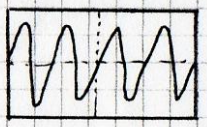
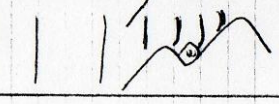
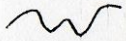
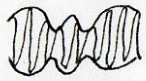
ANSWERS TO EASTER REVISION BOOKLET

TELECOMMUNICATIONS SECTION 1:

QUESTIONS	ANSWER	COMMENTS
1 a)	Light travels much much faster than sound. Speed of sound = 330m/s Speed of light = 300,000,000m/s	
b)	990m	Use $d = s \times t$ = 330 x 3 = 990m
2	TRANSMITTER	TRANSMITTER SENDS OUT THE SIGNAL.
3		FIRST PICTURE HAS TWO FULL WAVES SO DOUBLING THE FREQUENCY GIVES YOU DOUBLE THE WAVES IN THE TIME GIVEN. NB DOUBLING FREQ' IS GOING UP 1 OCTAVE
4.	Wavelength = 4m freq = 2Hz	4 complete waves = 16m 1 wave = 4m. Use $v = f\lambda$ $8 = f \times 4$ so $f = 2Hz$
5.		AERIAL TUNER DECODER AMPLIFIER SPEAKER BATTERY
6	330m.	Use $v = f\lambda$ 300,000,000 = 909000 x λ You can easily get λ = 330m Remember 909kHz = 909000 Hz.
7	BY DIFFRACTION	SW DOESN'T DIFFRACT AS MUCH.  LW more diffraction 
8	Radio waves cannot pass through metal boxes.	

Questions	ANSWER	COMMENTS
9	audio wave  carrier  transmitted signal 	
10		
11	A satellite that has a period of 24 hours. This matches the earth's rotation so the satellite is always 'seen' above the same spot on earth.	
12 a)	Thin piece of thread like glass.	
b)	 all angles are angles of reflection.	
13	TOTAL INTERNAL REFLECTION.	
SECTION 2	HEALTH PHYSICS	
1	a)	

SECTION 2 HEALTH PHYSICS. (3)

1) a) Place thermometer in mouth leave for a minute. Take out and read temp. If temp is greater or less than 37°C then patient is unwell.

b) • Scale is different Clinical 34C → 39C
Normal −10C → 110C.

• Shape

• Kink in medical one to prevent mercury going back.

2) $V = f \times \lambda$

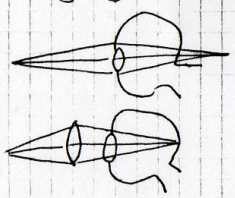
$1500 = 3{,}000{,}000 \times \lambda$

$1500 \div 3{,}000{,}000 = \lambda$: $\lambda = 0.0005m$

3) 90dB and above.

4) a) Long sightedness

b)



Cannot see things which are close up

Corrected by convex lens.

5) Convex or converging lens. $f = 1 \div P$
$= 1 \div 2.5 = 0.4m$

6) Alpha: stopped by 1cm air or thin paper.

Beta: stopped by thin foil.

Gamma: stopped by a few cms of thick lead.

7) a) The time it takes for half of the radioactive atoms to become stable

b) 400MBq $\xrightarrow{8d}$ 200MBq $\xrightarrow{8d}$ 100MBq $\xrightarrow{8d}$ 50MBq $\xrightarrow{8d}$ 25MBq

So 32 days activity is 25MBq

c) Gamma rays can be detected after passing out through body.

8) The removal of electrons from the atom.

9) The dose a person receives from radiation exposure.

SECTION 3 Using Electricity (4)

1) a) 2. live + neutral

b) Earth wire because [⧈] means double insulated ie package is made of plastic.

c) $P = V \times I$

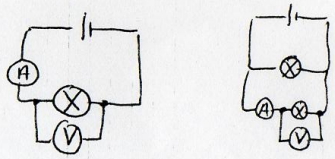
$1000 = 240 \times I$

$1000 \div 240 = I$ so $I = 4.2A$.

d) 5A fuse.

e) $Q = I \times t$; $Q = 4.2 \times (3 \times 60) = 756$ Coulo

2)

