

YEAR 12 SEMESTER ONE PHYSICS EXAMINATION
2001

2

Marks/m

SECTION B ANSWER SHEETS

Name: S. M. Anderson

Class: 12PH 2001

Question 16

$$(a) F = 1.2 \times 10^{-3} \times 100 \times 1 \times 10^{-3} \\ = 1.2 \times 10^{-4} \text{ N}$$

Must have unit

$$(b) \frac{F}{m} = a \therefore a = \frac{1.2 \times 10^{-4}}{1 \times 10^{-30}} = 1.2 \times 10^{26} \text{ m/s}^2$$

$$r = \frac{v^2}{a} = \frac{100}{1.2 \times 10^{26}} = 8.3 \times 10^{-25} \text{ m}$$

Question 17

(a) induced by changing magnetic flux in solid conductors

fluorescent screen, electron gun, deflection plates

(b) when an electron hits the screen light is produced. The deflection plates control the path of the beam.

Question 18

(a) induced by changing magnetic flux in solid conductors
eddy currents circulate

(b) Eddy currents produce heat and so cause energy losses

Name:

Class:

(c) the yoke of the transformer is laminated into thin sheets each insula from the other. This reduces the size of the eddy currents and reduces energy losses

Question 19

(a) A circular orbit around the Earth of period 24 hours in the plane of the equator.

(b) communications satellites use these orbits since the satellite is always visible to both sites on the Earth.

(c) A site near the equator so that the greater initial velocity of the satellite due to the Earth's rotation can allow the satellite to reach the height required for a geostationary orbit.

Question 20

(a) Distance
Sunspot activity
Van Allen Radiation belts

2 factors only required

(b) Planets move around the Sun in elliptical paths with the Sun at one focus of the ellipse

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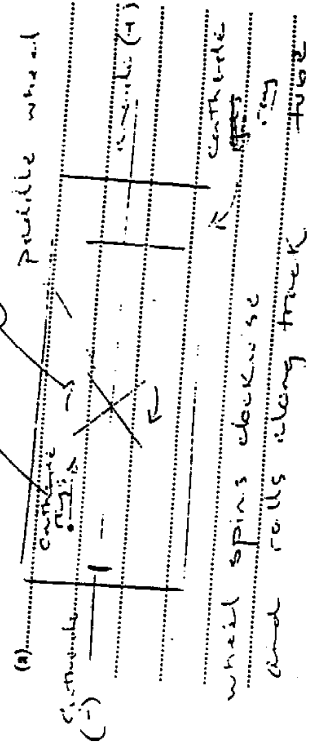
(c) The total energy and total linear momentum of the spacecraft-Jupiter system is conserved as it fly by. The spacecraft gains speed relative to the sun and Jupiter slows down slightly.

Question 21
(a) $\frac{V_s}{V_p} = \frac{330,000}{20,000} = 16.5:1$

$\therefore N_p/N_s = 1/16.5 = 0.061$
(b) $\frac{N_p}{N_s} = \frac{330,000}{67,000} = 5.5:1$

(c) Energy losses due to heating of the iron core by the induced eddy currents

Question 22



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(b) cathode rays have energy and momentum (one only required)

Question 23

(a) The light is given off by glass atoms after they are struck by cathode rays

(b) As the pressure is reduced the striations are caused by air molecules releasing light after being struck by the cathode rays

Question 24

(a) $V_p = 50 \sin 60^\circ = 43.3 \text{ m/s}$

(b) $\lambda = \frac{2 \times 50 \sin 60^\circ}{9.8} = 8.84 \text{ s}$

(c) $\lambda = \frac{5000000 \times 8.84}{221} = 2.21 \text{ m}$

Name.....
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Question 25

- (a) To change the current direction in the sides of the coil even half revolution so that the coil spins continuously in the same sense

$$\tau_{\text{Max}} = 100 \times 0.12 \times 0.1 \times 5 \times 200 \times 10^{-3} = 1.2 \text{ Nm}$$

① $\frac{1}{\text{mark unit}}$
Substitution and powers often.

Question 26

- (a) This experiment attempted to measure the speed of the Earth through the ether. ① No fringe pattern was noticed when the apparatus was turned through 90°  ①

(b) The speed of light was the same for all observers. It is independent of the motion of the observer.

