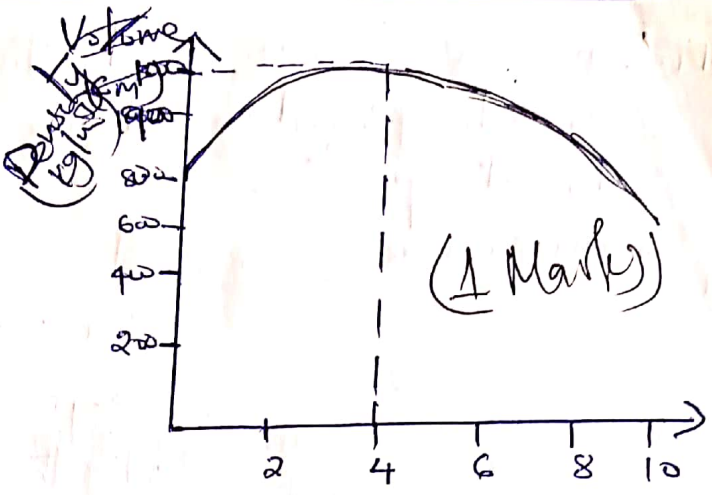


(1 Marks)



(1 Marks)

• Volume against Temperature

• Density against Temperature.

Total (4 Marks)

11.c. DATA GIVEN.

Initial Volume $= 20\,cm^3$ — (V_1)

Initial temperature $T_1 = 19 + 273 = 292K$. (1 Marks)

Final Volume $V_2 = ?$

Final temperature $T_2 = ? = 150 + 273 = 423K$.

From charles law.

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}. \quad (1 \text{ Marks})$$

$$\frac{V_2 \cancel{T_1}}{\cancel{T_1}} = \frac{V_1 T_2}{T_1}$$

$$V_2 = \frac{V_1 T_2}{T_1}$$ where $V_1 = 20cm^3$, $T_2 = 423K$, $V_2 = ?$ $T_1 = 292K$

$$V_2 = \frac{20cm^3 \times 423\cancel{K}}{292\cancel{K}} = 28.97cm^3 \simeq 29cm^3 \quad (1 \text{ Marks})$$

Therefore the Volume that pressure is kept constant $V_2 = V_2 = 29cm^3$.

END.

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