X216/12/01

INFORMATION SYSTEMS HIGHER

Attempt **all** questions in Section I.

Attempt **all** questions in Section II.

Attempt **one** sub-section of Section III.

Part A	Applied Multimedia	Page 12	Questions 17 to 21
Part B	Expert Systems	Page 19	Questions 22 to 26
Part C	The Internet	Page 22	Questions 27 to 30

For the sub-section chosen, attempt **all** questions.

Read all questions carefully.

Do not write on the question paper.

Write as neatly as possible.

SQA

SECTION I

Attempt ALL questions in this section.

1. The Birnham Performing Arts Centre stores details about acts and agencies in a single table. A sample of records from this table is shown below. "Act" is the primary key.

Act	Description	Fee	Contact No.	Agency	Agency Tel. No.
Radio Gaga	Queen Tribute Band	£900	01315557856	Bright Stars	01617776531
Mysterio	Magician	£180	01915625617		
Lisa Samuel	Singer	£400	01874252521	Limelight	01874563636
Lookalikes	Dance group	£500	01718885632	Bright Stars	01617776531

(a) Describe **one** *data insertion* problem with this database design. **2**

(b) The data in the table above is in 2NF. Justify this statement. **2**

2. Define the terms

(a) *compound key*; **2**

(b) *foreign key*. **2**

3. Bright Stars Agency uses a database to help organise the Christmas party for staff and their children.

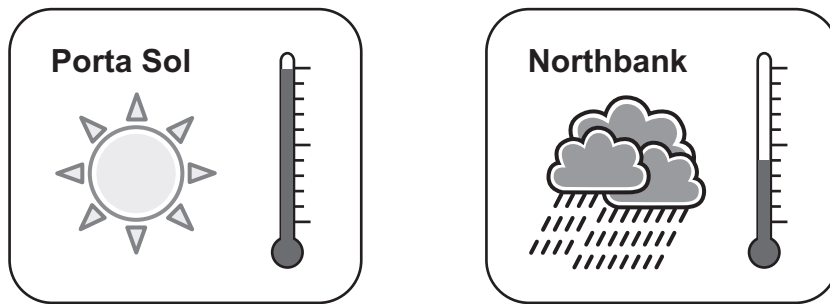| Employee Name	Department	Party Paid	Child
Jim Gregory	Accounts	✓	Lucy Chris
Claire Thomson	Personnel		Gemma
Sam Forester	Accounts	✓	Sarah

(a) Identify the *multi-valued attribute* from the table above. **1**

(b) State the most appropriate data type for storing "Party Paid". **1**

(c) The data in "Department" is stored as text. State **one** *domain constraint* which might apply to this attribute. **1**

4. Explain what is meant by the data type, *real*. **2**

5. State the *cardinality* of each of the following relationships.

(*a*) Train and Passenger **1**

(*b*) Smartphone and App **1**

6. Two examples of an app which shows the current weather and temperature in a specific locality are shown below.

State the category of this information according to its:

(*a*) *Frequency*; **1**

(*b*) *Form*. **1**

7. Information can be categorised according to its *Time*. The categories are *historic, present* and *future*. Information can also be categorised according to its *Type*.

State the different Type categories. **2**

8. A software strategy includes criteria for the evaluation of software and methods of providing user support.

(*a*) Other than cost, state **two** criteria for evaluating computer software. **2**

(*b*) Describe how FAQs provide user support. **2**

[Turn over

SECTION I (continued)

9. (*a*) Describe **one** aspect of the Regulation of Investigatory Powers Act (2000). **2**

   (*b*) State which Act gives citizens the right to find out how much government money was spent on recycling in 2010. **1**

10. Describe how *timelining* could be used to manage a project. **2**

11. State the purpose of a *footer* in a document. **2**

  (30)

[END OF SECTION I]

[Turn over for SECTION II on *Page six*

Attempt ALL questions in this section.

12. Northbank Supply Agency supplies part-time relief staff to sports centres and gyms in the Northbank area. Details of work carried out are recorded centrally in the office using timesheets as shown below.

