UCE physics paper 1

Section A

Answer all questions in this section

1. The electrical device used to control the amount of electric current is
   A. Ammeter
   B. Rheostat
   C. Voltmeter
   D. Galvanometer
   Answer is B; rheostat increases or lowers current

2. A calorimeter is lagged to minimize heat transfer by
   A. Evaporation
   B. Convection
   C. Conduction
   D. Radiation

   Answer is C; lagging is wrapping an insulating material like cotton, wool around a conducting material; this minimizes heat loss by conduction

3. The energy transferred from one point to another by moving charges is
   A. Light energy
   B. Electrical energy
   C. Sound energy
   D. Chemical energy
   Answer is B; electricity is transferred by electrons

4. The part of the human eye where images are formed is the
   A. Iris
   B. Pupil
   C. Retina
   D. Cornea
   Answer is C

5. In moving col galvanometer, the deflection produced is proportional to the
   A. Current passing through the coil
   B. Resistance of the windings
   C. Number of turns in the coil
   D. Strength of the magnet
   Answer is A; moving coil galvanometer measures current

6. Which of the following devices can be used to study wave forms

A. X-ray tube
B. Vacuum diode
C. Maltese cross tube
D. Cathode ray oscilloscope
   Answer is D

7. Which one of the following physical quantities is measured using a beam balance
   A. Area
   B. Mass
   C. Time
   D. Volume
   Answer is D

8. Which one of the following liquids is more suitable for making a simple barometer?
   A. Ether
   B. Water
   C. Alcohol
   D. Mercury
   Answer is D,; mercury has high density and does not wet glass

9. Which one of the following can be used to detect infra-red radiation?
   A. Photographic film
   B. Aerials
   C. Geiger-Muller tube
   D. Ionization chamber
   Answer is A
   Aerial detects radio waves
   Geiger –Muller and ionizing chamber detect ionizations

10. The heat absorbed by a liquid to change it to vapour at constant temperature is called
    A. Latent heat of fusion
    B. Specific latent heat of fusion
    C. Latent heat of vaporization
    D. Specific latent heat of vaporization
    Answer is C

11. Which one of the following changes when a force is applied on a body?
    (i)   Mass
    (ii)   Velocity
    (iii)   Displacement
    A. (i) and (ii) only
    B. (ii) and (iii) only
    C. (i) and (iii) only
    D. (i), (ii), and (iii)
    Answer is C

12. In the river, turbulent flow occurs
    (i)   At the water falls
    (ii)   Where there is a narrow opening
    (iii)   Where the river is wide and deep
    A. (i) only
    B. (iii) only
    C. (ii) and (iii) only
    D. (i) and (ii) only

Answer is D

13. A liquid of mass 2kgat 10^0C is supplied with 42,000J of heat. If the specific heat capacity of the liquid is 4200Jkg^{-1}K^{-1}, find the new temperature of the liquid.

    A. 22^0C   **B.** 15^0C   C. 14^0C   D. 4^0C

    $Q = mc\theta$

    $42000 = 2 \times 4200 \times \theta$

    $\theta = 5$

    New temperature $= 10 + 5 = 15^0$C

14. Which of the following is true about the function of anodes in the electron gun of the C. R. O?

    (i)   They deflect electron horizontally

    (ii)   They focus electrons

    (iii)   They accelerates electrons

    A. (i) and (ii) only

    B. (i) and (iii) only

    C. (ii) and (iii) only

    D. (i), (ii) and (iii)

    Answer is C

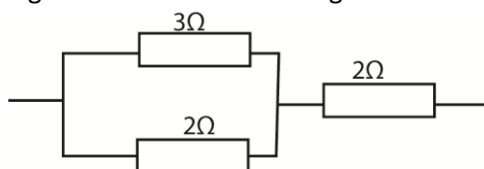15. Figure 1 shows a circuit diagram with three resistors of 3Ω, 2Ω and 2Ω

