PHYSICS 1 2014 - NECTA FORM FOUR

Solutions from: [Maktaba by TETEA](https://maktaba.tetea.org)

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1.

i	Ii	iii	iv	v	vi	vii	viii	ix	x
B	E	D	C	A	1	C	C	D	0.08

2.

i	Ii	iii	iv	v	vi	vii	viii	ix	x
M	J	A	I	H	E	G	C	B	L

3.

i. GOLD-LEAF ELECTROSCOPE
ii. SYPHON
iii. ELECTRIC MOTOR
iv. URANIUM
v. ABERRATION
vi. GALAXY
vii. MAGMA
viii. A TRIVALENT ATOM LIKE BORON
ix. A CLOSED ELECTRIC CIRCUIT
x. TEMPERATURE

4. (a) applications of impact and momentum

- Firing rifles
- Landing with a parachute
- Kicking a ball

(b)Elastic collision is the collision on which both kinetic energy and momentum are conserved.

-Inelastic collision is the collision in which only momentum is conserved.

Resultant force = 700 – 500 = 200N

Acceleration = resultant force/mass

= 200/50

= $4m/s^2$

(c) (i) Newton's second law of motion states that ''the rate of changing momentum of the body is directly proportional to the applied force in the direction of that force"

(ii) Recall that force = ma

=momentum change /time taken

=(50 x 40) + (-50 x 0)/1second

Force = 0.02 N

-***assumptions; -***

-initial velocity of sand on belt equals to zero

-no slipping of sand granules

5. (a) (i) Resonance is a phenomenon whereby one system is set to oscillation as a result of impulses received from another system which is vibrating at the former system natural frequency.

(ii) Overtones are sounds of frequencies higher than the fundamental frequency which produce by a musical instrument alongside the fundamental note.

(b) (i)because of; -

- Air temperature
- Expansion or contraction of wire due to temperature changes.

(ii)Sound is different due to ; -

- Overtones produced by flute are different from those produced by the violin.

(c) let, $f_1 = \frac{1}{2L1}\sqrt{\frac{T1}{M1}}$

$F_2 = \frac{1}{2L2}\sqrt{\frac{T2}{M2}}$

As the strings have the same length, $L_1 = L_2$ AND $M_1 = M_2$

So, $f_1 / f_2 = \sqrt{\frac{T1}{T2}}$

$$\frac{400}{f_2} = \sqrt{\frac{2}{8}}$$

$F_2 = 800$ Hz

(ii)From above,

$f_1 / f_2 = \sqrt{\frac{T1}{T2}}$

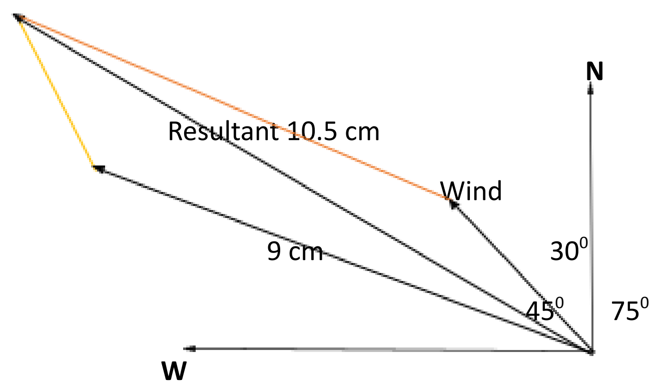
T = (2 x 9)/4

T = 4.5 N

6. (a)***parallelogram law states that*** "if two vectors are represented in magnitude and direction by adjacent sides of a parallelogram such that they all begin from the same point then their resultant is represented in magnitude and direction by diagonal of the parallelogram beginning at the origin"

(b) Absolute velocity is the velocity of a body as observed by a stationary observer.

Relative velocity is the velocity of a body as measured or observed by a moving observer.



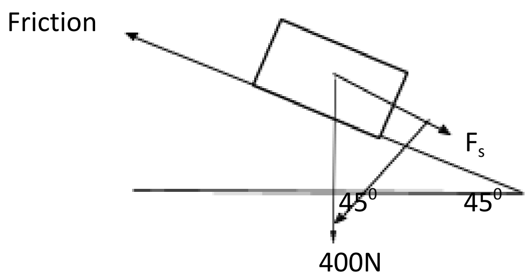
Scale; 1 cm = 10 km/h

From then graph, velocity of bird = 105 km/h

Direction of bird = 67^0 west of north.