Northbank Supply Agency

Employee Number _____1016_____

Employee Name _____R O'Donnell_____ Telephone _____0123 555 3434_____

Date	Venue	Venue Address	Duties	Hours worked	Hourly Rate
2/4/2012	Splash!	High Street Doonbrae	Lifeguard	8	£6·00
3/4/2012	Spa Pool	Diamond Hotel, Inverloch	Pool Attendant	4	£5·25
3/4/2012	Splash!	High Street, Doonbrae	Pool Attendant	4	£5·25
4/4/2012	Wellfit	Main Road, Northbank	Personal Trainer	6	£7·50

Employees are paid at an hourly rate which depends upon the duties performed. Pool Attendants receive £5·25, Lifeguards £6·00, Leisure Assistants £5·45, Gym Instructors £5·75 and Personal Trainers £7·50.

Northbank Supply Agency

Employee Number _____1037_____

Employee Name _____H Hashmi_____ Telephone _____0123 555 9681_____

Date	Venue	Venue Address	Duties	Hours worked	Hourly Rate
2/4/2012	Splash!	High Street Doonbrae	Personal Trainer	2	£7·50
3/4/2012	Spa Pool	Diamond Hotel, Inverloch	Pool Attendant	4	£5·25
3/4/2012	Splash!	High Street, Doonbrae	Pool Attendant	4	£5·25

Employees are paid at an hourly rate which depends upon the duties performed. Pool Attendants receive £5·25, Lifeguards £6·00, Leisure Assistants £5·45, Gym Instructors £5·75 and Personal Trainers £7·50.

SECTION II (continued)

12. (continued)

This data can be represented in un-normalised form as

<u>Employee number</u>
Employee name
Telephone
Date
Venue
Venue address
Duties
Hours worked
Hourly rate

Using Employee number as the primary key, transform this un-normalised data to third normal form.

You **must** show the intermediate stages of first normal form and second normal form and identify all primary and foreign keys at each stage of normalisation.

17

[Turn over

SECTION II (continued)

13. The owners of holiday properties in the Laguna Lake apartment complex rent their apartments to holidaymakers throughout the year.

   • Owners may own a number of apartments
   • Holidaymakers may make several bookings in a year

   A relational database has been set up to record these bookings. The entities and attributes are as follows:

   OWNER (OwnerID, OwnerName, OwnerAddress1, OwnerAddress2)
   BOOKING (CustomerID*, ApartmentNo*, Date, NumberOfNights)
   CUSTOMER (CustomerID, Forename, Surname, Address1, Address2, TelephoneNo)
   APARTMENT (ApartmentNo, Bedrooms, Floor, Price, OwnerID*)

   (*a*) Draw an *entity-relationship diagram* to represent this data model.   **6**

   Extracts of data from the OWNER and APARTMENT tables are shown below.

OwnerID	OwnerName	OwnerAddress1	OwnerAddress2
116	R Martinez		Laguna
119	T Garcia	Calle Londres, 8	Seville
134	J Loudon	11 Glasgow Road	Doonbrae
142	R Martinez		Laguna
151	D W Arthurs	9 Palmer Green	West Bratton

