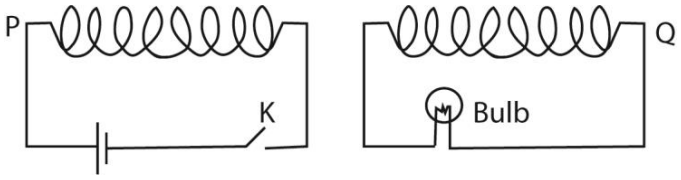
UCE physics 2010 paper 1

1. In a solar system, black layers are used because they are
   A. Bad emitter of heat
   B. Bad absorber of heat
   C. Good absorber of heat
   D. None of the above
   Answer is C
   Black layers are good absorber of heat, and good emitter of heat. So they are good for absorbing heat
2. Which of the following affects the frequency of a vibrating string?
   A. Tension and length
   B. Length and mass of the string
   C. Mass per length of the string and temperature
   D. Tension and velocity of sound produced
   Answer is A
3. Which of the following are second class levers?
   (i) Sew sow
   (ii) Wheel barrow
   (iii) Pair of tongs
   (iv) Nut cracker
   A. (i) and (ii) only B. (ii) and (iii) only C. (iii) and (iv) only D. (ii) and (iv) only
   Answer is D
   1st class lever has a pivot between the load and effort e.g. see saw
   2nd class lever has a load located between the pivot and effort e.g. wheel barrow
   3rd class lever has the effort between the fulcrum and the load e.g. fore arm
4. The energy changes that occur in a loud speaker is
   A. Electrical to sound
   B. Kinetic to sound
   C. Sound to electrical energy
   D. Potential to sound energy
   Answer is A
5. The figure below shows two cols P and Q close to each other.



When switch K s closed, the bulb lights momentarily because

(i) An e.m.f is induced in coil Q

(ii) An e.m.f induced in coil P

(iii) The magnetic field between P and Q changes

A. (i) only B. (ii) only C. (iii) only D. (i) and (iii) only

Answer is D

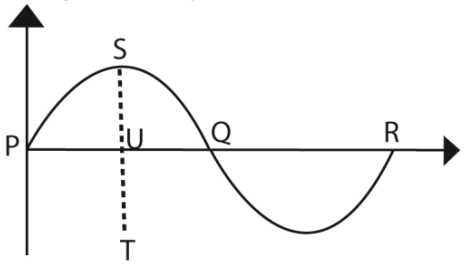
6. A stone has a mass of 72g and volume 9 cm^3. Find the density in kgm^{-3}.

A. $3.0 \times 10^3 kgm^{-3}$ B. $3.0 kgm^{-3}$ C. $3.0 \times 10^{-3} kgm^{-3}$ D. $3.0 \times 10^{-5} kgm^{-3}$

Answer is A

Density = $\frac{mass}{volume} = \frac{72}{1000} \div \frac{9}{10^6} = 3.0 \times 10^3 kgm^{-3}$

7. The figure below shows a wave trace when a.c is applied to the Y-plates and time base voltage to the X-plates of a C.R.O



The peak voltage is represented by

A. PQ B. PR C. SU D. ST

Answer is C

8. A body of mass 2kg is projected with a velocity of $10ms^{-1}$. Find the maximum height reached.

A. 0.5m B. 5.0m C. 10.0m D. 50.0m

Answer is B

$v^2 = u^2 + 2as$

$0 = 10^2 - 2 \times 10 \times s$

$s = 5m$

9. A charged electroscope loses its charge when a flame is brought near its cap because

A. Point action takes place at the cap

B. The flame blows the charge off the cap

C. Charges of opposite sign from the flame are attracted on to the cap

D. The flame ionizes nearby air molecules and those charges of opposite sign are attracted on the cap

Answer is D

10. Sound waves travel a distance of 48cm in 8s. If the separation between successive compression is 3.0cm, find the frequency of the wave

