PHYSICS 1 2005 - NECTA FORM FOUR

Solutions from: Maktaba by TETEA

By Yohana Lazaro

1

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

2

i	ii	iii	iv	v	vi	vii	viii	ix	x
I	D	F	N	M	E	R	O	L	G

3.(a)mass of an object does not change when the object is moved from earth to the moon,but its weight will change deu to change in force of gravity.

(b)(i)when an object is completely immersed in water two opposing forces are upthrust of water and the weight of that body.

(ii)Relative density is the ratio of weight of an object and upthrust acting on that body.

(c)Volume of object = $v_1 - v_0$

But density = mass/volume

= 85/(55- 30)

= 3.4 g/cm^3

(ii)volume of object = $v_1 - v_0$

= 25cm^3

Upthrust = weight of displaced liquid

=($v_1 - v_0$) x density x g

= (25 x 1)/1000 x 9.8

Upthrust = 0.245 N

Let apparent weight be W.

Since the apparent weight is the tension on the spring balance, then the app. Weight will act upward.

From, W = mg – U

0.085 x 9.8 – 0.245

Apparent weight will be 0.588 N.

4(a)Coefficient of linear expansivity of brass bar is 1.9 x 10^{-5}/K and that of iron is 1.2 x 10^{-5}/K

This indicates that brass will expand or contact more than ironwhen both are exposed to similar temperature changes.

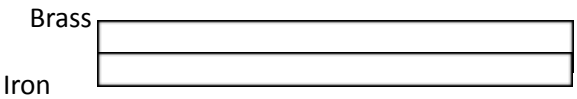
(i)initially.

-at high temperature.

Brass

Iron

(ii) Initially



-below freezing point

Brass

(b)(i) Coefficient of linear expansion of the body is the fractional change in its linear dimension per unit temperature change.

(ii) L_0 = 10 cm, α_b = 1.9 x 10^{-5}/C, α_i = 1.2 x 10^{-5}/C

Initial temperature, T_o = 20 ^{0}c

Final temperature of brass, T_b = 820^{0}c, of ion T_i = 770^{0}c

-for brass, change in length = $1.9 \times 10^{-5} \times 10 \times (820 - 20)$

$= 0.152$ cm

For iron, change in length $= 1.2 \times 10^{-5} \times 10 \times (770 - 20)$

$= 0.09$cm

Difference in length $= 0.152 - 0.09$

$= 0.062$ cm

(c) Applications of bimetallic strip

- ✔ Making thermostat
- ✔ Bimetallic thermometers
- ✔ Used in electric ion.

5(a)(i)laws of reflection;-

-the angle of reflection is equals to the angle of incident.

-the incident ray, reflected ray and the normal are in the same plane at the point f incidence.

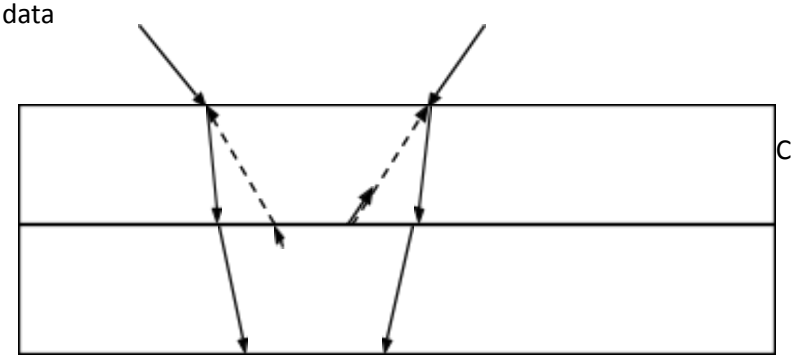
(ii)Characteristics of images formed by plane mirror;-

- Virtual
- Laterally inverted
- Same size as the object
- Distance of image from mirror equals to that of object from the mirror

(b)A swimming pool appears shallower than its actual depth because a light ray bend sas it passes from water to air. As rays of light from the bottom passs from water to air they are reflected at an angle of refraction greater than the angle of incidence.thus they appers to originate from the point higher than the where they originally came from.

(c) from the data

0.8 cm



C

1.8 cm B

1.2 cm

Case 1;

Slab C

Real depth = 0.8 cm

$M_c = 1.6$

From $\mu_c = \frac{real\ depth}{apparent\ depth}$

$1.6 = 0.8/d_c$, $d_c = 0.5$ cm

Case 2;- slab B

real depth = 1.8 cm

$\mu_B = 1.5$

then, $1.5 = 1.8/d_B$, $d_B = 1.2$ cm

Case 3; slab A

Real depth = 1.2 cm, $\mu_A = 1.4$

Then, $1.4 = 1.2/d_A$, $d_A = 0.86$ cm

Then position = total real depth – total apparent depth

= (1.2 + 1.8 + 0.8) – (0.86 + 1.2 + 0.5)

= 1.24 cm

6(a)(i)Magnetic field is a region around a magnetic material where magnetic effects can be detected.