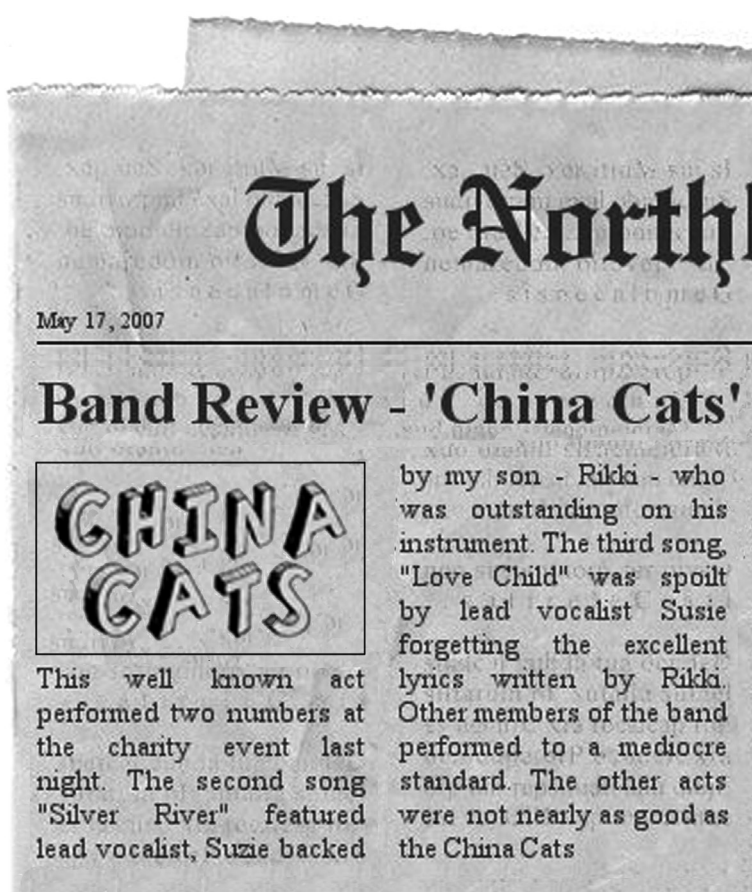| ApartmentNo	Bedrooms	Floor	Price	OwnerID
308	2	Upper	£280	116
213	2	Lower	£240	116
302	1	Upper	£240	127
450	1	Upper	£280	134

   (*b*) There is one *surrogate key* in these two tables. Identify the attribute and its table for this surrogate key and state how *entity integrity* would be affected if this attribute was not included, giving a reason for your answer.   **3**

   (*c*) Both tables have been sorted in order of OwnerID. State whether *referential integrity* has been implemented in these tables. Justify your answer.   **4**

14. *Presentation* and *Availability* are two characteristics that can affect the quality of information. Below is a review of an act in a local talent show which was published in the local paper, the Northbank Daily Echo. The review was written by the father of one of the band members.

Band Review - 'China Cats'

May 17, 2007

This well known act performed two numbers at the charity event last night. The second song "Silver River" featured lead vocalist, Suzie backed by my son - Rikki - who was outstanding on his instrument. The third song, "Love Child" was spoilt by lead vocalist Susie forgetting the excellent lyrics written by Rikki. Other members of the band performed to a mediocre standard. The other acts were not nearly as good as the China Cats

The table below shows an evaluation of the review using presentation and availability.

Characteristic	Comment
Presentation	The appearance of the graphic, "China Cats", is poor and would have been improved with the use of a photograph of the band.
Availability	The availability is poor as the Northbank Daily Echo is a local paper, not available nationally.

Complete a similar table for **four** other suitable characteristics. **8**

15. Birnham Services is intending to introduce *organisational information systems* into its business model.

   (*a*) State **three** different types of organisational information system. **3**

   As part of this development, they install a local area network.

   (*b*) (i) State the security risk with this type of network and an appropriate method of implementing data security. **2**

   (ii) The company choose a client-server network. Describe this type of network. **2**

   (iii) Describe appropriate methods of archive, recovery and backup storage of data for this network. **5**

SECTION II (continued)

16. A local supermarket is making increasing use of information management software. Spreadsheets are going to be introduced to produce customer receipts. A trial version has been developed which only includes a small number of the many items normally sold.

Items in column D are automatically entered using bar code scanners. When an item is scanned it appears in column D and its associated price is found and automatically entered using values from columns A and B. A screenshot of this trial version is shown below.

	A	B	C	D	E	F	G	H
1	**Item**	**Price**		**Customer Receipt**	**Till No**	HH17	**Date**	20/02/2012
2	Beans	£0·64						
3	Bread	£1·30		**Item**	**Quantity**	**Price**	**Total**	
4	Butter	£1·60		Beans	2	£0·64	£1·28	
5	Cheese	£3·10		Bread	1	£1·30	£1·30	
6	Coffee	£4·50		Tea	1	£3·25	£3·25	
7	Flour	£0·90						
8	Milk	£2·68					£5·83	
9	Sugar	£1·40						
10	Tea	£3·25				**Cash**	**£10·00**	
11						**Change**	**£4·17**	
12	**Items in list**	9						

(a) State the formula that is used in:

   (i) B12;   **2**

   (ii) F4.   **3**

(b) State **one** other class of information management software the supermarket could make use of. Describe **one** way in which the supermarket could make use of this class of software.   **3**

(c) Describe **one** social implication of the supermarket increasingly implementing an IS-driven business model.   **2**

                    (60)

[*END OF SECTION II*]

SECTION III

Attempt ONE sub-section of Section III

For the sub-section chosen, attempt *all* questions.

