PHYSICS 1 2009 - NECTA FORM FOUR

Solutions from: Maktaba by TETEA

By Yohana Lazaro

1

i	ii	iii	iv	v	vi	vii	viii	ix	x
D	D	C	C	A	A	D	E	C	*No answer*

2

i	ii	iii	iv	v	vi	vii	viii	ix	x
P	G	Q	J	K	F	H	N	D	A

3. (a)(i)Force is anything that that can make a stationary body to move, or a body in motion to change its motion.

(ii)pressure is the force acting normally per unit area.

(b)(i)A force is the weight that is exerted by the earth on a body in the earths gravitational field.

(ii)Force = m x a

300 = 1200 x a

Acceleration = 0.25 m/s

Also from, v = u + at

0 = u + (-0.25) x a, u = 20 m/s

Speed of the car was 20 m/s

(c)(i) smallest area = 0.3 x 0.5 = 0.15 m^2

Volume of log = 0.15 x 6 = 0.9 m^3

Mass of log = 200 x 0.9 = 180 kg

Weigght of the log = 180 x 10 = 1800 N

Then, pressure = force/ area

= 1800/0.15

$$= 12000 \text{ N/m}^2$$

Maximum pressure is exerted at smaller area = 12000 N/m^2

(ii)minimum pressure is at large area

$$= 1800/(0.5 \times 6)$$

$$= 600 \text{ N/m}^2$$

4.(a)(i)when the temperature of solids increased, they expand hence increases their volume, hence decreases density from density = mass/volume

(ii)Latent heat of fusion and vaporization are hidden because a substance undergoing fusion of vaporization absorbs energy that increases the kinetic energy of its molecules without changing btheir temperature.

(b)(i) Temperature vs quantity of heat

- Temprature is the measure of degree of coldness or hotness of the body, while quantity of heat is the energy contained by atoms of the substance.
- Temperature does not depend on the heat of the substance while quantity of heat depends on the quantity of substance present.
- Temperature can be measured directly by using thermometer while quantity of a heat cannot be measured directly.

(ii)Clinical thermometer is used to measure the human body temperature.

(c) since the scale is linear, then

If   4 cm ~20^{0}c – 0^{0}c ~20^{0}c then,

? ~100^{0}c – 0^{0}c ~100^{0}c

4 cm ~20^{0}c

Then, 100^{0}c = (4/20) x 100

$$= 20 \text{ cm}$$

The distance between 0^{0}c and 100^{0}c is 20 cm.

5. (a)A spectrum of light is a range of radiations that constitute light.

Dispersion of light is the sreading og light to its component radiations when a beam of white light is passed through a prism or diffraction graring.

Angle of deviation is the angle formed by the intersrction of the incident ray and the emergent ray in a prism.

(b)Additive theory of light is deals with mixing of coloured light while subtractive theory of light is deals with mixing colour pigments like paints.

(ii)Primary colours *red,green and blue lights are colours from which all other colours can be generated

Complementary colours are any two colours of light which add together to produce white light.example: mageta and green ;yellow and blue; cyan and red.

(c) magnification, m= v/u = 4

       V = 4u

       Also f = 25 cm

      But 1/v + 1/u = 1/f but v = 4u, substiting

   1/4u + 1/u = 1/25

  U = 31.25 cm

  Object distance is 31.25 cm.

6. (a)(i)Heating ; raising the temperature of the semiconductor increases the energy of its electrons such that they can cross the forbidden gap.

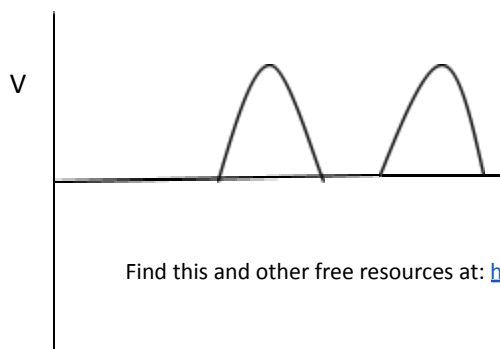Doping; Adding impurities to a semiconductor increases the number of free electrons.

(ii)Charge carriers in p-type doped semiconductorare **holes**

(b)(i)A potential difference develops between the heated and the cool ends of the semiconductor.

