PHYSICS 1 1997 - NECTA FORM FOUR

Solutions from: Maktaba by TETEA

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1.

i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii	xiii	xiv	xv
C	A	B	D	B	A	D	D	C	C	A	B	A	C	D

2.(a) -Mass is a measure of the amount of matter in an object.

-Inertia is the resistance of a physical object to any change in its state of motion.

-Impulse is a term that quantifies the overall effect of a force acting over time. ... When we calculate impulse, we are multiplying force by time.

(b)For bullet, from F = mass x acceleration

= mass x v/t, v= F x t/mass

V= (30 x 2)/0.25

Velocity of bullet is 240 m/s

For gun, from conservation of linear momentum,

(0.25 x 240)= (5 x v)

Velocity of gun is 12 m/s

3.(a)

Take a round bottomed flask and fill it with coloured water up to the brim.

Close the flask with a single-holed rubber stopper.

Insert a capillary tube into the flask such that some water from the flask gets into the capillary tube and reaches a certain level.

Heat the flask over a burner.

Observe the level of water in the capillary tube.

As the flask is heated, the water expands, and the level of water in the capillary tube rises.

This is due to the thermal expansion of water.

Again, Take a round bottomed flask and fill it with petrole up to the brim.

Close the flask with a single-holed rubber stopper.

Insert a capillary tube into the flask such that petrol from the flask gets into the capillary tube and reaches a certain level.

Heat the flask over a burner.

Observe the level of petrol in the capillary tube.

As the flask is heated, the petrolr expands, and the level of petrol in the capillary tube rises differently from that of water.

This is due to the thermal expansion of petrol.

(b)Apparent volume expansivity = (6.0 - 6.1) x 10-5

= 0.1 x 10-5

4.(a)-Resistance is a measure of the opposition to current flow in an electrical circuit.

-Electrical conductance, G, is the reciprocal of resistance (R)

-Ampere isthe SI unit of current.

(b)For parallel connection, effective emf = 1.5V, effective internal resistance = (1 x 1)/(1+1)=

r = 1/2.

Then, emf = I (R + r)

1.5 = I(10 + 1/2)

Current is 0.143 ohms.

Also, from power loss = I^2R, = $(0.143)^2$ x 10

Power is 0.2 Watts.

5.(a)When one element changes into another in this manner, it undergoes radioactive decay. Nuclear reactions involve a change in an atom's nucleus, usually producing a different element. Chemical reactions, on the other hand, involve only a rearrangement of electrons and do not involve changes in the nuclei.

(b) Alpha particles carry a positive charge, beta particles carry a negative charge, and gamma rays are neutral. An alpha particle is made up of two protons and two neutrons bound together. Beta particles are high energy electrons. Gamma rays are waves of electromagnetic energy, or photons.

6.(a)-An electrochemical equivalent (ECE) is the amount of a substance in grams produced or consumed by the passage of one coulomb of electricity in an electrochemical reaction.

-cathode is the electrode from which a conventional current leaves a polarized electrical device.

-An anode is an electrode through which the conventional current enters into a polarized electrical device.

(b)from, mass= ZIt, time, t = mass/(Zx I)

t = 0.99/(0.0003 x 3)

Time is 1100 seconds

7.(a)mechanical energy and electric energy can be converted by the motor.

(b)PE = mgh= (1000 x 20000) x 9.81 x 45

Potential energy is 8.829 GJ

From the principal of conservation of energy, the Kinetic energy will be equals to the Potential energy.

8.(a)Exposure time is controlled in a camera by shutter speed, and the illuminance depends on the lens aperture and the scene luminance.

(b)two meters away from the initial position of the camera must be moved.

9. (a)Characteristics of sound. The three characteristics of sound are

(i) Loudness,

(ii) Pitch

(iii) Quality or timbre.

(b)First Frequency, fi = 560Hz

First Column length, Li = 15cm = 0.15m First Wave length of sound in air, λl = ? Second Frequency, f2 = 1000Hz

Shortest length, 12 = ?

Solution

First: find Wave length of sound in air, λ = ?

From: L = 3λ/4

Al = 41/3 = (4 x 0.15)/3 = 0.12m

= 0.12m

Second: find Shortest length, 12 = ? Note: sound will travel in same speed

From: v = λ1f1 = 560 x 0.12 = 67.2m/s Then: A2 = V/f2 = 67.2/1000 = 0.0672m From: L2 = 3λ2/4 = (3 x 0.0672)/4 = 0.0504

L2 = 0.0504m

10.(a)conductivity is the measure of how easily electricity flows, electrical resistivity measures how much a material resists the flow of electricity.

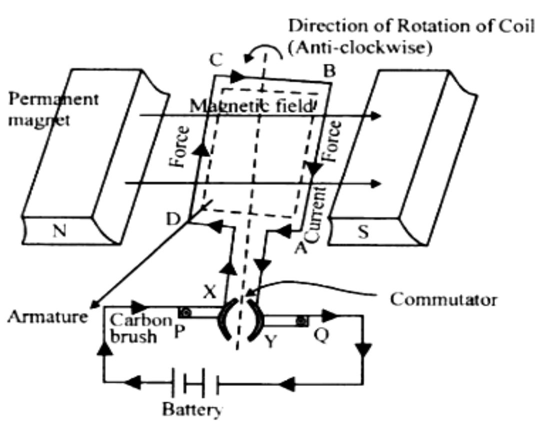
(b)Because wire A has half the length,and twice the diameter of wire B. For wire A, R

A =R=ρL/A. For wire B, R

B =ρ(2L)/(4A)=(1/2)ρL/A=R/2

Hence ratio is 1/8

11.(a)Simple DC motor diagram,



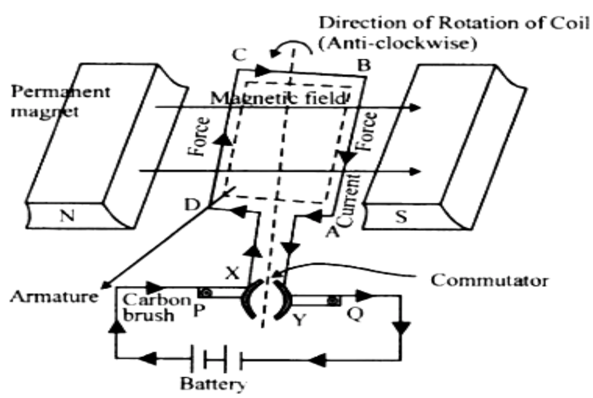
https://www.sarthaks.com/273960/a-draw-a-neat-and-labelled-diagram-of-a-d-c-motor-and-explain-its-construction-and-working

(b)Any coil carrying current can feel a force in a magnetic field. This force is the Lorentz force on the moving charges in the conductor. The force on opposite sides of the coil will be in opposite directions because the charges are moving in opposite directions. This means the coil will rotate.

(c)The supply to the motor is DC, but the electromagnets inside are supplied with alternating current from the commutator. The commutator is a switch (mechanical or electronic) that uses the armature angle to determine which coils to energize and with what polarity. It thus causes the energized electromagnets of the armature to be attracted to the field poles while they approach and to be repelled as they depart.

12(a)They are deflected by the magnetic and electric fields - which means they carry an electric charge.

(b)Cathode Ray oscilloscope.



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