SECTION III

Part A—Applied Multimedia

Attempt all questions.

17. A local secondary school is making use of a *hybrid* system to deliver learning materials to pupils.

    (*a*) Explain what is meant by a hybrid system as a delivery medium.   **2**

    (*b*) Describe how a hybrid system could be used in education.   **2**

18. Virtual Breaks has just purchased the latest golf simulator specifically aimed at the home entertainment market.

Their advertisement states:

"Experience the best in home entertainment. Our Virtual Golf Simulator allows you to choose from eight of the world's best golf courses . . ."

Describe **three** examples of how different multimedia elements could be used to enhance this product.   **6**

19. Illustrate the process of *kerning* by drawing **two** diagrams, one without kerning and one with kerning.   **2**

[Turn over for Question 20 on *Page fourteen*

SECTION III

Part A—Applied Multimedia (continued)

20. Viktor Marazech has recently qualified as a personal fitness trainer and has decided to set up his own business.

He wants to create a website to advertise his services. The website will feature examples of fitness programmes as well as dietary and nutritional information.

Viktor has prepared his *project brief* and contacts the *Project Manager* of a multimedia development company to help him.

(*a*) After the meeting with Viktor, the Project Manager draws up a *requirements specification*.

   (i) Describe the difference between the purpose of a project brief and a requirements specification. **2**

   (ii) One item contained in a requirements specification is *user/audience*. Viktor's website would be of interest to people who want to get fit.

     State **two** other items found in a *requirements specification* and give an example of each from the paragraph of information above. **4**

The Project Manager passes the requirements specification to the other staff members in the development team.

(*b*) State **two** other personnel within the multimedia development team and describe how each might be involved in the creation of Viktor's website. **6**

(*c*) Once completed, the website will have to be tested. Name and describe **one** form of testing that would be carried out by:

   (i) the development team; **2**

   (ii) Viktor Marazech. **2**

SECTION III

Part A—Applied Multimedia (continued)

20. (continued)

(*d*) The new website has been completed and is a great success. A section of a fitness programme is shown below.

	10 mins Jog at a steady pace
	Do sit ups until you feel quite tired, then do 5 more.
	5 mins Jog at a steady pace

   (i) Give **one** example of qualitative information and **one** example of quantitative information from the above screenshot.

2

 (ii) Use this website to illustrate the difference between the *value* and *cost* of information.

2

[Turn over

SECTION III

Part A—Applied Multimedia (continued)

21. VouchSafe is an online company specialising in the printing of high quality gift voucher stationery for the business market. Customers can choose from a range of voucher designs or create something individual to suit their own business.

    The screenshots on the opposite page show the "Home", "Voucher Samples" and "Customer Testimonial" pages from their website.

    (*a*) *Providing Feedback* and *Differing Ability Levels* are two criteria used to evaluate web pages for good user interface design.

    Identify **two** other relevant criteria that would be used in this case and use them to evaluate the web pages opposite.

    6

    (*b*) The "Contact Us" screen has an option for customers to complete an initial enquiry form. An example is shown below.

Name:	
E-mail:	
Phone:	
Subject:	Please Select Topic... ▾
Message:	

    Clear form   Send

    (i) State the type of *user interface* for the initial enquiry form shown and describe **one** advantage of using this type of user interface in this case.

    3

    (ii) State **one** other type of *user interface* shown on the website.

    1

21. (continued)

VouchSafe Ltd

| Home | Voucher Samples | Creating a Bespoke Voucher | Contact Us | Customer Testimonials |

Helping businesses create stunning gift voucher stationery.

Choose from our range of high quality image based vouchers or allow us to provide vouchers personalised to your business.