(ii)The colder end will be negative.

(c)(i)It allows current to flow in one direction only.

(ii) The current is a half wave rectifier.

V

The output voltage is half-rectified because one diode allows current t flow during the first half of the cycle when it is forward biased, but it stops the current during the second half as it acts as reverse biased.

7. (a)(i)A transformer is a device that is used to transform the voltage to a higher or lower value through a phenomenon of mutual inductance.

(ii)Because only alternating current has ability of inducing emf to another circuit through mutual inductance.

(b) Ways by which power is lost in transformer; -

☐ As heat in the coils of transformer

☐ Due to eddy currents as the opposes the current in the transformer

☐ Due to hysteresis losses.

☐ Sound generated as a result of the vibrations in the transformer.

(c)(i)$\frac{primary\ voltage}{secndary\ voltage} = \frac{primary\ turns}{secndary\ turns}$

$$\frac{240}{12} = \frac{1000}{secondary\ turns}$$

Secondary turns are 50 turns

(ii)Efficiency = power output/power input x 100%

Energy input = $I_{input}\ V_{input}$

= 125/100 x 240 = 30 W

Energy output = 24 W

Efficiency = 24/30 x 100%

= 80%

8. (a)(i)Radioactivity is the spontaneous emission of high energy electromagnetic radiations and particles by unstable nuclei as they tend to attain their stability.

(ii)Mass number is the total number of protons and neutrons in the nucleus of an atom.

(b)(i)B represents beta particles

C represents gamma rays

D represents alpha particles

A represent a battery

E represents radioactive material

(ii)E is uranium

(iii)differences between B and D

B	D
Negatively charged	-positively charged
-has straight path	-have non-straight path
-they have mass of electron	-they are heavier than beta particles
-they penetrate more	-they are less penetrating

(c)(i) consider the equation below,

$$^{239}_{92}M \longrightarrow ^{x}_{y}N + ^{0}_{-1}\beta$$

Comparing upper and lower scripts,

239 = x + 0, x =239

92 = y − 1, y = 93

(ii)The number of protons in N is 93

(iii) Mass number of M = N = 239

9. (a)Law of flotation states that "A *floating body displaces its own weight of the liquid in which it floats*"

(b)(i)mass of cork = density x volume

= 0.25 x 100

= 25g

From law of flotation, mass of displaced water = mass of cork = 25g

But, volume of displaced water = mass displaced water/density of water

= 25/1

= 25 cm^3

Since, volume of displace water = volume of cork in water

Hence, volume of cork immersed in water = 25 cm^3

(ii)volume of cork remained above water = total volume – immersed volume

= 100 – 25

= 75 cm^3

Weight = volume/density x g

= 75/1 x 0.01 N

Weight = 0.75 N

Hence the force required to immerse whole cork is 0.75 N

(c)Let volume of iceberg be V

Mass of iceberg = density x volume

= 0.9 x V = 0.9V

From law of flotation, mass of water = mass of iceberg = 0.9V

But volume of water displaced = mass/density = 0.9/1 = 0.9 = volume of iceberg in water

Hence, fractional volume of iceberg in water = 9/10

(d)(i)Energy is the ability to do work.

(ii) Potential energy of the ball as it is dropped = mgh

$$= 0.2 \times 10 \times 20 = 40J$$

Energy after hitting = 40 – 30

$$= 10 \ J$$

Then new height = 10/2 = 5 m

The height of the ball reaches on rebound is 5m

10. (i)A transistor is a semiconductor device used to amplify or switch electronic circuits.

(ii) Three ways of connecting transistors to form amplifier circuit

-

-

11. (i)Thermionic emission is a phenomenon of metals to emit electrons when they are heated by an electric current.

(ii)X-rays are high frequency electromagnetic waves produced when fast-moving electrons hit a metal target.

(iii)Uses of X-rays

☐ Used to produce images of very small objects

☐ Used in airports for non-invasive security searches.

☐ Used in study of arrangement of atoms in solids

☐ Used in hospitals to detect abnormalities in internal structures of the human body such as broken bone.

(b)*Production of X-rays in X-ray tube*

-

(c)Three main parts of the *Cathode Ray Oscilloscope,*

-Electron gun

-Deflection system

-Fluorescent screen.