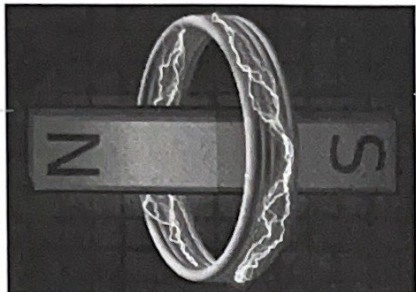Magnetism Escape Room prep

Intro page

on Desmos.com
(using Google pw)

TS (how far they get)

Instructions:

On a piece of paper, solve each of the problems. At the end of this activity, you will be taking a picture of your work to hand in on Teams.

Your answers will unlock the next room.

Good luck and have fun! ☺

Do as a review activity in groups
-a race for chocolate or bonus marks.

Code to enter room 1 (go to next page to enter answer):

Unlike magnetic poles _____ (write your answer in all CAPS)

Code: ATTRACT   7 characters in answer

****

Room #1

Magnetic __Field__ lines go from N to S

For the right hand rule your __thumb__ points in the direction of the current.

Left hand rule is used for __electron__ flow.

Ⓧ This symbol means the current is moving __into__ the page.

Parallel wires, carrying current in the opposite directions, will __repel__.

⅔

5 characters in answer

extra spaces @ end of answer cause problems

E	R	F	T	I
B	Y	G		O

Code:

Hint: Use the first letter of each word/phrase (all caps).

Code: ERFTI

****

if having trouble try ctrl+a and delete then type answer again

Teacher Desmos
sign in w Google

Phys 12

Magnetism Escape Rm

ATTRACT

Rm 1 ERFTI

Rm 2 318A2.3TC

$\boxed{20}$
(one more for each page)

Rm 3 WPPD

upper C X

Rm 4 B1.INDOWNCB2.8X10^-13N

Rm 5 0.85TC121V

Rm 6 ELINRIPELE

Rm 7 7.4TCD

include units
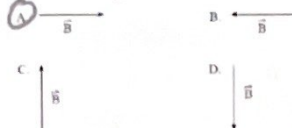label by Rm
hand in work
no spaces
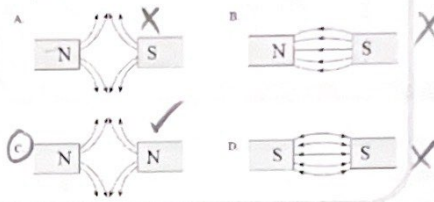all caps

Create Teams
Assign for them
to hand in on.

Room 2

An electric current flows through a solenoid as shown below.

red

What is the direction of the magnetic field inside the solenoid?

A. $\vec{B}$ → (circled)
B. $\vec{B}$ ←
C. $\vec{B}$ ↑
D. $\vec{B}$ ↓

yellow

Which of the following diagrams best shows the magnetic field lines between the poles of two permanent magnets?

A. N S ✗
B. N S ✗
C. N N ✓ (circled)
D. S S ✗

1/3 (circled)

$B = \mu_0 I \frac{N}{l}$

$N = \frac{B l}{\mu_0 I}$

$= 318$

green

The magnetic field at the centre of a solenoid of length 0.25m is 1.2×10^{-2} T.
The current in the windings is 7.5 A.
How many loops does it have?
Answer with a whole number.

blue

What is the magnetic field inside a 10. cm long solenoid with 1500 turns if a current of 120 A runs through it?
Answer with 2 sig figs and units.

$4\pi \times 10^{-7}$

$B = \mu_0 I \frac{N}{l}$

0.1 m

$= 2.3 T$

Code:
318 | A | 2.3T | C
[G] [G] [B] [Y]

Hint: No spaces or commas between your answers. Decimals are ok. Use all caps.

9 characters

Code: 318A2.3TC
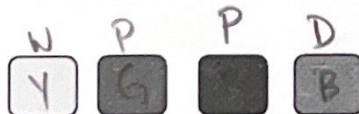
****

Room 3

In the right-hand rule, your R **palm** points in the direction of the force.