A. 0.5Hz B. 2.0Hz C. 18.0Hz D. 128.0Hz

Answer is B

f = $\frac{V}{\lambda} = \frac{0.48}{8} \div 0.03$= 2Hz

11. A ball falls from rest through a height of 92.5cm in 0.45s. Find the acceleration due to gravity.

    A. $\frac{92.5}{0.45^2\ x\ 100} ms^{-2}$ B. $\frac{2\ x\ 92.5}{0.45^2\ x\ 100} ms^{-2}$ C. $\frac{0.45^2\ x\ 100}{4\ x\ 92.5}$ D. $\frac{0.45^2\ x\ 100}{92.5}$

    Answer B

    s = ut + $\frac{1}{2}gt^2$, u = 0

    g = $\left(2\ x\ \frac{92.5}{100}\right) \div 0.45^2 = \frac{2\ x\ 92.5}{0.45^2\ x\ 100} ms^{-2}$

12. A needle floats on the surface of water because of

    A. Adhesion B. viscosity C. surface tension D. capillarity

    Answer is C

13. A body of mass 30kg weighs 60N on planet X. Which of the following statements is true?

    A. The acceleration due to gravity on X is greater than that on earth.
    B. The mass of the body is greater on X than it is on earth
    C. The acceleration due to gravity on X is less than that on earth.
    D. The mass of the body is less on X than it is on earth

    Answer is C

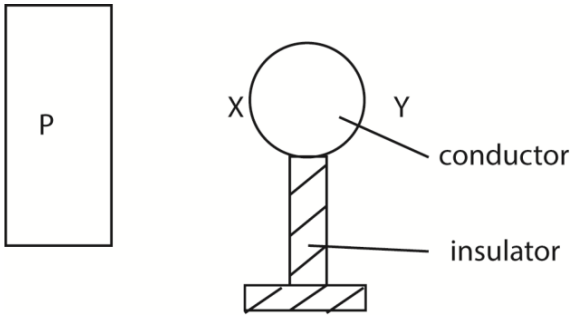
14. Which of the nuclei $^{235}_{92}W$, $^{218}_{83}Y$, $^{218}_{83}Z$, $^{238}_{92}X$ are isotopes

    A. W and Y B. X and Z C. Y and Z d. W and X

    Answer is D

    Isotope have the same atomic number but different mass numbers

15. In figure below, P is a charged body



The possible signs of charge at X, Y and P is

	X	Y	P
A.	Negative	Positive	Positive
B.	Negative	Positive	Negative
C.	Positive	Positive	Positive
D.	Negative	Negative	Negative

Answer is B

16. A body moving on a horizontal surface experiences a frictional force of 5N. If the normal reaction on the body is 20N, find the mass of the body

    A 0.5kg B. 1.5kg C. 2.0kg D. 2.5kg

    Answer is C

    Normal reaction = mg

    m = $\frac{20}{10} = 2kg$

17. Which of the following is correct about molecular theory of magnets

    A. Dipoles of a magnetized material face in one direction
    B. Unmagnetized material has no molecular magnets
    C. Magnetic keepers reduce the force of the dipole

D. Unmagnetized magnetic material has

Answer is A

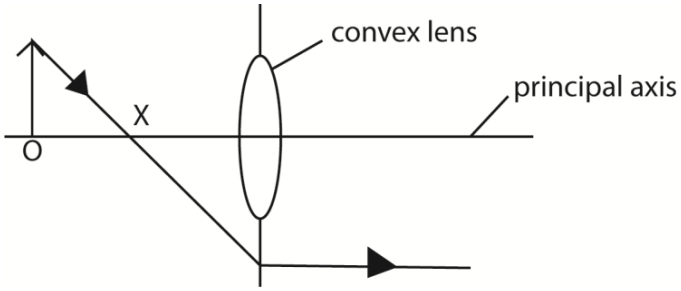
18. A crane lifts a mass of 500kg through a height of 12m in 5s. Find power output