(c) (i) Coefficient of dynamic friction is the frictional force per unit normal force experienced by a body moving on surface.

(ii) consider the free body diagram below



For a body at equilibrium, friction = F_s

$F_s = 400\sin45^0$

Friction = 282.8N

Normal reaction = 400cos45

= 282.8N

7. (a) (i)Refraction of light is the change in speed and direction of light when it passes from one medium to another of different density.

(ii) points to consider;-

- A ray of light parallel to the principle axis is reflected through the principle focus.
- A ray of light through the principle focus is reflected parallel to the principle axis.
- A ray of light through the center of curvature is reflected through its own path.

(b) (i) Mirage

Refractive index = real image '/ apparent image

4/3 = 16/app. Height

Apparent height = 12 cm

(c) (i)refractive index = velocity of light in vacuum/velocity of light in medium

Hence, relative velocity of light in paraffin is lower than that in water.

(ii) since paraffin has larger density than water, therefore as light travels from water to paraffin it bends towards the normal.

8. (a)(i) Radioactivity decay is the disintegration of an atom's nucleus by emission of alpha,beta and gamma radiations.

(ii)Beta particles are equivalent to an electron.

(b)(i)An isotope is atoms that has the same atomic number but having different mass number.

(ii) recall that, $^{14}_{6}C$

Nucleus charge = protons x charge of proton

= 6 x 1.602 x 10^{-19}C

= 9.612 x 10^{-19} C

(c) (i) –by measuring the relative density of the acid using a bulb hydrometer

- by measuring the emf of the battery

-by measuring the current delivered by the battery

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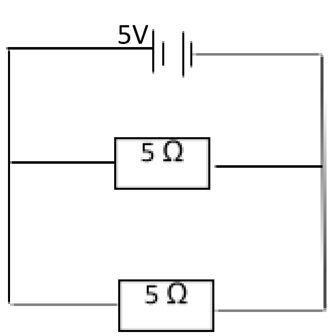

Since $I = V/R$

For parallel connection, $R = (R_1R_2)/(R_1 + R_2) = 25/10 = 2.5\ \Omega$

$I = 5/2.5$

$= 2A$

Storage capacity = I x time

= 2 x 20

= 40A hours

9. (a) (i)Volcano is a rupture on the earth crust that allows molten rocks, volcanic ash and gas to escape from the earth's interior.

(ii)No renewable energy sources of energy are energy sources that once used they cannot b replenished gain.

(b)(i)merits of volcanoes

- They lead to formation of islands and mountains.
- They are add nutrients to soil
- They contributes to soil formation.

Demerits of volcano

- Leads to environment pollution.
- Leads to destroy properties and vegetation
- Leads to loss of life.

(ii)Hazards of earthquakes

- Leads to landslides and avalanches
- Leads to tsunami that leads to floods.
- Leads to gross destruction of infrastructures and properties.

(c)(i) Disadvantages of non-sustainable energy;-

- Leads to environmental pollution
- Leads to locking of nutrients and elements in their waste products.
- Leads to imbalance in an ecosystem

(ii)Applications of energy generated from water

- Production of electricity
- Driving machines used in industries
- Cooling machines in factories.

10. (a) (i)Saturation current is the maximum current obtained at the output of a transistor.

(ii)Peculiar property of a diode as a rectifier is to allow the current to flow in only one direction.

(c)(i)To produce a bright trace on the CRT;

Increase the current of the heater .This increases the number of electrons in a cathode ray.

(ii)To produce vertical line,

-An alternating p.d is applied on the y-plates and a constant p.d on the x-plates.

(iii)To produce a wave-pattern

-An alternating p.d of a specific frequency is applied on the y-plates and the DC voltage

Of frequency higher than that of specific is applied on the x-plates.

(iv) Horizontal line is produced by applying an a.c voltage of a certain frequency across x-plates.

11. (a)(i) When a solid is heated, its atoms vibrate faster about their fixed points. ... Heat causes the molecules to move faster, (heat energy is converted to kinetic energy) which means that the volume of a gas increases more than the volume of a solid or liquid.

