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UGANDA CERTIFICATE OF EDUCATION

SENIOR 4 MOCK3 EXAMINATIONS 2015

535/1 PHYSICS

PAPER 1

TIME: 2 HOURS 15 MINUTES

***Instructions to candidates***

Write your name, centre/Index number and signature in the space above

Section A contains 40 objective type questions. You are required to write the correct answer A,B,C or D in the boxes at the right hand side

Section B contains 10 structured questions. Answers are to be written in the spaces provided on the question paper.

Acceleration due to gravity = 10 m s – 2

Specific heat capacity of water = 4200 J kg – 1 K – 1

Speed of sound in air = 330 m s-1

Speed of light = 3.0 × 108 m s-1

**For Examiners use only**

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SECTION A

1. Which of the following occurs when a ripple from a region of shallow water reaches a region of deep water?

A. The velocity remains constant and the wavelength increases.

B. The velocity increases and the wavelength increases.

**B**

C. The frequency increases and the velocity increases.

D. The frequency decreases and the wavelength increases.

2. In a house wiring system, all connection to power points are in parallel so as to

A. supply the same current.

B. operate at the same voltage.

**B**

C. minimize the cost of electricity.

D. consume the same amount of energy.

3. How much heat is required to raise the temperature of 20 g of water from 30ºC to 60ºC?

A. 252 J

**A**

B. 6300 J

C. 8400 J

D. 126000 J

4. A current of 5 A flows through a given point in a circuit for 2 minutes. Calculate the quantity of charge that passes the point.

A. 2.5 C

**D**

B. 10 C

C. 300 C

D. 600 C

5. The colour seen in a thin soap film is due to

A. refraction

B. interference

**A**

C. diffraction

D. total internal reflection

*E*

S

6.

In the circuit diagram above, the readings of the ammeter A and voltmeter V when switch S is open and closed respectively are as shown in the table below.

|  |  |  |
| --- | --- | --- |
|  | Ammeter reading (A) | Voltmeter reading (V) |
| S is open | 0.0 | 4.5 |
| S is closed | 3.0 | 3.0 |

Calculate the internal resistance of cell E

A. 0.0 Ω

B. 0.5 Ω

**B**

C. 1.0 Ω

D. 1.5 Ω

7. In which of the following devices is kinetic energy converted to electric energy?

A An accumulator

**D**

B An electric motor

C A combustion engine

D A dynamo

8. Calculate the time required for a kettle taking 10 A from 240 V supply to heat 5 kg of water through 80º , assuming no heat is lost

A 1.7 s

**D**

B 8.8 s

C 292 s

D 700 s

9. For a converging lens, magnification, *m* of an object placed a distance, *u* from the lens to form an image at a distance, *v* from the lens of focal length, *f* is given by

A. *m* = 

B. *m* = 

**B**

C. *m* = *u* × *v*

D. *m* = .

10. Plants inside a green house emit radiations which cannot pass through the green house glass because the radiations are

A. of short wavelength

B. of long wavelength

**B**

C. used to warm up the green house

D. absorbed by the glass

11. An air bubble is introduced at the bottom of a jar containing mercury. Which one of the following explains what will happen to the bubble?

A. The bubble will burst due to high pressure exerted by the mercury column

B. The bubble will rise to the surface while decreasing in volume

C. The bubble will rise to the surface while increasing in volume and burst

**C**

D. Nothing will happen to the bubble

12. Which of the following displacement-time graph shows the motion of a car moving away from traffic lights at a steady speed?

0

Displacement (m)

Time (s)

B

0

Displacement (m)

Time (s)

A

D

0

Displacement (m)

Time (s)

C

0

Displacement (m)

Time (s)

**A**

13. The temperature at which all the heat energy is removed from a substance is called

A. Kelvin temperature

**D**

B. celcius temperature

C. freezing temperature.

D. absolute zero temperature.

14. A tank 2 m tall and base area of 2.5 m2 is filled to the brim with a liquid which exerts a force of 40,000 N at the bottom. Calculate the density of the liquid.