A. 500 x 5 x 12W B. $\frac{500\ x\ 12\ x\ 5}{10} W$ C. $\frac{500\ x\ 10\ x\ 12}{5} W$ D. $\frac{500\ x\ 12}{10\ x\ 5}$

Answer is C

Power = $\frac{work\ done}{time\ taken} = \frac{F\ x\ d}{time} = \frac{Mg\ x\ d}{time} = \frac{500\ x\ 10\ x\ 12}{5}$

19. The figure below shows a ray of light from an object O refracted by a convex lens



The image formed by the lens is

(i) Real (ii) inverted (iii) upright

A. (i) only B. (ii) only C. (iii) only D. (i) and (ii) only

Answer is D

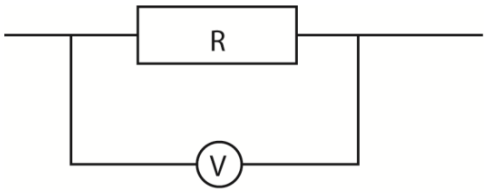
20. The velocity of a body of mass 2kg changes from $10ms^{-1}$ to $20ms^{-1}$ in 4s. Find the resultant force on the body

A. 2.5N B. 5.0N C. 10.0N D. 20.0N

Answer is B

F = $\frac{m(v-u)}{t} = \frac{2(20-10)}{4}$ = 5N

21.



If the current through the conductor is 2.5A and the voltmeter reads 12.5V, find the value R.

A. 31.25Ω B. 15.00Ω C. 5.00Ω D. 0.20Ω

Answer is C

R = $\frac{V}{I} = \frac{12.5}{2.5}$ =5Ω

22. Which one of the following does not affect the rate at which a gas diffuses

A. Temperature of the gas

B. Size of gas molecules

C. Volume of the gas

D. Size of the pores

Answer is C

23. Light traveling in air enters glass of refractive index 1.50. If the angle of incidence is 30^0, what is the angle of refraction?

A. 19.5^0 B.20.0^0 C. 45.0^0 D. 48.6^0

Answer is A

n = $\frac{\sin i}{\sin r}$; r = $sin^{-1}\left(\frac{\sin 30}{1.5}\right)$ = 19.5^0

24. The mass of a sample of radioactive iodine 131 is 800g. If the half-life of iodine 131 is 8days, find the mass remaining undecayed after 32days.

A. 25g B. 50g C. 100g D. 200g

Answer is B

Use table

Days	Mass remaining (g)
0	800
8	400
16	200
24	100
32	50

25. Aluminium expands more than copper for the same temperature change. Which of the following is true when a copper-aluminium bimetallic strip is heated

(i) It curves with copper on top

(ii) It curves with aluminium on top

(iii) It increases in length

A. (i) only B. (i) and (iii) only C. (ii) and (iii) only D. (iii) only

Answer C

26. A spherical ball has a radius of 3m. Find its volume in m^3.

A. $\frac{4\pi\ x\ 27}{3\ x\ 10^6}$ B. $\frac{\pi\ x\ 27}{4\ x\ 10}$ C. $\frac{4\ x\ 10^6}{27\ x\ \pi}$ D. $\frac{4\pi\ x\ 10^6\ x\ 3}{27}$