All our gift vouchers are presented in cheque book style, individually numbered with stubs.

£10 Gift Voucher

£10 Gift Voucher

Voucher Samples

| Home | Voucher Samples | Creating a Bespoke Voucher | Contact Us | Customer Testimonials |

£10 Gift Voucher

£10 Gift Voucher

Printed Restaurant Vouchers

Choose from one of our high quality restaurant photographs.

Vouchers are provided with a standard reverse side displaying the company contact details.

Prices start from £30 for a book of 50 vouchers

Customer Testimonials

| Home | Voucher Samples | Creating a Bespoke Voucher | Contact Us | Customer Testimonials |

John James
I am absolutely delighted with the gift vouchers from VouchSafe. I ordered everything easily online and my vouchers arrived within 3 working days. Excellent service, I would recommend to anyone.

Ark Software
We designed our own voucher and we were surprised at how easy it was. Great service, cheapest on the web by far.

Cow Shed Restaurant
Great range, super quality, competitive prices and fast delivery. Will certainly use again.

Westwood Garden Centre
Used the standard vouchers and customers have been commenting positively on the great photographs on the vouchers. Will certainly use this company again and would recommend to others.

Cake Kitchen
Took our own photos and sent them to VouchSafe. They designed the vouchers and we are very happy with the result. Competitive price and fast delivery. Thanks.

SECTION III

Part A—Applied Multimedia (continued)

21. (continued)

(*c*) Companies have the opportunity to supply their own artwork and create personalised gift vouchers. Artwork can be uploaded to the website as TIFF, JPEG or GIF files.

Assign each of the six statements below to TIFF, JPEG or GIF.

1 default file format for digital still cameras
2 very restricted colour depth
3 may require some dithering
4 most suitable file type for print media
5 most suitable file type for web graphics
6 most suitable file type for web photos.   **6**

(*d*) For customers who do not supply their own artwork, VouchSafe displays on its website a range of vouchers for purchase.

VouchSafe makes use of *digital watermarks* on the sample vouchers.

Explain why the use of digital watermarks benefits VouchSafe.   **2**

(50)

[END OF SECTION III—PART A]

SECTION III

Part B—Expert Systems

Attempt all questions.

22. Apple trees can develop various problems. Here is some information about three of these problems.

A   Bitter pit
- Several small brown sunken pits on fruit skin
- Tastes bitter under pit

B   Brown rot
- Browning of the fruit skin
- Tastes rotten

C   Scab
- Brown scabs on the fruit skin
- Tastes fine

An expert system is being devised to diagnose and help with a solution for problems with apple trees.

(*a*) (i) Derive **two** *attribute-value pairs* for bitter pit from paragraph A. **2**

 (ii) Create a *decision tree* based on the attribute-value pairs from part (i) or otherwise. Complete this decision tree for the three types of problem mentioned in paragraphs A, B and C. **4**

Two of these three problems have recommended solutions. It is known that spraying with chemicals can treat scab. Brown rot can be dealt with by removing and burning the infected fruit. However, there is no solution recommended for bitter pit.

The expert system is being created with variables "problem" and "solution".

(*b*) Create **three** rules for solutions to the three problems above. You should make use of the two variables "problem" and "solution". **6**

(*c*) Describe **two** benefits of using an expert system on apple tree problems. **2**

(*d*) Describe **one** drawback of creating an expert system on apple tree problems. **1**

(*e*) Describe the role of the *knowledge engineer* in the creation of this expert system. **3**

[Turn over

SECTION III

Part B—Expert Systems (continued)

23. Jennifer works in a baker's shop. She has been asked to describe some of her working practices. She makes the following notes.

   I If a customer asks for a sausage roll and the sausage roll is not hot enough then do NOT reheat the sausage roll.

  II A chocolate éclair contains fresh cream. A finger doughnut contains fresh cream. All fresh cream cakes should be displayed in the refrigerated cabinet.

(*a*) Represent each simple statement in paragraph I by using a shorthand or code and then use propositional logic to represent the whole statement. **4**

(*b*) Represent each of the three sentences in paragraph II using predicate logic. **5**

24. In a forward chaining expert system, facts P, Q, R and S are known to be true. The following rules are in the knowledge base.