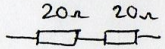


3) 0.5A

4) 6V

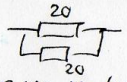
5) $P = V \times I$
$= 6 \times 0.006$
$= \underline{0.036W}$

6)



$= 40\Omega$

OR



$\frac{(20 \times 20)}{20+20} = 10$

OR use 1/x button to give 10Ω

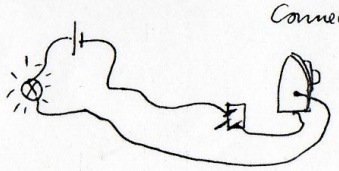
7) $P = V \times I$

$2000 = 240 \times I$; $I = 2000 \div 240$
$= \underline{8.3A}$

Now use $V = I \times R$
$240 = 8.3 \times R$ $R = 240 \div 8.3$
$= \underline{29\Omega}$

OR You could use
$P = I^2 \times R$
$2000 =$

8)



Connect circuit between metal of iron and earth pin of plug.

9) Splits the current from mains so that thinner wire can be used. Also parallel circuit.

10) $P = \frac{V^2}{R}$

$950 = \frac{230^2}{R}$

$950 \times R = 230^2$

$R = \frac{230^2}{950} = 55.7\Omega$

11) $E = P \times t$

$= 950 \times 2 \times 60$

$= 114{,}000\ J.$

12) $V = I \times R$

$12 = 2 \times R$

$12 \div 2 = R \quad R = 6\Omega$

Current would decrease if resistance is increased.

13) B = Carbon brushes, delivers current into coils.

A = Commutators, changes direction of current in coils

C = Coils.

D = Field coils, make magnetic fields.

SECTION 4 TRANSPORT

1) Average speed is the speed taken over the complete journey.
Instantaneous speed is your speed at that point in time.

2) $d = s \times t$

$60km = s \times 2\frac{1}{2}h$

$60km \div 2\frac{1}{2}h = s \qquad s = 2.4km/h$

3) a) a = change in speed ÷ time taken

= 60mph ÷ 4.5 sec

= 13.3 mph/s.

b) Change in speed = accel × time = 5 mph/s × 4 = 20mph

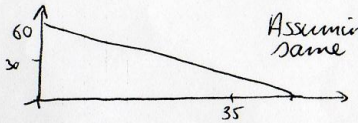
New speed = 25mph + 20mph = 45mph

4) a) deceleration $= \frac{60 - 0}{35} = 1.7 m/s^2.$

b) Area under graph $\frac{1}{2} \times 60 \times 35 = 1050m$

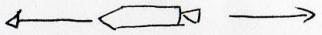
c) $F = m \times a = 20{,}000 \times 1.7 = 34\,000N$

d)



Assuming reverse thrust is the same plane will take longer to stop

5)



Thrust 5000N Resistance 5000N.

Constant speed = balanced forces.

6) Newtons I Law. Things will keep moving unless an unbalanced force acts on them.
Seat belt provides backwards force to prevent person from keeping moving.

7) Unbalanced force = 2,500N

$F = m \times a$

$2{,}500 = 1{,}000 \times a \qquad a = 2{,}500 \div 1000 = 2.5 m/s^2.$

8) Weight = mass × gravity

$= 15000 \times 10 = 150{,}000N$

9) $E_k = \frac{1}{2} \times m \times v^2 = \frac{1}{2} \times 60 \times 5^2$

$= \frac{1}{2} \times 60 \times 25 = 750\ J$

10) Work done $= F \times d = 90 \times 8 = 720\ J$

$P = E/t = 720/12 = 66W$

11) a) $E_p = m \times g \times h = 200 \times 10 \times 2.5 = 5000\,J$

b) $E_k = E_p$

$5000 = \frac{1}{2} \times m \times v^2$

$5000 = \frac{1}{2} \times 200 \times v^2$ $\quad v^2 = \frac{5000}{100} = 50$

$v = \sqrt{50} = 7.1\,m/s$

12) Minimum force = weight

$W = m \times g = 10 \times 1.66 = 16.6\,N$

SECTION 5 ELECTRONICS

1 a) Input Process Output

b) Keyboard — Microchip processor — Screen

2) C is digital ie on or off

3) Solenoid electricity → movement

electricity to light.