Answer is A

Volume of sphere = $\frac{4}{3}\pi r^3$

27. The work done in transferring one coulomb of charge from one point to another in the circuit is the

A. Power

B. Current

C. Potential difference

D. Electromotive force

Answer D

28. A vibrator of frequency 20Hz produces waves of velocity $2ms^{-1}$. Find the period of the wave.

A. $1.0 \times 10^{-1}s$ B. $5.0 \times 10^{-2}s$ C. $5.0 \times 10^{-1}s$ D. $1.0 \times 10^{1}s$

Answer B

T = $\frac{1}{f} = \frac{1}{20} = 0.05s^{-1}$

29. During power stroke of a petrol engine the

A. Inlet valve open

B. Piton move down

C. Expanding gas pushes the piston down

D. Burnt gas is pushed out from the cylinder.

Answer is B

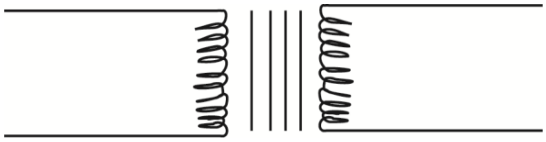
30. A heater rated 240V, 500W boils off water at 100^0C in 6minutes. Find the mass of the steam formed. (specific latent heat of vaporization of water is $2.26 \times 10^6 Jkg^{-1}$)

A. $\frac{6\ x\ 2.26\ x\ 10^6}{500}$kg B. $\frac{500\ x\ 6\ x\ 60}{2.26\ x\ 10^6}$kg C. $\frac{6\ x\ 60\ x\ 2.26\ x\ 10^6}{500}$kg D. $\frac{500\ x\ 2.26\ x\ 10^6}{6\ x\ 60}$kg

Answer is D

P = $\frac{ML}{t}$

M = $\frac{500\ x\ 6\ x\ 60}{2.26\ x\ 10^6}$

31. 

The figure above shows an electric symbol for a

A. Transformer B. ammeter C. rheostat D. cell

Answer is A

32. A mirage is formed as a result of
    A. Diffraction of light
    B. Absorption of light
    C. Separation of white light into its components
    D. Total internal reflection of light.

    Answer is D

33. A spring has a natural length of 12cm. When load X is suspended from it, its length increases to 22cm and when a load of 250N is attached to it, its length increases to 27cm, Find the value of X.

    A. $\frac{250\ x\ 10}{15}$N B. $\frac{250\ x\ 10}{5}$N C. $\frac{250\ x\ 5}{10}$N D. $\frac{250\ x\ 15}{10}$

    Answer is A

    F = ke

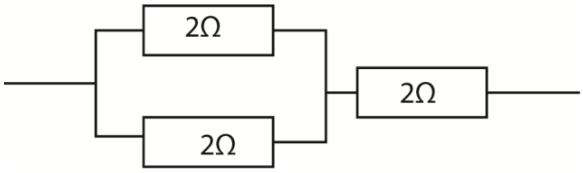
    = $\frac{250}{(27-12)}\ x(22-12)$

34. Which one of the following is an advantage of a force pump over a lift pump?
    A. A force pump does not use atmospheric pressure to raise water
    B. A force pump raises water to a level higher than a lift pump
    C. A force pump uses less energy to raise water then a lift pump
    D. The length of a force pump is less than that of a lift pump

    Answer is B

    A lift pump cannot raise water to height more than 10.4m while a force pump can.

