PHYSICS 1 2003 - NECTA FORM FOUR

Solutions from: [Maktaba by TETEA]

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i	ii	iii	Iv	v	vi	vii	viii	ix	x
E	B	A	C	C	B	D	A	D	A

2.

i	ii	iii	Iv	v	vi	vii	viii	ix	x
F	O	L	J	I	N	P	T	E	B

3.(a)(i)eleration is the rate of changing velocity

(ii)power is the rate of doing a work, or is the workdone per unit time

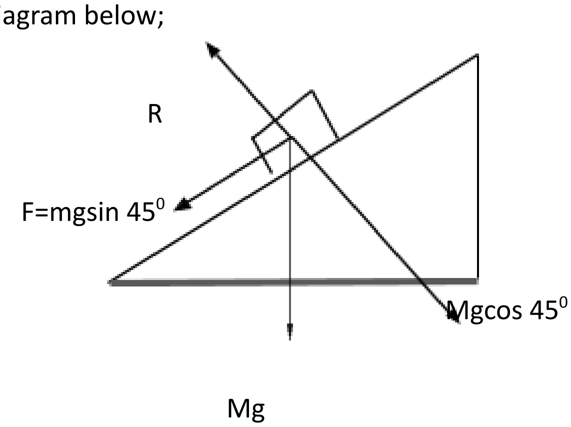
(iii)Newton is the amount of force which will produce an acceleration of $1m/s^2$ when applied on a 1 kg mass.

(b)Newtons second law of motion states that "the rate of changing omentum of the body is directly proportional to the applied force and takes place to the direction f force"

Newtons third law states that "to every action there is equal and opposite reactio"

(c) given mass =55g,inclination is 45^0

Consider the diagram below;



(i)weight, mg is resolved into:

Mgsin45^0 parallel to the slope, and

Mgcos45^0, normal to slope

Normal reaction , R =mgcos 45^0 and F=mgcos45^0

But F=ma,equating

Mgsin45^0=ma $\Rightarrow$ a=10m/s^2 x sin 45^0

a = 7.071 m/s^2

(ii)distance,S=ut +1/2at^2

Given u = 0,t =0.2s, a=7.071m/s^2

S=0 +1/2 x 7.071 x $(0.2)^2$

Distance = 0.14m

4(a)(i) the thermometer measures the temperature of boiling water (100^0C)

(ii)the liquid in the the thermometer is mercury.this is because the boiling point of ethanol 78^0C and so caanot be used to measure temperatures beyond 70^0C

(iii)ethanol will be used to measure the temperature of about -80^0C because mercury freezes at -39^0C while ethanol at -144^0C.

(b)(i)melting point of ice will be lowerd if salt is added

(ii)the volume of water increases if it changes to ice (iii)the boiling point of liquid is lowered when the pressure on the liquid is reduced.

(c)power P =50W, mass of block m= 2kg temp.change = 8K, time t= 5mins

Energy = power x time = 50W x 5 x 60

Energy = 15000J

But also energy = mct

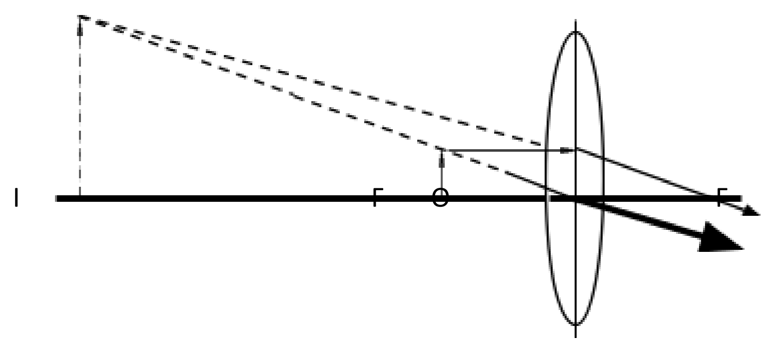
Make C the subject, C = energy/(temp. change x mass)

= 15000/(2 x 8)

Specific heat capacity is 937.5J/Kg K

5(a)(i)Use of a lens as a magnifying glass

-position of object between the principle focus and the lens



Properties o image

-virtual

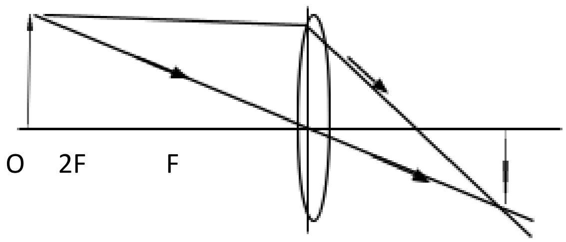
-larger than object

-on the same side as object

-upright

(ii) use of lens in camera

Convex lens, position of object beyond 2F



Properties;-

-real

-smaller than object

-between F and 2F

-inverted

(c)given

U = 6.25cm, v = 150cm

By using real is positive

I

1/f = 1/u + 1/v

1/f = 1/6.25 + 1/150

f = 6cm

at infinity 1/v =1/f so v = 6cm

then change in image distance = 6 – 6.25

= -0.25 cm beyond mirror

6(a)deffects of simple cell

(i)polarization; this is the process of forming hydrogen bubbles around the copper plates;thus preventins other hydrions from being liberated.

(ii)local action, this occurs when the cell is used upp without external current flowing.

(b)Fuse is a device used to protect an electric circuit against excess current.

(c)we should determine the maximum amount of current of adevice.