Fig. 1

Find the effective resistance in the circuit

    A. 1.4Ω   B. 2.8Ω   **C.** 3.2Ω   D. 7.0Ω

    Resultant resistance in parallel $= \frac{3 \times 2}{3+2} = 1.2$

    Total resistance $= 2 + 1.2 = 3.2$Ω

16. Which of the following is/are about a metal ring placed near a positively charged body?

    (i)   The ring gets charged by electrostatic induction

    (ii)   The field lines pass through the ring

    (iii)   The ring acts as a shield

    A. (i) only

    B. (ii) only

    C. (i) and (ii) only

    D. (i) and (iii) only
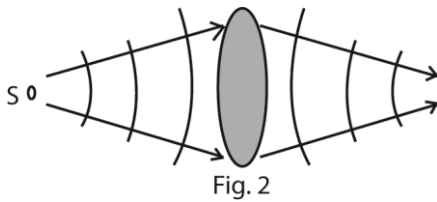
    Answer is D; (ii) is not correct

17. When an object is placed 12cm from a concave mirror, an image of height 4cm is formed at 24cm from the mirror. Find the height of the object

    A. 2cm   B. 3cm   C. 6cm   D. 8cm

    Magnification$= \frac{24}{12} = \frac{4}{x}$; x = 2cm

    Answer is A

18. Figure s shows a wave moving through a convex section of a medium.

Fig. 2

Which one of the following properties of waves is shown on the diagram?

A. Interference
B. Diffraction
C. Refraction
D. Reflection

Answer is C

19. An engine rated 10,000watts raises a body vertically at a velocity of 20ms^{-1}. Find the mass of the body in kg.

A. 5.0×10^1 B. 5.0×10^2 C. 2.0×10^4 D. 2.0×10^5

$P = FV$

$10,000 = F \times 20$

$F = 500N$

But $F = ma$

$500 = m \times 10$

$m = 50kg$

Answer is A

20. When air cells P and Q were observed under a microscope, smoke particles in P moved faster than those in Q. Which one of the following is the correct explanation of the observation above?

A. Cohesion of the air in P is stronger than that in Q
B. Air in P is at a higher temperature than in Q
C. The mass of air in P is less than that in Q
D. Air in P is denser than that in Q

Answer is B; increase in temperature increases the kinetic energy of molecules

21. A nuclide $^{226}_{88}X$ decays into a nuclide Y by emitting an alpha particle followed by a beta particle. Find the atomic number of Y

A. 84   B. 85   C. 86   D. 87

Answer is D; emission of alpha particles reduces the atomic number by 2 to 86, loss of beta particle increases atomic number by 1 to 87

22. Which of the following explains why keepers are used in storage of magnets?

(i)   To prevent mutual repulsion and attraction
(ii)   To form continuous magnetic loop
(iii)   They are hard to magnetize and retain magnetism for a long time

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

Answer is D

23. A person with a deep voice produces a note of frequency 200Hz. The wavelength of the sound waves produced is (velocity of sound = 34ms^{-1})

A. 0.58m   B. 0.85m   **C.** 1.70m   D. 3.4m

$$\lambda = \frac{v}{f} = \frac{340}{200} = 1.7m$$

24. In domestic hot water supply system, the boiler is always placed at the bottom because;
    A. When water is heated, it becomes less dense and rises
    B. The hot water cylinder is always above the boiler
    C. Heating is faster when the boiler is at the bottom
    D. When water is heated in the boiler at the bottom it moves up by conduction

    Answer is A

25. A spring has a length of 0.02m when unloaded. If the length of the spring is 0.06 when a load of 2N hangs freely, find the spring constant.
    A. 100Nm^{-1} **B.** 50Nm^{-1} C. 33Nm^{-1} D. 25Nm^{-1}

    Answer is B

    F = ke but e = 0.06 – 0.02 = 0.04m
       2 = k x 0.04
       k = 50Nm^{-1}

26. Nuclides W, X, Y and Z are represented as; $^{32}_{15}W$, $^{30}_{14}X$, $^{30}_{16}Y$ and $^{32}_{16}Z$. which of the nuclides are isotopes?
    A. W and Z   B. X and Y   C. X and Z   D. Y and Z

    Answer is D; isotopes have the same atomic number

27. Figure 3 shows a magnet moved towards a wire connected to a centre zero galvanometer. Which one of the following is correct about the movement of the pointer?