4) $V = I \times R$ $\quad 12 = I \times 2000$

$I = 12 \div 2000 = 0.006\,A$

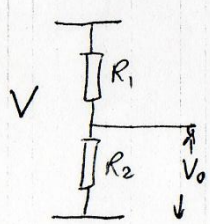
5) $V_o = \frac{18}{27} \times 12 = 8V$

$V_o = \frac{2}{10} \times 6 = 1.2V$

$V_o = \frac{20}{60} \times 6 = 2V$

$V_o = \frac{4}{12} \times 240 = 80V$

Rule is:



$V_o = \frac{R_2}{R_1 + R_2} \times V$

7) a) Voltage increases

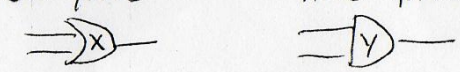
b) Transistor will switch on if voltage increases above 0.7

c) To protect transistor

8) A timing circuit

Capacitor charges up voltage rises to 0.7V transistor will come on. Closing the switch discharges the capacitor thus putting the light of

9) OR GATE AND GATE



10) a) Voltage gain = $V_{out} / V_{in} = 0.5V / 0.5mV$

$= 0.5 \div 0.5 \times 10^{-3}$

$= 1000$

b) $P = \frac{V^2}{R}$ $\quad 10 = \frac{0.5^2}{R}$

$10 \times R = 0.5^2$

$R = \frac{0.5^2}{10}$

$= 0.025\,\Omega$

ENERGY

1 a) Coal, oil and gas (fuels from dead animals)

b) Coal, oil and gas will run out.

2 Any from wind, waves, solar.

3 $2000MW \div 200kW = 2000{,}000{,}000 \div 200{,}000$

$= 20{,}000$ generators.

(9)

4. $E_P = m \times g \times h$

$= 3 \times 10^{10} \times 10 \times 200$

$= 6 \times 10^{13}$ J

So only 80% available 80% of 6×10^{13} J

$0.8 \times 6 \times 10^{13}$ J

$= \underline{4.8 \times 10^{13} \text{ J}}$

5 BOILER → STEAM TURBINE → ELECTRIC GENERATOR → CONDENSER → BOILER

6. a) To reduce the current for transmitting the electricity. Reducing current reduces power losses.

b)

	Primary		Secondary
	25kV	$\xrightarrow{\times 16}$	400kV
	4000	$\xrightarrow{\times 16}$	64,000 turns.
Current	2000	$\xrightarrow{\div 16}$	125 Amps.

7. $P = I^2 \times R$

$= 40^2 \times 400$

$= \underline{640{,}000 \text{ W}}$

8. $E = c.m.\Delta T$ $\Delta T = 100°C - 25°C$

$= 4200 \times 0.3 \times 75$

$= \underline{94{,}500 \text{ J}}$

9. $E_H = c.m.\Delta T$ $E = m \times L$

$= 4200 \times 0.5 \times 75$ + $= 0.5 \times 2.3 \times 10^6$

$= 157{,}500$ J $= 1{,}150{,}000$ J

TOTAL ENERGY $= \underline{1{,}307{,}500 \text{ J}}$

(10)

10) $E = P \times t$

$= 2000 \times 3 \times 60$

$= 360000$ J.

$E_H = c.m.\Delta T$

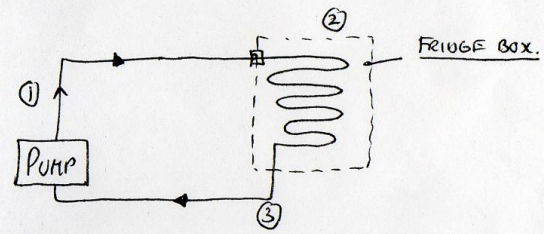
$360\,000 = 4200 \times 1 \times \Delta T$

$\frac{360\,000}{4200} = \Delta T$

$\underline{\Delta T = 85°C}$

11) Roof insulation, double glazing and cavity wall insulation

12)



① Special liquid called R7 is pumped to fridge box where it is allowed to evaporate thus taking the heat away. At ③ the gas is condensed and the heat is given up at the back of fridge; it is then pumped around again.