A.  kg m-3 B.  kg m-3

**B**

C.  kg m-3 D.  kg m-3

15. A notch on a material spreads more rapidly when the material is

A. in tension

B. in compression

**A**

C. pre-stressed

D. reinforced

16. The leaf of a charged gold leaf electroscope gradually collapses with time due to

A. leakage to the surroundings.

B. surrounding magnetic field.

**A**

C. pressure variation in the surroundings.

D. similar charges from the surroundings.

17. When sound waves pass through a metal bar, the atoms of the metal

A. rotate in circles

B. move along the bar.

C. expand and contract.

**D**

D. vibrate about a fixed position

2.0 Ω

1.8 Ω

3.0 Ω

18.

Calculate the effective resistance for the arrangement of resistors in the figure above.

**C**

A. 0.7 Ω B. 2.8 Ω C. 3.0 Ω D. 6.8 Ω

19. The frequency of a radio wave is 6.6 × 108 Hz.

Find the wavelength of the wave.

A. 2.20 × 10-3 m

B. 4.55 × 10-1 m

**B**

C. 3.60 × 103 m

D. 1.98 × 1014 m

20. Which one of the following statements is true?

A. The average kinetic energy of the molecules of the gas depends on temperature.

B. The average speed of the molecule of a gas decreases as temperature increases .

**A**

C. The pressure of a fixed mass of gas decreases as temperature increases.

D. The volume of a fixed mass of gas increases as temperature decreases.

21.   + *P*

In the above reaction *P* is likely to be

A. an alpha particle

B. a beta particle.

**B**

C. a gamma ray.

D. a neutron.

22. An electric appliance is rated 240 V, 750 W. Its fuse should be of

A. 1 A

B. 3 A

**C**

C. 5 A

D. 13 A

23. The pitch of a note from a guitar string can be made higher by

A. lengthening the string

**B**

B. tightening the string

C. heating the string

D. increasing the thickness of the string.

24. The power used in a 100 Ω resistor connected to a 12 V source of e.m.f is

A. 0.69 W

B. 1.20 W

**C**

C. 1.44 W

D. 8.33 W

25. The stability of a bus is reduced when a heavy load is placed on its roof rack because

A. the total weight is increased.

**D**

B. the pressure upon the tyres is increased.

C. the maximum speed is reduced.

D. the centre of gravity is raised.

26. If the forces acting on a train moving along a level straight track are equal and opposite, the train will

A. come to a stop

**D**

B. accelerate uniformly

C. move with faster speed

D. move with constant speed

27. Which of the following represents the firing order of a four stroke petrol engine?

A. exhaust, inlet, compression, power.

B. inlet, power, compression, exhaust.

**A**

C. power, compression, inlet, exhaust.

D. inlet, power, exhaust, compression.

Effort

Load

28.

The block and tackle pulley system above has an efficiency of 80%. The load which it can lift by an effort of 10 N is

A. 4 N

B. 8 N

**C**

C. 40 N

D. 50 N

29. The statement of Archimedes’ principle is

A. When a body is immersed in a fluid it experiences a force that is equal to the weight of the fluid displaced.

B. A floating body displaces its own weight of the fluid in which it float a

C. When a body is wholly or partially immersed in water, it experiences an upthrust equal to the weight of the water displaced.

D. When a body is wholly or partially immersed in a fluid, it experiences an upthrust equal to the weight of the fluid displaced.

