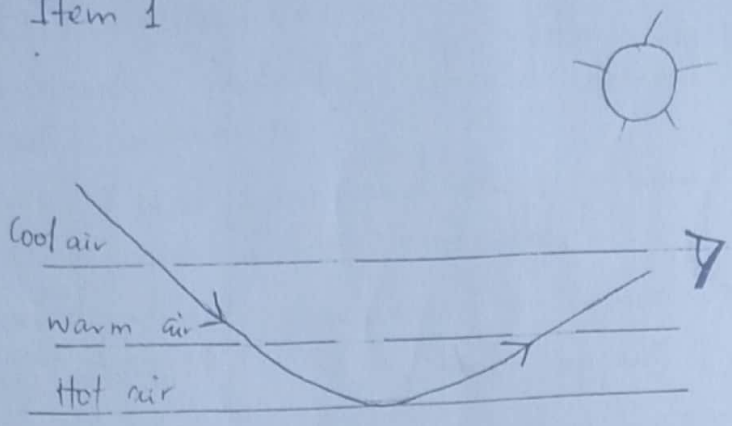
Marking guide for Physics 535/1 COUHEIA Mock, 2024:

a) Item 1



01 mrk for three layers of air

01 mrk for total internal reflection.

Correct explanation for formation of mirage ie emphasizing refraction and total internal reflection — 02 mrks

b) - The vehicle was completely closed implying that there was no gap for sound to be defracted. — 02 mrks

- Absorption of sound in the car by soft tissues like car seats and their bodies. — 02 mrks

c) Radiations;
- Ultraviolet (UV)
- Infrared

02 mrks for the two radiations.

How they reached the kids

Rays from the sun travel through vacuum by radiation. — 02 mrks.

They pass through the glass by conduction. — 02 mrks.

From the glass to the kid's through vacuum rays travel by radiations and conduction to their bodies. — 02 mrks.

Total = 16 mrks

Item 2

a) Structure of an atom

Parts (Nucleus and Energy levels). - 01 mark for 2 parts

Particles (protons and neutrons in the nucleus, electrons in the shells. - 01 mrk for 3 correct particles.

Charge; - protons are positively charged
- electrons are negatively charged
- neutrons have no charge

- 01 mark for 3 correct charges on the right particle.

Mass is mainly concentrated in the nucleus - 01 mrk.

Radiations emitted
- ~~Al~~pha particles
- Beta particles
- Gamma rays

- 02 mrks for three correct.
- 01 mrk for two or one correct.

(b) Dangers of radiations.
- Damages soft body tissues.
- Damages eye sight
- causes cancer.
- causes mutations
- damages reproductive organs.

- 03 mrks for any three correctly answered.

Safety precautions :

- Radioactive materials should stored in lead containers.
- Wear lead apron and gloves when using radioactive materials.
- Avoid direct exposure to reproductive body organs.
- Avoid eating where radioactive materials are being used.

03 mrks for any 3 correct.

c) Medical applications :

- Used to treat cancerous cells.
- They are used to sterilize medical equipments.
- They used to measure blood volume.
- They are used to scan for Tuber culosis.

02 mrks for any 2 correct.

Industrial applications.

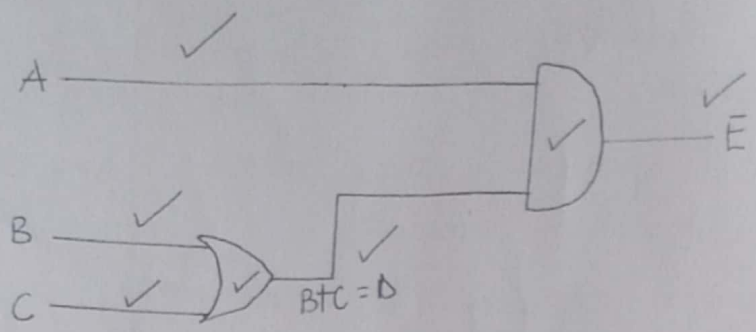
- They are used to maintain thickness of materials.
- They are used to preserve food.
- They are used to detect leakage in underground pipes.
- They are used to detect cracks in welded joints.

02 mrks for any 2 correct.

Total = 16 scores

Item 3

a)



7 mrks

Let the Inputs be;

half pay - A

Ream - B ✓

liquid soap - C

Let the out put be; 01 mrk

Attend class - D

(b) Truth table

A	B	C	B+C = D	AD = E
0	0	0	0	0
1	0	0	0	0
0	1	0	1	0
0	0	1	1	0
1	1	0	1	1
1	0	1	1	1
0	1	1	1	0
1	1	1	1	1

08 mrk for each correct out put

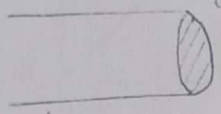
Total = 16 mrks

a) Item 4

$d = 4cm$

$r = 2cm$

$r = \frac{2}{100} = 0.02m$.



$A = \pi r^2$

$= \pi \times (0.02)^2$

$A = 0.001256 m^2$.

01 mrk for Area

$P = F/A$

01 mrk for the pressure formula

$F = mg$

but m = density x volume

$d = 1000 kgm^{-3}$, $V = 22000 \times 1000 cm^3$

01 mrk for volume conversion to m^3.