(ii)Magnetic lines of force is a path drawn in the direction in which a north magnetic pole would move under the influence of field if it were placed at that point

(b)(i)Strength of a magnet cannot increases beyond limit because when all domains have been oriented in the same direction , no further magnetization is possible and the material is said to be saturated.

(ii)Increases in temperature results in greater atomic vibration which consequently prevents the domain from being aligned in the same direction.

7(a)(i)Ohms law states that “the current through the ohmic conductor is proportional to the potential difference across it, provided that the physical state of the conductor remains constant.

(ii)types of electric circuits;-

-open circuit

- closed circuit.

(b)R1 = 5Ω, R2 = 10 Ω, R3 = 20 Ω

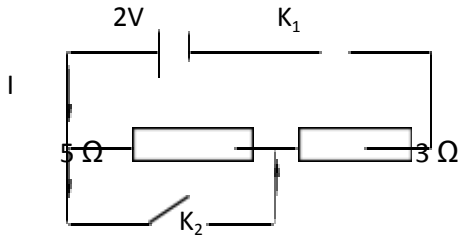
-maximum resistance is obtained when all resistors in series

= 5 + 10 + 20

= 35 Ω

- Minimum resistance is when the resistors are in parallel
- 1/R = 1/R1 + 1/R2 + 1/R3
- R = 20/7 Ω

(c)(i)When switch K_1 is closed



Current = emf/total resistance

= 2/(5 + 3)

= 0.25 Ω

(ii)When switches K_1 and K_2 are both closed 5 Ω resistors is bypassed

Current I = V/R = 2/3 = 0.67 A

(iii) When switch K_1 is open and K_2 is closed the circuit is said to e open. In open circuit NO current flows, i.e. Hence I = 0 A

8(a) $^{232}_{90}Th \longrightarrow {}^{228}_{88}Ra + {}^{4}_{2}\alpha$ (α-particle)

$^{228}_{88}Ra \longrightarrow {}^{228}_{89}Ac + {}^{0}_{-1}\beta$ (β-particle)

$^{228}_{89}Ac \longrightarrow {}^{228}_{90} + {}^{0}_{-1}\beta$ (β-particle)

$^{228}_{90}Th \longrightarrow {}^{224}_{88}Ra + {}^{4}_{2}\alpha$ (α-particle)

(b)(i) alpha particle

(ii)gamma rays

(iii) beta particle

(iv) radio waves.

(c)(i) given a sample of ^{234}Th whose half – life $t_{1/2}$ = 24 days

Initial activity $C_0 = 4 \times 10^5\ s^{-1}$, time passed t = 72hrs

$C = C_0 2^{-n}$; where C = count rate, n = number of half lives.

$n = t/t_{1/2} = 72/24 = 3$

$C = 4 \times 10^5 \times 2^{-3}$

$= 5 \times 10^4\ s^{-1}$

(ii)Safety precautions to be taken;-

-the sample must be stored in the lead casing

-the package should be labeled appropriately so that it should be handled carefully.

9(a)(i)the principle of moments states that "if the body is in equilibrium, sum of clockwise moments equals to total anticlockwise moments about any point of action.

(ii)pascals principle of pressure state that "when the pressure is applied to the enclosed fluid it is distributed equally throughout the container"