In a simple DC motor, a loop of Y **wire** passes through a magnetic field.

Moving charges are G **deflected** by magnetic fields.

The largest force happens when charges are moving G **perpendicular** to the magnetic field.

1/2 (circled)

Code:
W | P | P | D
[Y] [G] [ ] [B]

4

Hint: Use the first letter of each word/phrase (all caps).

Code: ~~WPTD~~
     NPPD

****

$$F = BI\ell$$
$$\text{yellow} \uparrow = 1.1N$$

$$F = qvB$$
$$= 2.8 \times 10^{-13}N$$

Room 4

A wire carrying 12A of current is placed in a magnetic field of strength 0.63T.

thumb

fingers into page
→ palm down

What are the magnitude and direction (up, down, right, left, into page, or out of page) of the magnetic force acting on the wire?
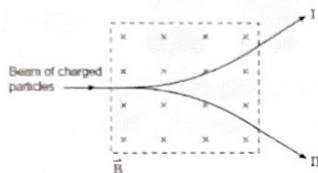
blue

A proton is travelling at 2.3×10^6 m/s in a circular path in a 0.75T magnetic field. What is the magnitude of the force on the proton?
Answer format: #.#x10^-##N

green

An armature rotates as a loop of wire passes through a magnetic field. The ends of the loop are attached a split ring commutator that is connected to a DC battery. (first letters only)

(3)

red

A beam of positively and negatively charged particles enters a magnetic field as shown. Which paths illustrate the positive and negative charges leaving the magnetic field region?

Beam of charged particles

$\vec{B}$

For + RHR
For − LHR

fingers into page ($\vec{B}$)
thumb current
palm force

	PATH OF POSITIVE CHARGES	PATH OF NEGATIVE CHARGES
A.	I	I
B	I	II
C.	II	I
D.	II	II

Code:

B | 1.1 N DOWN CB | 2.8X10^-13N

B | Y | (2) | (B)

30 characters
in answer

Hint: no spaces between answers. Use upper case X for scientific notation.

Code: B1.1NDOWNCB2.8X10^-13N

****

$F_c = F_m$

$\frac{mv^2}{r} = qvB$

$B = \frac{mv}{qr} = \frac{(1.67\times10^{-27})(3.5\times10^5 \text{m/s})}{(1.6\times10^{-19})(4.3\times10^{-3})} = 0.850\text{T}$

red

A proton travels through a magnetic field at a speed of 3.50X10⁵m/s perpendicular to the field. If the radius of the arc of the deflected proton is 4.30X10⁻³m, what is the magnetic field strength?

blue

An alpha particle travels at a speed of 3.0X10⁶m/s through a magnetic field with a strength of 4.2X10⁻¹T. What is the radius of the path of the electron when the magnetic field is parallel to the direction of the electron's travel?

A. 1.5m   B. 0.75m   C. No deflection

yellow

Electrons are accelerated from rest through a potential difference. These electrons pass undeflected through a perpendicular magnetic (2.3X10⁻²T) and electric (1.5X10⁵N/C) fields. What is the accelerating voltage?

$F_e = F_m$

$qE = qvB$

$v = \frac{E}{B} = \frac{1.5\times10^5 \text{N/c}}{2.3\times10^{-2}\text{T}} = 6.5217\times10^6 \text{m/s}$

Code: 0.85T   C   121V
          red   blue yellow

Hint: Leave red as decimal number 0.___. Still use all capitals.
Don't use sci note for these answers in this room.

Code: 0.85TC|21V

10 characters

$E_p = E_k$

$qV = \frac{1}{2}mv^2$

$V = \frac{1}{2}\frac{mv^2}{q}$

$= \frac{1}{2}\frac{(9.11\times10^{-31})(6.5217\times10^6)^2}{1.6\times10^{-19}\text{c}}$

$= 121 \text{ V}$

$\vec{B}$

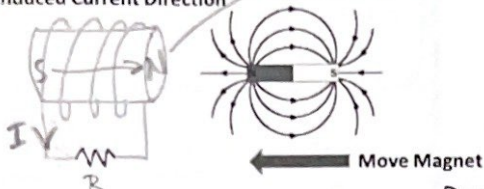$|\vec{E}|$

e^-

The process of producing an induced emf in a conductor by the use of a magnetic field is called _electromagnetic_ _induction_.