$\therefore F = (d \times v) \times g$

$= \frac{1000 \times 22000 \times 1000 \times 10}{1000,000}$

01 mrk for finding the mass

$= 220,000 N$

01 mrk for the force

$P = \frac{220,000}{0.001256}$

01 mrk for substitution into the pressure formula

$= 175159235.67$

$= 1.75 \times 10^9 Pa$.

02 marks for the answer with correct unit.

(b) When water is subjected to high pressure, it escapes as vapour which displaces oxygen hence putting off flames.

04 mrks

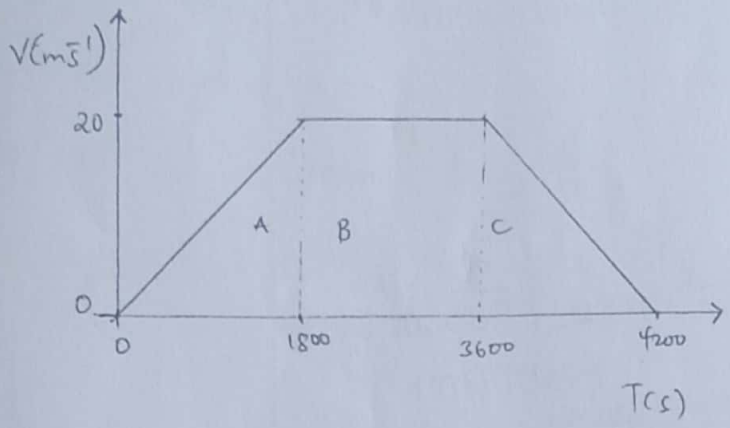
c) The build up of heat in the restaraut creates two regions i.e one at high temperature and one with at lower temperature. This creates a convection current spreading the heat to other area through by air conduction through solid materials and radiation through vacuum.

04 mrks

Total = 16mrks

a) Item 5

Velocity - time graph:



01 mrk - 2 labelled axes

01 mrk - correct sketch.

02 mrk - conversion of units.

04 mrk - for calculating distance.

Km/h ⟶ m/s

$\frac{72 \times 1000}{3600} = 20 ms^{-1}$

1 minute ⟶ 60 s

30 minutes ⟶ 60 × 30 s

30 minutes = 1800 s

A

$u = 0 ms^{-1}$, $V = 20 ms^{-1}$, $t = 1800 s$

Area = $\frac{1}{2} bh$

$= \frac{1}{2} \times 1800 \times 20$

$= 1800 m$.

B

Area = $l \times w$

$= 20 \times 1800$

$= 36{,}000 m$

C

Area $= \frac{1}{2}bh$

$= \frac{1}{2} \times 20 \times 600$

$= 6000\,m$.

Total distance $= 18000 + 36000 + 6000$

$= 60,000\,m$

~~11400m~~.

b) Water has a high heat capacity and therefore absorbs large quantities of heat cooling the car.

04 mrks

c) Pull water using;

- pulley system ✓
- wheel and axle system ✓

01 mrk for any choice of the method.

03 mrk for explanation.

Total = 16 mrks

Item 6:

(a) Electric power lines carry high voltages incase they fall they lead to electric shocks and fire. — 02 mrks

(b) Bill for occupant 1;

$$= \left(\frac{1000}{1000} \times \frac{30}{60}\right) + \left(\frac{150}{1000} \times 4\right) + \left(\frac{7}{1000} \times 5\right)$$

02 mrks for number of units per month

$$= (0.5 + 0.6 + 0.035) \times 30$$

∴ Energy consumed in 30 days = 34.05 kWh

01 mrk for cost.

Cost = 34.05 × 504

= 17,161.2/=

Bill for occupant 2.

$$= \left(\frac{1500}{1000} \times \frac{40}{60}\right) + \left(\frac{10}{1000} \times 5\right)$$

02 mrk for units per month.

Energy consumed in a month = (1 + 0.05) × 30

= 31.5 kWh

01 mrk for cost.

Cost = 31.5 × 504

= 15,876/=

Cost of using a security light:

$$\left(\frac{10}{1000} \times 8\right) \times 30 \times 504 = 1,209.6/=$$

01 mrk for cost of security light divided by 2.

$$\frac{1,209.6}{2} = 604.8/=$$

Bill for Occupant one

$= 17161.2 + 604.8$ — 01 mrk

$= 17,766/=$

Bill for Occupant two;

$= 15876 + 604.8$ — 01 mrk.

$= 16,480.8/=$

(c). Use LED bulbs that consume less energy.
- Switch off appliances when not in use. — 05 mrks
- Regulate the device to the minimium required electric energy.
- Reduce use of appliances that serve the same purpose.

Total = 16 marks

Item 7:

a) Efficiency $= \frac{P_{output}}{P_{input}} \times 100\%$ — 01 mrk for (formulat

$= \frac{240 \times 20}{12000} \times 100\%$ — 01 mrk - substituting

$= 40\%$ — 01 mrk for correct answer

Conculsion low efficiency of the transformer. — 01 mrk for conculsion.

b) Energy losses	Minimising Energy losses.	
- Eddy currents	- laminating the iron core.	04 mrks -Energy losses.
- Magnetic leakage	- Winding one coil on top of the other.	
- Magnetic reversals	- Using soft magnetic materials.	04 mrks Minimising losses.
- Resistance in the coils.	- Use thick copper wires.	

c) — 02 mrks well labelled diagram.

02 mrks for correct steps.

Total = 16 mrks