(iii)-hydraulic jack,

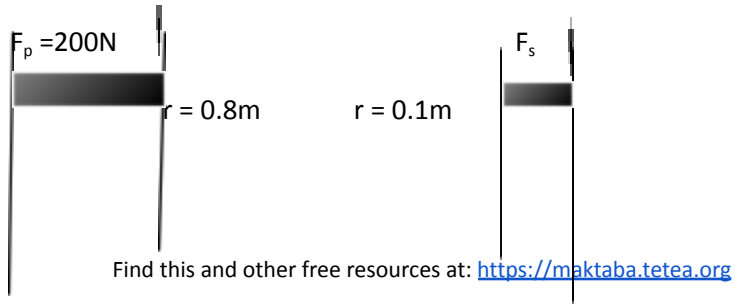
-hydraulic press

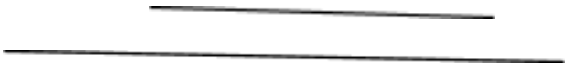
-car brake system

(b)(i) Given R = 0.8 m

Plunger radius r = 0.1m

Force on plunger = 200N





Area of the plunger $A_p = \pi r^2$

$= 3.14 \times 0.1^2 = 0.031\ m^2$

$P = F_p/A_p$

$= 200/0.031$

$= 6451.61\ N/m^2$

Force on the piston $= 6451.61 \times 3.14\ 0.8^2$

$= 12976.95\ N$

(ii) consider the volume transferred

Volume, $V = Ah$

So, $A_p h_p = A_s h_s$

So, $h_s = A_p h_p / A_s$

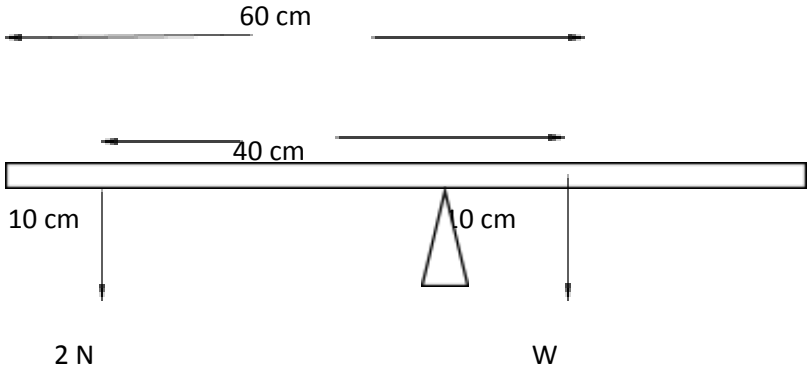
$= (0.1^2/0.8^2) \times 0.64$

$= 0.01\ m$

(c)let weight be W

Distance $d_1 = 10$ cm

Second weight = 2 N



$40 \times 2 = 10 \times W$

W = (40 x 2)/10

= 8 N

10(a)(i) Average temperature of the planets decrease with increasing distance of the planet from the sun.

(ii) Variation of average densities of the planets,

(iii) period of revolution of planets around the sun increases with increasing distance of the planets from the sun.

(b) (i)An astronaut in space needs special suit to prevent blood from boiling because air pressure in space is nearly zero, such that body temperature is enough to boil the blood.

(ii) An astronaut in space can float without falling because gravitation force is almost zero in the outer space.

(iii) An astronaut cannot swim in space because there is no matter to be pushed against so that he can get the reaction to move forward. This is due to Newton's third law of motion.

(c)(i) distance = radius , R = 7.80×10^8 km

Time = 12 yrs

Assume orbit is circular,

Distance of its path = $2\pi R$

$= 2 \times 3.14 \times 7.80 \times 10^5$

$= 4.903 \times 10^9$ km

(ii)speed = distance/time

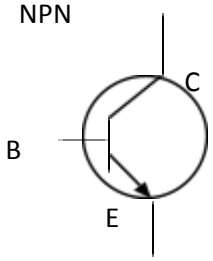
$= 4.903 \times 10^9 / 1 \times 12 \times 365 \times 24$

$= 46.6 \times 10^3$ km/hr

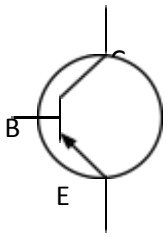
11.(a)

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

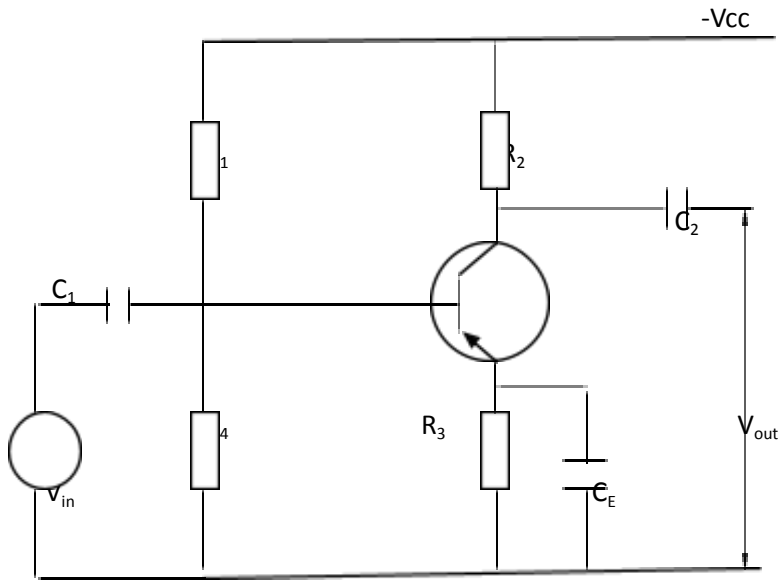
(b) NPN



PNP



(c) diagram of PNP stabilized common emitter amplifier circuit.



Resistors R_1 and R_4 are potential dividers

Resistor R_3 is temperature stabilizer.