Figure 3
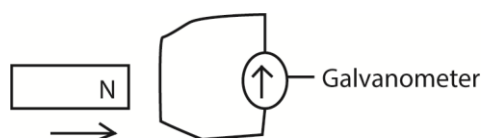
    A. The pointer stays at rest
    B. Pointer deflects to the right
    C. Pointer deflects to the left
    D. Pointer deflects right and then to the left

    Answer is D due to electromagnetic induction

28. Which of the following are property/are properties of mechanical waves?
    (i)   They require material medium for transmission
    (ii)   They do not depend on the density of the medium
    (iii)   They travel at different speed through different medium
    A. (i) only
    B. (i) and (ii) only
    C. (ii) and (iii) only
    D. (i) and (iii) only

    Answer is D

29. A force of 2.0Ncauses a trolley to accelerate at a rate of 0.5ms^{-2}. Find the acceleration of the trolley when a force of 8.0N acts on it.
    A. 0.125ms^{-2} B. 0.500ms^{-2} **C.** 2.000ms^{-2} D. 32.000ms^{-2}

    Answer is C

    F = ma
    m $= \frac{2}{0.5} = 4kg$
    a $= \frac{F}{m} = \frac{8}{4}$ 2 ms^{-2}

30. Which of the following sets consist of ductile materials only?
    A. Plasticine, copper
    B. Steel, glass
    C. Chalk, cast iron
    D. Copper, cast iron
    Answer is A

31. Which one of the following diagrams shows the correct direction of magnetic field around a conductor carrying current?

    A   B   C   D

    Answer is D

32. A body released from the top of the wall hits the ground with a velocity of 2ms^{-1}. Find the height of the wall in meters.

    A. $\dfrac{4}{2\,x\,10}$
    B. $\dfrac{4\,x\,10}{2}$
    C. $\dfrac{4\,x\,2}{10}$
    D. $\dfrac{2\,x\,10}{4}$

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

    $s = \dfrac{2\,x\,2}{2\,x\,10}$

    Answer is A

33. The daily cost of using twp50W bulbs is shs. 200. If 1kWh of electricity cost is shs 400, find the time for which the bulbs are lit daily
    A. 0.20h   B. 0.05h   **C. 5.00h**   D. 20.00h
       Total power= 50 + 50 = 100W
       Into kW = 100/1000 = 0.1kW
       Cost = 0.1 x 400 = shs. 40
       Then 40 x y hours = 200
       y = 5hrs

34. Which of the following explains why primary coil are wound on top of the secondary coil in a transformer?
    A. To allow maximum flux linkage between primary coil and secondary coil
    B. To reduce loss of heat due to change in direction of magnetic domains
    C. To reduce heat loss due to Eddy currents
    D. To reduce heat loss due to resistance of the copper wire
       Answer is A

35. Figure 4 shows three forces of 1N, 3N and R acting at a point O. Find the magnitude of R required to produce a resultant force of 5N.
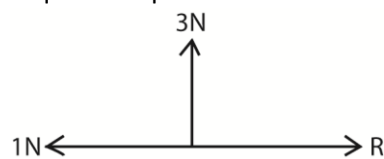

    Fig. 4

    A. 1N   B. 3N   C. 4N   D. 5N
       Answer is D
       Horizontal force = (R – 1)

$5^2 = 3^2 + (R - 1)^2$

R = 5

36. The energy stored in moving body depends on its
    (i)   Mass
    (ii)   Volume
    (iii)   Velocity
    A. (i) only
    B. (i) and (ii) only
    C. (i) and (iii) only
    D. (i), (ii) and (iii)
    Answer is C