**D**

30. In a simple cell, the source of electrons which constitutes the electron current is

A. the zinc plate

B. the copper plate

**A**

C. dilute sulphuric acid

D. potassium dichromate

31. On a cool day, a metal feels cold to the touch because

A. metals contain less heat.

B. the temperature of the metal is the same as that of the surroundings.

C. the temperature of the metal is less than that of the surroundings.

**D**

D. the metal conducts the heat away from the hand.

32. A hippopotamus can easily walk on mud without sinking while a goat will sink because

A. a hippopotamus has more weight than a goat.

B. the centre of gravity of a hippopotamus is lower than that of a goat.

**D**

C. a hippopotamus exerts more pressure on the ground than a goat.

D. a hippopotamus exerts less pressure on the ground than a goat.

33. The process by which a substance emits particles spontaneously on its own is called

A. radiation.

**B**

B. radioactivity.

C. photo electricity.

D. thermionic emission.

34. When a balloon filled with hydrogen is released into the air on a calm day, it

A. rises to a definite height when the pressures inside and outside are equalised.

**C**

B. rises until the pressure inside reduces to zero.

C. rises for a while and then bursts.

D. comes to the ground and darts around.

35. When a metal sphere is dropped in a viscous fluid, it eventually attains a steady velocity called

A. turbulence velocity.

**B**

B. terminal velocity.

C. viscous velocity.

D. streamline velocity.

36. A copper atom,  has

|  |
| --- |
| Electrons protons neutrons |
| A | 29 29 34 |
| B | 34 34 29  **A** |
| C | 34 29 29 |
| D | 34 29 34 |

37. A uniform metre rule pivoted at the 25 cm mark balances when a mass of 0.15 kg is hung at the 8 cm mark. Calculate the mass of the metre rule.

A, 0.020 kg.

B. 0.048 kg.

**C**

C. 0.102 kg.

D. 1.020 kg.

38. If a mercury barometer reads 760 mm of mercury, what is the atmospheric pressure in N m-2?

(The density of mercury is 1.36 × 104 kg m-3)

A. 1.03 × 104 N m-2

**C**

B. 1.36 × 104 N m-2

C. 1.03 × 105 N m-2

D. 1.36 × 105 N m-2

*i*

*r*

39.

The diagram above illustrates an experiment to determine the refractive index of glass. Which one of the following graphs would give a straight line through the origin?

A.  against 

**C**

B. sin*i* against *r*

C. sin*i* against sin *r*

D. *i* against *r*

40. If a negatively charged ebonite rod is brought near the cap of a negatively charged electroscope, the gold leaf

A. decreases in divergence.

B. increases in divergence.

**B**

C. remains unchanged.

D. gains positive charges.

SECTION B

41. (a) Define *moment of a force* (**01** mark)

**The moment of a force about a point is the product of the force and the perpendicular distance of its line of action from the point**.

(b)

A uniform metre rule is balanced at the 30 cm mark when a load of 0.80 N is hung at the zero mark. Find the mass of the metre rule. (**03** marks)

***mg*×20 = o.80 ×30**

***m*×10×20 = 0.80 ×30**

***m* = **

***m* = 0.12 kg or 120 g**

42. An electrical appliance is rated 240 V, 60 W

(a) What do you understand by this statement? (**01** mark)

**When the appliance is connected to a 240 V mains supply, it gives out energy at a rate of 60 joules per second.**

(b) Calculate the current flowing through the appliance, when the appliance is operated at the rated indicated values. (**03** marks)

***P* = 60 W, *V* = 240 V, *I*  = ?**

***P* = *VI***

**60 = 240 × *I* *I* =  = 0.25 A**

43.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Time (s)  15  0  10  5  8  6  4  2  20  25  Velocity (m s-1)  14  12  10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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The velocity-time graph above shows the motion of a 2 kg mass.

Calculate

(a) the acceleration of the mass. (**01** mark)

Acceleration, *a* =

*a* =  =  = 1.67 m s-2

(b) The force acting on the mass. (**01** mark)

***m* = 2 kg, *a* = 1.67 m s-2, *F* = ?**

***F* = *ma***

***F* = 2 × 1.67 = 3.34 N**

(c) the total work done by the end of 6 s (**02** marks)

***u* = 5 m s-1, *v* = 15 m s-1, *a* = 1.67 m s-2, *t* = 6 s, *s* = ?**

***s* = *ut* + ½ *at*2**

***s* = 5 × 6 + ½ × 1.67 ×62**

***s* = 30 + 30.06 = 60.06 m**

**work = *F*×*s* = 3.34×60.06 = 200.6 J**

44. (a) What is a transverse wave? (**01** mark)

**A transverse wave is the one which is propagated by vibrations perpendicular to the direction of travel of the wave**.

(b)

*Q*

*P*

4

8

12

16

20

24

6

4

2

0

-2

-4

-6

Displacement (cm)

Distance (cm)

The diagram in the figure above represents a wave travelling in water.

(i) Name the parts labelled *P* and *Q* (**01** mark)

*P* is **trough**. *Q* is **crest**.