35. The resistors each of 2Ω are connected as shown in the figure below



The effective resistance is

A. 1.5Ω B. 2.0Ω C. 3.0Ω D. 6Ω

Answer is C

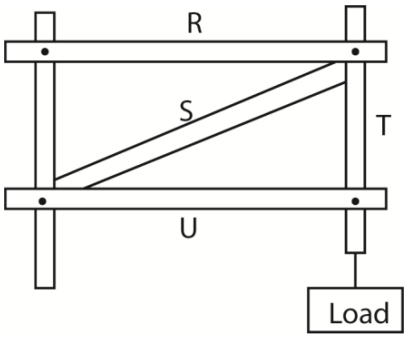
R = $\frac{2\ x\ 2}{2+2} + 2$ = 3Ω

36. Which one of the following is not a radioactive emission?

    A. X-rays B. γ-rays C. α-rays d. β-particles

    Answer is A

37. The figure below shows a structure supporting a load

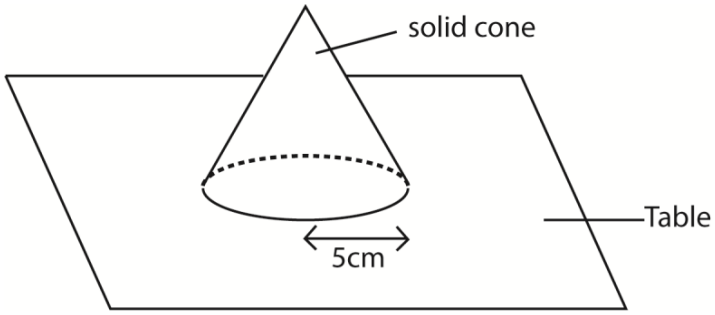


Which of the girders R. S, T and U is under compression?

A. U and R B. T and R C. S and U D. S and T

Answer is C

38. The figure below shows a cone of mass 4kg and base of radius of 50cm resting on a table



Find the pressure it exerts on the table

A. $\frac{0.25\pi}{4\ x\ 10}$Nm^{-2} B. $\frac{4\ x\ 10}{25\pi}$Nm^{-2} C. $\frac{25\pi}{4\ x\ 10}Nm^{-2}$ D. $\frac{4\ x\ 10}{0.25\pi}Nm^{-2}$

Answer is D

P = $\frac{F}{A} = (4\ x\ 10)\ \div \pi(0.5)^2$

39. Which of the following is true about a standing wave?

(i) The wave profile does not move

(ii) It is formed when the waves are of equal amplitude and speed moving in opposite directions overlap

(iii) It is formed when identical waves travelling in the same direction with equal speed overlap

A. (i) and (iii) only B. (i) and (ii) only C. (ii) and (iii) only D. (i) only

Answer is B

40. A fire alarm rates 240, 1.5kW runs for 10hrs a day. If the cost per unit of electricity is shs. 380, find the daily cost of running the alarm.

A. Shs. 570 B. shs. 2400 C. shs. 3800 D. shs. 5700

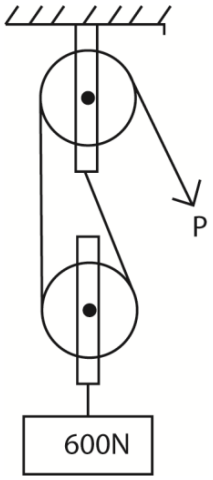
Answer is D

Total power used = 1.5 x 10 = 15kWh

Cost = 15 x 380 = shs. 5700

SECTION B (40MARKS)

41. The figure below shows a pulley system supporting a load of 600N



Find the

(i) Tension in the string (02marks)

T = $\frac{600}{2} = 300N$ because velocity ratio =2

(ii) Value of P if the mechanical advantage is 3 (02marks)

M.A = $\frac{Load}{Effort}$

Effort = $\frac{600}{3}$ = 200N

42. (a) State any two properties of alpha particles

- positively charged
- ionize gases
- deflected by magnetic and electric field
- low penetrating power
- have a mass of 4

(b) Radon, $^{222}_{86}Rn$ decays to radium isotope, Ra, by emission of two beta particles according to the equation

$^{222}_{86}Rn \rightarrow {}^{A}_{88}Rn + 2{}^{0}_{-1}e$

(i) What is the value of A?

A = 222

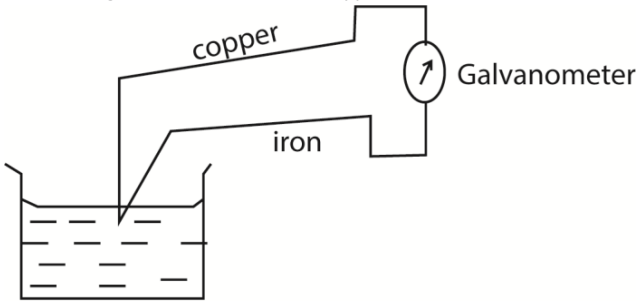
(ii) How many neutrons does the nucleus of radium isotope have?