Question 27

$$v = \frac{2 \times \pi \times 0.3}{0.1} \quad \text{① } \mu\text{m} \quad \text{② } t = 0.1 \text{ s}$$

$$= 189 \text{ m/s} \quad \text{① } \mu\text{m} \quad \text{② } \text{mark substitution}$$

$$60 \text{ cm/s} = 16.7 \text{ m/s}$$

Yes (18.97/16.7) No explanation required

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Question 28

- (a) Towards the centre of the Earth (downwards is wrong)

$$v = \frac{2 \times \pi \times 384,400,000}{27.32 \times 24 \times 60 \times 60} \quad \text{①}$$

$$= 1023 \text{ m/s}$$

(c)

$$F = mv^2$$

① Subst.

$$= \frac{7.36 \times 10^{24} \times 1023.2^2}{384,400,000}$$

$$= 2.0 \times 10^{24} \text{ N} \quad \text{① } \mu\text{m} \quad \text{② } t = 0.1 \text{ s}$$

Question 29

$$3 \times 10^8 \text{ m/s}$$

$$3 \times 10^8 \text{ m/s}$$

$$7 \times 10^{15}$$

$$= \frac{3 \times 10^8}{7 \times 10^{15}}$$

$$= 3 \times 10^{-7} \text{ s}$$

Question 30

Name: _____

Class: _____

(a) $g = 6.67 \times 10^{-11} \times 9.1 \times 10^{24}$ ^{① equation}

$= \frac{(4800 \times 6.67)}{26.3} \text{ m/s}^2$ ^{② substitution and powers of ten}

(b) $W = 80 \times 26.3$

$= 2108 \text{ N}$ ^③

YEAR 12 SEMESTER ONE PHYSICS EXAMINATION
2001

SECTION C ANSWER SHEETS

TOTAL
SECTION C

Name: S. McAndrew

Class: year 12 physics

substitution

①

Question 31

correct
arithmetic

(a) $\frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{1}{0.6} = 1.67$ ^①

$\therefore t_E = 1.67 \times 10$ ^{multiplication}

$= 16.7 \text{ years}$ ^{by ①}

- (b) A rapidly moving clock shows less time than a clock at rest. ^①
But the moving clock thinks it is at rest and that the stationary clock is moving away from it. Which observer is correct?
- (c) When the spaceship decelerates the time dilation equation cannot be applied since the spaceship is a non-inertial frame of reference.

* In 1 mark questions give 1 mark for correct substitution and powers of ten
In 2 mark questions the second mark is for correct arithmetic / or correct unit

Name

Class

Question 32

(a) J. J. Thomson (Thomson) (1)

$$q\sqrt{B} = q\sqrt{E} \quad \text{--- (1)}$$

$$\sqrt{B} = \sqrt{E} \quad \text{--- (1)}$$

$$\frac{1}{2}mv^2 = qV \quad \text{--- (1)}$$

$$\therefore \frac{1}{2}m\left(\frac{E}{B}\right)^2 = qV \quad \therefore \frac{q}{m} = \frac{E^2}{2VB^2}$$

(c) All cathode rays are identical (1)
OR Cathode rays are present in all matter
OR Cathode rays are smaller than hydrogen ions

Question 33

$$(a) \frac{1}{2} \times 9.8 \times t^2 = 1000$$

$$\therefore t = 14.3 \text{ s}$$

$$(b) S_H = W_H t = 100 \times 14.3$$

$$= 2857 \text{ m}$$

$$(c) \frac{1}{2}mv^2 = \frac{1}{2}mv^2 + mgh$$

$$v^2 = 200^2 + 2 \times 9.8 \times 1000$$

$$\sqrt{v} = 244 \text{ m/s}$$

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Question 34

$$(a) V_0 = mv^2$$

$$= 0 + 9.8 \times 5$$

$$= 49 \text{ m/s}$$

$$V^2 = \sqrt{200^2 + 49^2}$$

$$= 206 \text{ m/s}$$

$$\Theta = 13.3^\circ$$

Question 34

$$(a) \sqrt{H} = \frac{100}{1.82} = \frac{10}{0.349} = 18.2 \text{ m/s} \quad \text{--- (1)}$$

$$(b) V_0 = W_0 + 2a \Delta y \quad \text{Substitute}$$

$$0 = W_0 + 2 \times -9.8 \times 37 \quad \text{--- (1)}$$

$$W_0 = \sqrt{7252} \text{ m/s} \quad \text{--- (1)}$$

$$= 26.9 \text{ m/s}$$

$$(c) \tan \Theta = \frac{2252}{18.2} \quad \text{Substitute}$$

$$\therefore \Theta = 88.5^\circ \quad \text{--- (1)}$$

$$= 88.5^\circ$$

Name.....

Class.....