(ii) If the frequency of the wave is 20 Hz, calculate the velocity of the wave. (**02** marks)

***f* = 20 Hz, *λ* = 16 m, *v* = ?**

***v* = *f λ***

***v* = 20 × 16 = 320 m s-1**

45. (a) Define focal length of a converging lens. (**01** mark)

**The focal length of a converging lens is the distance between the optical centre and the principal focus.**

(b) The focal length of a converging lens is 20.0 cm. what is its power?

(**02**marks)

***f* = 20.0 cm**

**power =**

**power = = 5 D**

(c) State any two properties of an image of a real object formed by a diverging lens. (**01**mark)

The image is **erect, diminished, virtual**.

46. (a) State Ohm’s law. (01mark)

**The current passing through a wire at constant temperature is proportional to the potential difference between its ends**.

(b)

4 V

3 Ω

6 Ω

Two resistors of resistances 3 Ω and 6 Ω are connected across a battery of 4 V of negligible internal resistance as shown above.

Find the

(i) combined resistance. (**02**marks)

**Let combined resistance be *R***

**= + = =**

***R* = 2 Ω**

(ii) current supplied by the battery. (**01** mark)

***R* = 2 Ω, e.m.f. = 4 V’ *I* = ?**

***V* = *IR***

**4 = *I* × 2 *I* = = 2A**

47. (a) What happens to an insulator when it is rubbed by another insulator of different material? (**02**marks)

**When two insulators of different materials are rubbed together, some of the surface electrons acquire enough energy to break off the material with less affinity for electrons and cling to the material with a higher affinity for electrons. The material to which the electrons stick becomes negative ion, while the material that lost some of its electrons becomes a positive ion**.

(b)

The diagram shows a conductor supported on an electrical insulator. The conductor is given some positive charge. Show how the charge is distributed on the conductor. (**01** mark)

(c)

Sketch the electric field pattern due to the two charges *P* and *Q* placed near each other as shown above. (**01** mark)

48. (a) Define electromotive force of a battery. (**01** mark)

**The electromotive force of a battery is the total work done in joules per coulomb of electricity conveyed in the circuit in which the battery is connected**.

(b) List four different sources of e.m.f. (**02** marks)

**Dry cell**, **dynamo**, **thermocouple**, **photo cell**, **lead-acid cell**, etc.

(c) What is meant by lost volts? (**01** mark)

**Lost volts is the p.d. required to send current through the internal resistance of a cell**.

49. (a) Draw circuit diagrams showing how two lamps may be connected to the mains power supply in a house so that

(i) the lamps are controlled by only one switch. (**01** mark)

Mains

Switch

Live

Neutral

Lamps

(ii) each lamp is controlled by its own switch. (**01** mark)

Mains

Switches

Live

Neutral

Lamps

(b) (i) An electric flat iron is marked 240 V, 800 W.

What does this mean? (**01** mark)

**The flat iron gives out 800 joules of heat energy per second when a potential difference of 240 V is applied across its ends**.

(ii) Calculate the quantity of heat energy that is given out by the flat iron in b(i) above if it is operated for 1 hour. (**01** mark)

**Power = 800 W, time = 3600 J**

**Heat energy, *H* = power × time**

***H* = 800 ×3600 = 2880000 J**

50. A dam at a height of 550 m above sea level supplies water to a hydroelectric generating station which is at a height of 50 m above sea level. 2000 kg of water pass through the turbines in one second.

(a)

(i) Calculate the potential energy per second. (**01** mark)

**Height, *h* = 550 – 50 = 500 m, mass in one second, *m* = 2000 kg, *g* = 10 m s-2**

**Potential energy per second, *Q* = *mgh***

***Q* = 2000 ×10 × 500**

***Q* = 10,000,000 W**

(ii) the maximum electrical power output of the station if the whole system is 80% efficient. (**02** marks)

**Electrical power output, *P* =**

**P = 8,000,000 W**

(b) Find the velocity of the water when it reaches the generating station.

(**01** mark)

**Potential energy per second = kinetic energy per second**

***mgh = ½mv*2**

**10,000,000 = ½×2000×*v*2 = 1000 × *v*2**

**Hence *v* = = 100 m s-1** END