222 = 88 = 134

43. (a) What is meant by temperature of a body?

Temperature is the degree of hotness or coldness of a body

(b) The figure below shows a type of thermometer



(i) Name the type of thermometer

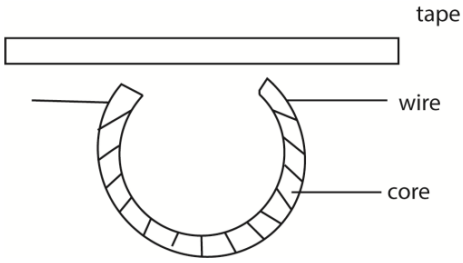
Thermo-electric thermometer

(ii) Name the physical property it uses to measure temperature
e.m.f

(iii) What is the use of a galvanometer
Measures e.m.f generated

44. (a) What is magnetic field?
It is a region of space around a magnet where magnetic force is experienced

(b) The figure below shows the head of a cassette tape recorder.



(i) Explain why a current through the wire causes the tape to become magnetized.
Because the magnetic field linking the coil changes

(ii) The tape is usually made of plastic and coated with a thin layer of iron oxide. Why is iron oxide used?
It is easily magnetized and demagnetized.

45. (a) Define the following

(i) Aperture of a lens
It is the width of a lens

(ii) Virtual image
It is an image formed by apparent intersection of light rays

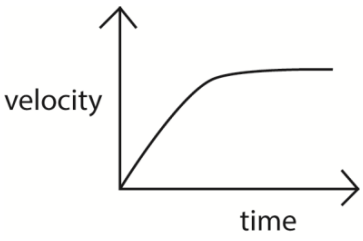
(b) A converging lens has a focal length of 10cm. calculate the power of a lens.

P = $\frac{1}{f\ (m)} = \frac{1}{0.1} = 10D$

46. (a) (i) What is meant by terminal velocity?
This is the constant speed of a body falling through a fluid

(ii) State a factor that affects terminal velocity of a body falling in a fluid.
weight
viscous force
density of fluid
volume/shape of a falling body
temperature of fluid

(b) A ball bearing is released at the surface of viscous liquid and allowed to sink through the liquid. Draw a velocity-time graph for the motion of the ball bearing.



47. (a) What is meant by absolute temperature?
It is the lowest temperature at which gaseous molecules cease to exist

(b) A sealed flask contains a gas at a temperature of 27^0C and pressure of 90kPa. If the temperature rises to 127^0C what will be the new pressure?

$\frac{P}{T} = constant$

$P = \frac{90\,000}{(27+273)}\ x\ (273 + 127) = 120kPa$

48. (a) What is the purpose of a vacuum in X-ray tube?

Minimize resistance to electrons caused by air molecule

(b) State three reasons why it is possible to detect fracture in bones using X-rays.

- they do not penetrate bone but pass through the flesh

49. (a) State two ways by which energy losses in a transformer are minimized.

- use of low resistance copper wire
- use of soft magnetic core
- use of laminated core
- winding secondary coil over the primary coil

(b) A 240V, 60W lamp is connected to the secondary coil of a step up transformer is operating on a 24V supply. If the transformer is 100% efficient, find the current in primary coil.

P = VI

I = $\frac{60}{240} = 0.25A$

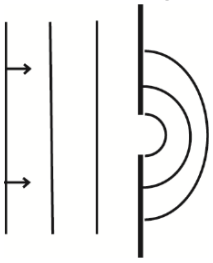
240 x 0.25 = 24 x I

I = 2.5A

50. (a) What is meant by diffraction of a wave?

It is the bending of a wave around obstacles

(b) Draw a diagram to show the path of plane water waves through a narrow gap



(c) State two factors that determine intensity of sound.

- density of air
- frequency
- humidity
- distance from the source

Thank you