(i)given V = 250V, power = 400W

P = IV

I = 400/250

Requred is 2A

(ii)given V = 240V, power p = 7.2Kw

I = 7200/240

Required is 30A

(iii) V = 240v power = 2Kw

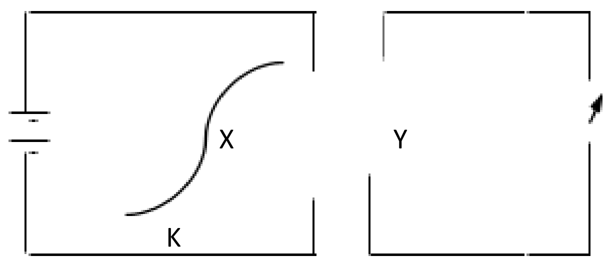
I = 2000/240

Required is 10A

7(a)High voltage is used for transmission because it minimise energy losses as heat. Since voltage is high then current will be low hence low temperature

(b)Electromagnetic induction is a phenomenon by which emf is induced in a conductor as a result of change in magnetic flux linked with the conductor.

(c)(i)



When switch K is clossed the galvanometer deflrcts and then turns to zero.

When switch K is opened the galvanometer deflects in opposite direction and returns to zero again

The deflection occurs at the point of closing and opening due to fact that at these moments the change in magnetic fluxes occur.

(ii)the galvanometer must be a centre zero type to enable reading deflections on either sides

(iii)to increase the current induced in Y, the number of turns of X should be increased.

8(a)(i)properties of X-rays;-

- They travel in straight line at velocity of light
- Can be diffracted by crystals
- They affect photographic film

- They ionize gases

(ii)properties of cathode rays

- They carry negative charge
- Travel in straight line
- They produce fluorescence
- They posses kinetic energy

(b)(i)uses of Cathode Ray Tube

- Measuring curret
- Measure small time intervals between signals
- Measure frequency of alternating currents

(ii)X-rays vs gamma rays

- ✔ X-rays are produced due to transitions of electrons while gamma rays are due to nuclear reactions.
- ✔ Tungsten in x-ray tube does not decay, while the in gamma production there is decay or fussion of materials

- ✔ X-rays are produced by stable atoms of of a material (tungsten) hit by fst moving electrons,

  while gamma rays is produced due to disintgration of unstable nucleus formed after fussion or fission.

(c)given half life $t_{1/2}$ = 2 hrs

Initial count C_1=2400/s

Final count C_2 = 300/s

Since C N, $C_1/C_2 = N_1/N_2$

But $N_2 = N_1 2^{-n}$

So,

300/2400=2^{-n}

n = 3

also n = $t/t_{1/2}$ t = 3 x 2 = 6 hrs

total time = 11:00am + 6hrs = 5:00 p.m

9(a)Impulse of force is the product of force and time for which it acts.

(i)ball A

M_A=0.3kg u_A = 4m/s, u_B = 0m/s

(i)required final velocity of A

Recall principle of energy conservation

$m_A U_A + m_B u_B = m_B v_B + m_A v_A$

so V_A = (0.3 x 4 – 0.8 x 1.8)/0.3

velocity of A will be 0.8 m/s in the opposite direction.

(ii)kinetic energy of the whole system before collision is given by

KE= ½ $m_A u_A$ + ½ $m_B U_B$

= ½ x 0.3 x 4^2 + 0

KE = 2.4J

Kinetic energy after collision

= ½ x 0.3 x 4^2 + ½ x 0.8 1.8^2

KE = 1.392J

Hence, due to loss of energy due to collision, the final KE is less than the initial KE.

10.(a)(i)Asteroid are astronomical objects objects smaller than planets which orbits the sun

(ii)stars are large heavenly bodies made up of hot gases known as plasma.

(iii)meteors are asteroids which enter the earth's atmosphere, and burn completely before reaching the earth's surface.

(b)(i)Heliocentric theory is the theory which shows that the sun is at the center of the solar system and all other bodies including the earth .

(ii)Geocentric theory is the theory that that bases on the observations and common sense to describe the universe and which states that the earth is at the centre while the sun moon and planets revolve around it.

(c)given radius, $r = 58 \times 10^6$ km

Time, $t = 88$ days $= 88 \times 24$hrs $= 2112$hrs

From lengh of path $= 2\pi r$

$= 2 \times \pi \times 58 \times 10^6$

$= 364.57142 \times 10^6$

Also since speed = distance time travelled

$== 364.57142 \times 10^6/(7 \times 2112)$

$= 1.73 \times 10^5$ km/hr

11(a)(i)A transistor is a semiconductor device used to amplify electric current and voltage and switching.

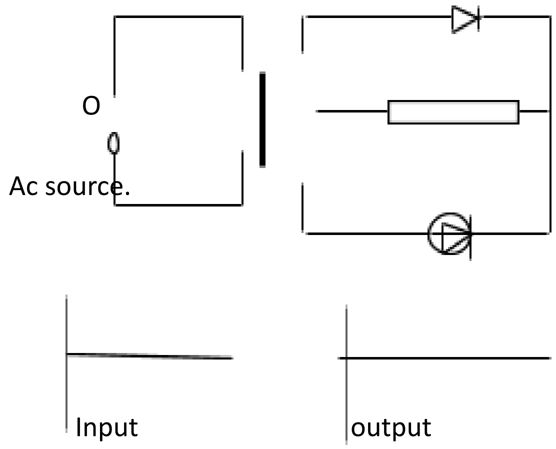
(ii)Doping is the process of adding small amount of impurities to semiconductors so as to improve conductivity.

(iii)Rectification is the process of converting an alternating cuurent to direct current.

(b)Conductor vs semiconductor vs insulator.

Conductor	**semiconductor**	**insulator**
-valence bond overlaps with conduction band	-valence and conduction bands are close to each other	-valence band and conduction band are far apart
-there is no forbidden gap	-forbidden gap is so thin	-forbidden gap is so wide

(c)diagram to show full wave rectifier using two diodes.



CENTRE-TAP FULL WAVE rectifier