37. A beaker of mass 50g has a mass of 82g when filled with 40cm³ of a liquid. Find the density of the liquid
   A. 3.30gcm⁻³   B. 2.05gcm⁻³   C. 1.25gcm⁻³   **D**. 0.080gcm⁻³
    B. $D = \frac{m}{V} = \frac{82-50}{40} = 0.080$gcm⁻³

38. Which of the following is a set of characteristics of an image formed by a plane mirror?
    A. Real, and laterally inverted
    B. Virtual and same size as the object
    C. Virtual and diminished
    D. Real and the same size as the object
    Answer is B

39. Figure 5 shows a meter rule balancing on a knife edge when a mass, M, is hanged at one end.
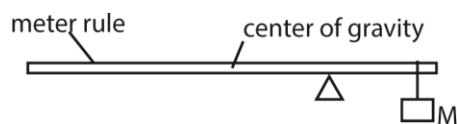

    Which one of the following is true if mass, M, is moved towards the knife edge?
    A. The meter rule turns in an anti-clockwise direction
    B. The center of gravity changes to another position
    C. The meter rule turns in a clockwise direction
    D. The meter rule remains balancing
    Answer is A; anticlockwise moments becomes greater

40. The diagrams below show different containers with equal volume of the same liquid at the same temperature. Which one of the containers will have the volume of the liquid reduced most after some time?
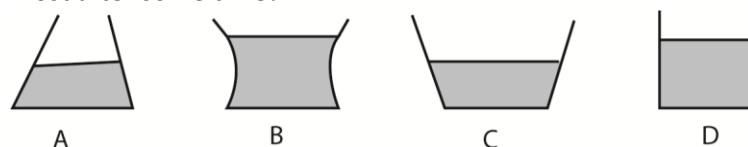
    Answer is C, it has the largest surface area for evaporation

Section B (40marks)

41. (a) (i) Define conduction as applied to heat transfer (01mark)
     Is the transfer of heat from a region of high temperature to a region of low temperature through material without movement of mater as a whole.

(ii) State any two factors that determine the the rate of heat transfer by conduction along a metal bar (01mark)

     temperature gradient

    cross section area

    nature of material

    length of material

(b)) Explain why the efficiency of heat engines is low. (02marks)

- incomplete combustion of fuel to form carbon monoxide instead of carbon dioxide
- Energy lost through expulsion of hot gases
- some energy lost in friction
- heat conducted away by cylinder walls

42. (a) State one similarity between X-rays and gamma rays (01mark)

   - both are electromagnetic waves

   - both travel in straight line

   - both are not deflected by electric and magnetic field

   - both ionize gases

   - both carry energy

(b) How do X-rays differ from gamma rays? (01mark)

- gamma rays penetrate matter than X-rays

- gamma rays have shorter wavelength

(c) Describe one danger and the safety measure to be taken when handling these radiations. (02marks)

Dangers

-   Cause cancer
-   Destroy cell
-   Cause mutation
-   Cause infertility
-   Cause skin burns

Precaution

-   Avoid radiations
-   Use lead shield

43. (a) What is meant by focal point of a convex mirror? (01mark)
This is a point on the principal axis from which all rays close and parallel to the principal axis appear to diverge after reflection from the mirror.

(b)(i) State two practical uses of a convex mirror. (01mark)

- driving mirror
- inspection of vehicles
- supermarket

(ii) Explain why a convex mirror is preferred in both cases in (b)(i) (02marks)

-   Provide wide field of view
-   Produce upright images

44. (a) What is meant by the term heat capacity? (01mark)

Heat required to change the temperature of the body through 1K

(b) a heater rated 840W, 240V takes 50 minutes to raise the temperature of water from 25^0C to 85^0C. Calculate

(i) mass of water (02mark) (specific heat capacity of water = 4200Jkg^{-1}K^{-1})

$Pt = mc(\theta_2 - \theta_1)$

840 x 50 x 60 = m x 4200 x (85 – 25)

m = 10kg

(ii) volume of water (01mark) (density of water 1.000kgm^{-3})

