

PRELIMINARY PHYSICS REVISION

PAPER 2

PART A

1. **B**

$$I = q/t$$

2. **C**

$$\vec{V} = \Delta \vec{s} / \Delta t$$

Velocity is a vector quantity which measures the rate of change of displacement.

3. **C**

$$R_T = 40 + 60 = 100\Omega \quad I_T = 2A$$

$$V(60\Omega) = 2 \times 60 = \mathbf{120\text{ V}}$$

4. **B**

Momentum is always conserved in any collision providing the net force acts on the system is zero.

5. **D**

$$P = E/t = VI = I^2R$$

Power measures the **rate** at which energy is dissipated. Thus it is not determined by the amount of time used.

6. **D**

$$V = f\lambda \quad f = 1/T$$

7. **A**

Sound is a mechanical wave which requires a medium to propagate.

8. **D**

$$P = VI = V^2/R \quad R = V^2/P$$

9. **D**

$$\begin{aligned} \text{Average velocity} &= \text{Total displacement} / \text{Total time} \\ &= \text{Total area of v-t graph} / \text{time} \\ &= (6 \times 4 + 6 \times 1 \times 2) / 5 \\ &= \mathbf{5.4\text{ ms}^{-1}} \end{aligned}$$

10. **B**

Lowest volume = Smallest amplitude

Highest pitch = Greatest frequency

11. **A**

$$\left. \begin{array}{l} I_1 \propto 1/d_1^2 \\ I_2 \propto 1/d_2^2 \end{array} \right\} I_1 : I_2 = d_2^2 : d_1^2 = 150^2 : 100^2 = 2.25$$

$$I_2 = 64 \div 2.25 = \mathbf{28.4\text{ units}}$$

12. **B**

$P = VI = V^2/R$ Substitute the values of voltages and powers, we find the ans. B is correct.

13. **D**

$$F = Eq$$

Since the all charges are identical and the electric field strength is uniform, the forces acting on the charges are equal.

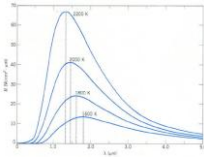
14. **D**

15. **B**

In a red giant, there are a nuclear fusion of helium at the core and the fusion of hydrogen in the surrounding shell. The main source of energy to counteract the gravitational collapse in a red giant is due to fusion of helium.

16. **D**

Alpha particles have the least penetrating power and gamma rays have the greatest penetrating power

17. **A**18. **C**

Star Q is much bigger than the sun but has lower surface temperature. It is therefore a red giant.

19. **C**

Hubble discovered that the spectra of all galaxies displayed red shift. Based on the extent of the red shift of different galaxies He then developed Hubble's law. These collective evidence led to the development of the "big bang" theory

20. **B**

The main energy source of all stars is the nuclear fusion reaction.

21. **D**

Colour index is a numerical value used to indicate the surface temperature of a star.

22. **D**

Absolute magnitude is a number used to indicate the Luminosity of a star. The smaller absolute magnitude indicates the greater luminosity.

23. **A**

The uneven distribution of matter in the early universe allowed accretion which led to the formation of stars.

24. **C**

The period of the sunspot activity occurs every 11 years

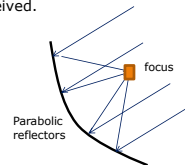
25. **A**

Newton proposed the law of universal gravitation.

PART B

(26) The signals collected from outer space are in the form of electromagnetic waves, which experiences attenuation due to the inverse square law.

By using parabolic reflectors, weak electromagnetic signals can be reflected off the concave surfaces and are concentrated at the focus. This is used to boost up the intensity the signals received.



(27) (a) X ray has shorter wavelengths than visible light

X ray is filtered out by the atmosphere whereas visible light is not

(b) Both are electromagnetic waves which travel at $3.00 \times 10^8 \text{ ms}^{-1}$ in vacuum.

Both do not require medium for propagation

(28)

Electromagnetic wave	Detector	Can be produced by	Filtered out by atmosphere(yes or no)
X rays	Photographic film	X-ray tube	Yes
Visible light	eyes	Lamp	No
Gamma-ray	Photographic film	Radioactive element	Yes

(29)

- ❑ Galvani: In 1786, experimented with dissected frog. He noticed that two different metals attached to a nerve of a dissected frog caused the frog's legs to contract when the two metals touched each other. Galvani believed the contraction of the frog's legs was due to "animal electricity".
- ❑ Volta disagreed with Galvani's idea of animal electricity. He believed that the electricity was produced by the contact of the two different metals. → leading to the construction of Voltaic pile, an assembly of large number of alternate zinc and brass discs separated by cardboard discs soaked in salt solution. Voltaic pile was the first source of portable electrical energy, fore-runner of present day batteries
- ❑ Although Galvani's idea of animal electricity was not correct, his work was the catalyst for Volta in designing and constructing Voltaic pile → opened the door for the further investigation and research into production of continuous current. **Hence they both equally contributed.**

(30)

Fuses

conducting wire with high resistance and low melting point → will be melted if the current exceeds a given limit.

Avoid damages to electrical appliances and possible fires due to excessive heat produced.

Earth wire

Connect to the casing of an appliance (appliance is earthed)

In case the active wire is in contact with the casing of the appliance → disconnect the current due to short circuit.

Avoid getting electric shock when touching the casing → protecting against muscular contraction, ventricular fibrillation ... → death and injury.

Therefore spending money for safety devices is justified since it prevents possible damages to appliances and injury, death to people.

(31) Pros

Our lives have been made easier every day by the use of a vast number of electrical gadgets. Many tasks that were once performed by hand are now accomplished with a purpose-built electrical appliance and most domestic and industrial work requires less labour.

Electricity also gave people access to entertainment and communication from their homes. Eg. TV, internet ...

Increases safety on streets and at homes
(Street lights make streets safer at night.)
Alarm systems security cameras enhances our safety at homes)

Cons

The production of electricity strains our current supply of non-renewable resource of fossil fuel.

Excessive industrialisation has eroded the cultures of many local communities.

Increasing reliance on machines and technology results in less need for human labour and this may lead to unemployment and social disturbance.

The combustion of coal and petroleum has led to concerns about global warming and acid rain.

Assessment

Increase access electricity for a community has a positive impact since the overall benefits outweigh the problems which with strict regulations can be minimised.

- (32) (a) Inertia is the tendency of an object to resist the change in its state of motion.



Apply law of conservation of momentum.

$$P_i = P_f = 0$$

$$45 \times 4 + 60 \times (-3) + 150V = 0$$

$$V = 0 \text{ ms}^{-1}$$

The velocity of the boat is 0 ms^{-1}

(33)

Heliocentric	Geocentric	Compromise
Kepler, Newton, Copernicus	Ptolemy, Aristotle	Tycho Brahe

- (34) (a) Wien's law

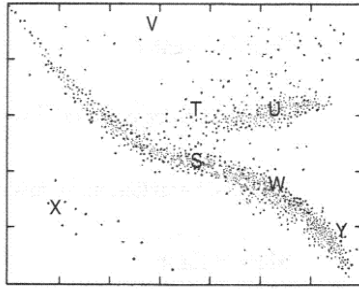
$$\lambda_p T = 2.9 \times 10^{-3}$$

$$T = 2.9 \times 10^{-3} + 1000 \times 10^{-9} = 3000 \text{ K}$$

(b) red

(c) M

(35)



H-R diagram