Find Induced Current Direction

creates a N to repel the N on magnet

Since B goes S to N

I ∨
R

<-- The conventional current will go to the _right_ (left or right?) through the resistor?

Move Magnet

2

Maximum flux occurs when the field lines are _perpendicular_ to the plane of the loop.

Lenz's Law: The induced current flows in a direction as to produce a magnetic force that opposes the direction of the applied force.

EL   IN   RI   PE   LE

Code: ☐ O Y G B

10 characters in answer

This time: Include the first TWO letters from each word, all capitalized, in your answer.
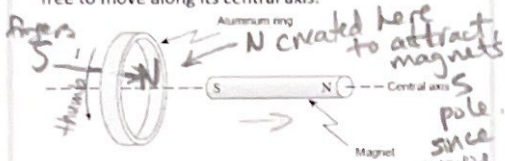
Code: ELIN PELE
          RI

****

$$\Phi = BA$$
$$B = \frac{\Phi}{A}$$
$$= \frac{0.13}{\pi 0.075^2}$$
$$= 7.4T$$
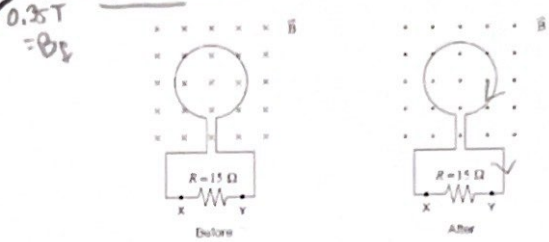
$$\mathcal{E} = \frac{-N\Delta\Phi}{\Delta t} = \frac{-1(B_f - B_i)A}{\Delta t}$$
$$= \frac{-1(-0.35 - 0.75)(0.3^2)}{0.45}$$
$$= 0.78\overline{2}V$$

Room 7

blue

The flux through a circular coil with a radius of 0.075m is 0.13Wb when placed perpendicular to a magnetic field. What is the strength of the magnetic field?

B_i red

A loop of wire of area 0.32m² is placed in a 0.75T magnetic field as shown. The magnetic field is changed to 0.35T in the opposite direction in 0.45s.

0.35T
$= B_f$

The diagram below shows an aluminum ring and the current induced in it by the nearby magnet that is free to move along its central axis.

fingers

N created here to attract magnets

S pole, since moving away

Aluminum ring
Central axis
Magnet

The magnet must be
A. stationary.
B. moving to the left.
C. moving to the right.
D. spinning about its central axis.

yellow

What are the magnitude and direction of the current length through the 15Ω resistor?

	MAGNITUDE OF CURRENT	DIRECTION OF CURRENT
A.	0.019 A	X to Y
B.	0.019 A	Y to X
C.	0.052 A ✓	X to Y
D.	0.052 A ✓	Y to X

$V = IR$
$I = \frac{V}{R}$
$= \frac{0.78\overline{2}}{15\Omega}$
$= 0.052A$

③

Code:
7.4T — B
C — Y
D

6 characters

Code: 7.4TCD

B changed to be out of page so Lenz's says current created B into page
- thumb into page ($\vec{B}$)
→ fingers curls cw causing current y to x (I)
↑
using other rule

Last Room

YOU DID IT! AWESOME!!!

Pleox Submit copy of work on assin in Teams

Have a great summer!

All the best in your future

Desmos

[Custom] — to create new
activity

copy pages from other
activity by going to
preview click on
"▢" in upper left

"Ctrl V" into new activity
on left side where mini
screens appear

Create page in word, snip,
save as pdf, on new
Desmos page [media]
or
code: ___ ~~~ [sketch]
background
(can
write on