Question 35

$$(a) \quad E = \frac{100}{0.01}$$

$$= 10^4 \text{ V/m}$$

$$(ii) \quad F = 1.6 \times 10^{-19} \times 10^4$$

$$= 1.6 \times 10^{-15} \text{ N}$$

(c) upwards (towards + plate)

(d) downwards (towards - plate)

$$(e) \quad qE = q/rB$$

$$v = \frac{E}{B}$$

$$= \frac{10^4}{0.05} = 2 \times 10^5 \text{ m/s}$$

Question 36

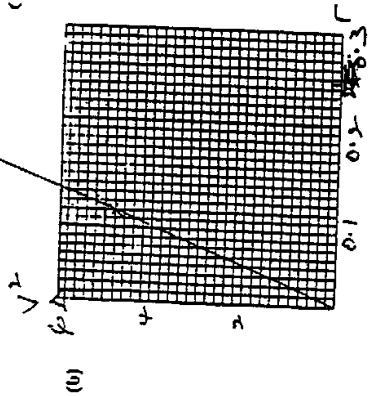
$$(a) \quad F = \frac{mv^2}{r} \quad \text{--- (1)}$$

$$0.25 \times 9.8 = \frac{0.05 v^2}{r} \quad \text{--- (2) substitution}$$

$$v^2 = 49 \quad \text{Ans}$$

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Class.....



straight line — (1)
correct gradient
(same as part (i)) — (1)

(c)

$$v^2 = 49 \times 0.5$$

$$\therefore v = 4.9 \text{ m/s}$$

$$T = \frac{2 \times \pi \times 0.5}{4.9} = 0.64 \text{ s}$$

Question 37

$$(a) \quad v = \frac{50 \times 20 \times 10^{-6}}{1.0 \times 10^{-3}} \text{ V}$$

$$(b) \quad \frac{\Delta v}{\Delta t} = \frac{\Delta \lambda}{\Delta t} \quad \text{--- (1)}$$

$$\Delta \lambda = \frac{1 \times 10^{-3} \times 0.5}{1000} \quad \text{--- (2) substitution}$$

$$= 5 \times 10^{-7} \text{ Wb}$$

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(c) $B = \frac{\phi}{A}$
 $= \frac{5 \times 10^{-9}}{5 \times 10^{-3}}$ — ① substitution
 $= 10^{-6} T$ — ① UNIT

Question 38

(a) Albert Einstein

(b) The minimum energy a photon must have if it is just to release an electron from the metal ϕ

(c) The lowest frequency of the light that releases electrons from the metal

(d) photocells ①
 solar cells ① 2 only needed
 breathalyzer ①

YEAR 12 SEMESTER ONE PHYSICS EXAMINATION
 2001

SECTION A ANSWER SHEET

Name: S. McAndrew

Class: year 12/12/11

TOTAL
SECTION A

Instructions for answering multiple-choice questions

- Complete your answers in either blue or black pen.
- Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample: $2 + 4 =$ (A) 2 (B) 6 (C) 8 (D) 9
 $A \bigcirc B \bigcirc C \bigcirc D \bigcirc$

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.
 $A \bigcirc B \times C \bigcirc D \bigcirc$

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word *correct* and drawing an arrow as follows.
 $A \times B \text{ correct } C \bigcirc D \bigcirc$

Start Here →

1. $A \bigcirc B \bigcirc C \bigcirc D \bigcirc$
2. $A \bigcirc B \bigcirc C \bigcirc D \bigcirc$
3. $A \bigcirc B \bigcirc C \bigcirc D \bigcirc$
4. $A \bigcirc B \bigcirc C \bigcirc D \bigcirc$
5. $A \bigcirc B \bigcirc C \bigcirc D \bigcirc$
6. $A \bigcirc B \bigcirc C \bigcirc D \bigcirc$
7. $A \bigcirc B \bigcirc C \bigcirc D \bigcirc$
8. $A \bigcirc B \bigcirc C \bigcirc D \bigcirc$
9. $A \bigcirc B \bigcirc C \bigcirc D \bigcirc$
10. $A \bigcirc B \bigcirc C \bigcirc D \bigcirc$
11. $A \bigcirc B \bigcirc C \bigcirc D \bigcirc$
12. $A \bigcirc B \bigcirc C \bigcirc D \bigcirc$
13. $A \bigcirc B \bigcirc C \bigcirc D \bigcirc$
14. $A \bigcirc B \bigcirc C \bigcirc D \bigcirc$
15. $A \bigcirc B \bigcirc C \bigcirc D \bigcirc$