  1   P and Q gives T

  2   P and Q gives V

  3   Q and T gives W

  4   S and T gives W

  5   Q and R and S gives W

(*a*) State which of these rules would be included in the *conflict set*. **3**

(*b*) (i) Describe the specificity conflict resolution strategy. **2**

     (ii) State which rule would be fired using specificity and describe the change caused by firing this rule. **3**

(*c*) State the purpose of the *RETE algorithm*. **2**

SECTION III

Part B—Expert Systems (continued)

25. An expert system on tortoises produces the following output screen.

> **The Tortoise Expert**
>
> The tortoise does not
>
> 1   move around much   CF 50%
> 2   respond to hand waving close to eyes   CF 80%
> 3   feed itself   CF 75%
>
> The conclusion is
> "Get an ophthalmic test for frost damaged eyes"   **End**

(*a*) Give **one** example of qualitative information and **one** example of quantitative information from the above output screen.   **2**

(*b*) Evaluate the user interface as shown for this expert system.   **2**

(*c*) The rule used to produce the conclusion based on the three facts shown has a certainty factor of 90%. Calculate the certainty factor for the conclusion.   **2**

(*d*) Use the expert system on tortoises to illustrate the difference between the *value* and the *cost* of information.   **2**

26. (*a*) Describe a distinction between a *decision support system* and an *expert system*.   **2**

(*b*) The PROSPECTOR expert system was first successfully used in 1980. State the domain for this "classical" expert system and describe how the inference engine operated.   **3**

    (50)

[END OF SECTION III—PART B]

[Turn over

SECTION III

Part C—The Internet

Attempt all questions.

27. Northbank Supply Agency is developing a website. An extract from a test page is shown below.

(a) Part of the HTML code for the test page is shown here.

1. <head>
2.
3. <style>
4. h5 {text-align:center}
5. </style>
6.
7.
8. <h1>Northbank Supply Agency</h1>
9. <**Y** align=center>
10. Pool Attendant/Lifeguard
11. <**W**>Leisure Assistant/Gym Instructor/Personal Trainer</**W**>
12. </**Y**>
13. <**X**> We can supply the above staff for
14. <**Z** style="font-size:24px">ANY</**Z**>
15. Sports facility within 50 KM of Northbank</**X**>
16. </body>

(i) The HTML tags <p> and <br> are used to format lines of text. These tags have been replaced in the above code by the letters **W** and **X**.

State which tags have been replaced by each of the letters **W** and **X**. Justify your answer. **4**

(ii) The HTML tags <span> and <div> are used to format text. These tags have been replaced in the above code by the letters **Y** and **Z**.

State which tags have been replaced by each of the letters **Y** and **Z**. Justify your answer. **4**

SECTION III

Part C—The Internet (continued)

27. (continued)

    (*b*) Write the missing HTML code for

        (i) line 2;

       (ii) line 6;

     (iii) line 7.   **3**

    (*c*) The designer was asked to make some changes to the test page and replace the code in lines 10 and 11 with

```
10. <table border = "1">
11. <tr><td><h5>DUTY</h5></td>
12. <td>Rate</td></tr>
13. <tr><td><Pool Attendant</td>
14. <td>£5·25</td></tr>
15. <tr><td>Leisure Assistant</td>
16. <td>£5·45</td></tr>
17. </table>
```

Sketch the output which would be produced by this code.   **4**

[Turn over

SECTION III

Part C—The Internet (continued)

28. (*a*) The table shown below illustrates the differences between Class A, B and C IP addresses. It has a number of missing entries which are highlighted as I, II, III and IV.

State a suitable entry for each of the four missing values. **4**

Class	Sample Address	Number of networks	Number of hosts
A	120.0.123.123	(I)	16777216
B	(II)	16384	65536
C	(III)	2097152	(IV)

(*b*) The following are some of the tasks involved in transmitting data across the Internet using the TCP/IP suite of protocols.

1   uses routers
2   responsible for host to host communication
3   reassembles packets into the correct order
4   uses routing tables
5   responsible for communication between networks.

Some of these tasks are characteristic of TCP and others of IP.