(ii) Ball and ring experiment.

(b)(i) Thermostat works on the principle of thermal expansion of solid materials. A traditional thermostat has two pieces of different metals bolted together to form what's called a bimetallic strip (or bimetal strip). The strip works as a bridge in an electrical circuit connected to your heating system

(ii) Bimetal thermometers work on the principle that different metals expand at different rates as they are heated. By using two strips of different metals in a thermometer, the movement of the strips correlates to temperature and can be indicated along a scale.

(c) (i)An inductor coil is a device consisting of two coils –one with many turns and another with few wound around a soft iron core which is used to generate a spark by electromagnetic induction.

(ii)*Working principle of induction coil*

-When the current in the primary coil changes by turning the switch **K** off, by Lenz's law, emf is induced in the secondary coil. This emf is larger than the primary emf because the secondary coil has more turns. The high value of this emf causes a spark to jump across the gap.

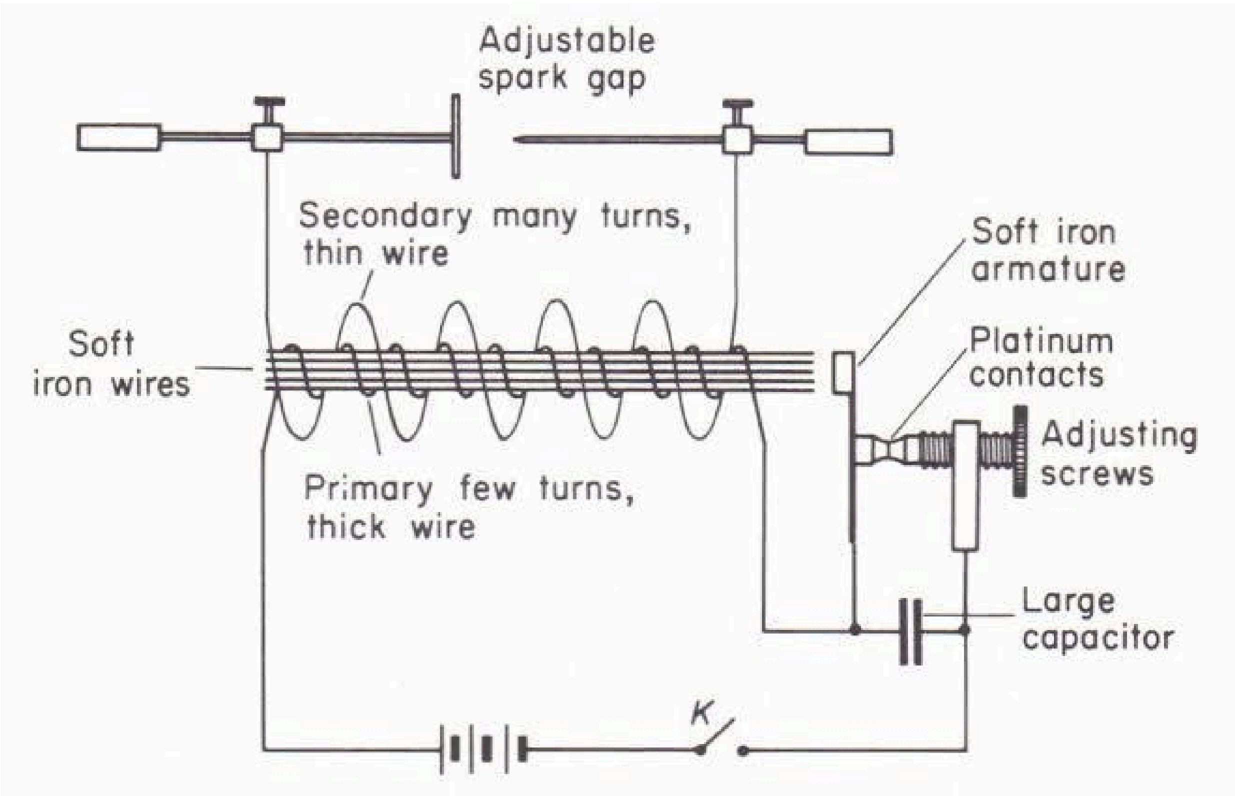

Fig. 43.13. Induction (spark) coil