PHYSICS 1 2018 - NECTA FORM FOUR

Solutions from:

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1.

i	ii	iii	lv	v	Vi	vii	viii	ix	x
A	B	D	E	B	E	A	C	C	A

2.

i	ii	iii	lv	v	Vi	vii	viii	ix	x
L	B	A	D	E	F	H	I	J	M

3. (i) Velocity ratio

(ii) Heat capacity

(iii) 1 joule

(iv) Diode

(v) Fusion

(vi) Dynamo

(vii) Inelastic collision

(viii) Neutrons

(ix) Transverse waves

(x) Earth

4. (a) A hydrometer is weighted with lead shots in order to make it sink partially in a liquid.

i)A hydrometer has a narrow stem to make it sensitive to changes in density of a liquid.

ii)When an object floats in a fluid it displaces a fluid of mass equal to its own (law of floatation).

(b)(i) Mass of rubber = mass of water displaced

0.45 x 100= Vol. of rubber in water x density of water

45 = Vol Rubber x 1 g/cm^3

Volume of rubber in water = 45cm^3

(ii)Let Force required to immerse the rubber completely = F.

Fm= Weight of water that will be displaced when rubber is pushed to sink.

Fm=Volume of rubber x density of water x g above water

Volume of rubber=Volume of rubber - 45 cm^3 above water

100cm^3 - 45cm^3

volume = 55cm^3

Then, force = mass x acceleration

= 55 x 1/1000 x 10

= 0.55 N

5.(a) Factors affecting evaporation includes;

-temperature

-surface area

-humidity

-rate of air flow

(b)(i) Relative humidity is the ratio of the amount of water vapor present in a mass of air to the amount of water vapor required to saturate the same mass of air.

(ii)from, relative humidity = SVP at few point÷ SVT at air temperature.

= 24 - 16 = 8^0 C

(c)When the temperature of a liquid is increased, more liquid molecules gain kinetic energy and escape from the surface.

This causes vapor pressure increases until a point where it equals the ambient pressure. At this temperature the liquid boils.

6.(a)(i) Audibility range is the range of frequencies of sound waves which can

be heard/detected by the human ear.

The audibility range is between 20Hz and 20000Hz.

(i) Ultrasonic sound is sound of a frequency higher than the highest frequency

in the audibility range (20 000 Hz).

Ultrasonic sound cannot be heard by the human ear.

   (b)It is because the wavelengths of overtones produced by the two instruments.

6.(c) given

   Length of string, L = 75cm = 0.75m

   Mass of string, M = 8.2g = 0.0082kg

   Tension of string, T = 18N

   1st harmonic, f_1 =?

   3rd harmonic, f_3 =?

   Solution

   From: fn = fn=n1/2l√LT/m

   1st harmonic, fi = ?

   fn=1x1/20.75√0.75x18/0.0082 =27

   fi = 27Hz

   3rd harmonic, f_3 = ?

   fn=3x1/20.75√0.75x18/0.0082 =81

   f_3 = 81Hz

7.(a)(i) Radioactive decay is the disintegration of an atom by loss of sub atomic particles such as protons and neutrons as well as electromagnetic waves.

(ii)

(c). GM tube is a hollow cylinder filled with a gas at low pressure. The tube has a thin window made of mica at one end. There is a central electrode inside the GM tube. A high voltage supply is connected across the casing of the tube and the central electrode as shown in the following diagram. When alpha, beta or gamma radiation enters the tube it produces ions in the gas. The ions created in the gas enable the tube to conduct. A current is produced in the tube for a short time. The current produces a voltage pulse. Each voltage pulse corresponds to one ionizing radiation entering the GM tube. The voltage pulse is amplified and counted.

The greater the level of radiation, the more ionisation in the tube so the greater the number of counts.

The GM tube counting the number of ionizations may not provide a completely accurate reading, as the number of counts will simply keep increasing.The number of disintegrations cannot be determined easily in practical work, but the count of radioactive particles detected by a Geiger Muller counter is a useful approximation at this level, and can give an indication of the rate of change of activity.

8.(a)Examples which show rectilinear propagation of light.

Ray box: When a ray box is placed on a sheet of paper and switched on straight beams of light will be seen through its slits. Shadow edges: When light from one source is blocked by a small object, a shadow is formed. The sharp edges of a shadow show that light travels a in straight line.

Cardboard experiment: When three similar cardboards with holes in identical locations are placed in front of a lamp, you can see a beam of light through the holes only if the cardboards holes are aligned.

(b)(i) from Snell's law, sn i÷sin r = refractive index.

But r = 90° and I = critical angle,C

Then, 3/4 = sin C÷ sin 90°

C = 49.59°

(ii)Primary -It is formed from light that has undergone one total internal reflection in water droplets.

Secondary -It is formed by light that has undergone two total internal reflection in water droplets.

Primary -Red colour is on the outside of the bow.

secondary -Violet colour is on the out side of the bow.

primary -Violet colour is on the inside of the bow.

secondary -Red colour is on the inside of the bow

(c)

V- Violet

B - Indigo

C - Blue

D - Green

E - Yellow

F - Orange

G - Read

9.(a) (i) Astronomy is the study of the origin, composition and motion of bodies in outer space.

(ii) Importance of Astronomy:

-Measurement of time and development of calendars.

-Navigation in high seas uses knowledge of astronomy.

-Space exploration uses the knowledge astronomy.

b) i) differences between planet and galaxy

a galaxy is a giant collection of billions of stars and bodies which revolve around the sun, while a planet is a large spherical object which revolves around a star and which has cleared its neighborhood by force of gravity.

ii) characteristics of a planet;

-must orbit the sun

-attains spherical shape due to gravity and size

-must have cleared its neighbors due to gravity

(c)Importance of the stratosphere to living things on the earths surface.

-It contains ozone which absorbs harmful radiations from outer space.

-It has air which supports life and other processes on earth Aeroplanes fly in this layer.

10.(a)

(i)Maxwells Cork Screw rule: Imagine a right handed cork screw with its axis

coincident with the current carrying wire. Now rotate the screw to advance it in the direction of the current, the direction in which the thumb rotates gives the direction of the magnetic field lines

(ii) Flemings Right-hand Rule (for generators) shows the direction of induced current when a conductor attached to a circuit moves in a magnetic field. It can be used to determine the direction of current in a generators windings.

b) (i)Structural difference between an ac and dc generators is that an ac generator uses slip rings while a dc generator uses commutators.

(ii) Induction coil is used in the generation of a spark that ignites fuel in a petrol engine .

(c)From power conservation,

Power on the left = Power on the Right

But, Power= IV

I = 24÷ 12 = 2A

11.(a) (i) Thermal expansion is the change in length, area or volume of a body due to change in temperature.

(ii) Application of thermal expansion;

-in railway rails to allow for free expansion

-spaces are left in steel roofs and bridges to allow for expansion

-in laying concrete slabs spaces are left to allow expansion

-telephone and electric wires are left sagging for easy expansion.

(b)(i)   Application of bimetallic strip

used in thermostats to regulate temperature

used in bimetallic thermometers

(ii)A bimetallic strip made of brass and invar curve outside with brass when heated because brass has a greater coefficient of linear expansivity than invar.

(c) A simple fire alarm consists of an electric bell, a bimetallic strip and a battery connected to an open circuit.
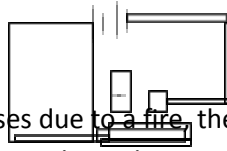
When the temperature rises due to a fire, the bimetalic strip gets heated and bends towards points A. When it touches point A, it completes the circuit and electricity flows in the electric bell when this happens the bell rings.