$V = \frac{M}{D} = \frac{10}{1000} = 0.1m^3$

45. (a) What is meant by up thrust? (01mark)

Is the upward force experienced by a body immersed in fluid

(b) An iron block of mass 3.2 x 10^{3}kg and volume 0.6m^3 is totally immersed in a liquid of density 1.56kgm^{-3}. Find the weight of the block in

(i)air (01mark)

Weight in air = mass x acceleration due to gravity

= 3.2 x 10^3 x 10 = 3.2 x 10^{4}N

(ii) the liquid (02mark)

Weight in fluid = weight n air – upthrust

= 3.2 x 104 – 1.56 x 0.6 x 10

= 22640N

46. (a) explain why electric power is transmitted at high voltage (01mark)
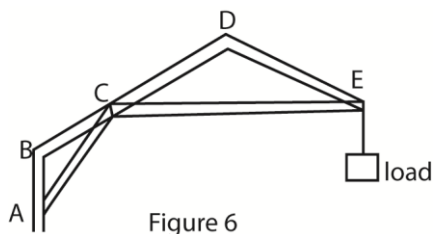
To reduce power loss since current is reduced

(b) The p.d across a resistance wire is 12V. Find the quantity of electric charge flowing through the wire to generate 1.68kJ of heat energy in one second. (03marks)

Heat energy, E = QV

$Q = \frac{1680}{12} = 140C$

47. (a)

Figure 6

In figure 6, identify two girder under

(i)   Tension (01mark)

AB, BC, BD, CD, DE

(ii)   Compression (01mark)

AC, CE

(b) State two reasons why it is necessary to reinforce concrete to be used as girders. (02marks)

- withstand tensile stress

- with stand compression force

48. (a) Describe how resonance is produced using an air column in a closed tube (02marks)
    - A vibrating turning fork is placed close to the mouth of the tube.
    - The length of air column is varied until a loud sound is heard.
    (b) Calculate the frequency of the first overtone of sound produced by closed pipe and of length 10cm, if the velocity of sound in air is 340ms^{-1}. (02marks)

    At first overtone λ = L and L = $\frac{10}{100}$ = 0.1m

    From v = fλ then f = 2$\left(\frac{V}{2L}\right)$ for first overtone

    $\qquad$ = 2 x $\frac{340}{2\ x\ 0.2}$

    $\qquad$ =3400Hz

49. (a) Define the following
    (i) Momentum (01mark)
        It is a product of mass and velocity
    (ii) Kinetic energy (01mark)
        It energy possessed by a body due to motion

    (b) A trolley A of mass 5kg travelling at 9ms^{-1} collides with a stationary trolley B of mass 4kg. After collision they both move together at 5ms^{-1}. Find the loss in kinetic energy. (02marks)

    Kinetic energy = $\frac{1}{2}mv^2$

    Kinetic energy lost = kinetic energy before – kinetic energy after

    $$= \frac{1}{2}\ x\ 5\ x\ 9^2\ -\frac{1}{2}\ x\ (4+5)x\ 5^2$$

    $$= 202.5 - 112.5$$

    $$= 90J$$

50. (a) What is a hard magnetic material? (01mark)
    A hard magnetic material is one which is not easily magnetized and not easily demagnetized.
    (b) A soft iron bar and a steel bar are suspended inside a coil above a container of iron filling as shown in figure 7.
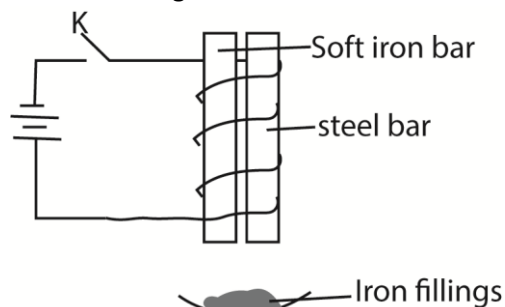
    Explain what is observed when switch K is closed
    More iron fillings will be attracted to the soft iron bar than to steel bar because soft iron is easily magnetized than steel bar

Thank you
Dr. Bbosa Science