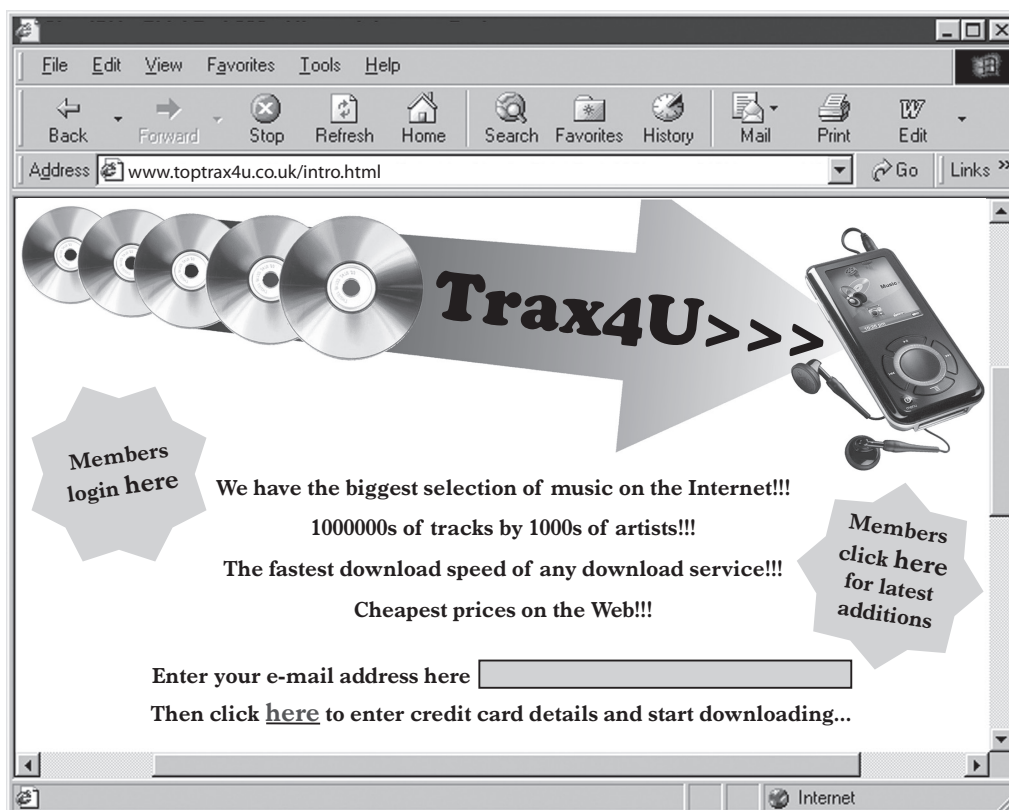 (i) Assign each of the five tasks to either TCP or IP. **5**

 (ii) Name **two** other *Internet protocols* and describe their uses. **4**

SECTION III

Part C—The Internet (continued)

29. Hayley was browsing the World Wide Web looking for some music by her favourite band when she found this site.

(*a*) Use this website to illustrate the difference between the *value* and *cost* of information.

2

The URL of the site is http://www.toptrax4u.co.uk/intro.html.

(*b*) Identify and name **two** parts of the structure of this URL.

4

(*c*) Use **one** example from the information displayed to comment on the *credibility* of the web page. Give a reason for your answer.

3

(*d*) Give **one** example of qualitative information and **one** example of quantitative information from the above web page.

2

(*e*) One characteristic of site design is *browser compatibility*. State **two** other characteristics of site design and comment on the above web page in terms of each of them.

4

[Turn over for Question 30 on *Page twenty-six*

SECTION III

Part C—The Internet (continued)

30. The World Wide Web is one service provided by the Internet.

(*a*) Describe the function of the following Internet organisations.

    (i) W3C   **2**

    (ii) Nominet   **2**

(*b*) Describe **one** possible use for each of the following types of Internet resource.

    (i) Academic web page   **1**

    (ii) Commercial web page   **1**

    (iii) Personal web page   **1**

(50)

[END OF SECTION III—PART C]

[END OF QUESTION PAPER]

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